Federal Ministry
Republic of Austria
Sustainability and Tourism

Integrated National Energy and Climate Plan for Austria

2021-2030

pursuant to Regulation (EU) 2018/1999 of the European Parliament and of the Council on the Governance of the Energy Union and Climate Action

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Contents

Part 1

SECTION A: NATIONAL PLAN

1. OVERVIEW AND PLAN DEVELOPMENT PROCESS

1.1. Summary

i. Political, economic, environmental and social context

Austria is a federal republic built on the economic principles of the social market economy. Balancing the interests of employers and employees plays an essential role in political discourse, although the 'social partnership' has undergone changes in recent years. The standard of living is very high, even by European standards, and the long-term average unemployment rate is relatively low. Social benefits and the progressive taxation of wages and income have an equalising effect on society. Since 1990, population growth in Austria has accelerated significantly, in particular due to immigration from EU Member States and third countries. This growth is concentrated primarily in metropolitan areas, while some of the surrounding rural areas are exhibiting downward population trends.

The environmental situation in Austria can be described as positive in terms of essential parameters such as water quality, air quality (with the exception of certain regions) and the use of renewable energy resources. Furthermore, by European standards a very high percentage of agricultural land is farmed in an ecological or environmentally appropriate way, and there are very high levels of sustainable forest use. There are, however, areas for improvement, such as the development of transport, in particular in conurbations and along transit routes, and the accompanying immission levels. This problem area is being addressed, including on a long-term basis, through the continuous development of rail infrastructure. Currently, Austria already has the highest share of rail transport within the European Union.

Austria is also currently intensifying its efforts to achieve CO_2 savings in the area of private transport. The Tax Reform Act 2020 [*Steuerreformgesetz 2020*] that has been adopted implements additional ecological measures in the area of mobility and introduces the taxation of sustainable fuels. The intention, among other things, is to provide a price signal as early as the point at which the purchase decision is made by introducing a registration tax that is dependent on price and emissions (with a tax rate of up to 32% and a penalty for particularly emission-intensive passenger cars). A CO_2 component will also be introduced in the area of engine-related insurance tax (current motor vehicle tax), thereby steering a course towards low-emission motor vehicles. In addition, electric bicycles will become eligible for input tax deduction and tax incentives will be provided for biogas, sustainable hydrogen and liquefied natural gas.

Together with companies and private households, public budgets are the main sources of financing for measures focussing on the climate and energy. Sustainable public finances thus create the room for manoeuvre needed to develop strategic options for meeting climate and energy targets. In view of the long-term challenges of decarbonisation, the Austrian government is therefore committed to sustainably consolidating public budgets and permanently reducing the general government debt. In order to do so, it is necessary to critically examine whether the existing expenditure and revenue structure is compatible with the climate and energy targets. It is also important to minimise the risk to public budgets from missed or delayed action (cost of inaction), as this is counterproductive to the objective of permanently reducing general government debt. For the first time since 1954, the government will spend less than it receives. This means the end of the debt management policy, without introducing any new taxes. These sustainable budget and tax policies must also be pursued for the rest of the 2020s. In the interests of budgetary sustainability, it is therefore necessary to ensure that a system of reciprocal financing is provided for measures that are relevant in terms of budgets and tax policy.

In several regions, land use is a critical issue. Alongside population trends and economic prosperity, the primary reason for this is the lack of adequate spatial planning tools at local and regional level.

In connection with the economic, environmental and social context of the plan, the UN's Sustainable Development Goals (SDGs) are also of paramount importance. These goals are to be implemented in Austria through mainstreaming in all policy areas, thus ensuring sustainable economic, environmental and social development, while explicitly taking into account the principle of budgetary sustainability.

As one of the basic prerequisites for sustainable development, real equality between the genders is anchored in the SDGs as a cross-cutting issue. These state that the 17 Sustainable Development Goals are geared towards achieving gender equality, and achieving this equality will in turn make a decisive contribution to the progress of all of the goals. One of the key factors is that women have political participation and decision-making power at all levels on an equal footing with men.

In the Austrian constitution, the federal government, provinces and municipalities have committed themselves to real gender equality. Austria implements this through the strategy of gender mainstreaming, which involves taking into account the impact on both sexes from the outset of all decision-making processes. The aim is to achieve equality between women and men by keeping the gender perspective in mind in all areas and at all levels of policy making and corresponding action. Austria is thus fulfilling its obligations at national, European and international level.

As a result, the economic, environmental and social dimensions are taken into equal consideration both in the National Energy and Climate Plan and in the Federal Government's

integrated Climate and Energy Strategy.

ii. Strategy on the five dimensions of the Energy Union

In May 2018, the Austrian Federal Government adopted its Climate and Energy Strategy (#mission2030). The Strategy aims to meet the Sustainable Development Goals in the areas of greenhouse gas reduction, renewable energy and energy efficiency by 2030, in line with the objectives of the European Union. Security of energy supply, competitiveness, affordability (including budgetary sustainability considerations) and research and development complete the aims of the Strategy, making it largely consistent with the five dimensions of the Energy Union. The Strategy not only forms the basis for Austria's National Energy and Climate Plan (NECP) in accordance with the Regulation of the European Parliament and of the Council on the Governance of the Energy Union and Climate Action[1], but also provides the medium- and long-term framework for transforming the energy system in line with the goals of the Paris Agreement on climate change. Long-term decarbonisation must be used in the best possible way in terms of the eco-social market economy, as well as from an economic, environmental and social standpoint. Accordingly, the implementation of these long-term objectives does not denote a loss of prosperity, but must be shaped in such a way as to result in a highly successful economic, environmental and social model of a resource-efficient economy. For this to happen, all relevant provisions must be taken in the vision for 2030 and stranded costs and lock-in effects must be avoided.

[1] OJ (EU) L 328 of 21.12.2018, p. 1.

iii. Summary table showing the main objectives, together with policies and measures

Table 1: Main objectives and action areas of the NECP

Objective (2030) ***Sector***	**Measure**	**Instruments**	**(Other) dimensions affected**
Main objectives and measures affecting the decarbonisation dimension			
Reduction of GHG emissions (non-ETS) by 36% compared to 2005			
Transport **GHG sector contribution: -7.2 million t CO_2 equivalent compared to 2016 (total contribution)**	Strengthen and develop public transport, including electrification and mobility management proposals	Public procurement Infrastructure development Funding Identification and gradual phasing out of counterproductive incentives and subsidies	Decarbonisation Energy efficiency
	Mobility management for businesses, towns and cities, municipalities, regions and tourism	Infrastructure Raising awareness Funding	Decarbonisation Energy efficiency
	Increase walking and cycling	Infrastructure development Raising awareness Funding	Decarbonisation Energy efficiency
	Goods transport: shift from road to rail	Funding	Decarbonisation Energy efficiency
	E-mobility in private transport	Funding for infrastructure and vehicle purchase Regulatory precedence R&D	Decarbonisation Energy efficiency Security of supply

Objective (2030) *Sector*	**Measure**	**Instruments**	**(Other) dimensions affected**
	Investigate the creation of additional environmentally and socially acceptable incentives for low-emission and zero-emission mobility in the tax and funding system. The first major steps were taken on the adoption of the Tax Reform Act 2020 (see following measures)	Tax law	Decarbonisation
	Greening of the standard fuel consumption tax (SFCT) From 1 January 2020, environmentally friendly vehicles will be charged less SFCT or will be exempted. For vehicles with particularly high CO_2 emissions (more than 275 g/km), the tax surcharge will be increased from EUR 20 to EUR 40 per gram of CO_2/km New tax for motorcycles	Tax law (Tax Reform Act 2020)	Energy efficiency Decarbonisation
	Greening of engine-related insurance tax (current motor vehicle tax) Switching to a more environmental form of assessment base for motorcycles and passenger cars As of 1 October 2019, CO_2 emissions are also taken into account in the assessment base in addition to the cubic capacity or power of the internal combustion engine Preferential treatment for hybrid cars and cars with below-average CO_2 emissions	Tax law (Tax Reform Act 2020)	Energy efficiency Decarbonisation
	Input tax deduction for electric bicycles Possibility to deduct input tax for business use of electric bicycles	Tax law (Tax Reform Act 2020)	Decarbonisation
	Input tax deduction for electric motorcycles Possibility to deduct input tax for business use of electric motorcycles	Tax law (Tax Reform Act 2020)	Decarbonisation

Objective (2030) ***Sector***	**Measure**	**Instruments**	**(Other) dimensions affected**
Buildings GHG sector contribution: -3 million t CO_2 equivalent compared to 2016 (total contribution)	Meet the heating and cooling needs of newly constructed buildings, as far as possible without using fossil fuels, and in any event excluding fossil oil	Regulatory policy (national law and EU law) Identification and gradual phasing out of counterproductive incentives and subsidies	Decarbonisation Energy efficiency Security of supply
Energy and industry (non-ETS) A corresponding quantitative GHG sector contribution will be enshrined in the Climate Protection Act	Promote the switch to renewable energy sources and energy efficiency measures for heating and cooling	Regulatory policy (national law and EU law) Financial incentives and identification and gradual phasing out of counterproductive incentives and subsidies	Decarbonisation Energy efficiency Security of supply
Agriculture A corresponding quantitative GHG sector contribution will be enshrined in the Climate Protection Act	Avoid methane and nitrous oxide emissions in agriculture, in particular through: Fertiliser management, including contributing a significant proportion of farm manure to biogas conversion systems Conservation and development of humus (through management methods and maintenance of arable land) Maintenance of permanent grassland Adjustments in livestock farming	Funding for climate-related practices and measures Regulatory policy Economic framework conditions (e.g. via the Renewable Energy Expansion Act [*Erneuerbaren Ausbau Gesetz*]) Raising awareness Identification and gradual phasing out of counterproductive incentives and subsidies	Decarbonisation
Forestry A corresponding quantitative GHG sector contribution will be enshrined in the Climate Protection Act	Maintain the carbon pool and continuously increase timber growth and timber harvesting in accordance with the basic principles of sustainable forest management	Identification and gradual phasing out of counterproductive incentives and subsidies	

Objective (2030) ***Sector***	**Measure**	**Instruments**	**(Other) dimensions affected**
Waste management A corresponding quantitative GHG sector contribution will be enshrined in the Climate Protection Act	Avoid methane and CO_2 emissions in waste management, in particular through: Prevention of waste Aerobic and anaerobic treatment of biogenic waste Reduction in single-use plastic items Increase in the proportion of municipal waste recycled	Regulatory policy (national law and EU law) Raising awareness Identification and gradual phasing out of counterproductive incentives and subsidies	Decarbonisation
Fluorinated gases A corresponding quantitative GHG sector contribution will be enshrined in the Climate Protection Act	Prevent F-gas emissions, in particular through: Implementation of EU law Reduction in the cooling needs of buildings (see also the building measures concerning thermal renovation and standards for new buildings) Qualification in the area of cooling and air conditioning	Regulatory policy (national law and EU law) Raising awareness Funding Identification and gradual phasing out of counterproductive incentives and subsidies	Decarbonisation
Spatial planning	Improve spatial planning and energy spatial planning	Planning Regulatory policy Identification and gradual phasing out of counterproductive incentives and subsidies	Decarbonisation Energy efficiency

Objective (2030) ***Sector***	**Measure**	**Instruments**	**(Other) dimensions affected**
Increase the share of renewable energy in gross final energy consumption of energy to 46-50%, and source 100% of electricity consumption from renewables (nationally/balanced)	***Expansion of renewable energy*** Expand the generation of renewables under the Renewable Energy Expansion Act [*Erneuerbaren-Ausbau-Gesetz* – EAG] Create a '100 000 rooftops solar panel and small-scale storage programme' Basic conditions for feeding biogas and renewable hydrogen into the existing natural gas infrastructure Develop a hydrogen strategy Support sector-specific investments in the future of the hydrocarbon industry (mining royalties)	Funding, market-based invitations to tender Regulatory law Market incentives Identification and gradual phasing out of counterproductive incentives and subsidies	Decarbonisation Security of supply Market integration
	Tax advantage for biogas and hydrogen Favourable tax treatment due to the allocation of hydrogen and biogas to the Natural Gas Tax Act	Tax law/Tax Reform Act 2020	Decarbonisation
	Tax exemption for sustainable biogas	Tax law/Tax Reform Act 2020	Decarbonisation
	Tax exemption for sustainable hydrogen	Tax law/Tax Reform Act 2020	Decarbonisation
	Tax advantage for liquefied natural gas (LNG)	Tax law/Tax Reform Act 2020	Decarbonisation
	Tax exemption for bio-LNG	Tax law/Tax Reform Act 2020	Decarbonisation
	Abolish the tax on self-produced electricity Extend the tax exemption for self-produced and self-consumed electricity generated by a photovoltaic system	Tax law/Tax Reform Act 2020	Decarbonisation

Objective (2030) ***Sector***	**Measure**	**Instruments**	**(Other) dimensions affected**
	Mitigate temporary surpluses and shortfalls through the use of appropriate flexibility technologies together with sector coupling (with particular focus on new legislative projects for electrolysis installations)		
Transport	Increase the share of renewable energy in transport in 2030 to at least 14% by using biofuels and increasing the share of e-mobility	Regulatory law Financial incentives/funding Identification and gradual phasing out of counterproductive incentives and subsidies	Decarbonisation Security of supply
Buildings	Phase out the use of fossil fuels by replacing them with renewable energy sources for heating, hot water and cooling	Funding, regulatory law Identification and gradual phasing out of counterproductive incentives and subsidies	Decarbonisation Security of supply
	Phase-out of oil-fired heating systems in the long-term (by 2050 at the latest) – milestone by 2030	Funding, regulatory law Identification and gradual phasing out of counterproductive incentives and subsidies	Decarbonisation Security of supply
Agriculture and forestry	Expand agricultural and forestry bioenergy production	Market incentives Identification and gradual phasing out of counterproductive incentives and subsidies	Decarbonisation Security of supply
Main objectives and measures affecting the energy efficiency dimension			
Improve primary energy intensity by 25-30% compared to 2015			

Objective (2030) *Sector*	**Measure**	**Instruments**	**(Other) dimensions affected**
Buildings	Carry out thermal energy renovation of building stock and improve efficiency of heating systems; Provincial business advisory programmes	Funding (investments, consultations) Consultations	Energy efficiency Decarbonisation
	Increase the share of efficient renewable energy sources and district heating/cooling systems for heating, hot water and cooling, including component activation, active use of hot water storage and buildings as storage for load balancing and load flexibility	Funding, regulatory law Identification and gradual phasing out of counterproductive incentives and subsidies	Energy efficiency Decarbonisation
Transport	Implement public transport measures, walking/cycling, goods transport, e-mobility (see decarbonisation above)	See decarbonisation above	Energy efficiency Decarbonisation
Industry	Provincial business advisory programmes Implement energy efficiency measures and use renewable energy sources in industrial manufacturing processes Heat recovery Thermal renovation of existing commercial buildings Large businesses are obliged to carry out an energy audit or to implement an energy and environmental management system SMEs are encouraged, by way of funding, to implement an energy management system	Funding, regulatory law Identification and gradual phasing out of counterproductive incentives and subsidies	Energy efficiency Decarbonisation

Objective (2030) ***Sector***	**Measure**	**Instruments**	**(Other) dimensions affected**
Horizontal	Implementation of the EU's Energy Efficiency Directive	Regulatory law (in conjunction with accompanying market incentives) Public procurement Energy management for businesses Raising awareness	Energy efficiency Decarbonisation
Main objectives and measures affecting the security of energy supply dimension			
	Invest in electricity, gas and district heating grid infrastructure Invest in storage, including heat accumulators, grant remuneration to storage for system capacity Maintain efficient existing installations Accelerate demand response	Regulatory law Market incentives	Security of supply Market integration
Main objectives and measures affecting the internal energy market dimension			
	Accelerate and simplify licensing procedures, relax power line regulations Develop Austrian grid infrastructure plan Accelerate market integration and energy system flexibility Adapt the grid tariff structure	Regulatory law Market incentives Reduction in bureaucracy	Internal energy market Security of supply
Main objectives and measures affecting the research/innovation/competitiveness dimension			
Horizontal	Implement the Austrian Energy Research and Innovation Strategy European cooperation on the SET Plan Transnational and global cooperation – 'Mission Innovation' membership	R&D	Innovation Competitiveness Decarbonisation Energy efficiency Security of supply

Objective (2030) ***Sector***	**Measure**	**Instruments**	**(Other) dimensions affected**
Measures spanning the dimensions			
	Regularly evaluate the environmental effectiveness of tax, funding and incentive measures	Tax, funding and incentive measures	Decarbonisation Energy efficiency
	Analyse other European tax and funding systems to identify possible additional measures	Tax, funding and incentive measures	Decarbonisation Energy efficiency
	Identification and gradual phasing out of counterproductive incentives and subsidies	Tax, funding and incentive measures	
	Option: Further greening of the incentive, funding and tax system	Tax, funding and incentive measures	Decarbonisation Energy efficiency
	Option: Extension of the trading system (ETS) to other sectors	Economic instrument	Decarbonisation
	Option: Use ETS auction revenue for climate- and energy-related projects	Funding	Decarbonisation

1.2. Current policy and administrative structures

i. Energy system at national and EU level – political context of the plan

European context

Within its 2030 climate and energy policy framework, the EU has three main objectives:

- reduce greenhouse gas emissions by at least 40% (compared to 1990 levels);
- increase the share of renewable energy sources to 32%;
- increase energy efficiency by at least 32.5%.

On the basis of the European Council's conclusions of October 2014, the European Commission put forward several legislative proposals – including the Directive on the revision of the emissions trading system[2], the Regulation on binding annual greenhouse gas emission reductions by Member States ('effort sharing')[3], the Directive on renewable energy, the Directive on energy efficiency and the Regulation on the Governance of the Energy Union and Climate Action[4] – all of which have since been adopted by the European Parliament and the Council. Consequently, for the dimensions of decarbonisation (greenhouse gases and renewables) and energy efficiency in particular, a binding legal framework is in place, which is to be systematically implemented over the coming years.

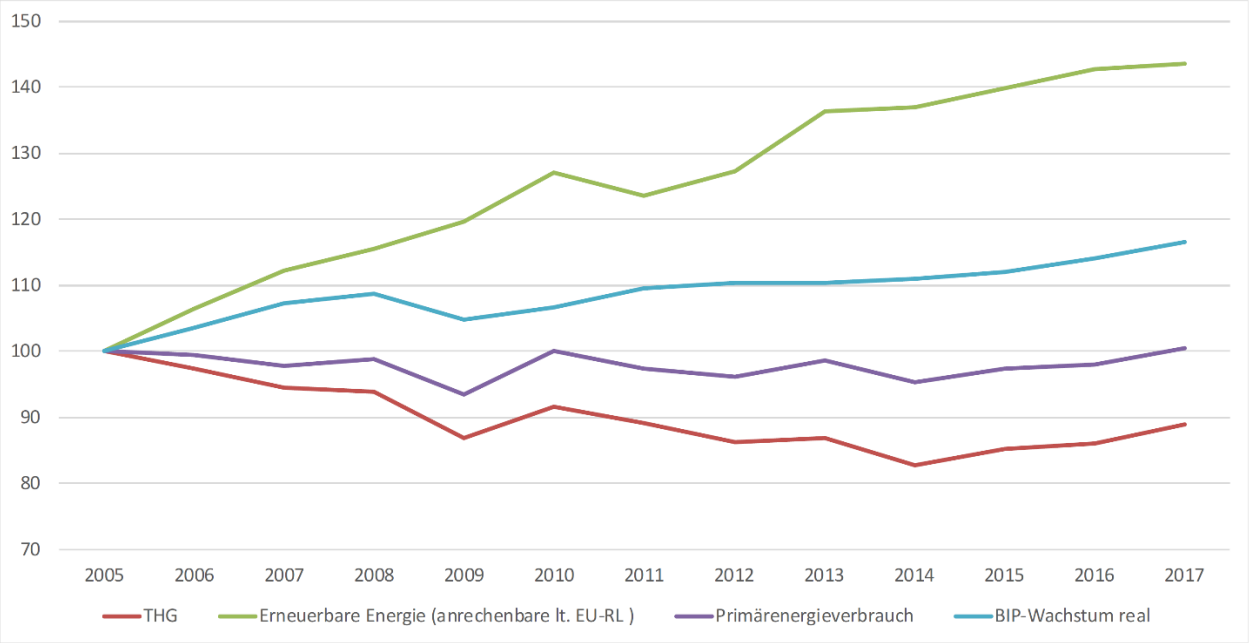
In addition to this National Energy and Climate Plan, the Member States are also required in accordance with the Regulation on Governance to prepare and submit a long-term strategy in line with the Paris Agreement on climate change by 1 January 2020. The European Commission submitted its draft long-term strategy for the European Union at the end of November 2018 – shortly before the UN Conference of the Parties (COP 24) in Katowice.

[2] Directive (EU) 2018/410 of the European Parliament and of the Council amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, OJ L 76, 19.3. 2018, p. 3.
[3] Regulation (EU) 2018/842 of the European Parliament and of the Council on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030, OJ L 156, 19.6. 2018, p. 26.
[4] OJ L 328, 21.12. 2018, p. 1.

Austrian context

If we look at developments in greenhouse gas emissions, renewable energy and energy efficiency in comparison with economic development since 2005, it is clear that Austria has made significant progress in all three areas over the past decade. The uptake in renewable energy has been most successful, while greenhouse gas emissions have fallen and primary energy consumption has stabilised. For the latter two indicators, there has also been a relative decoupling vis-à-vis GDP throughout the period. However, from 2015 to 2017, greenhouse gas emissions, primary energy consumption and GDP largely increased in parallel.

Figure 1: Development of greenhouse gas emissions, renewable energy (as defined by EU Directive), primary energy consumption and GDP (in real terms) 2005-2017 (indexed, 2005=100)



Source: Federal Ministry for Sustainability and Tourism, 2019

THG	*GHG emissions*
Erneuerbare Energie (anrechenbare lt. EU-RL)	*Renewable energy (according to EU Directive)*
Primärenergieverbrauch	*Primary energy consumption*
BIP-Wachstum real	*Real GDP growth*

Climate and Energy Strategy of the Austrian Federal Government

On 28 May 2018, the Federal Government adopted the Austrian Climate and Energy Strategy (#mission2030), which provides the framework for action in terms of Austrian climate and energy policy up to 2030. This project concerns the long-term transformation of the energy system in order to meet the future challenges in relation to climate protection and fulfil the commitments made under the Paris Agreement and at European level. This means that by 2030, emissions in non-ETS sectors must be reduced by at least 36% compared to 2005. In order to achieve this, Austria has set ambitious targets for expanding renewable energy and improving energy efficiency. The aim of this national strategy is to increase the share of renewable energy to 45-50% by 2030, with 100% of the total electricity consumption being covered by renewables. Primary energy intensity should fall by 25-30% compared to 2015. Further details of the objectives under the Regulation on the Governance of the Energy Union and Climate Action are set out in Chapter 2 of the Plan.

To achieve these ambitious targets, #mission2030 provides for a range of measures, and intensive work is already under way to implement them. Twelve
'flagship projects' have been identified as the first key steps to be taken, comprising both short- and long-term measures. However, additional measures will be required and these are described in Chapter 3 of the plan.

Table 2: Overview of the 12 flagship projects for #mission2030

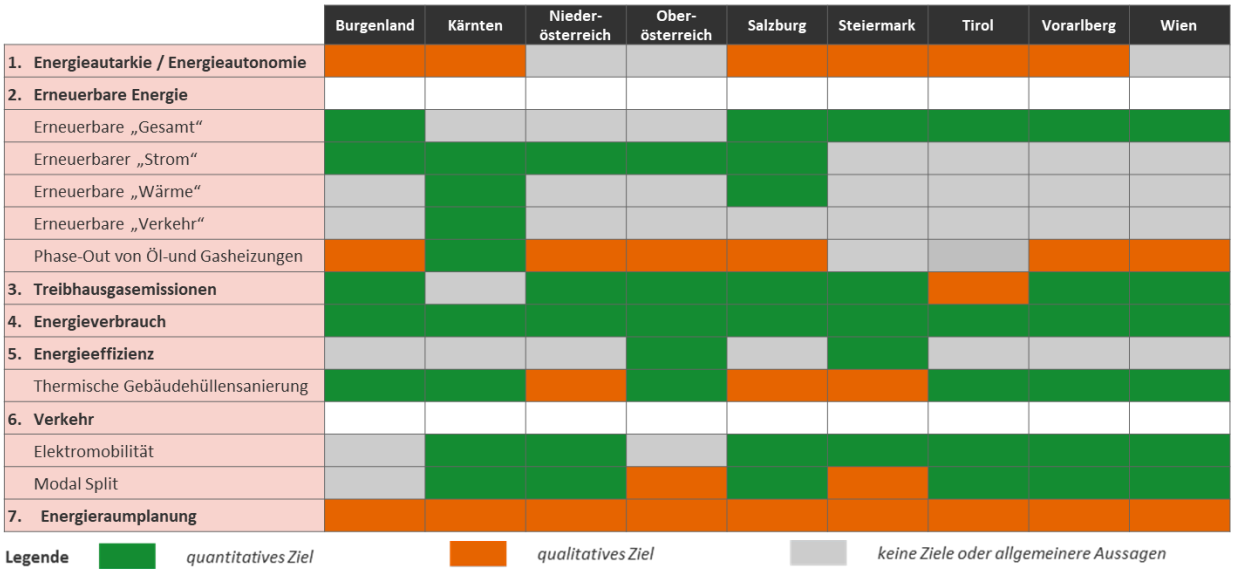
Flagship project (FP)	**Areas for action**	**Responsibility**	**Timetable**
<u>Mobility</u> FP 1: Efficient goods transport logistics	Support for logistics R&D, pilot projects	Federal Ministry for Transport, Innovation and Technology (BMVIT)	2018-2022
FP 2: Strengthening public rail transport	Infrastructure development Orders	BMVIT, Austrian Federal Railways (ÖBB), provinces	2018-2022
FP 3: E-mobility plan	Road e-mobility Rail e-mobility E-mobility management	BMVIT, Federal Ministry for Sustainability and Tourism (BMNT), provinces, ÖBB	2019-2022 2019-2030 2019-2022

Buildings/heating FP 4: Thermal renovation of buildings	Funding instruments Legal framework	BMNT, Federal Ministry of Finance (BMF), Federal Ministry of Justice (BMVRDJ), provinces	2018-2023
FP 5: Renewable heating	Funding instruments Legal framework	BMNT, BMF, provinces	Immediately, step-by-step plan
Renewable energy/electricity FP 6: 100,000 rooftops solar panel and small-scale storage programme	Promotion of investment Tax exemption Legal framework	BMNT, BMF, BMVRDJ, Federal Ministry for Digital and Economic Affairs (BMDW)	2019-2023
FP 7: Renewable hydrogen and biomethane	Legal framework and preferential tax treatment	BMNT, BMF	From 2020
Financing FP 8: Green finance	Market analysis, dialogues with stakeholders, 'Austrian Green Bonds' pilot project, energy transition investment plan; Sustainability Bond of Oesterreichische Kontrollbank (OeKB) with a volume of EUR 500 million over 7 years	BMF, BMNT	From 2019
Research/innovation FP 9: Energy research initiative 1: *Energy systems of the future [Energiesysteme der Zukunft]*	Research, technology and innovation (RTI) support programme European funding (e.g. SET Plan, EU Framework Programme) Testing technologies under operating conditions	BMVIT, BMNT	2018-2023
FP 10: Energy research initiative 2: *'Mission Innovation Austria' programme*			2018-2025
Horizontal topics FP 11: Communication – education and awareness-raising for a sustainable future	Communications strategy School curricula Training	BMNT, BMVIT, Federal Ministry of Education, Science and Research (BMBWF), provinces, municipalities	2018-2023
FP 12: Bio-Economy Strategy	Bio-economy platform Federal Government action plan Leading bio-economy firms/bio-economy cluster	BMNT, BMVIT, BMBWF	From 2019

Climate and energy strategies of the provinces

In their respective climate and energy strategies, the provinces have set quantitative or qualitative objectives in many areas. Measures taken by the provinces to achieve these objectives also contribute to achieving the national objectives.

Figure 2: Overview of the climate and energy strategies of the Austrian provinces and the quantitative and qualitative objectives contained therein



Source: Austrian Energy Agency

1. Energieautarkie / Energieautonomie	**1. Energy self-sufficiency/energy autonomy**
2. Erneuerbare Energie	**2. Renewable energy**
Erneuerbare „Gesamt“	Renewable ‘total’
Erneuerbare „Strom“	Renewable ‘electricity’
Erneuerbare „Wärme“	Renewable ‘heating’
Erneuerbare „Verkehr“	Renewable ‘transport’
Phase-Out von Öl-und Gasheizungen	Phasing out oil and gas heating
3. Treibhausgasemissionen	**3. Greenhouse gas emissions**
4. Energieverbrauch	**4. Energy consumption**
5. Energieeffizienz	**5. Energy efficiency**
Thermische Gebäudehüllensanierung	Thermal renovation of building envelopes
6. Verkehr	**6. Transport**
Elektromobilität	Electric mobility
Modal Split	Modal split
7. Energieraumplanung	**7. Energy spatial planning**
Burgenland	**Burgenland**
Kärten	**Carinthia**
Niederösterreich	**Lower Austria**
Oberösterreich	**Upper Austria**
Salzburg	**Salzburg**
Steiermark	**Styria**

Tirol	**Tyrol**
Vorarlberg	**Vorarlberg**
Wien	**Vienna**
Legende	**Key**
quantitatives Ziel	quantitative objective
qualitatives Ziel	qualitative objective
keine Ziele oder allgemeinere Aussagen	no objectives, or more general statements

ii. Current policies and measures in relation to the five dimensions of the Energy Union

Dimension 1: Decarbonisation

Greenhouse gas emissions

Decision No 406/2009/EC on the effort of Member States to reduce their greenhouse gas emissions from 2013 to 2020 ('effort sharing')[5] set Austria a target to reduce greenhouse gas emissions in non-ETS sectors by 16% by 2020 compared to 2005. This target was laid down in the Austrian Climate Protection Act [*Klimaschutzgesetz*, KSG] and divided up among the various emitting sectors. In order to ensure that the target trajectory is adhered to, multi-annual action plans were agreed with the provinces. As things stand, these cover the years 2013-2014 and 2015-2018. A regular implementation review and (internal) reporting take place every two years. These measures are currently in the implementation phase. A follow-up plan for the years 2019 and 2020 has been initiated but not yet completed.

The main focus of these measures is on expanding the share of renewable energy and improving energy efficiency in the main emitting sectors (in particular transport and buildings), as well as preventing non-CO_2 greenhouse gases in the agricultural sector (reducing methane and nitrous oxide emissions through climate friendly farming practices, above all in relation to fertiliser management, tillage and livestock farming), the waste management sector (reducing methane emissions from landfills) and F-gases. Essential measures are set out in European legislation, such as the Energy Performance of Buildings Directive (EPBD) or the Directive on the promotion of renewable energy.

Transport

In 2017, greenhouse gas emissions from the Austrian transport sector (excluding air transport) amounted to 23.6 million tonnes of CO_2 equivalent, making it the second largest emitting sector after industry (including ETS). Emissions in the transport sector are exhibiting an upward trend:

[5] OJ L 140, 5.6. 2009, p. 136.

since 1990, they have increased by 73%. The causes for this are manifold; as well as the sharp increase in the distances driven in Austria, the export of fuel in fuel tanks has contributed significantly to this development. Greenhouse gas emissions from road goods transport (heavy and light commercial vehicles including fuel export) have increased by 109% since 1990, while from passenger road transport they have increased by 58%. In 2017, almost two thirds (64%) of greenhouse gas emissions from road transport came from passenger transport. In both segments, the increase in distances driven is the largest cause of emissions, followed by fuel exported in fuel tanks.

Measures to reduce greenhouse gas emissions in the transport sector are implemented at different levels. At federal level, the main objectives of the measures are inter-regional infrastructure development, the creation of strategic framework plans, transport-related taxation and financing issues related to financial equalisation between local authorities (allocation of tax revenues to provinces and municipalities). The provinces and municipalities, meanwhile, are primarily responsible for providing an attractive range of local and regional public transport, spatial planning, pedestrian and cycling infrastructure and parking space management or parking ordinances.

The following transport measures have so far been successfully implemented:

- Increasing the share of renewable energy sources in the fuel sector by implementing corresponding EU provisions – in Austria, the biogenic content of diesel, in terms of energy value, is around 6.3%, while for petrol it is currently around 3.4%.
- The standard fuel consumption tax, which is chargeable when a car is first placed on the national market (new car purchase or private import) and provides incentives to buy vehicles with low CO_2 emissions.
- Gradually expanding the inter-regional rail infrastructure. Of particular note are the extension of the Western Railway to four tracks (Vienna to Innsbruck, with significant sections as a high-speed line), the ongoing expansion of the Southern Railway (Vienna – Graz – Klagenfurt) including the Semmering and Koralm tunnel projects, and the construction of the Brenner Base Tunnel, which is essential for the trans-European goods transport between Germany and Italy.
- The ongoing improvements to local and regional public transport services in metropolitan areas.
- Providing mobility management for businesses, towns and cities, municipalities and regions under the climate protection initiative 'klima**aktiv** mobil' in order to support the development and implementation of climate-friendly measures for clean, low-CO_2 mobility at business and municipal level and in the tourism sector.
- Drawing up and implementing the Cycling Masterplan [*Masterplan Radfahren*] and the Walking Masterplan [*Masterplan Gehen*] and supporting the creation of cycling and pedestrian infrastructure, with federal co-financing.

- Implementing concepts relating to energy spatial planning and the revitalisation of town centres (functional diversity) and other spatial planning initiatives.
- Providing significant support for e-mobility through the package of measures introduced by the Federal Ministry for Sustainability and Tourism [*Bundesministerium für Nachhaltigkeit und Tourismus*, BMNT] (Domestic Environmental Support [*Umweltförderung im Inland*]) and the Federal Ministry for Transport, Innovation and Technology [*Bundesministerium für Verkehr, Innovation und Technologie*, BMVIT] together with the motor vehicle industry. These measures aim to promote e-mobility using renewable energy by funding the purchase of electric vehicles and the expansion of the recharging infrastructure, by simplifying things from an organisation and fiscal point of view (standard fuel consumption tax, engine-related insurance tax, benefits in kind) and by introducing key provincial supporting initiatives promoting e-mobility within their area of impact.
- Implementing the Eurovignette Directive for heavy goods vehicles.
- The possibility of VAT input tax deduction for e-bikes.

Buildings

Since 2005, greenhouse gas emissions in the buildings sector (residential buildings and private and public service buildings) in Austria have decreased by about one third (-34%). A variety of effective measures have contributed to this, in particular the switch from oil- and gas-powered heating systems to renewable forms of energy and district heating systems, the thermal renovation of existing buildings built during particularly energy-inefficient construction eras (1950s-1980s) and the gradual increase in construction regulations for new buildings and, increasingly, for renovations.

Over the past 10 years, significant momentum has been created through federal and provincial funding instruments. In an agreement under Article 15a of the Federal Constitution between the Federal Government and the provinces, high energy standards were set for housing subsidies (above all for social housing) which go beyond the standards laid down in construction law. Between 2009 and 2018, a total of around 2.65 million tonnes of CO_2 per year were saved through the use of energy measures in housing subsidies (renovations and new buildings) (data taken from notifications from the provinces under the agreement). In addition to provincial housing subsidies, the Federal Government (together with the provinces) provides funding under the renovation initiative (and paid via the Domestic Environmental Support scheme) not only for private households or building owners for building renovations ('renovation vouchers') but also for businesses' commercial premises. Consequently, in the past few years, considerable numbers of building renovations or conversions to renewable heating systems have been carried out. Between 2009 and 2018, support in the form of renovation vouchers led to a total CO_2 reduction of around 725,000 tonnes per year. This combination of instruments strengthens their effects as, to some extent, both instruments can be used.

Adjustments to building legislation have also been made in recent years in response to the requirements laid down the in the EU's Energy Performance of Buildings Directive. The provinces (which are responsible for building regulations) have recently agreed on a new road map for achieving 'nearly zero-energy buildings' when constructing new buildings from 2021, while optimising costs. The aim is to ensure that, despite the significant increase in construction as a result of population growth, the rise in specific living space and a growing desire for comfort, greenhouse gas emissions can be kept at a low level. In addition, there are minimum standards in place for building renovations (major renovations). For commercial properties above the low energy standard (new buildings), funding is offered through the Domestic Environmental Support scheme.

Agriculture and forestry

A key instrument for achieving climate-friendly agriculture is the agri-environmental programme ÖPUL (Austrian programme for environmentally friendly agriculture [*Österreichisches Programm für umweltgerechte Landwirtschaft*]). This is based on a horizontal approach which aims at providing the widest possible coverage of agricultural environmental services in relation to climate, soil, water and biodiversity. In 2018, around 91,700 farms participated in the ÖPUL, which represents more than 83% of the total number of Austrian farms in IACS[6]. In total, therefore, around 80% of all Austrian agricultural land (excluding alpine pastures), some 1.84 million hectares, were involved in ÖPUL measures. Compared to other EU Member States, Austria therefore has a high participation rate in such voluntary agri-environmental measures.

The key climate protection issues included in the ÖPUL include:

a. limited use of inputs and the creation of broadly closed nutrient cycles (e.g. organic farming);
b. accumulation and retention of organic matter as carbon pools in arable soils;
c. maintenance and location-adjusted management of permanent grassland and wetland habitats;
d. grazing of cattle, sheep and goats.

Point (a)

As over 30% of Austria's agricultural land was included in the ÖPUL measures 'Bio[7]' and 'EEB[8]', in 2018 alone around 760,000 ha[9] refrained from using mineral fertilisers, thereby reducing greenhouse gas emissions. Commitments to reduce fertiliser use are also covered by the ÖPUL

[6] Integrated Administration and Control System.
[7] 'Organic farming'
[8] 'Restriction of inputs designed to increase yields'
[9] 'Organic farming': 466,511 ha; 'Restriction of inputs designed to increase yields': 271,693 ha.

measures 'Nature conservation' [*Naturschutz*] and 'Preventive groundwater protection' [*Vorbeugender Grundwasserschutz*], combined with fertiliser balancing and training. As improved fertiliser management is, in principle, very dependent on awareness of the problem and the willingness of farmers to change their methods, the current ÖPUL also contains increased relevant further training and requirements on carrying out soil testing.

Point (b)

The more diverse crop rotation that is common in organic farming and supported under the agri-environmental measures, nitrogen fixation using legumes and the use of organic fertilisers (e.g. solid manure, slurry, compost) all contribute to the development of humus and carbon in agricultural soil. Greening arable land for as long as possible by growing catch crops and fodder also helps to develop humus – in 2018, almost 460,000 ha[10], or around 35% of Austria's arable land, were covered by ÖPUL greening measures. The accumulation of organic matter, or protection against soil erosion, is also aided by the reduction in tillage implemented under the ÖPUL measure 'Mulch/direct seeding' [*Mulch- und Direktsaat*] (approx. 130,000 ha arable land in 2019).

Point (c)

Due to the high proportion of organic matter, grassland soils are important carbon pools. The conversion of grassland into arable or permanent crop land or into settlements, traffic areas or economic areas results in high humus losses. Meadows and pastures are currently protected both under the first pillar of the CAP (as part of greening) and by various ÖPUL measures. Support for the tailored management of extensive grassland areas, and in particular wetland habitats with particularly high levels of soil organic matter, is provided under the 'ÖPUL nature conservation' measure.

Point (d)

The ÖPUL measures 'Animal welfare – pastures' [*Tierschutz – Weide*] and 'Alpine pasturing and herdkeeping' [*Alpung und Behirtung*] are also relevant to climate protection. Grazing of animals leads to a rapid separation of manure and urine, which reduces greenhouse gas emissions and atmospheric pollutants (ammonia). In 2018, 870,000 grazing or alpine-pasturing LUs[11] received ÖPUL support.

In addition to the ÖPUL measures, the Austrian nitrate action programme should also be highlighted in this context, as it contains rules on fertilisers which are compulsory for all farmers.

Austria also has a long-standing expert committee, the Council for Soil Fertility and Soil Protection [*Fachbeirat für Bodenfruchtbarkeit und Bodenschutz*], which forms part of the BMNT. This

[10] ÖPUL measure 'Greening – catch crops' [*Begrünung – Zwischenfruchtanbau*]: 270,000 ha (as of 2017); ÖPUL measure 'Greening – evergreen system' [*Begrünung – System Immergrün*]: 188,043 ha (as of 2017).
[11] Livestock units.

committee operates at inter-institutional level (Federal Government, provinces, research institutes, agricultural counsellors, etc.), drawing up recommendations for farmers, above all in relation to fertilisers. These recommendations are used, for example, as a basis for giving advice to farmers, for teaching in agricultural schools or as a basis for the nitrate action programme.

In principle, the provinces have constitutional regulatory powers in relation to fertilisers and soil protection – with the exception of forest soils and water legislation.

At European level, six priorities have been set for rural development, which are reflected in the funding programmes of each Member State. Priority 5, 'Resource-efficient, climate-resilient economy', and Priority 6, 'Social inclusion and economic development', are important for meeting climate and energy goals as well as for wider climate issues.

In the Austrian Special Directive Rural Development Funding Programme 2014-2020 [*LE-Projektförderungen 2014-2020*], the following climate and energy measures in line with Priorities 5 and 6 are available in the area of agricultural production:

Priority 5, 'Resource-efficient, climate-resilient economy':

- Education
- European innovation partnership (EIP-AGRI)
- Advisory services
- Investment in inter-farm irrigation infrastructure
- Investment in infrastructure to develop and diversify agricultural and forestry holdings through the use of energy from renewable raw materials and through energy services
- Photovoltaics in agriculture
- Investment in renewable energy

Priority 6, 'Social inclusion and economic development':

- Education
- European innovation partnership (EIP-AGRI)
- Creation and operation of clusters
- Creation and operation of networks
- Advisory services
- Diversification into non-agricultural activities

The educational and advisory measures are not quantifiable in terms of CO_2 equivalent, but they are crucial to the implementation of climate and energy-related measures within agricultural holdings. The measure concerning investment in agricultural production under the Rural Development Programme 2014-2020 is also very important, as it allows for expensive construction and mechanical emission reduction measures (such as ground-level slurry

application or capping farmyard manure storage) to be carried out.

The forestry sector is of great importance to Austria. Decades of multifunctional forest management have already led to the accumulation of great biomass reserves, and the forests' role as a reservoir has increased enormously. The continuous growth in sustainable wood and biomass harvests has also resulted in a very high share of renewable energy sources in electricity and heat production, which contributes significantly to the high share of renewable energy sources in Austria. Through the increased recycling of wood and the associated substitution effects, the forestry sector and the timber industry make a significant contribution to climate protection. This holistic management method is also in line with the IPCC's recommendations, which state that in the medium to long term, the concept of sustainable forest management represents the land use sector's most important contribution to climate protection.

In recent years, the increasing occurrence of extreme weather events has shown that climate change is already having an impact. The priority is therefore to introduce medium- to long-term climate change adaptation measures in order to protect and stabilise terrestrial carbon pools and maintain ecosystem performance (conservation of productive arable land, grassland and forest, greater reduction in soil loss, protection against natural hazards, etc.).

Waste management and F-gases

Since 1990, greenhouse gas emissions in the waste management sector have fallen significantly – despite the increase in waste quantities. Successful measures that have led to proven reductions in emissions include, in particular, the prohibition on depositing untreated municipal waste in landfills, the installation of landfill gas collection systems, material recycling measures and large-scale thermal treatment of residual waste in modern waste incineration plants, which also contribute towards energy production (electricity and heat). Based on the planned increase in the recycling of biogenic waste, anaerobic digestion and the resulting energy production will also become more important.

In order to achieve a sustainable reduction in the use of fluorinated gases (F-gases), which are harmful to the climate, statutory requirements are laid down by the Fluorinated Greenhouse Gas Act 2009 [*Fluorierte Treibhausgase-Gesetz 2009*], which is supplemented by EU law (Regulation) and adjusted accordingly.

Horizontal measures: The climate protection initiative 'klima**aktiv'**

The objective of the climate protection initiative 'klima**aktiv**' is to increase market penetration of high-quality, climate-friendly products and services, thereby achieving a reduction in greenhouse gas emissions. Alongside regulatory law and public funding, klima**aktiv** is an instrument in use in the field of voluntary measures and incentives under Austrian climate and energy policy.

Through standards, awareness-raising, information, consultation and further education, klima**aktiv** provides incentives and market stimulus to use renewable energy sources for energy efficiency measures in the field of construction, renovation and mobility ('klima**aktiv** mobil'). klima**aktiv** provides guidance and serves as a quality assurance system for public funding, helping to ensure more efficient use of funding, in particular the Domestic Environmental Support scheme and the Climate and Energy Fund.

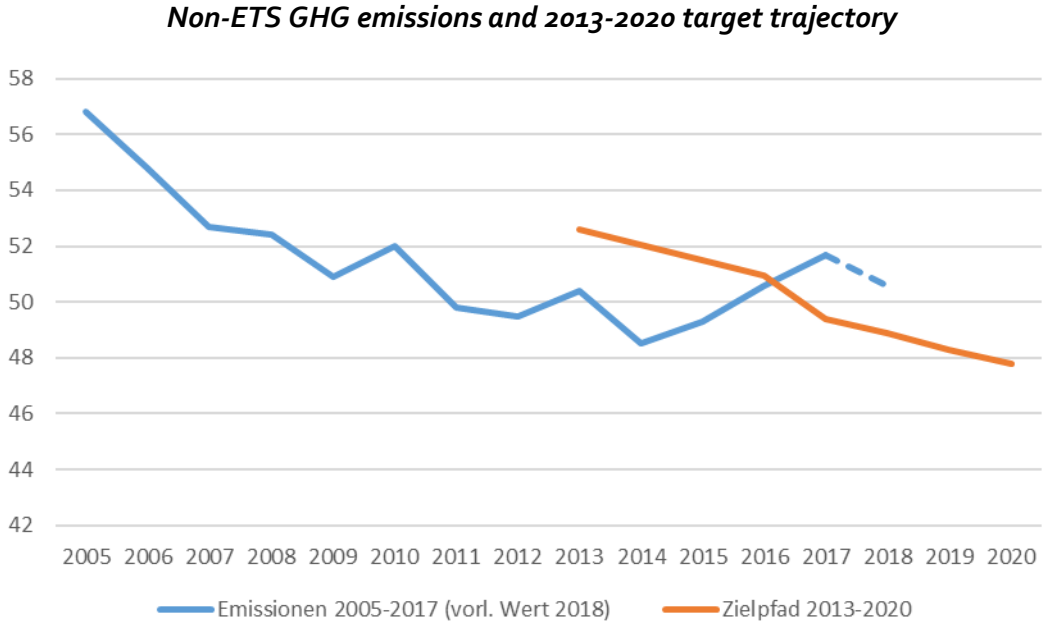
As well as providing consultation, awareness-raising, partnerships, training and certification, klima**aktiv** mobil offers its own funding programme for Austria's businesses, associations, towns, cities, municipalities, regions and the tourism sector, in conjunction with the Domestic Environmental Support scheme and the Climate and Energy Fund, providing financial support for the implementation of measures for clean, low-CO_2 mobility, the focus of which is on mobility management, e-mobility, alternative propulsion methods using renewable energy, cycling and innovative, flexible mobility services. Some 15,000 klima**aktiv** mobil projects have already been initiated. Under the klima**aktiv** mobil programme, financial support in the amount of some EUR 122.4 million – approximately EUR 112.6 million of which from national BMNT funds in the context of klima**aktiv** mobile, the Climate and Energy Fund and the Domestic Environmental Support scheme and EUR 9.8 million from EU funds (EAFRD) – has triggered total environmental investments of around EUR 816 million in clean mobility and safeguarded 7,000 jobs.

By financing klima**aktiv** and klima**aktiv** mobil through the Domestic Environmental Support scheme, the Climate and Energy Fund and its own budget, the BMNT assumes the role of a key driver and moderator of the societal move towards a sustainable economic, energy and mobility system. klima**aktiv** is a multilevel governance instrument, combining administration, economy, science and civil society. Based on this integrated approach, klima**aktiv** provides a communication and cooperation platform for climate protection which promotes integrated analysis and better networking between the public and the private sector. klima**aktiv** works together with the economic sector and the provinces, towns, cities and municipalities on a number of issues, and has partnerships with a range of companies. It has therefore had a positive impact on the location on both the demand side and the supply side.

Achieving 2020 targets

Up to the 2016 reporting year, Austria's greenhouse gas emissions in non-ETS sectors were below the target trajectory in accordance with Decision No 406/2009/EC on the effort of Member States to reduce their greenhouse gas emissions up to 2020 ('effort sharing') and the Climate Protection Act. In 2017, the target trajectory was exceeded for the first time, by 2.1 million tonnes of CO_2 equivalent, partly due to one-off effects. The reasons for this included the adjustment of the target trajectory in line with EU law (reduced by around 1 million tonnes of CO_2 equivalent) and an increase in emissions of 1.2 million tonnes of CO_2 equivalent compared with 2016. According to the provisions of the Austrian Climate Protection Act, additional measures must therefore immediately be negotiated between the Federal Government and the provinces and implemented, in order to ensure that the targets under the Effort Sharing Decision are met. On the basis of the provisions of the Fiscal Equalisation Law 2017 [*Finanzausgleichsgesetz 2017*], any costs arising from a breach of target values (purchase of emissions allowances) are additionally divided between the Federal Government and the provinces at a ratio of 80:20. As the target has been more than met in the years 2013-2016, there are still currently unused emissions allowances, which Austria may still use in the period 2017-2020 to meet its target trajectory ('banking' in accordance with the rules of the Effort Sharing Decision).

Figure 3: Austria's greenhouse gas emissions in millions of tonnes of CO2 equivalent in non-ETS sectors, 2005-2017/2018, and the target trajectory for 2013-2020 under the Effort Sharing Decision



Source: BMNT/Federal Environment Agency, 2019

Emissionen 2005-2017 (vorl. Wert 2018)	Emissions 2005-2017 (preliminary value 2018)
Zielpfad 2013-2020	Target trajectory 2013-2020

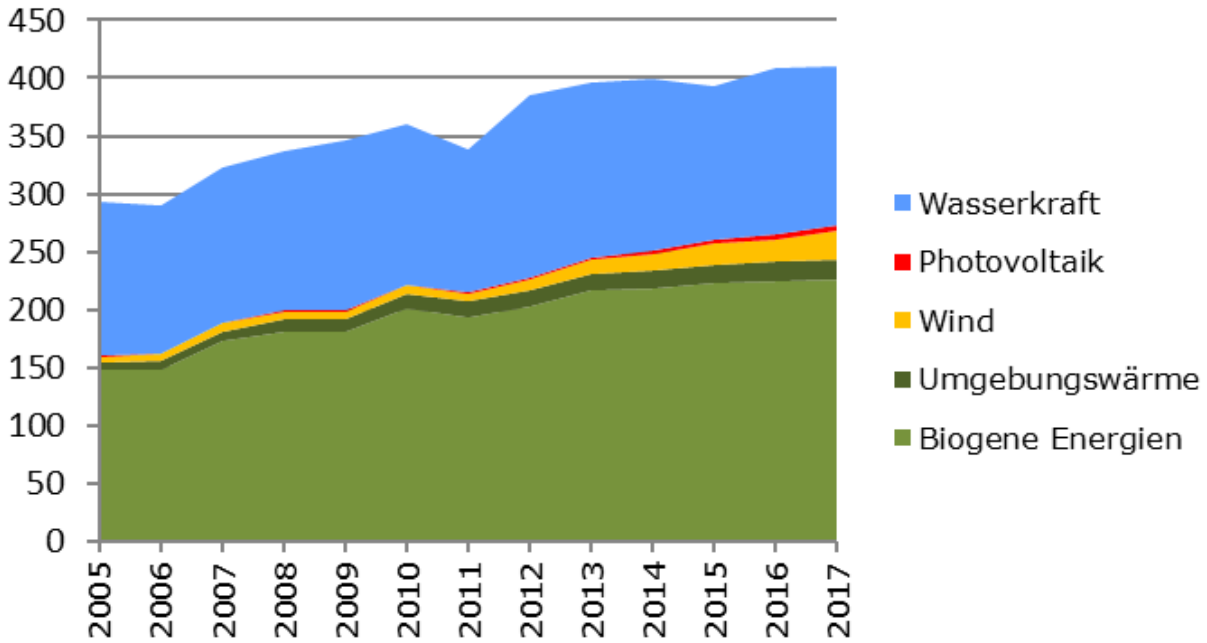
Renewable energy

In Austria in 2017, the share of renewable energy in the gross final energy consumption of energy was 32.6%. With regard to energy use for space heating and air conditioning, the share of renewable energy in 2017 was 32%. The share of renewable energy in gross electricity consumption in 2017 was 72.2%, while it constituted 9.7% of energy use in the transport sector.

Due to its topographical location, Austria has at its disposal the two main renewable energy sources: hydroelectric power and biogenic energy. These two renewable energy sources make up the greatest share of domestic primary energy production, with the share of biomass on the increase. Other types of renewable energy, in particular the use of ambient heat (heat pumps, solar heat and geothermal energy) and primary energy production using wind and photovoltaics, are also constantly and visibly increasing.

Figure 4:

Domestic production of renewable energy in PJ

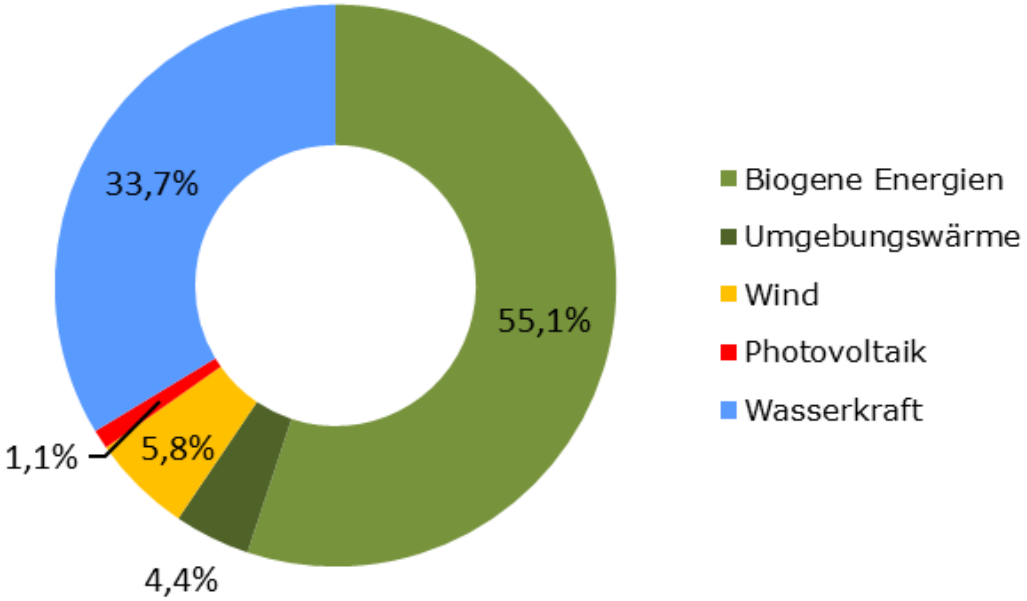


Source: BMNT based on the energy balances of Statistics Austria, 2018

Wasserkraft	Hydroelectric power
Photovoltaik	Photovoltaics
Wind	Wind
Umgebungswärme	Ambient heat
Biogene Energien	Biogenic energy

Figure 5:

Domestic production of renewable energy 2017



Source: BMNT based on the energy balances of Statistics Austria, 2018

Biogene Energien	Biogenic energy
Umgebungswärme	Ambient heat
Wind	Wind
Photovoltaik	Photovoltaics
Wasserkraft	Hydroelectric power

In recent years, effective instruments have been used to gradually increase the share of renewable energy. These include in particular the Green Electricity Act [*Ökostromgesetz*], support for renewable energy systems in the heating sector (particularly in buildings) from the Federal Government (Domestic Environmental Support scheme, to promote the conversion of heating systems) and the provinces (housing subsidies, to cover the energy requirements of residential buildings) and the replacement of fossil fuels with biofuels in the transport sector. The Green Electricity Act was amended in 2017 with the aim of creating greater flexibility, particular for households, and facilitating better integration of existing installations, for example through the incorporation of storage technologies. This guarantees security of supply in a more decentralised energy system. The Green Electricity Act was last amended in October 2019. The key elements of this revision are described in more detail in chapter 3.1.2 (i).

Key federal laws concerning renewable energy

Federal Act on Support for Electricity Production from Renewable Sources (Green Electricity Act 2012 – ÖSG 2012) – BGBl. I No 75/2011

The Green Electricity Act 2012 provided an ambitious basis for promoting green electricity in Austria, replacing the Green Electricity Act in force since 2003 (in the version of Federal Law Gazette I No 104/2009) for new installations. In order to ensure a fairer and more even allocation of the available funding among applicants and boost the expansion of green electricity production, funding amounts have increased significantly and feed-in tariffs have been reduced or applied degressively, where economically reasonable for the installations. In the wind and hydroelectric power sector, applicants currently on the waiting list have been given the opportunity to receive support immediately by accepting a discount – scaled on the basis of time and tariff size – on the feed-in tariff requested. The model also provides a solution for capping the green electricity tax for large consumers, whereby the green electricity support tariff is linked, in percentage terms, to charges for grid use and grid losses, without constituting a scaling of taxes based, for example, on grid level. End consumers located within the same grid level are not differentiated between based on province or network area. A central point of contact and settlement centre for green electricity support, OeMAG Abwicklungsstelle für Ökostrom AG, was established under the Green Electricity Act 2012. Also, in order to relieve the burden on green electricity installation operators, administrative procedures were able to be reduced and simplified, for example by establishing a register of installations or by limiting the requirement to submit an application in respect of decisions of recognition.

Federal Act on support for measures in the areas of water management, the environment, contaminated land remediation, protection of the environment abroad and in relation to the Austrian JI/CDM programme on climate protection (Environmental Support Act [Umweltförderungsgesetz – UFG]) – BGBl. No 185/1993

On the basis of the projects supported in the period 2014-2018, the Domestic Environmental Support scheme for renewable energy sources (with an energy output of 1,916 GWh/a) and energy efficiency measures (with an energy output of around 2,588 GWh/a) are making a vital contribution towards achieving the EU's 2020 targets.

Slightly less than a third (around 560.4 GWh/a, or 29%) of the energy produced from renewable energy sources by approved projects was attributable to local biomass heating. On average, each local heating installation that received support produced 1,519 MWh/a of thermal energy, which it used to feed a local heating grid. Further significant amounts of energy were produced by heat distribution projects.

The focus of support for heat distribution also includes around 40 projects for feeding waste heat into new or existing local and district heating grids or establishing waste heat distribution grids. At around 349 GWh, these projects make up the majority of renewable energy use in this area of

focus.

Support for energy savings is also playing an increasingly significant role. The projects supported in the period 2014-2018 achieved annual energy savings of around 2,588 GWh/a, of which around 1,816 GWh/a came from general operational energy saving measures and 772 GWh/a from thermal building renovation measures.

In the areas of local biomass heating, biomass CHP, boiler replacement, heat distribution and optimisation of local heating installations, and for some demonstration installations, the provinces were obliged to provide co-funding. In the period 2014-2018, this compulsory provincial support amounted to EUR 41.5 million. Projects in these areas also received EU co-funding.

Ordinance of the Federal Minister for Agriculture and Forestry, Environment and Water Management on fuel quality and the sustainable use of biofuels (Fuel Ordinance 2012 [Kraftstoffverordnung 2012]) – BGBl. II No 398/2012

The Fuel Ordinance established the obligatory use of renewable energy in road transport at national level, in accordance with the objectives of the EU Directives (Directive 2009/28/EC on the promotion of the use of energy from renewable sources and the Fuel Quality Directive (2009/30/EC)). The cornerstone of the Ordinance is the 'substitution requirement', under which all fossil fuel distributors are required to substitute a certain proportion of the fossil fuel placed on the market with renewable energy. More specifically, current targets are to substitute 6.3% of diesel fuel and 3.4% of petrol fuel based on energy value. Both targets are mainly achieved through the addition of around 7% biodiesel to diesel (B7) and 5% bioethanol to petrol (E5) by volume, which occurs nationwide. In order to avoid as far as possible any negative environmental effects from the biofuels used, the Fuel Ordinance contains detailed requirements and criteria intended to guarantee that the biofuels used are sustainable and have a positive environmental impact.

Achieving 2020 targets

Under EU law, Austria is required to increase the share of renewable energy in its gross final energy consumption of energy to 34% by the year 2020. This figure has already almost been reached. In 2017, the share of renewable energy under EU Directive 2009/28/EC was 32.6%. The shares of the individual energy sources in the total creditable renewables are as follows: hydropower (37.5%), wind (5.4%), photovoltaics (1.1%), biofuels (4.7%), heat pumps (2.4%), renewable share of district heating (10.4%) and other renewables (38.5%; includes wood fuels, lyes, biogases, solar heat and geothermal energy).

Dimension 2: Energy efficiency

Austria transposed the key elements of the Energy Efficiency Directive (2012/27/EU, referred to below as EED) by way of the national Energy Efficiency Act ([*Bundes-Energieeffizienzgesetz*]; BGBl. I No 72/2014, referred to below as EEffG). The contents of the EEffG include:

- Compliance with the requirements of the EED.
- Stabilisation of final energy consumption at 1,050 PJ and cumulative final energy savings of 310 PJ by 2020.
- The requirement for large companies to carry out an external energy audit or to implement an energy or environmental management system. Section 9 of the Energy Efficiency Act requires large companies to carry out an energy audit. This requirement on companies first entered into force with the EEffG at the start of 2015, and the first audits were to be reported by the end of 2015. A small number of companies did not pass the threshold for classification as a large company until 2016 or 2017. Energy audits are to be carried at least every four years, so the next major submission of energy audit reports is expected at the end of 2019.
- Support programmes to encourage SMEs to implement energy and environmental management systems.
- The requirement for energy suppliers to implement energy efficiency measures. The obligations scheme for energy suppliers is laid down in Section 10 of the EEffG. From 1 January 2015, energy suppliers with an annual energy output of at least 25 GWh have been required annually to implement energy efficiency measures with final energy savings of 0.6% compared to the previous year's output of energy to final energy consumers in Austria, and to report their energy efficiency to the monitoring body[12].
- The requirement for the Federal Government to implement energy efficiency measures.
- Strategic measures (including provincial support for housing construction, energy and environment, the Domestic Environmental Support scheme – see above) to promote energy efficiency measures.

Achieving 2020 targets

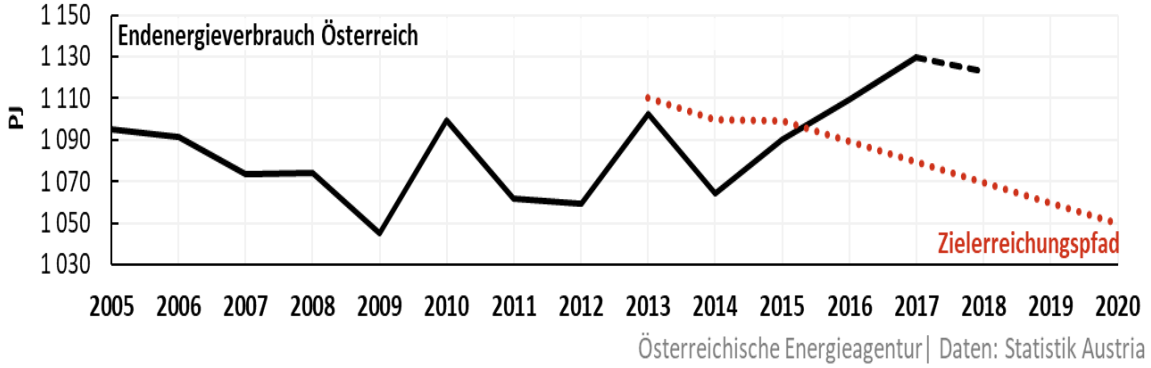
Maximum final energy consumption by 2020

In 2017, Austria's final energy consumption of 1,130 PJ exceeded the 2020 target value of 1,050 PJ.

[12] The monitoring body for energy efficiency has been established by order of the BMNT. It is a point of contact and information for companies, public bodies and energy service providers subject to the requirements of the Energy Efficiency Act. One of the monitoring body's duties is to analyse the data it receives and develop standardised methods for evaluating energy efficiency measures. It also has various reporting obligations to the general public and the BMNT.

In comparison to the previous year (2016), it had risen by some 1.8%. According to Statistics Austria, the main reasons for this were increases in traffic levels and industrial production. The provisional energy balance sheet for 2018 shows a value of 1,122 PJ for final energy consumption, a decrease of just under 1% compared to the previous year. The main reason for the decline, according to Statistics Austria, was higher outdoor temperatures during the heating period, which caused the heating degree total to drop by about 10%[13].

Figure 6: Final energy consumption (provisional value for 2018) and target trajectory under the Energy Efficiency Act



Source: Austrian Energy Agency, Statistics Austria, 2019

Endenergieverbrauch Österreich	Final energy consumption in Austria
Zielerreichungspfad	Target trajectory
Österreichische Energieagentur	Austrian Energy Agency
Daten: Statistik Austria	Data: Statistics Austria

On the basis of the data available, it now unlikely that the energy efficiency target value of 1,050 PJ in 2020 will be achieved. Progress towards this target value is partly dependent on fairly volatile factors which are difficult to influence, such as weather patterns, population growth and economic growth.

Cumulative energy efficiency target of 310 PJ in the period 2015-2020

Progress towards achieving the target under Section 4(1)(3) EEffG presents a different picture. The savings from the measure notifications under the obligations scheme and from strategic measures totalled (2014-2017) 168.3 PJ, and contribute towards the savings target of 310 PJ. This suggests that the EEffG target of 310 PJ will be achieved by 2020.

Energy efficiency measures notified

The majority of the cumulative annual savings from 2014 to 2017 came from energy taxes

[13] https://www.statistik.at/web_en/statistics/EnergyEnvironmentInnovationMobility/energy_environment/energy/energy_balances/index.html, retrieved September 2019

(strategic measures), followed by 'heating systems and hot water' (measures under the obligations scheme).

Household measures accounted for annual savings of 25.4 PJ, comprising 37.34% of total savings. In low-income households, the measures taken resulted in annual savings of 0.62 PJ, comprising 0.9% of total savings.

Table 3: Energy savings from policy instruments in PJ

Measures	**Cumulative savings in TJ**
	2014-2017
Energy efficiency obligation scheme for energy suppliers	64.60
Provincial support for housing construction, energy and environment	28.26
Domestic Environmental Support ([*Umweltförderung im Inland*] UFI)	22.87
Federal support for green electricity	1.8
Energy taxation	39.21
Motorway tolls for HGVs	0.84
Austrian Federal Government's 'renovation initiative'	3.35
klimaaktiv mobil	0.18
Climate and Energy Fund	7.06
Federal Government property	0.12
Rounded total	**168.29**

Energy audit obligation for companies

Of the 2,015 large companies that registered with the energy efficiency monitoring body as being subject to the requirements of Section 9 EEffG, 51% are classed as manufacturing companies and private-sector service companies. 939 companies have carried out an external energy audit, while 656 companies carried out an in-house energy audit.

Of all energy audits reported, 59% found potential energy savings of between 1% and 10% at the company. The transport sector shows relatively high potential savings on average, ranging between 5% and 20%. In energy audits with potential savings of over 20%, the key focus is on building measures.

For the creation of the energy audits, a total of 570 qualified energy service providers were listed in the public register of external energy service providers on the website of the energy efficiency monitoring body as of July 2019.

Energy management in SMEs

In order to encourage SMEs to implement energy and environmental management systems, a BMNT support programme was launched with a total of EUR 5 million. Energy advisory programmes, co-financed by the Domestic Environmental Support scheme, are also offered to SMEs in the provinces.

Dimension 3: Security of energy supply

General

Around a third of the energy from primary energy sources comes from Austrian production, a large and ever increasing share of which comes from renewable energy sources. Biogenic fuels and propellants and hydroelectric power are the two main energy sources in terms of domestic production. Photovoltaics, wind power and ambient heat are growing constantly and rapidly. Energy imports account for around two-thirds of gross inland energy consumption, with oil and gas the main two imports. Although domestic oil and gas output is relatively modest and exhibiting a downward trend, in 2017 they still constituted 6.1% (oil) and 13.4% (gas) of gross inland energy consumption.

Security of supply indicators have shown positive developments over the last 10 years in Austria. The net import tangent, which shows the level of dependence on imports, has fallen significantly since 2005, from 72.2% to 64.5%. Natural gas storage capacity sits at 8,216 million cubic metres (mcm), slightly less than the annual natural gas consumption in Austria, while emergency oil reserves, standing at more than a quarter of the average annual consumption, are greater than

the obligatory emergency reserves required by the International Energy Agency. As well as security of supply, energy prices are also central to Austria's status as a location for business. The trend in the energy price index (EPI) shows a significant increase in household energy prices up to 2012, followed by a significant decrease up to 2016, before prices started to rise again in the last two years. However, the real EPI in 2018 will be only slightly higher than in 2005. The Austrian electricity price index (ÖSPI) fell sharply up to 2016 – after an initial considerable increase – and has also risen again in the last two years. The development of gas industry prices in Austria shows, similarly to the international price trend, an increase in real prices up to 2012, followed by a significant decline. Since 2008, the price of electricity has become continuously cheaper for Austrian industry, whereas in the EU it initially rose and recently fell only slightly below the starting level of 2009.

Oil and petroleum products

Although the share of oil and petroleum products has fallen from almost 55% in the first half of the 1970s to around 35.7% today, they still rank first among the energy sources contributing to Austria's gross inland energy consumption. In 2017, the final energy consumption of petroleum products in Austria decreased from 11.3 million tonnes to 10.2 million tonnes. The transport sector accounted for around 80% of this, while 10% is attributed to private households (heating/hot water). The rest is spread across manufacturing, agriculture and services.

Two companies (OMV Austria Exploration & Production GmbH and RAG Exploration & Production GmbH) extract oil in Austria, while OMV AG is the only importer of crude oil. Petroleum products are imported by approximately 65 companies and exported by around 20. There is one refinery (Schwechat) and around 15 mixed undertakings. Eighty companies are active in the wholesale supply of petroleum products. Small- and large-scale consumers are supplied by around 20 companies in the fuel and lubricants trade. There are around 2,600 public service stations in Austria. Currently, all oil imports reach Austria and the Schwechat refinery from the Port of Trieste via the Transalpine Pipeline (TAL) and the Adria-Wien Pipeline (AWP). Petroleum products are transported by road, rail, ship and pipeline (the West Product Pipeline [*Produktenleitung West*, PLW] connects the Schwechat refinery and the Lobau product storage facility with the St. Valentin tank farm).

In 2017, 7.2 million tonnes of oil were imported into Austria (around 90% of the annual demand). Imports came from 13 countries from different regions, with Kazakhstan and Libya ranked first and second. The Schwechat refinery is the only refinery in Austria. Its annual processing capacity is 9.6 million tonnes. Its utilisation rate in recent years has ranged between 90% and 95%. Furthermore, in 2017, 7.1 million tonnes of petroleum products were imported into Austria, compared with product exports of 3.1 million tonnes in 2017.

Obligatory emergency reserves: At the end of 2017, Austria's obligatory emergency reserves totalled 2.76 million tonnes (0.83 million tonnes of crude oil and 1.93 million tonnes of petroleum products). The obligation to hold stocks corresponding to 25% (90 days) of the previous year's imports is therefore met. The administration has not drawn up a risk assessment for oil, nor does it have a prevention plan for which it is responsible.

Natural gas

Austria occupies a key position in the European gas grid and is a major gas transit country. The Baumgarten gas transfer facility in Lower Austria is one of the most important gas hubs in Europe. At 41.14 bcm in 2017, the quantity of natural gas transported through Austria is significantly higher than domestic consumption (8.892 bcm in 2017).

Three companies (OMV Austria Exploration & Production GmbH, RAG Austria AG and RAG Exploration & Production GmbH) extract natural gas in Austria.

Since the beginning of the decade, natural gas storage capacity in Austria has risen from 4.6 bcm to the current capacity of 8.2 bcm provided by the five natural gas storage companies operating in Austria.

Imports based on long-term contracts, which Austrian importers have concluded with suppliers in Norway and Russia, form a cornerstone of the supply of gas. In 2017, a total of 8.090 bcm of natural gas was imported into Austria.

Due to the ongoing liberalisation of the natural gas market, the purchase of natural gas at short notice has become much more important to the natural gas exchange. The volume of gas traded by the Central European Gas Hub (CEGH) on the spot market has increased significantly in recent years, from 0.09 bcm in 2010 to 5.47 bcm in 2017.

The risk assessment for natural gas and the creation of the preventive action plan and the emergency plan are carried out under the leadership of the BMNT in close cooperation with E-Control, the market area manager and the distribution area managers. The publicly available preventive action plan includes the results of the risk assessment, the results of the calculation of the infrastructure standard and of the assessment of compliance with the supply standard and the requirements placed on natural gas companies. The emergency plan contains crisis levels in line with the EU Security of Gas Supply Regulation (early warning level, alert level and emergency level), a description of the relationships between actors – including information flow (e.g. alert chains), the allocation of tasks and roadmaps in critical supply situations or during a crisis – and energy intervention measures.

Electricity

Risk assessments in the electricity sector currently take place on a voluntary basis. The 'Risk analysis for the electricity sector's information systems, with particular reference to smart meters and data protection' [*Risikoanalyse für die Informationssysteme der Elektrizitätswirtschaft unter besonderer Berücksichtigung von Smart-Metern und des Datenschutzes*], which is publicly available, is the result of voluntary cooperation between the Austrian Federal Chancellery, Ministries relevant to security, representatives from the Austrian energy sector and Energie-Control Austria as the competent regulatory authority. Chapter II of the Regulation of the European Parliament and of the Council on risk-preparedness in the electricity sector and repealing Directive 2005/89/EC, which was negotiated under the Austrian Council Presidency, provides for the performance of risk assessments[14].

With regard to a preventive action plan and an emergency plan, there are currently no EU provisions comparable to those for the gas sector. However, the Network Development Plan, which is to be drawn up by Austrian Power Grid AG every year for a ten-year period, can be considered a key preventive element. Similarly, the 'Energy intervention crisis manual for electricity' [*Energielenkungskrisenhandbuch Strom*] and the 'National grid restoration strategy' [*Konzept des nationalen Netzwiederaufbaus*] can be considered comparable instruments to an emergency plan.

Network code

The legal basis for the network code on electricity emergency and restoration is Regulation (EU) No 714/2009 (conditions for access to the network for cross-border exchanges in electricity). The network code on electricity emergency and restoration provides rules for managing the electricity grid in cases of emergency, total failure (blackout) and restoration.

APCIP – Austrian Programme for Critical Infrastructure Protection

In 2008, the Austrian Programme for Critical Infrastructure Protection (2008 APCIP Masterplan) was adopted, and has since been replaced by the 2014 APCIP Masterplan. APCIP coordination is carried out by the Federal Chancellery and the Federal Ministry of the Interior with the involvement of the relevant federal ministries, provinces, interest groups and strategic companies. The Resolution on a new Austrian Security Strategy (ÖSS) adopted by the National Council on 3 July 2013 tasked the Federal Government with developing a state-level strategy to increase Austria's resilience and protect critical infrastructure. The APCIP represents an essential contribution towards implementing the ÖSS.

[14] Regulation (EU) 2019/941, OJ (EU) L 158 of 14.6.2019, p. 1.

In addition to the Federal Government's APCIP, the provinces have their own programmes to protect their regional critical infrastructure, which involve regular exchanges between the Federal Government and the provinces.

Key laws concerning security of supply at federal level

Federal Act on intervention measures for security of energy supply (Energy Intervention Act 2012 [Energielenkungsgesetz 2012 – EnLG 2012]) – BGBl. I No 41/2013

The Energy Intervention Act 2012 provides for the creation of a system of measures in Austria to maintain the supply of energy to the population in the event of a crisis and to comply with Austria's obligations under international law to introduce emergency measures. It covers solid and liquid energy sources, electricity and natural gas.

Federal Act on holding minimum stocks of oil and petroleum products (Oil Stockholding Act 2012 [Erdölbevorratungsgesetz 2012 – EBG 2012]) – BGBl. I No 78/2012

The Austrian stockholding system is based on the Oil Stockholding Act 2012 as amended by BGBl. I No 163/2015 and requires importers of oil and/or petroleum products to maintain 25% (90 days) of their net imports from the previous year as obligatory emergency reserves.

Federal Act on mineral raw materials (Mineral Raw Materials Act [Mineralrohstoffgesetz – MinRoG]) – BGBl. I No 38/1999

The Mineral Raw Materials Act lays down rules for exploring, extracting and processing free-to-mine, state-owned and privately-owned mineral raw materials, for searching for and investigating geological structures to be used to store liquid or gaseous hydrocarbons (i.e. oil and natural gas), for underground container-free storage of hydrocarbons and for processing the stored hydrocarbons, where it is carried out by the storage rights holder in connection with the operation of the storage facility.

Dimension 4: market integration

Electricity

Austria forms part of the Central Western European (CWE) wholesale electricity market and is closely linked with its neighbouring countries. In 2017, the electricity interconnection level in Austria was 15.3%, well above the 2020 target of 10%. The country's central location poses challenges in terms of north-south electricity flows. Austria's electrical grid needs to be able to absorb and transport large and increasing levels of electricity generation from solar and wind

power.

There are bottlenecks in the transmission network for Hungary, Czechia, Slovenia, Italy, Switzerland and, as a result of regulatory requirements, also for Germany as of 1 October 2018. For the important day-ahead market, these bottlenecks are managed either through implicit auctions as part of the European day-ahead market coupling (AT-IT-SI), or through explicit auctions at all other congested borders. There is no direct grid connection between Austria and Slovakia.

Austria is particularly active in the Central Eastern European (CEE) region. This region comprises the countries of Poland, Czechia, Slovakia, Hungary, Slovenia, Germany and Austria.

Austria is also actively involved in the Central Southern European (CSE) region. This region comprises Germany, France, Slovenia, Italy, Greece and Austria, plus Switzerland as an observer country. A particularly important step in this region was the implementation of the day-ahead market coupling at (most) Italian borders in 2015.

The successful commissioning of the Multiple NEMO Arrangements (MNA) in the CWE region led to a breakthrough in the integration of the European electricity markets in July 2019. Since then, more than one electricity exchange in Austria has been able to offer its traders participation in the joint European day-ahead market coupling. Through its strong links with the CWE region, since 2011 Austria has therefore been active as a full member of the Pentalateral Forum (Benelux, Germany, France, Switzerland and Austria). The aim of this initiative is to provide political support for a process of regional integration towards a European energy market.

Austria is also a member of the CESEC (Central and South-Eastern Europe Connectivity) regional initiative, which aims to speed up the integration of gas and electricity markets in central and south-eastern Europe. It was set up in February 2015 by Austria, Bulgaria, Croatia, Greece, Hungary, Italy, Romania, Slovakia and Slovenia. These countries were later joined by eight Contracting Parties to the Energy Community: Ukraine, Moldova, Serbia, North Macedonia, Albania, Bosnia and Herzegovina, Kosovo and Montenegro.

Network Development Plan (NDP)

The Network Development Plan is a legal obligation for transmission system operators. Both Austrian Power Grid AG (APG) and Vorarlberger Übertragungsnetz GmbH (VÜN) draw up their own Network Development Plan, which must be approved by the regulator E-Control. The NDP contains a list of investments that have already been agreed and projects to be implemented within the next three years. The NDP also sets out network planning for the next ten years, taking into account developments in energy performance.

The current Network Development Plan 2019 is based on ENTSO-E's Ten Year Network Development Plan (TYNDP) 2018 and the NDP 2018, and provides information on the key transmission infrastructure to be developed in the APG network. Within the framework of TYNDP, the European transmission system operators plan coordinated network expansion across Europe. In TYNDP 2018, ENTSO-G and ENTSO-E have for the first time published joint scenarios for a future energy system, which show the interactions between electricity and gas systems.

Projects of common interest – electricity

Regulation (EU) No 347/2013 provides a framework for identifying, planning and implementing projects of common interest (PCIs). PCIs are essential to the creation of nine priority strategic geographical energy infrastructure corridors in Europe.

The projects are particularly intended to help create a sustainable energy system in order to address challenges such as increasing energy demand, ensure security of supply, cope with bottlenecks, increase market liquidity and trading opportunities, promote the use of technology such as smart grids and enable the integration of renewable energy.

The list of PCIs is drawn up every two years. In particular, this process involves the Member States, the European Commission, the Agency for the Cooperation of Energy Regulators (ACER), the national regulatory authorities and the project promoters. Currently in force is the third PCI list, from 2017; the process of drawing up the fourth list began in autumn 2018.

Due to its central geographic location, Austria is particularly affected by north-south connections and energy flows, and must therefore increasingly balance out volatility in renewable energy generation.

In October, the European Commission presented the draft for a Delegated Regulation on the fourth PCI list. If no objections are raised by the Council or the European Parliament, the Delegated Act will enter into force after the expiry of the objection period of two months (renewable once); this is likely to be in the first quarter of 2020.

Irrespective of the final result on the fourth PCI list, Austria will support the projects proposed by Austrian project promoters for the fourth PCI list.

The draft for the fourth PCI list contains the following Austrian PCIs in the electricity sector:

Priority corridor 'North-south electricity interconnections in western Europe':

2.18. Capacity increase of hydro-pumped electricity storage in Kaunertal, Tyrol; Project promoter: TIWAG

Priority corridor 'North-south electricity interconnections in central eastern and southern Europe':

Cluster Austria — Germany, including the following PCIs:

3.1.1 Interconnection between St Peter (AT) and Isar (DE) (380 kV 'Germany line'); Project promoter: APG/TenneT

3.1.2 Internal line between St Peter and Tauern (AT) (380 kV 'Salzburg line'); Project promoter: APG

3.1.4 Internal line between Westtirol and Zell-Ziller (AT) (380 kV); Project promoter: APG

3.4. Interconnection between Würmlach (AT) and Somplago (IT); Underground lines; 220 kV; Project promoter: Alpe Adria Energia S.r.l.

The project promoters for 3.4 (Somplago-Würmlach) have applied for support from the Connecting Europe Facility (CEF). These applications, along with the projects themselves, were supported by Austria. A CEF grant was approved at the beginning of 2019.

German-Austrian pricing zone

Since the liberalisation of the electricity markets, Germany and Austria have formed a common market zone in the wholesale electricity market. On 1 October 2018 this German-Austrian market zone was split. As a result, Austria is guaranteed a free long-term capacity of 4,900 MW. This leads to an adjustment of the Austrian electricity price index (ÖSPI). The ÖSPI is derived from prices on the European Energy Exchange (EEX). The relevant prices are those for long-term supply contracts, known as electricity futures. Previously, the corresponding futures for the common German-Austrian electricity market were used to calculate the ÖSPI. This calculation was switched for the first time in September 2018 and since then the electricity futures exclusively for the Austrian market have been taken into account. The calculation system itself remains in the existing form. Tariffs with a fixed price agreement will not be adapted until the date fixed in the contract.

Gas

Austria occupies a key position in the European gas grid. The Baumgarten gas transfer facility in Lower Austria is one of the most important gas hubs in Europe. The Austrian grid operators' transmission and distribution network is around 46,000 km in length (as of 2017). In addition to the gas distribution system (high and low pressure), end consumers are also supplied by way of transit pipelines. These are pipelines of international importance, which cross Austria, but which are also used for transportation within Austria. Natural gas is transported internationally via a dense network of pipelines, stretching from Russia, through former Soviet states, Slovakia, Czechia and Austria, to destinations in western and southern Europe.

Through the Gas Act 2011 [*Gaswirtschaftsgesetz 2011*, GWG 2011] and the gas market model introduced in 2013, an entry/exit system was implemented, the balancing group system was extended to transmission level and a virtual trading point for the settlement of all gas transactions was introduced. Every customer is either directly or indirectly (through their utility company) a member of a balancing group. In the new gas market model, the three previous control areas have been converted into market areas (Eastern, Tyrol and Vorarlberg). The Eastern market area is the only one that also has transmission pipelines. In this market area, the previous system of capacity bookings has been replaced by an entry/exit system. The entry/exit system allows capacity at entry and exit points to be booked independently of one another and traded.

The natural gas storage operators active in Austria – RAG Energy Storage GmbH, OMV Gas Storage GmbH, Uniper Energy Storage GmbH, Astora GmbH & Co. KG and GSA LLC – have storage facilities with a total working gas volume of approximately 8.2 bcm. Natural gas is stored in partially depleted hydrocarbon-bearing geological structures at a depth of currently about 500 to 2,300 m.

Coordinated Network Development Plan (CNDP)

In its role as market area manager, Austrian Gas Grid Management AG is responsible for drawing up a Coordinated Network Development Plan once a year, in consultation with the transmission system operators (Gas Connect and Trans Austria Gasleitung GmbH), which must then be approved by the regulatory authority E-Control. The objectives of the Coordinated Network Development Plan are, in particular, to meet the demand for line capacity to supply end consumers while taking into account emergency scenarios, to ensure a high degree of availability of line capacity, to cover transport needs and to comply with the obligation to meet the infrastructure standard in the market area. The CNDP will be developed in line with the European planning principles laid down in the 'Ten Year Network Development Plan (TYNDP)' by ENTSO-G. In addition to describing the pan-European infrastructure, this plan in particular considers supply potential, market integration and security of supply and thus also covers the overall dynamics of the European gas market. In TYNDP 2018, ENTSO-G and ENTSO-E have for the first

time published joint scenarios for a future energy system, which show the interactions between electricity and gas systems.

Long-term Plan (LTP)

Austrian Gas Grid Management AG, as the distribution area manager, is also responsible for drawing up the Long-term Plan for the Austrian distribution area at least once a year. This is approved by the regulatory authority E-Control Austria. The aim of the Long-term Plan is to ensure transport capacities in the distribution area both for the supply of end consumers and for the transport requirements of the storage companies and their customers and the producers of natural gas and biogas.

Projects of common interest – gas

As with the electricity sector, Austrian projects of common interest (PCIs) aim to improve market integration, address bottlenecks at borders and enable cross-border bi-directional gas flows. Issues of security of supply and diversification of energy sources and routes are thus treated as priorities at national and EU level. Due to its central geographic location, and also due to the Baumgarten gas hub, Austria is particularly affected by capacity expansion projects or new pipeline projects. The draft for the fourth PCI list contains the following Austrian PCIs in the gas sector:

Priority corridor 'North-south gas interconnections in central eastern and south eastern Europe':

6.26.

6.26.1 Cluster Croatia — Slovenia — Austria at Rogatec:

GCA 2015/08: Entry/Exit Murfeld (AT); Project promoter: GCA

Key laws concerning market integration at federal level

Electricity Industry and Organisation Act 2010 [Elektrizitätswirtschafts- und Organisationsgesetz 2010, ElWOG 2010] – BGBl. I No 110/2010

The implementation of the third internal energy market package required regulations in the electricity and gas sector to be comprehensively redesigned. The aim of this Federal Act is to

account for these requirements. It contains rules on the production, transmission, distribution and supply of electricity and on the organisation of the electricity industry. It also lays down rules on system use charges, on accounts and on the organisation, unbundling and transparency of the accounting done by electricity companies, as well as their other rights and obligations.

Federal Act laying down new rules for the natural gas sector (Gas Act 2011 [Gaswirtschaftsgesetz 2011 – GWG 2011]) — BGBl. I No 107/2011

This Federal Act aims to account for the requirements of Directive 2009/73/EC, particularly in relation to unbundling. It lays down rules for effective unbundling of transmission networks, for ensuring free market access for suppliers and for developing capacity for new consumer installations. An 'entry/exit market model' was also created with the aim of substantially increasing the liquidity of the gas market by setting up virtual trading points.

Federal Act implementing Regulation (EU) No 347/2013 on guidelines for European infrastructure (Energy Infrastructure Act [Energie-Infrastrukturgesetz – E-InfrastrukturG]) — BGBl. I No 4/2016

The purpose of this Federal Act is to account for the requirements of Regulation (EU) No 347/2013. The key elements of this are designating the Federal Minister for Science, Research and Economic Affairs as the competent authority (infrastructure authority), selecting the procedure for the comprehensive decision and securing the development of pipeline installations.

Federal Act on the regulatory authority for the electricity and natural gas industry (Energy Control Act [Energy-Control-Gesetz – E-ControlG]) – BGBl. I No 110/2010

The Energy Control Act defines the responsibilities and tasks of the Austrian regulator 'Energie-Control Austria for the regulation of the electricity and gas industry', or E-Control for short, [*Energie-Control Austria für die Regulierung der Elektrizitäts- und Erdgaswirtschaft*] as a public agency with legal personality.

Federal Act imposing a tax on the supply and consumption of electricity (Electricity Tax Act [Elektrizitätsabgabegesetz]) – BGBl. I No 201/1996

By largely exempting sustainable electricity production from the obligation to pay electricity tax and simplifying administration for electricity producers, the aim is to support sustainable domestic electricity production through tax measures. In addition to an exemption for electrical energy produced from renewable primary energy sources, e.g. small hydroelectric power stations, wind turbines and similar, in the form of a tax-free allowance of 25,000 kWh, an uncapped tax exemption will be introduced for electrical energy produced by means of photovoltaics.

Federal Act supporting the construction of local and district heating and cooling pipelines (Heating and Cooling Pipeline Development Act [Wärme- und Kälteleitungsausbaugesetz – WKLG]) — BGBl. I No 113/2008

This Federal Act generates CO_2 savings and increases energy efficiency through support for

investment. The creation of cooling grids is designed to curb the increase in electricity consumption for air-conditioning and to make cost-effective use of existing heat and waste heat potential, particularly on an industrial scale.

Federal Act introducing provisions for the combined heat and power sector (Combined Heat and Power Act [KWK-Gesetz]) – BGBl. I No /2008

The purpose of this Act is to support new high-efficiency CHP plants through investment grants, provided the plants are not already being supported by means of other State resources.

Measures to overcome energy poverty

As a result of the third internal electricity market package, it has been possible to take the first important steps in improving the conditions for people in payment difficulties:

a strict reminder procedure has been introduced before electricity or gas is cut off, which gives people more time to look for solutions. The high ancillary costs of late payment for electricity and gas (reminder costs, disconnection costs, etc.), which were incurred by the very people who were unable to pay their energy bills, have been standardised and limited. Based on this law, ancillary costs collected by the network operators can be regulated taking social criteria into account.

An obligation to contract is intended to ensure that people with poor credit ratings or old debts can also purchase electricity and gas, provided they pay a monthly instalment of their electricity costs in advance. Poor credit ratings or old debts are no reason to refuse the basic service. The tariff is not more expensive than the standard tariff for household customers.

Large energy suppliers are obliged to set up contact and advice centres, which also cover problems relating to energy poverty.

The Green Electricity Act relieved low-income households of additional costs for green electricity production.

The Energy Efficiency Act contains incentives for energy suppliers – which are obliged by the EnEffG to provide evidence of energy efficiency measures – to increasingly implement energy efficiency measures also in low-income households.

Dimension 5: research, development and competitiveness

Research and technological development play a key role in global decarbonisation and are central elements in the fundamental conversion of the energy system. Austria still has huge potential to build on past innovation success stories to develop and successfully implement innovative technologies and solutions. The following strategic objectives are in place:

- put energy research and innovation at the heart of solving societal challenges

(mission orientation);

- increase the speed at which the results of research and technological development reach the market through the introduction of targeted measures (impact orientation);
- gradually increase funding for energy research and innovation;
- increase the presence of Austrian research institutes and innovation companies at global level (transnational RTI collaboration);
- thereby establishing Austria as a technology leader in energy-related areas and increasing international competitiveness.

In future, energy research and innovation will be organised around these guidelines, a fact which is characterised by an integrated perspective based on a systemic approach. System integration of the growing range of available technology and solutions, in terms of global approaches, is equally as important as the targeted development and advancement of technology and components. The current Austrian government programme established a corresponding research initiative which is open to all kinds of technology. Under this initiative, mission-oriented research and development for specific challenges in the energy system and large-scale testing of technologies and solutions under real operating conditions will be used to achieve technological leadership and boost development and implementation. In the period 2021-2030, these formats will be further developed, building on the experience previously gained.

iii. Key aspects of cross-border relevance

Due to its geographical situation (mountainous, land-locked central European country), Austria has specific characteristics, some of which have a cross-border impact on the energy and transport system.

Major trans-European transit routes – both north-south and west-east – travel through Austrian territory, putting great pressure on the transport infrastructure. As well as economic opportunities, this also has negative side effects, in particular with regard to air quality and noise. In addition, significant quantities of fuel are put into tanks in Austria by cross-border transport companies and then largely used in neighbouring countries. This effect is, in no small part, also due to the fact that diesel is cheaper in Austria than in most neighbouring countries. This has led to a significant increase in greenhouse gas emissions in Austria, as, according to the IPCC, emissions balancing is carried out in accordance with the principle of quantities sold domestically.

Austria occupies a key position in the European gas grid and is a major gas transit country. The Baumgarten gas transfer facility in Lower Austria is one of the most important gas hubs in Europe. In the electricity sector too, Austria has close links with its neighbours. In 2017, the electricity interconnection level in Austria was 15.3%, well above the 2020 target of 10%.

For further information see point 1.2, sub-point ii, 'Security of supply' and 'Market integration'.

iv. Administrative structures for implementing national energy and climate policy

Austria is a federal state. Via the federal constitution, legislative competence across the various sectors is shared between the Federal Government and the provinces. There are also some mixed competences. Some sectors (including energy law) follow the principle of basic legislation at federal level and implementing legislation at provincial level. The 'indirect federal administration', through which federal tasks are handled by provincial enforcement bodies, also ensures a strong 'federalisation' of duties.

Climate policy in Austria is a classic cross-sector matter, in particular as regards the distribution of competences for climate policy measures for reducing emissions and adapting to climate change. The Federal Ministry for Sustainability and Tourism (BMNT) plays a national coordinating role with regard to climate policy. Strategic processes are managed in the same sense by the BMNT (together with other ministries where appropriate). The BMNT also assumes responsibility for reporting on climate issues to the UNFCCC Secretariat and to the European Union.

Key competences for implementing measures lie with the federal ministries (federal climate- and energy-related support and incentives in non-ETS sectors), the provinces (particularly buildings, small combustion plants and spatial planning) and the municipalities (particularly public transport and parking space management). In addition, the BMNT also has key competences for implementing measures, particularly in the areas of EU emissions trading, energy, waste management, chemicals policy and agriculture and forestry. In some cases, however, these competences are also shared with the provinces (especially waste management, agriculture and forestry).

Not least as a consequence of the strong diversification of competences in climate policy matters, in 2011 the Federal Government (at the initiative of the then Federal Ministry of Agriculture, Forestry, the Environment and Water Management) passed a Federal Climate Protection Act. The purpose of this act is to coordinate Austrian climate policy in line with international and EU law. To this end, a National Committee on Climate Change was established, on which, alongside the competent federal ministries, are represented the nine provinces, social partners (employers' and employees' associations), the political parties represented in the National Council (*Nationalrat*, i.e. the lower house of the Austrian parliament), economic interest groups and environmental NGOs, among others.

One of the key functions of the Climate Protection Act is to ensure a process for developing climate protection measures and to lay down emission ceilings (target trajectories) in line with

European legislation. The emission ceilings for the period 2013-2020 were also allocated to the emitting sectors and laid down in law.

In the energy sector, a regulatory authority for the electricity and natural gas industry was founded in 2001 under the name 'Energie-Control Austria for the regulation of the electricity and gas industry' (E-Control). In 2011, it was converted into a public agency with legal personality (E-Control Act).

1.3. Stakeholder consultation at national and EU level – outcomes

Even in the early stages of the Climate and Energy Strategy (#mission2030), national stakeholders and the general public were fully involved by the Federal Government. In April/May 2018, an extensive public consultation was carried out. This was divided into an online public consultation (which received around 500 responses), multiple round table events with broad stakeholder participation to advance the discussion on certain topics, and a parliamentary enquiry (see below). For the mobility sector, the BMVIT and the BMNT, together with the provinces and numerous experts, held a separate stakeholder process, Mobility transition 2030 [*Mobilitätswende 2030*].

This National Energy and Climate Plan relates directly to the strategic focus and priority areas of #mission2030. In order to draft the plan, federal and provincial working groups were set up starting in July 2018, which drew up proposals for measures at sector level. In November 2018, the National Committee on Climate Change was also consulted in accordance with the Climate Protection Act and was given the opportunity to submit a written opinion. This body comprises representatives of the following institutions and social groups:

- the relevant ministries (Sustainability, Transport/Innovation, Finance, Economic Affairs, Science, Health/Social Affairs, Justice) and the Federal Chancellery;
- parties represented in the Austrian National Council (lower house of parliament);
- all nine provinces;
- social partners (Economic Chamber, Chamber of Agriculture, Chamber of Labour, Trade Union Confederation);
- industry, energy and consumer information associations;
- Association of Towns and Municipalities;
- representatives of the scientific community;
- Federal Environment Agency;
- environmental protection NGOs.

i. Participation of the Austrian Parliament

During the consultation phase for the Federal Government's Climate and Energy Strategy, members of the parties represented in the Austrian Parliament were involved in the round table events (in some cases acting as chair). A parliamentary climate enquiry was also organised specifically for the Climate and Energy Strategy, involving representatives of the scientific community, the provinces and civil society, among others. The political parties took the opportunity to set out their positions on climate change policy.

The National Energy and Climate Plan was drawn up with the repeated involvement of the members of the political parties represented in the National Council by way of the National Committee on Climate Change (November 2018, July 2019).

ii. Participation of local and regional administrations

During the consultation phase for the Climate and Energy Strategy (see above), the Austrian provinces took part in the round table events and were also involved in the build-up to key aspects of the strategy. The provinces took this opportunity to set out their positions on climate change policy, also doing so through the online consultation on the strategy.

The provinces were heavily involved in drawing up the National Energy and Climate Plan through the establishment of a working group between the Federal Government and the provinces and further sub-working groups at sectoral level. All provinces were given the opportunity to actively participate in the (sub-)working groups and to submit concrete proposals for action. The provinces and other city and municipality interest groups (Association of Towns, Association of Municipalities) are also members of the National Committee on Climate Change and were therefore also able to submit final written opinions. Coordination with the provinces takes place, inter alia, through the provincial climate protection officers, with the involvement of the Federal Minister responsible for climate protection.

In addition, the provinces are also involved in drawing up key national strategies relevant to the sectors of energy and climate protection. The heat strategy, bio-economy strategy and hydrogen strategy processes are particularly affected by this. Existing (interim) results from these processes were taken into account when finalising the plan.

iii. Consultation with stakeholders, including social partners, and participation of civil society and citizens

During the consultation phase for the Climate and Energy Strategy (see above), social partners (employers' and employees' associations), industry and energy associations and civil society (in particular NGOs in the environmental and energy sector and companies) were involved in the round table events, and to some extent also took part in the online consultation, in order to communicate their concerns in writing. The general public (citizens) were also given the opportunity to participate in the online consultation (see above).

This draft of the National Energy and Climate Plan was drawn up with the involvement of social partners and NGOs by way of the National Committee on Climate Change (November 2018, July 2019). In November 2019, during finalisation of the plan, a comprehensive public consultation was held in accordance with the requirements of the Governance Regulation. Comments from citizens and stakeholders were thoroughly analysed and taken into account where possible. Around 120 comments were received in total.

In order to discuss measures on mobility, which is a particularly challenging sector, 'future conferences' were held in all nine provinces as early as 2018 as part of the *Mobilitätswende 2030* stakeholder process, with widespread participation of local and regional administrations. Common guiding principles were adopted by the Federal Government, provinces, towns, cities and municipalities.

iv. Consultation with other Member States

In the course of drafting the NECP, Austria contacted all of its EU neighbouring states to ensure regional consultation within the meaning of the Governance Regulation. During the consultation meetings, the opportunity was given to review and comment on each other's plans. More details on regional cooperation with other Member States are given in Chapter 1.4.

v. Iterative consultation process with the European Commission

The Republic of Austria officially submitted its draft National Energy and Climate Plan to the European Commission on 20 December 2018 in accordance with the Regulation on Governance. On 30 January 2019, Austria – like all other Member States – had the opportunity to present key figures and content elements of the draft plan as part of the 'Technical Working Group on NECPs' at the invitation of the Commission.

On 18 June 2019, the European Commission published a communication on the results of the examination of the plans as well as recommendations to the Member States. The recommendations addressed to Austria were widely communicated to the national stakeholders and a meeting of the National Committee on Climate Change was held on 8 July 2019.

Further working group meetings were subsequently agreed, in particular to develop additional measures in the transport sector. Measures in the agricultural sector have also been further specified through an internal process in the Federal Ministry for Sustainability and Tourism.

Target definitions for the renewable energy and energy efficiency sectors have been clarified in more detail with the European Commission. In the renewable energy sector, a bilateral meeting was held in March 2019, during which mainly questions of target definition and gross final energy consumption were discussed.

On 10 September 2019 Austria participated in the 'Technical Workshop for Renewables and Energy Efficiency'. Prior to this workshop, a bilateral meeting was also held with representatives of the European Commission (DG ENER) under the leadership of Claudia Canevari. Detailed questions and the recommendations of the European Commission on the energy efficiency part of the National Energy and Climate Plan were discussed:

- Relationship between 'Long Term Renovation Strategy' (LTRS) and Article 7: the aim is to produce a coherent document in which efficiency, greenhouse gas emissions and renewables fit together in terms of targets and contributions. The key elements for LTRS should be included in the NECP.
- 'Energy efficiency first': the positive effects of energy efficiency on the other areas (internal market, security of supply, decarbonisation) must be demonstrated. It must be shown how the principle is implemented and monitored in Austria.
- National contribution: a fixed, absolute value must be given, and policies and measures must be detailed at the level of programme (not individual projects).
- Other European measures such as ecodesign or reducing CO_2 in cars must be taken into account when calculating national contributions.

1.4. Regional cooperation in drawing up the plan

i. Elements of coordinated planning with other Member States

Regional cooperation with neighbouring States

As part of the process of drawing up the draft National Energy and Climate Plan (NECP), regional cooperation has taken place with Austria's neighbouring States: Germany, Czechia, Slovakia, Hungary, Slovenia and Italy, as well as with Poland, Croatia and Belgium. As part of this, the majority of Member States, including Austria, have chosen to invite each other to cooperation meetings. Each of these meetings saw several Member States come together to inform one another of the contents of their respective draft NECPs and to identify possible connecting factors enabling closer cooperation.

Austria participated in the associated conferences held in

- Bratislava (November 2018; Slovakia, Czechia, Hungary, Poland),
- Berlin (April 2019; Germany, along with Czechia, Slovenia, etc.),
- Ljubljana (July 2019; Slovenia, Italy, Croatia, Hungary)
- Brussels (September 2019; various Member States)

Austria also invited Germany, Czechia and Slovakia to a conference held in Vienna on 28 June 2019 within the scope of regional cooperation. During this conference, the participating States presented their respective draft plans and subsequent discussions were held to identify topics of cross-border significance, thereby further deepening the cooperation. The conference focused on objectives and policies/measures in all five dimensions of the Energy Union.

Use of existing forums for regional cooperation

Austria is part of the Pentalateral Energy Forum (Belgium, Netherlands, Luxembourg, Germany, France, Austria, Switzerland) for regional cooperation in Central and Western Europe to improve electricity market integration and the security of supply. During the PENTA Directors-General meeting held in November 2018 in Vienna, the decision was made to use the PENTA Forum for future NECP coordination. On that basis, the PENTA member states drew up the 'Political Declaration of the Pentalateral Energy Forum on Integrated National Energy and Climate Plans' which was signed by the Energy Ministers of all PENTA member states during the Ministerial Meeting held on 4 March 2019. In this declaration, it was stated that the PENTA states would draft a common chapter for the NECP with the intention of laying the foundation for a structured

dialogue on the subject of further long-term cooperation. In order to establish this process as an integral part of the cooperation, a separate body was established within the PENTA to ensure long-term NECP cooperation. The common chapter was signed by the Energy Ministers during the PENTA Ministerial Meeting held on 25 June 2019. In September 2019, a subsequent meeting of the NECP representatives took place in Brussels, during which the next steps for the implementation of the common chapter were defined.

ii. Consideration of the results of regional cooperation in the plan

The contents of the national energy and climate plans were exchanged and discussed at the above-mentioned cooperation-related events, and areas of cross-border interest (e.g. transmission networks in the energy sector, projects of common interest, etc.) were examined in greater depth. Within the framework of the Pentalateral Forum (see above), common text elements were developed and taken into account in the present plan. The results of this process are presented in the following section.

Common chapter of the Pentalateral Energy Forum

Introduction

The Pentalateral Energy Forum is a voluntary regional cooperation, since 2005, between Belgium, France, Germany, Luxembourg, the Netherlands and, since 2011, Austria, counting for more than one third of EU population and covering more than 40% of the electricity generation in the EU. Switzerland joined as a permanent observer in 2011 and contributes actively to the technical work and decision shaping. In close cooperation with the European Commission (on invitation), the Pentalateral Energy Forum enhances the cooperation between all relevant parties in order to create a regional electricity market as an intermediate step towards one common European electricity market.
The cooperation is led by the Ministers responsible for energy policy, who meet on a regular basis. The follow-up of the activities is ensured by the Penta Coordinators and the Penta NECP Committee under the direction of the respective Directors General (Section Heads in Austria) of the Pentalateral countries. The work programme is carried out by Transmission System Operators (TSOs), ministries, regulatory authorities (NRAs), the European Commission and market parties who meet on a regular basis in 3 Support Groups.
The major success over the past 15 years is that Penta countries have evolved from a purely national policy perspective on energy markets to the adoption of a regional approach. Concrete regional milestones are put in place in several dimensions which remain relevant today:

Internal electricity market/market integration:
The Penta Support Group 1 (SG1) focuses on the coupling of the electricity markets in the region. The SG1 fostered the flow-based market coupling (FBMC) of the day-ahead markets as an objective, and in May 2015 the FBMC was officially launched in the Penta region, as the first of its kind in the European Union. Since then, the FBMC has been continuously improved to further increase its welfare gains and serves now as the basis for a fully EU entrenched FBMC for the day-ahead markets.

Moreover, in order to increase the available transmission capacity for cross-border trade on the intraday market, the SG1 fostered a coordinated intraday capacity calculation process after day-ahead flow-based market coupling for all borders in the region which has been implemented in March 2016 as a first step of the coupling of European intraday markets.
The Support Group has been a privileged witness of the drastic change in the electricity landscape and the governance of the electricity markets. Whereas in 2005 electricity operators still worked rather separately, the group has actively stimulated over the years the cooperation between stakeholders, which contributed e.g. to the regional grouping of TSOs in their associations, the merger of Power Exchanges or TSOs, and the emergence of new regional actors (TSCNet, Coreso, former CASC-CWE, SSC).

With a view to the new implementation plans that have to be prepared according to the Clean Energy Package, Penta countries will closely coordinate and explore joint action.

Internal electricity market/flexibility:

The Support Group 3 (SG3) focuses on flexibility issues in the region. The work in the SG3 has until now been concentrated on balancing, intraday and the role of demand side response as three major fields for regional cooperation to improve the flexibility of our electricity markets. Various technical background papers have been delivered summing up the main barriers and obstacles towards an enhanced use of flexibility in the Penta region. The participation of SG3 has been open to traditional participants (NRAs/TSOs) as well as other stakeholders like Distribution System Operators (DSOs), large consumer organisations and renewable producers.

Regarding balancing, assessments of current approaches and an exchange on good practices have taken place within the Penta forum. In addition, Penta is playing an important role in the implementation process of the European Union Guidelines on Electricity Balancing. Regarding Demand Side Response (DSR), a separate expert group has worked on a report describing the actual situation in the Penta region with a focus on the rules and responsibilities of new market players in each country of the region. Regarding the further cooperation of Penta countries on hydrogen, a workshop has taken place, in order to define possible cooperation topics on this issue.

Security of supply:

The Support Group 2 (SG2) deals with security of supply issues in the region. There has been a Memorandum of Understanding among Penta countries on cooperation as regards security of supply (MOU), signed in June 2017. Based on this and in the light of the new EU regulation on risk preparedness, a crisis exercise ("PENTEX 2018") had been organised in 2018 in order to achieve a better mutual understanding of national concerns, identify potential relevant (cross border) crisis situations for the region and assess different measures to mitigate the effects of a crisis.

The 1st regional generation adequacy assessment (GAA) performed by the Penta TSOs and published in March 2015 constituted an important milestone. The methodology for the assessment used a probabilistic and chronological approach with an hourly resolution for the years 2015/2016 and 2020/2021 which represented a significant improvement in comparison to the existing deterministic approaches. Furthermore, the Penta TSOs used a common regional dataset based on the same scenarios and assumptions, such as a regional-wide temperature-sensitive load model and harmonised probabilistic hydrological data.

The governments of the Penta countries are convinced that these dimensions remain relevant. Next to a continuation on the above-mentioned areas, Penta countries will in the upcoming years use the Pentalateral Energy Forum to work on the following priorities:

Decarbonisation of the electricity sector

Common vision on decarbonised electricity in Penta by 2050:
Penta countries will exchange their visions for a decarbonised electricity system by 2050 (with intermediate steps for 2030 and 2040) as part of a highly energy efficient and highly renewables-based energy system, a stepwise phasing out of fossil generated power and by an efficient end-use of electricity. As a first step, a comparison of national scenarios on what the electricity system 2050 could look like will be performed as well as the identification of common and diverging aspects across the scenarios and how security of supply would be guaranteed in these scenarios. This will create the basis for a common understanding of the expectations and challenges for building a future electricity system.

Start cross-border cooperation on renewable electricity:
Penta countries will work on voluntary basis towards developing a menu of common concepts covering different levels of cooperation, including exploring the possibilities for opening of national tendering schemes/cross-border tendering, common tenders for those Penta-countries which are interested and making increased use of the EU enabling framework for renewable energy and the existing cooperation mechanisms, such as joint projects and statistical transfers ("cluster menu") for those Penta-countries which are interested.
The Penta countries also support the ongoing work of the European Commission and the Member States on developing a European Union Renewables Financing Mechanism.

Integration of electro-mobility options and services without regional restrictions
Penta countries will contribute to increasing the share of renewable energy in transport by promoting electromobility (including fuel cell options). They facilitate the integration/implementation of electromobility options and services without restrictions within the Penta region, by identifying and if needed removing barriers for the cross-border deployment of electro-mobility and charging services and by assuring interoperability.

Explore the options for carbon pricing and their cross-border impact on electricity prices:
Penta countries that plan or consider to introduce a carbon price will on a voluntary basis exchange views on policy approaches for the introduction of a carbon price, its advantages and disadvantages in terms of CO_2 reduction, security of supply, price developments and a level playing field of their industries.

Internal electricity market

Market integration

Penta countries will further improve the monitoring of FBMC with a view to increase cross-border trade and social welfare and to optimise consumer benefit. Penta countries will make the monitoring more innovative, with a view to translating it into the key common indicators to assess the evolution towards a fully decarbonised Pentalateral electricity market in 2050.

Penta countries will work together in the swift implementation of the Clean Energy Package and possible cross-border impacts for the energy market (e.g. further development and improvement of redispatch cooperation in the Penta-region).

Flexibility

Penta countries will focus on the impact of the implementation of flexibility options such as the role of demand side management, PtX and hydrogen, the role of storage, electric mobility and analyse concrete electricity related barriers for sector coupling.

Regarding the potential future role of increasingly renewables based hydrogen as an energy carrier in their energy system, Penta countries will examine possible common approaches for guarantees of origin, cross-border infrastructure, the respective role of TSOs and DSOs and standards for hydrogen blending, as well as exchange information and best practices on support schemes for hydrogen and innovation projects and the future role of hydrogen in general.

Security of supply

Penta countries will continuously improve the Pentalateral Generation Adequacy Assessment by taking into account improved weather data, the latest figures and targets from the NECPs of Penta countries when determining the future energy mixes and some other sensitivity analysis. The third assessment is currently being elaborated by the Penta TSOs for the horizons 2021 and 2025 taking into account regional (based on national) storylines, improved Flow Based calculations and Demand Side Flexibility sensitivities.

In the frame of the Clean Energy Package (CEP), and more specifically in the context of regional cooperation and the risk preparedness regulation, discussions have been started with ENTSO-E, the Commission and other stakeholders to define rules for the cooperation between Member States in view of identifying potential regional crisis scenarios and of preventing, preparing for and handling electricity crises in a spirit of solidarity and transparency and in full regard for the requirements of a competitive internal market for electricity. Penta countries will work together to develop concrete regional measures in crisis situations.

Financing instruments for the energy transition

The Pentalateral Energy Forum will start to exchange on possible regional approaches

to increase energy efficiency and the roll out of renewables for example by looking together with financial institutions such as EIB for joint approaches to reduce risks in both sectors and hence facilitate the achievement of Penta members' objectives.

iii. Main concerns for closer cooperation at European level

In addition to the considerable efforts being made at Member State level, the implementation of the objectives of the National Energy and Climate Plan requires further European Union initiatives in certain key areas. From Austria's point of view, the 'Green Deal' initiative launched by the new European Commission is a welcome move.

For example, extensive structural changes in the **Mobility and Energy sector** require corresponding guidelines in the common internal market.

- Under the Austrian Presidency, the Graz Declaration was adopted at the informal Meeting of Environment and Transport Ministers in Graz under the heading 'Starting a new era: clean, safe and affordable mobility for Europe'. At its heart is a request to the Commission to draw up a mobility strategy by 2021.
- The existing CO_2 fleet agreements should be tightened up on the basis of an early review – in accordance with the decarbonisation pathway required under the Paris Agreement and the EU long-term strategy – with a view to enabling a faster switch to electromobility for passenger cars and light and heavy commercial vehicles, particularly after 2030. Proposals for specific measures include:
  - Rapid introduction of CO_2 limits for buses.
  - Establishment of predictability for the automotive industry by rapidly establishing reduction paths for the period after 2030.
- Pushing for the revision of the Eurovignette Directive in order to bring about cost transparency for road freight transport by internalising external costs (e.g. by taking account of CO_2 emissions, removing the maximum limits for charging external costs and obliging all Member States to levy external costs on polluted routes).
- Amendment of the VAT Directive, in particular the abolition of exemptions for international transport.
- Completion of the Single European Sky: The ever-increasing volumes of air traffic make it necessary to make more efficient use of existing airspace capacity, which can also lead to further reductions in emissions. The additional burden on airlines resulting from the gradual removal of the free allocation of CO_2 emission allowances (EU ETS) to airlines should be offset, in so far as is possible, by more efficient air traffic control.
- With regard to the recharging infrastructure, the standardisation of standards should be pursued rapidly in order to remove barriers within the common internal market. In

addition, recharging services should be included in the list of MOSS (Mini one stop shop) exemptions to facilitate the collection of VAT in other EU countries (VAT registration will no longer be required in the country in which roaming sales take place).

- With regard to European driving school training, a new automatic transmission test should be introduced. Following this, drivers will simply be able to take a supplementary manual transmission test (in spite of having learnt to drive in an automatic or electric vehicle), and the driving licence would be issued without an entry prohibiting the holder from driving vehicles with manual transmission ('short manual test').
- Based on the evaluation of the European Battery Directive, which is currently under way, it should be assumed that account will be taken of the increasing importance of electromobility in an updated version of the Directive and that even greater attention will be paid to the environmentally sound recycling of batteries from electric vehicles, uniform battery labelling for clear identification at waste collection points and the reuse of batteries.
- More also needs to be done to overcome the barriers to smooth cross-border rail transport. Measures must be taken across Europe in order to strengthen the position of the railways as the environmentally friendly backbone of mobility:
  - Upgrading of infrastructure: Austria is investing heavily in upgrading its national rail network, as well as in removing European 'bottlenecks' along the TEN axes. However, national measures can only be fully effective if all EU partner countries invest in upgrading the TEN network for passenger and goods transport.
  - Efficient cross-border operations: In order to strengthen the competitiveness of rail transport, European standards aimed at ensuring cross-border operations of greater efficiency must be implemented beyond the investment phase.
  - All Member States have been called upon to improve the framework conditions for a modal shift to rail. (see next bullet point)
  - On an EU-wide basis, it should be ensured that the railway network is financed in a sustainable manner by the Member States in accordance with current laws (in particular Directive 2012/34/EU), with particular attention being paid to the maintenance of the existing infrastructure.
  - A further boost to night train services could be provided in particular by optimising the economic framework conditions. Tax incentives and exemptions for international rail transport should be expanded at European level.
- In addition, attractive high-speed rail connections must be established between the capital cities and major centres of the European Union, and regional rail connections must be safeguarded and expanded. All Member States have been called upon to improve the framework conditions for a modal shift of the transportation of goods and people from the roads to the electrified rails as a top priority. In addition, Europe-wide foundations (standardisation, range of vehicles) must be laid with a view to providing additional technological options for the decarbonisation of the cross-border transportation still being

undertaken by road (alternative renewable fuels; electrification systems).

- In the aviation sector, the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) should be implemented as far as possible within the scope of the existing emissions trading system (ETS) or as a complement thereto. The necessary changes will be made within the scope of the next amendment of the ETS. As part of this amendment, Austria should also adopt a stance that is in line with the climate goals in preparation for the upcoming negotiations at European level. In addition, the blending of alternative fuels should become mandatory in the aviation sector in the medium term.
- Likewise, ambitious targets (e.g. towards zero emissions, climate resilient reliable infrastructure) and effective instruments need to be clearly anchored within the 'Inland Waterway Transport Agenda for Europe (2021-2027)'.
- Further adjustments would also have to be made in connection with the Directive on the energy performance of buildings and the Directive on ecodesign requirements to ensure that the use of fossil fuels in new buildings is completely eliminated as soon as possible and that the climate-friendly refurbishment of existing buildings can be driven forward on the basis of common standards.

- A European strategy on hydrogen
  - The Commission should push for the development of an internationally anchored European strategy on hydrogen that also takes account of the emerging and future global hydrogen trade.
  - The strategy should also set out increased funding opportunities for hydrogen, both within the scope of the planned 'Sustainable Investment Plan' and through existing PPPs, such as the 'Fuel Cells and Hydrogen Joint Undertaking' (FCH JU).
  - A funding window for hydrogen should be taken into consideration as part of the 'Connecting Europe Facility' (CEF).
  - In addition to the planned '1 million charging stations' initiative, the Commission should also focus more heavily on the use of hydrogen vehicles for specific use cases (heavy goods traffic, public transport, buses, trains) in parallel with the work being carried out to establish an Austrian strategy on hydrogen.

- Gas package 2020
  - As an integral part of the Green Deal, the forthcoming proposal for a 'gas package' will be submitted to the EC in good time during 2020.
  - Among other things, this should include a clear roadmap for the blending of renewable gases, together with uniform standards and a reliable system of guarantees of origin. The future role of network operators should also be discussed.
  - In this regard, consideration should be given to allowing network operators to operate electrolysis plants, provided they help to ensure the continued efficient and reliable operation of the network.

- In addition, the establishment of a European quota for the feed-in of renewable gases into the gas grid could also be investigated.

The framework conditions for the **effective pricing of CO_2** should also be set as uniformly as possible in the interests of competition. With this in mind, the following areas of action are specifically brought into the discussion:

- Additional measures aimed at establishing more effective CO_2 pricing for the aviation sector or at establishing a tax situation that is not distorted when compared with other modes of transport.
- From an environmental and economic point of view, a CO_2 price with a corresponding incentivising or steering effect is indispensable to achieving long-term development towards net zero emissions in an economically efficient manner. To this end, framework conditions should also be set at European level as quickly as possible to ensure that a uniform approach is also taken in sectors not covered by the EU emissions trading system. During the discussion on this, both fiscal instruments and an expansion of the existing emissions trading system can be considered.
- Under the long-term objectives of the Paris Agreement, greater account needs to be taken of the principle of cost transparency and the polluter pays principle, including in connection with EU foreign trade and customs policy. In order to avoid distortions of competition on the one hand and to ensure that CO_2 prices are set in accordance with the polluter pays principle in as many areas of consumption as possible on the other hand, work on a WTO-compliant border adjustment mechanism (Carbon Border Adjustments = CO_2 border tax on steel and cement, etc.) needs to progress rapidly. Such revenue can be transferred to the EU budget as own funds, as is the case with customs duties.

The **regulatory and policy frameworks** established in Union law play a central role in ensuring cost-effective compliance with the objectives set out in the NECP. In order to avoid counterproductive and therefore budget-intensive interactions between Union and national law, the Republic of Austria will, in future, endeavour, when drawing up the policy areas or instruments outlined in this Chapter – taking account of their effects on Austria as a business location – to make the most cost-effective contribution possible to the achievement of the objectives set out in the NECP.

In the context of the decisions and debates regarding the design and implementation of the EU's multiannual financial framework (MFF) from 2021 onwards, Austria supports the following priorities:

- A decision for at least 25% of MFF spending from 2021 onwards to be used to achieve the climate objectives. In this context, it is also important to examine at national level how to ensure the most cost-effective contribution to the achievement of non-ETS objectives.
- A Common Agricultural Policy (CAP) more closely aligned to the European climate targets and in particular greater focus of the CAP on (i) reducing nitrogen surpluses, (ii)

reducing emissions from livestock farming, (iii) increasing energy efficiency in agriculture, (iv) maintaining permanent grassland, (v) maintaining humus in arable land and (vi) preserving and managing forests in a sustainable manner.

- Greater orientation of the rural development programme towards achieving climate objectives in a cost-effective manner.
- Closer focus of EU cohesion policy on the switch to renewables, including the creation of a 'Just Transition Fund' by reallocating the appropriate cohesion funds.
- Greater orientation of the 'Horizon Europe' framework programme for research towards innovations in the area of low-emission and climate change-resistant technologies.
- An EU-wide expansion of the charging infrastructure for electromobility (including by investEU, which will take over from the EFSI).
- Promotion of the development of hydrogen-based fuel technology (e.g. within the scope of the corresponding windows under Horizon Europe and investEU).
- Promotion of the automation and networking of sustainable mobility by means of the Digital Europe programme.
- Introduction of a national contribution to the EU budget, calculated on the basis of the amount of non-recycled plastic packaging waste generated in each Member State ('plastic own resources') based on statistical data, in order to create an incentive for Member States to reduce the amount of non-recycled plastic that they use.
- Since the 'Connecting Europe' Facility (CEF 2.0) is intended to make an effective contribution to the EU's climate change goals, it is all the more important to ensure that CEF 2.0 is adequately funded in the EU Multiannual Financial Framework (MFF) 2021-2027. Funding for the transport-related elements of CEF 2.0 should therefore correspond to that provided by the MFF 2014-2020 – minus the budget allocated to 'Military Mobility'. With regard to the Blending Call instrument, which aims to support innovative projects such as the roll-out of infrastructure and fleets for alternative fuels, it appears that this instrument needs to be made much more accessible to smaller companies (SMEs).

Proposals for further measures

- Extension of minimum standards under the EU Ecodesign Directive in order to increase the level of efficiency
- Greater consideration should be given to the key opportunities offered by Carbon Capture and Utilisation (CCU) for European industry
- Intensification of long-term research into synthetic fuels, especially for sectors that are otherwise difficult to decarbonise, such as aviation

- Expansion of financing instruments for the use of renewables, taking account of international projects in the area of renewables; efficient and financially stable design of the 'Union Renewable Financing Mechanism'
- Efforts by the EU and the Member States to launch shared projects in the area of renewables, both within the EU and with third countries, should be increased, with the possibility of recognising national and EU objectives
- Quick and efficient implementation of the Important Projects of Common European Interest (IPCEI)

2. NATIONAL TARGETS AND OBJECTIVES

2.1. Dimension 1: Decarbonisation

2.1.1. Greenhouse gas emissions and carbon sequestration

i. Austria's objective under the Effort Sharing Regulation

As required by Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 ('effort sharing'), Austria aims to reduce its greenhouse gas emissions in non-ETS sectors by 36% by 2030 compared to 2005. The EU Effort Sharing Regulation requires a linear target trajectory to be maintained between 2021 and 2030.

Greenhouse gas emissions in the 'with existing measures' scenario

In 2017, Austrian greenhouse gas emissions in the non-ETS sector were approximately 51.7 million tonnes of CO_2 equivalent (mt CO_2eq). The target for 2030 is around 36.4 mt CO_2eq, which means that Austria must reduce its emissions by around 30% when compared with 2017. Assuming economic growth (GDP) of 1.5% per year on average, the 'with existing measures' (WEM) scenario points to a reduction in emissions of around 47.9 mt CO_2eq by 2030, which corresponds to a reduction of around 16% when compared with 2005. A sensitivity analysis carried out for the WEM scenario assuming average annual GDP growth of around 1% resulted in 46.3 mt CO_2eq by 2030, which corresponds to a reduction of around 18% when compared with 2005. This means that if economic growth is around 0.5% slower, this will result in a saving of around 1.5 million tonnes of greenhouse gas emissions in 2030, with the most significant reductions being achieved in the transport sector.

In terms of the transport sector, the results of the sensitivity analysis show that lower annual GDP growth will bring about a reduction in greenhouse gas emissions of 1.3 mt CO_2eq in 2030, since the volume of goods transport in particular will reduce. This is because Austria is an export-driven economy with large freight companies.

The sensitivity analysis shows that emissions in the heat and electricity generation sector will only fall by around 55,000 t CO_2eq more than in the WEM scenario. This also results from the assumption of lower electricity imports against a backdrop of reduced economic growth. It has been assumed that the operation of the only refinery in Austria will not be affected by economic growth, since, as at 2017, more than half of the diesel consumed in Austria is imported.

In the case of low GDP growth in 2030, emissions within the industry sector will fall by around

297,000 t CO_2eq when compared with the WEM scenario.

Changes in GDP do not have any significant impact on emissions in the buildings sector. In the event of slow economic growth in 2030, greenhouse gas emissions would exceed the WEM scenario by 126,000 t CO_2eq. Since less money is invested in renovation as a result of the fall in energy prices (the sensitivity scenario assumes a similar slowdown in global growth and therefore in the demand for energy sources), the fuel requirements for heating buildings ultimately increase.

No sensitivity analysis was carried out for the non-energy sectors (agriculture, waste, F-gases).

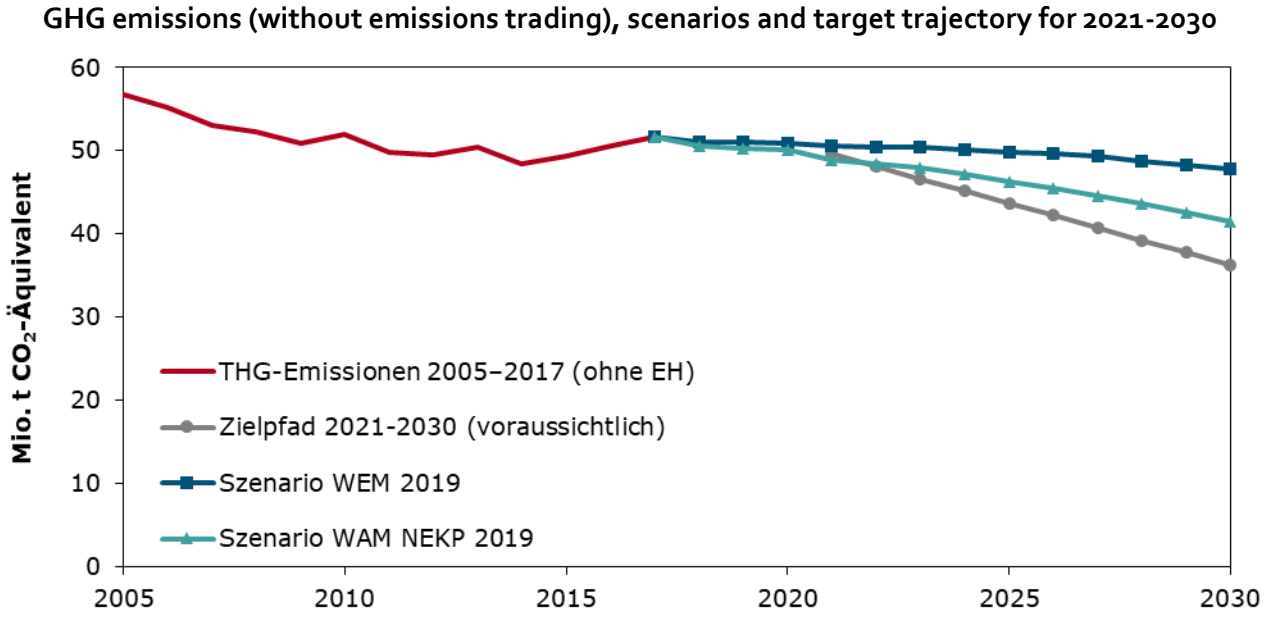
Greenhouse gas emissions in the 'with additional measures' scenario

During the preparation of this plan, a 'with additional measures' scenario was created, which shows the model-based effects of the measures set out in Chapter 3 on greenhouse gas emissions and energy consumption ('NECP evaluation', Federal Environment Agency, November 2019). The results for this scenario are set out in detail in Chapter 5 of the Plan.

For sectors that are subject to the EU Effort Sharing Regulation, the models applied show a reduction in greenhouse gas emissions of 41.5 mt CO_2eq by 2030. This corresponds to a reduction of 27% when compared with the base year 2005. Disregarding the possibilities for using flexibility mechanisms in accordance with the Effort Sharing Regulation, further measure-based reduction efforts will be required in order to close the shortfall of around 5 mt CO_2eq in the achievement of the objectives by 2030.

Decisions as to whether and to what extent further options for measures are to be applied or flexibility mechanisms used will have to be made by a new federal government from 2020 onwards.

Figure 7: Results of the WEM and WAM scenarios with regard to greenhouse gas emissions by 2030 outside the EU ETS



Quelle: Umweltbundesamt (2019)

Mio. t CO_2-Äquivalent	**mt CO_2eq**
THG-Emissionen 2005-2017 (ohne EH)	GHG emissions 2005-2017 (without emissions trading)
Zielpfad 2021-2030 (voraussichtlich)	2021-2030 target trajectory (forecast)
Szenario WEM 2019	2019 WEM scenario
Szenario WAM NEKP 2019	2019 NECP WAM scenario
Quelle: Wmweltbundesamt (2019)	*Source: Federal Environment Agency (2019)*

Key areas of action to ensure the achievement of the objectives

All non-ETS sectors will contribute to achieving the target. Cost-effective sectoral targets will be set in the Austrian Climate Protection Act for all sectors not covered by the EU Emissions Trading Scheme (non-ETS). As was established within the scope of #mission2030, the focus is initially on the transport and building sectors, which have the biggest quantitative potential for reduction. The reduction in the respective non-ETS sectors is to be achieved by introducing measures in Austria that will set us well on the way towards decarbonisation in accordance with the Paris Agreement on climate change.

Transport is currently the most polluting sector, accounting for approximately 46% of overall (non-ETS) emissions. The plan is to reduce emissions by approximately 7.9 mt CO_2eq to around 15.7 mt CO_2eq (2017: 23.6 mt CO_2eq) in order to achieve the overall target by 2030. Austria's strategic approach to achieving low-emission mobility in the future is to follow the principle of

Avoid (the use of unnecessary transport), *Shift* (to efficient modes of transport) and *Improve* (the technologies used). This sets a pathway which is compatible with the government programme's goal of fossil-free mobility by 2050 and positions Austria as a leader in electromobility and the expansion of public transport.

The building sector also has huge potential for reduction, especially through thermal renovation, which will create important economic momentum for the domestic trade, by shunning fossil fuels in new buildings and by switching to renewable energy sources and high-efficiency district heating in the existing building stock. This will enable emissions to be reduced in a socially and economically sustainable manner by around 3 mt CO_2eq to around 5 mt CO_2eq by 2030.

In the industry sector (excluding ETS installations), the energy efficiency measures pushed through, together with as broad a switch to renewable energy sources or power-based processes as possible, should boost innovation.

In the agricultural sector, sustainably reducing emissions poses a challenge. Greenhouse gas reductions are feasible in particular through measures related to animals (fertiliser management, feeding strategies, farming systems) and tillage (humus development and stabilisation/carbon storage, erosion control) and by maintaining permanent grassland, productive arable land and wetlands. In order to achieve climate and energy targets, measures to increase the production and use of renewable energy (agricultural biogas installations, waste heat utilisation, renewable fuels, retrofitting engines) and to increase operational energy efficiency will be required. In order to successfully put reduction measures into practice, awareness-raising activities (training, information, demonstration, consultation) must also continue and be expanded.

As an important measure in Austria's Climate and Energy Strategy, the national bio-economy strategy makes a significant contribution towards achieving climate targets. The bio-economy has a double impact on the climate: On the one hand, carbon sequestration in renewable raw materials leads to a reduction in atmospheric CO_2 levels, while on the other hand, bioenergy is one of the pillars of the decarbonisation of the energy system. Bio-based products also carry the advantage that they can be thermally recovered at the end of their life cycle, thereby also allowing for climate-friendly disposal.

In agricultural areas, land sealing and changes in land use lead to a conflict of objectives with agricultural production. The continuous and extremely high loss of soil in Austria (currently around 12 ha per day, the target being 2.5 ha per day) makes it clear that, as well as productive arable and grassland areas receiving better protection from spatial planning instruments, there is also a need for more efficient use of source streams, including biogenic residues from agriculture and forestry in particular, and regional circular models, as is supported by the bio-economy strategy. Cross-sector output from the agricultural and forestry sector arising from the increased provision of renewable raw materials must in any case provide an economic and environmental benefit for the sector.

A bio-economy strategy will address all key areas of action to reduce the use of fossil raw materials. The efficient and sustainable use of biogenic raw materials opens up a diverse range of available alternatives for Austria as a location for business. Renewable raw materials from agriculture and forestry and biogenic residues from production processes in the Austrian economy can form the basis for high-quality and innovative products, innovative services and a significant reduction in greenhouse gas emissions and resource consumption. The potential offered by the bio-economy depends on the availability of biogenic raw materials and residues. The aim is to achieve a clear reduction in CO_2 emissions on the basis of life cycle analyses. The bio-economy will therefore reduce dependence on non-renewable and fossil raw materials, promote innovation and economic development, create new jobs and support social changes based on sustainability.

In the waste economy and as far as fluorinated gases (F-gases) are concerned, EU law (F-Gas Regulation) and domestic measures (implementation of the Circular Economy Package) will reduce emissions and ensure international targets are met.

A significant proportion of Austria's greenhouse gas emissions are generated by burning fossil fuels. The best way to drive down greenhouse gas emissions is to increase energy efficiency and switch to renewable energy sources. A mix of measures to reduce greenhouse gases, develop renewable energy and improve energy efficiency is vital in ensuring targets are achieved efficiently. At the same time, attention should be paid to the interaction between energy-related and non-energy-related GHG emissions.

ii. Austria's obligations under the Land Use Regulation

Agriculture and forestry in Austria are an important source of renewable raw materials and energy sources (and their waste products). In this context, forests play a particularly important role in the global climate system and in achieving the long-term goals of the Paris Agreement. Now that land use has been included in the EU climate targets for 2030 (LULUCF Regulation), emission and carbon storage from agriculture and forestry are now firmly embedded in the objectives of the Effort Sharing Regulation (see above). For accounting purposes, various arrangements have been put in place.

For the accounting of utilised agricultural area (arable land and grassland), but also land used for other purposes, such as settlements, infrastructure, etc., the emission balance for the period 2005-2009 is taken as a basis.

For managed forest land, a reference value based on forest management 2000-2009 is used. If, on the basis of the respective accounting rules, a positive balance is recorded for the entire land

use sector, credits for Austria amounting to 250,000 tonnes CO_2 per year can be counted towards the national effort sharing target, if necessary. If, on the other hand, a negative balance is recorded, the effort sharing target is increased.

A particular challenge for the measures in this sector is to maintain productivity and above all to further increase the sustainable harvesting of timber in the forestry sector, and also to support the stability and further development of biogenic carbon pools by increasing biomass in forests and maintaining and, where possible, increasing humus-rich arable land.

In future, therefore, a stronger focus will be placed on an environment and climate policy framework under the EU's future agricultural policy and instruments.

Measures that affect the land use sector will help to achieve the national target for Austria by 2030 in keeping with Article 4 of the LULUCF Regulation. A stronger focus on an environment and climate policy framework under the EU's future agricultural policy and instruments will have a supporting influence moving forward.

iii. Other national targets and objectives in line with the Paris Agreement and the long-term strategy, and sector targets

'The Federal Government wants to set the ball rolling for the Austrian economy and for Austrian society in terms of infrastructure development, security of energy supply, the development of new market models, innovation, research and development, with the aim of turning the energy system into a modern, low-input, carbon-free system by 2050. […] Austria is hoping to achieve a completely carbon-free energy sector by 2050.' (extract from: the Austrian Climate and Energy Strategy – #mission2030).

The implementation of a decarbonisation pathway or a development pathway aimed at 'net zero emissions' by 2050 is a long-term process. A technologically open framework needs to be put in place which is tailored to the pathway, is in keeping with European targets and takes account of competition. For companies and installations that are energy intensive yet highly efficient by international standards, comprehensive carbon leakage protection during the transition to the complete decarbonisation of the energy system forms an important basis for economic competitiveness.

Further clarifications on the long-term objectives at EU level and in Austria are included in the long-term strategy, which is to be presented on 1 January 2020 in accordance with the Regulation on the governance of the Energy Union and climate action.

2.1.2. Renewable energy

i. Austria's share of renewable energy by 2030 and indicative target trajectory from 2021 to 2030

Austria's objective is to increase the ratio of renewable energy to gross final energy consumption to 46-50% by 2030. In 2017, the share was 32.6%, meaning that the interim target of 34% by 2020 is already in sight.

Another objective is to generate 100% of total electricity consumption (national balance) from domestic renewable energy sources by 2030. This expansion takes into account the anticipated increase in electricity consumption, as electricity from renewable sources in Austria will be used in the mobility, building and production sectors to replace imported fossil fuels. It also relies on future trends in digitalisation, decentralisation and participation.

Electricity trading on the European internal market will still have an important part to play. Austria's objective is to balance imported and exported electricity and to meet demand with domestic renewable energy.

Balancing energy and control energy, the flexibility needed for grid operation and assured capacity will continue to be provided, where technically and economically feasible, in order to guarantee security of supply. Balancing energy and control energy for the purpose of stabilising grid operations are not included when calculating the 100% renewable energy supply.

For reasons of resource efficiency, privately generated electricity in the goods production sector should continue to be generated through the low-input, efficient use of by-products on company premises (e.g. in the steel or paper industry), including from non-renewable energy sources. These are generally firms that are required to participate in emissions trading and to acquire allocations for their CO_2 emissions. This means that the above quantities of electricity need not be offset by additional exports.

Although renewable energy is already very important, the heat market still depends heavily on imported fossil fuels. In order to mitigate that dependency, the use of biomass, solar heat and ambient heat will be developed by 2030, both as direct heating and as district heating. In addition, the existing contribution of heat from waste management and industrial waste heat will be maintained or boosted. The details will be set out in a National Heating Strategy in liaison with the regions and in consultation with numerous other stakeholders.

A large proportion of natural gas will be replaced in future by renewable gas. Greening the gas, i.e. using biomethane from biogenic residues and waste, hydrogen and synthetic methane from renewable power sources based on a significantly improved system of proof of origin, are key components in the development of a sustainable energy system.

The proportion of renewable energy in the transport sector will increase, primarily as a result of the increasing market penetration of electromobility, coupled with a high proportion of renewable energy in the electricity mix and a slight increase in the use of sustainably produced biofuels. In 2017, Austria's share of renewables in the transport sector was around 9.5%. The additional 4.5% required in order to achieve the minimum target of 14% in 2030 will come mainly from the growing share of e-mobility and the increased use of biofuels in the petrol and diesel sector. More specifically, the proportion of bioethanol in petrol, which is currently 5%, will be increased to 7-10%, and a blend of synthetic diesel fuels made using renewable sources will also be introduced at a rate of about 3%.

Table 4: Indicative target trajectory for renewable energy

Current situation	Target	Indicative target trajectory			Target
2017	2020	2022	2025	2027	2030
(Share of renewable energy in gross final energy consumption)					
		min. 18% improvement 2020-2030	min. 43% improvement 2020-2030	min. 65% improvement 2020-2030	
32.6%	34%	36.2 - 36.9%	39.2 - 40.9%	41.8 - 44.4%	46 - 50%

ii. Estimated trajectories for the sector-specific share of renewable energy in gross final consumption of energy in the period 2021-2030 in the electricity, heating and cooling and transport sectors

According to the RED I calculation method, in 2016, renewable electricity generation was around 51.95 TWh. This corresponds to 71.75% of domestic electricity consumption in 2016, which stood at 72.4 TWh.

The objective is to generate 100% of total electricity consumption (national balance) from domestic renewable energy sources by 2030. The Austrian Climate and Energy Strategy #mission2030 sets out additional reasoned exemptions to this: Balancing energy and control

energy for the purpose of stabilising grid operations are not to be included when calculating the 100% target, and privately generated electricity from fossil energy sources in the goods production sector will continue to be possible for reasons of resource efficiency. According to calculations, in 2030 these will amount to around 6 TWh (5.75 TWh from goods production and 0.5 TWh grid-stabilising balancing and control energy).

For the year 2030, following expert consultation and taking into account the full range of current national scenarios, domestic electricity consumption is anticipated to be in the region of 80-85 TWh. Therefore, taking the exemptions into consideration, in order to achieve the objective, 74-79 TWh of electricity must be generated from renewable sources in 2030, constituting a net increase of 22-27 TWh. 'Net' signifies that existing installations which will be decommissioned before 2030 also need to be replaced.

The estimates of the exemptions and of the gross inland energy consumption in 2030 were drawn up in accordance with the targets set out in the Austrian Climate and Energy Strategy #mission2030 by the Federal Ministry of Sustainability and Tourism in consultation with external experts (Austrian Energy Agency, E-Control, Federal Environmental Agency).

For the heating and cooling sectors, further in-depth work must be undertaken, in particular the development of a 'heating strategy' in collaboration with the provinces. This is expected to be completed in 2020.

In any event, the measures in the Federal Government's integrated Climate and Energy Strategy (#mission2030) target a significant increase in e-mobility (initially in cars and light goods vehicles) and a gradual replacement of heating systems based on fossil fuels (in particular heating oil) with renewable energy sources, heating pumps and efficient district heating (see Chapter 3).

In the transport sector, the existing measures, which will be continued until 2030, will be further developed. In the case of biofuels, the most important measures are the blending of around 7% biodiesel with diesel fuel and around 5% bioethanol with petrol. In addition, a certain proportion of 100% biodiesel is still used for closed fleets. In the electricity sector, the renewable share of traction power and other overland means of transport (e.g. for cable cars) is currently the main contributor to achieving the objective. In 2017, Austria achieved a 9.6% share of renewable energy in transport.

The most important additional contributions to achieving the minimum objective of 14% renewables in transport by 2030 are above all the increase in e-mobility, which, in terms of energy consumption in transport, corresponds to an increase in the share of renewables of around 1.8%, and the planned increased use of biofuels. More specifically, in the area of biofuels, the bioethanol admixture is to be increased and synthetic diesel fuels from renewable sources are to be used in the diesel sector. This measure increases the use of renewables in transport by an additional 2.4%, thereby ensuring that the 14% target will be met by 2030.

The sector-specific expansion of renewables does not represent a trajectory in itself, but it shows the model-based development path on the basis of the assumptions made in the 'with additional measures' scenario.

Table 5: Sector-specific shares of energy from renewable sources, measured in terms of gross final consumption of renewable energy (model-based development paths according to the 'with additional measures' scenario)

Sector	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
	Share in relation to gross final consumption of renewable energy									
Electricity	18%	18%	19%	19%	20%	21%	21%	22%	22%	23%
Heating and cooling	17%	17%	17%	17%	18%	18%	18%	19%	19%	20%
Transport	2%	2%	2%	2%	3%	3%	3%	3%	3%	3%
Total	**37%**	**38%**	**38%**	**39%**	**40%**	**42%**	**43%**	**43%**	**44%**	**46%**

Source: Federal Environment Agency 2019, 'with additional measures' scenario

iii. Estimated trajectories by renewable energy technology that the Member State projects to use to achieve the overall and sectoral trajectories for renewable energy from 2021 to 2030, including expected total gross final energy consumption per technology and sector in Mtoe and total planned installed capacity (divided by new capacity and repowering) per technology and sector in MW

The technology-specific expansion of renewables does not represent a trajectory in itself, but it shows the model-based development path on the basis of the assumptions made in the 'with additional measures' scenario.

Table 6: Estimated development paths by renewable energy technologies (according to the 'with additional measures' scenario)

Technology	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
	in petajoules									
Solid biomass (incl. biogenic waste and alkalis and district heating)	189	189	190	190	191	194	196	198	200	202
Liquid biomass	29	30	30	31	34	34	34	34	34	36
Ambient heat	18	18	19	20	21	21	22	23	24	25
Hydroelectric power	157	158	157	158	159	161	162	161	160	160
Wind power	31	34	37	40	43	46	50	53	57	60
Photovoltaics	13	16	20	23	26	29	32	35	39	42
Electricity from biomass	19	19	19	19	19	20	20	20	20	20
Electricity and district heating from geothermal energy	1	1	1	2	2	2	2	2	2	2
Hydrogen	0	0	0	0	0	1	1	1	2	4
Biomethane/synth. methane/biogas	3	4	4	5	6	7	8	10	11	13
Transformation input power for H_2								-1	-3	-4
Total	**460**	**469**	**477**	**487**	**501**	**515**	**526**	**536**	**546**	**559**

Source: Federal Environment Agency 2019, 'with additional measures' scenario

iv. Estimated trajectories for bioenergy demand (disaggregated between heat, electricity and transport) and bioenergy supply (by raw materials and sources, distinguishing between domestic production and imports)

Information in this regard can be found primarily in Tables 5 and 6.

v. Other national development paths and objectives, where available

Development paths related to the supply and use of renewable energy sources are largely determined by the design of the future incentive scheme. In particular, this concerns the Renewable Energy Expansion Act and the development of grid infrastructure and storage facilities. The corresponding measures are set out in detail in Chapter 3 of the Plan. Other objectives are in place which support and complement the renewable energy targets:

Education and awareness-raising for a sustainable future

- The possibility of taking direct action can reduce concerns about climate change, thereby taking account of the desire of the population to play a part in climate action.
- The aim is for households to play an active role in the energy transition. Digitalisation plays an important role in this area, above all by enabling consumers to make active use of new services and products.
- Public sector bodies serve as a valuable model when it comes to public procurement. The best bidder principle will therefore be applied as standard in climate- and energy-relevant procurement by public sector bodies.

Nuclear-free decarbonisation

Austria will consistently defend this position at all levels and will lobby for no more funding for nuclear energy. Austria will therefore continue to fight against the use of nuclear energy at European and international level and to push for continual improvements to nuclear safety.

Shift to zero- and low-emission vehicles

For new registrations, Austria has a clear objective to shift the focus to zero-emission cars and light goods vehicles by 2030. For lorries and buses, specific incentives are planned to help significantly increase the number of zero-emissions vehicles by 2040.

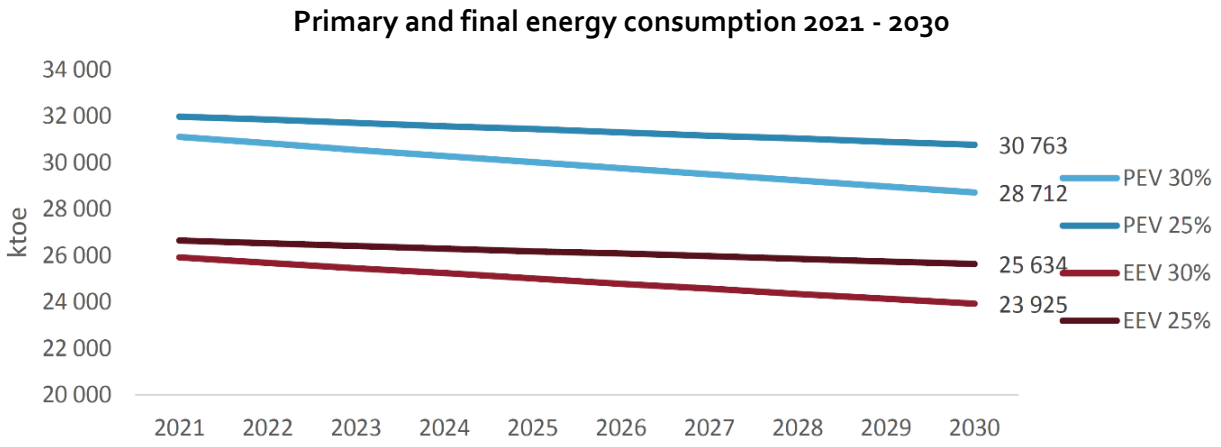
2.2. Dimension 2: Energy efficiency

i. Austria's indicative national contribution to the EU energy efficiency target, including indicative development path 2021-2030 and cumulative savings 2021-2030 pursuant to Directive 2012/27/EU

Energy efficiency measures are among the best economic measures for preventing greenhouse gas emissions and are high on the agenda in Austria, as well as being a recurring theme of the energy union ('energy efficiency first' principle). However, energy efficiency measures may exacerbate what are occasionally long amortisation periods in business. Core measures, such as the switch to e-mobility and increased renovation rates, will increase energy efficiency (by a factor of 3 for e-mobility) with no loss of prosperity.

The Energy Efficiency Directive (EED 2012/27/EU) as amended in 2018 under the Clean Energy Package provides for an EU energy efficiency target of 32.5% for 2030. As part of the Federal Government's Climate and Energy Strategy (#mission2030), Austria set itself the target of improving primary energy intensity by 25-30% compared to 2015. If primary energy demand exceeds 1,200 petajoules (PJ) by 2030, the excess energy will have to be covered by energy from renewable sources. As the ratio of renewable energy to consumption and the greenhouse gas emission targets are fixed, if energy consumption increases, commensurately more renewable energy will have to be used.

Figure 8: indicative target trajectory



Source: Federal Ministry for Sustainability and Tourism

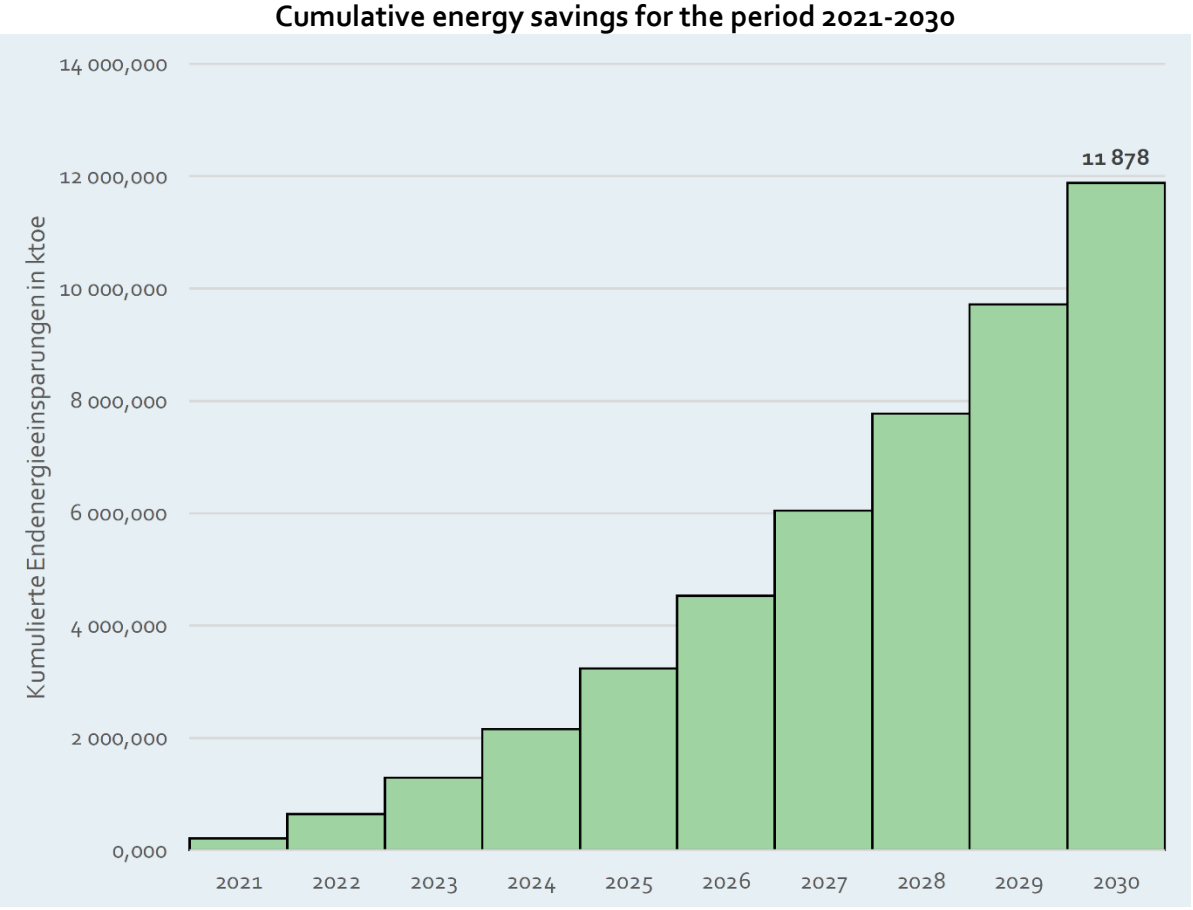
Primär- und Endenergieverläufe 2021 - 2030	Primary and final energy consumption 2021 - 2030
Ktoe	ktoe
PEV 30%	Primary energy consumption 30%
EEV 30%	Final energy consumption 30%

Figure 6 shows the primary and final energy consumption from 2021 to 2030. Austria has set itself a target of improving primary energy intensity by between 25% and 30% when compared with 2015. In absolute terms, this corresponds to primary energy consumption of 30,763/28,712 ktoe and to final energy consumption of 25,634/23,925 ktoe in 2030. This calculation was based on an annual economic growth rate of 1.5%[15].

[15] GDP:
http://www.statistik.at/web_en/statistics/Economy/national_accounts/gross_domestic_product/annual_data/index.html

Energy balance:
https://www.statistik.at/web_en/statistics/EnergyEnvironmentInnovationMobility/energy_environment/energy/energy_balances/index.html

Figure 9: cumulative savings 2021-2030 pursuant to Article 7 of Directive 2012/27/EU in the version of Directive 2018/2002/EU



Source: Federal Ministry for Sustainability and Tourism

Kumulierte Endenergieeinsparungen in ktoe	Cumulative final energy savings in ktoe

Figure 7 shows the cumulative savings from 2021 to 2030 pursuant to Directive 2012/27/EU in the version of Directive 2018/2002/EU. The calculation is based on the average annual final energy consumption over the most recent three-year period prior to 1 January 2019, which amounts to 26,995 ktoe. 0.8% therefore corresponds to a value of around 216 ktoe per year. This results in a cumulative saving in the period 2021-2030 of approximately 11,878 ktoe.

At present, Article 7 is being implemented in accordance with Directive 2012/27/EU by means of a combination of strategic measures (Art. 7b) and an obligation scheme (Art. 7a). The amended Energy Efficiency Directive 2018/2002/EU will be implemented by means of strategic measures and a possible obligation scheme; the extent to which each of these contributes to the objectives will be determined in the course of the national legislative procedure.

Table 7: Absolute values — 30% improvement in energy intensity

30% scenario	2020			2021			2030			
	PEC/GDP	**PJ**	**Mtoe**	**PEC/GDP**	**PJ**	**Mtoe**	**PEC/GDP**	**PJ**	**Mtoe**	**ktoe**
Primary energy intensity (PJ)	3.78			3.71			2.99			
Primary energy consumption		1,314	31		1,302	31		1,202	29	
Final energy consumption		1,095	26		1,085	26		1,002	24	
Cumulative energy savings								497	12	11,878

Table 8: Absolute values — 25% improvement in energy intensity

25% scenario	2020			2021			2030			
	PEC/GDP	**PJ**	**Mtoe**	**PEC/GDP**	**PJ**	**Mtoe**	**PEC/GDP**	**PJ**	**Mtoe**	**ktoe**
Primary energy intensity (PJ)	3.87			3.81			3.21			
Primary energy consumption		1,344	32		1,339	32		1,288	31	
Final energy consumption		1,120	27		1,116	27		1,073	26	
Cumulative energy savings								497	12	11,878

Tables 7 and 8 provide an overview of the absolute values for 2020 and the projected values for 2021 and 2030, assuming an average increase in gross inland consumption of 1.5%[16] and an improvement in primary energy intensity of 25% and 30% respectively in 2030.

[16] http://www.statistik.at/web_en/statistics/Economy/national_accounts/gross_domestic_product/annual_data/index.html

ii. Indicative milestones (2030, 2040 and 2050) under the long-term renovation strategy, including savings and area to be renovated

Under Article 2a(2) of the Directive on the energy performance of buildings, in its long-term renovation strategy, each Member State must set out a roadmap with measures and domestically established measurable progress indicators, with a view to the long-term 2050 goal of reducing greenhouse gas emissions in the Union by 80-95% compared to 1990, in order to ensure a highly energy efficient and decarbonised national building stock and in order to facilitate the cost-effective transformation of existing buildings into nearly zero-energy buildings. The roadmap must include indicative milestones for 2030, 2040 and 2050, and specify how they contribute to achieving the Union's energy efficiency targets in accordance with Directive 2012/27/EU.

The renovation strategy will be prepared at national level and submitted to the European Commission by 10 March 2020 in accordance with Article 46(1) of the Regulation on the Governance of the Energy Union and Climate Action.

The following milestones and indicators can be found in the draft long-term renovation strategy (LTRS) which has been submitted by the federal states for consultation:

Table 9: LTRS – milestones and indicators

MW	1990	2017	2030	2040	2050
non-renewable share	140,824 TJ	102,253 TJ	80,327 TJ	65,795 TJ	51,262 TJ
high-efficiency alternative energy share	87,326 TJ	122,107 TJ	139,821 TJ	153,447 TJ	167,073 TJ
Total	228,151 TJ	224,360 TJ	220,148 TJ	219,241 TJ	218,335 TJ
non-renewable share	61.7%	45.6%	36.5%	30.0%	23.4%
high-efficiency alternative energy share	38.3%	54.4%	63.5%	70.0%	76.6%
MODEL	9,691kt	6,360 kt	4,812 kt	3,807 kt	2,928 kt
TARGET	9,819 kt	6,284 kt	4,582 kt	3,273 kt	1,964 kt
MODEL without greengas	0%	-34%	-50%	-61%	-70%
MODEL with green gas	0%	-36%	-53%	-67%	-80%

Source: OIB 2019, draft long-term renovation strategy

iii. Other national contributions (long-term, sectoral) where applicable

Under Article 4(4) [*sic*] of the Governance Regulation in conjunction with Article 5(6) of the Energy Efficiency Directive 2012/27/EU, the gross conditioned floor area in government buildings that does not meet the minimum overall efficiency requirements, or the annual energy savings to be achieved from 2021 to 2030, must be indicated. When calculating the energy savings target, it should be borne in mind that the energy savings achieved through energy efficiency measures must correspond to a renovation rate of 3% of the gross conditioned floor area.

These values were ascertained for the 2014-2020 commitment period and should be updated for the new period 2021-2030. Current data on the gross conditioned gross floor area will not be available until 2021. Estimates of the floor area and the resulting energy savings will be prepared for the final NECP.

2.3. Dimension 3: Security of energy supply

i. National objectives with regard to diversifying energy sources and supply from third countries in order to increase the resilience of regional and national energy systems

The existing grid infrastructure, power plant capacity and domestic energy resources mean that Austria has a high level of security of supply. The top priority in the transformation of the energy system is to maintain that high level of security of supply.

The objective is to strengthen the security of supply and become less dependent on imported energy. To achieve this, Austria aims to further develop domestic (especially renewable) energy sources. This includes the objective of generating 100% of total electricity consumption (national balance) from domestic renewable energy sources in 2030, with certain justified exemptions (see point 2.1.2, sub-point i). Likewise, the objectives set out in points 2.1 and 2.2, and the associated measures, have a positive impact on the increased security of energy supply.

On the European stage, Austria is committed to further diversification of energy imports, coordinated at EU level, and to improved international coordination in crisis situations.

Austria is also actively involved in the process for Projects of Common Interests (PCI). These projects in the electricity and gas sector are designed to meet challenges such as increasing energy demand, ensure security of supply or overcome bottlenecks. Due to its central geographic location, Austria is particularly affected by north-south connections and energy flows, and must therefore increasingly balance out volatility in renewable energy generation.

In October, the European Commission presented the draft for a Delegated Regulation on the

fourth PCI list. If no objections are raised by the Council or the European Parliament, the delegated act will enter into force after the expiry of the objection period of two months (renewable once); this is likely to be in the first quarter of 2020.

Irrespective of the final result on the fourth PCI list, Austria will support the projects proposed by Austrian project promoters for the fourth PCI list.

ii. Where applicable, national objectives with regard to reducing energy import dependency from third countries, for the purpose of increasing the resilience of regional and national energy systems

Security of supply indicators have shown positive developments over the last 10 years in Austria. The net import tangent, which shows the level of dependence on imports, has fallen significantly since 2005, from 71.8% to 64.2%. Since the beginning of the decade, natural gas storage capacity in Austria has risen from 4.6 bcm to the current capacity of 8 bcm, a trend that is set to continue. Similarly, emergency oil reserves, standing at more than a quarter of the average annual consumption, are greater than the obligatory emergency reserves required by the International Energy Agency (IEA).

The objective of promoting the development of renewable energy, and above all renewable electricity, provides an opportunity to increase the scale of decentralised domestic energy supply and strengthen regional supply concepts. The development of renewable energy in the electricity sector will also be instrumental in achieving the objective of eliminating dependency on imports by 2030 (see also point 2.3., sub-point i). The national targets for this are set out in points 2.1. and 2.2. Alongside related measures, this has a positive impact on reducing dependence on energy imports from third countries. Similarly, the feed-in of renewable gas (bio-methane from biogenic residue), hydrogen and other renewable gas production methods (synthetic methane, etc.) will play a significant role within the gas sector in the future.

Reserve and storage systems should also ensure that sufficient time is available for adaptation measures in the event of undersupply, and sufficient diversification of oil supply countries will spread the risk of supply bottlenecks.

Austria also wishes to further cement its role as an important hub for the European electricity and gas market and as a storage facility to guarantee supply security for the whole of Europe. As a result, in 2017, approximately 10% of EU natural gas imports were handled via the Baumgarten hub and in the electricity sector approximately 5% of all exports and 7% of all imports were physically transported through the European transmission grid via the Austrian interconnectors.

iii. National objectives with regard to increasing the flexibility of the national energy system, in particular by means of deploying domestic energy sources, demand response and energy storage

The objective is to strengthen the security of supply and become less dependent on imported energy. In order to achieve this, not only is it necessary to increase the production of renewable domestic energy sources, it is also necessary to use energy in a more efficient and intelligent manner. Our infrastructure must allow for new developments on the energy market, decentralised production, new storage technologies and digitalisation.

With a target of a 100%-balanced power supply from renewable energy in 2030, sufficient balancing and control energy must be available and the flexibility needed for grid operation must be maintained at all times so that this can be achieved economically and ecologically. High-efficiency combined heat and power plants (CHP plants) needed to maintain the power and heat supply, especially in urban areas, are particularly important here, as are storage and pumped storage facilities.

Furthermore, this multidimensional strategy aims to increase investment in storage infrastructure (from short-term storage up to seasonal storage) and transmission and distribution networks should be increased or adapted to meet the increased demand.

Optimal use will be made of existing efficient plants in line with climate and energy targets. The economic investments already made in power lines, storage facilities and power plants will make a proactive contribution to the transformation of the energy system. This existing capacity should be used and the existing network infrastructure must take on additional tasks (e.g. power-to-gas, power-to-heat, wind-to-hydrogen, power-to-liquids). Within the scope of hydroelectric power, the operation of existing installations, including the exploitation of their potential for flexibility, should be ensured in accordance with the implementation of the Water Framework Directive.

2.4. Dimension 4: internal energy market

2.4.1. Interconnectivity of the electricity grid taking into account EU interconnectivity targets

In 2017, the electricity interconnection level in Austria was 15.3%, and was therefore already above the EU's 2030 target of 15%. As a result, no further explicit interconnectivity target has been set for 2030 in Austria. However, it is to be expected that, in view of the national target of 100% renewable electricity generation by 2030, Austria's electricity generation capacity will increase. Austria will therefore also continue to drive forward the socially and environmentally compatible development of the network infrastructure *(also see point 2.3 and the measures set out in point 3.4 in this regard)*

2.4.2. Development of energy transmission infrastructure in the context of the Energy Union, including Projects of Common Interest where applicable

i. Key electricity and gas transmission infrastructure projects, and, where relevant, modernisation projects, that are necessary for the achievement of objectives and targets under the five dimensions of the Energy Union Strategy

Our infrastructure must allow for new developments on the energy market, such as decentralised production, new storage technologies and digitalisation. This will be achieved through socially and environmentally friendly development and by modernising the network infrastructure. The planned measures need to be environmentally and eco-friendly and put an end to soil-sealing and the impact on the man-made environment and natural habitats. The aim is also to accelerate and simplify licensing procedures and reduce the level of bureaucracy involved, in line with civil rights and the relevant EU legislation.

The following cornerstones are to be taken into account:

- *Synchronise grid development with the development of renewable energy*
  The investments made by grid operators make them key enablers for investments in renewable energy. Grid development and the development of renewable energy must take place systemically. Synchronicity and overall planning will bring about security of supply and planning security, as well as *saving costs*.
- Safeguard *reserve capacity*
  Reserve capacity should be safeguarded in a cost-efficient manner through the

market, e.g. by putting capacity out to tender by all potential market operators.

- *Facilitate local networks and storage facility operations*
  In order to strengthen the market, regulatory barriers to local initiatives in the production, distribution and storage of electricity and heat should be gradually eliminated
- *Use waste heat*
  Aside from supplying district heat from various renewable energy sources (biomass, geothermal energy, solar thermal energy, photovoltaics, etc.) and combined heat and power, storage of waste heat from production processes will also be vital.
- *Integrate buildings into the system as storage facilities*
  It will be increasingly possible to use buildings and their energy technology systems as energy storage systems.

In addition, the Network Development Plan (NDP), which describes network planning for the next ten years, taking into account developments in energy performance, sets out important projects in the electricity sector. Similarly, all effective measures to optimise and develop the gas grid in line with demand and to ensure security of gas supply are set out in the long-term plan for the distributors and the coordinated network development plan (CNDP) for the pipelines *(see also Point 1.2)*

The draft for the fourth PCI list contains the following Austrian PCIs:

Electricity

Priority corridor 'North-south electricity interconnections in western Europe':

2.18. Capacity increase of hydro-pumped electricity storage in Kaunertal, Tyrol; Project promoter: TIWAG

Priority corridor 'North-south electricity interconnections in central eastern and southern Europe':

Cluster Austria — Germany, including the following PCIs:

3.1.1 Interconnection between St Peter (AT) and Isar (DE) (380 kV - 'Germany line'); Project promoter: APG/TenneT

3.1.2 Internal line between St Peter and Tauern (AT) (380 kV - 'Salzburg line'); Project promoter: APG

3.1.4 Internal line between Westtirol and Zell-Ziller (AT) (380 kV); Project promoter: APG

3.4. Interconnection between Würmlach (AT) and Somplago (IT); Underground lines; 220 kV; Project promoter: Alpe Adria Energia S.r.l.

Gas

Priority corridor 'North-south gas interconnections in central eastern and south eastern Europe'

6.26.

6.26.1 Cluster Croatia — Slovenia — Austria at Rogatec:

GCA 2015/08: Entry/Exit Murfeld (AT); Project promoter: GCA

Oil

Priority Corridor 'Oil supply connections in central eastern Europe' ('OSC')

9.2: Bratislava — Schwechat — Pipeline: pipeline linking Schwechat (Austria) and Bratislava (Slovak Republic)

ii. Where applicable, main infrastructure projects envisaged other than Projects of Common Interest (PCIs)

Key 'electricity line' projects in the 2018 Network Development Plan (NDP)

Weinviertel grid region ('Replacing the APG Weinviertel line')

- In order to integrate renewable energy sources into the grid, the transmission network infrastructure in the eastern Weinviertel must be strengthened (replaced) and substations must be developed. To this end, plans are in place for a new 110 kV grid support system in the northern Weinviertel, in the form of the Zaya substation, and a new 220 kV line connection to the Austrian border. With the completion of the 380 kV line, the old 220 kV line from Bisamberg to the Austrian border is to be dismantled.
- The replacement of the APG Weinviertel line will result in a 380/110 kV grid system by the end of 2022.

Upper Austria central region

- Replacement of the current 110 kV supply lines with 220 kV lines from Ernsthofen/Kronstorf to the motorway intersections and 220/110 kV expansion of the Pichling substation by 2026. The 220/110 kV Wegscheid grid support system is then planned to enter into service in 2028.

- Separation of the 110 kV network in the Upper Austria central region into two sub-networks, on the basis of the increased short-circuit power and so that the 110 kV protection system can continue to operate in a safe and reliable way in the interests of optimum security of supply

Carinthia grid region (interconnection between Lienz and Obersielach)

- Improvements to the transmission grid in the Carinthia region and 380 kV ring connection in Austria. Different options are being investigated for the construction of lines aimed at improving the grid in the Carinthia grid area (incl. upgrading the existing line to 380 kV).

220 kV line connecting St. Peter, Hausruck and Ernsthofen (general renovation)

- General renovation and the installation of a cutting-edge cable system along the existing road, which is 111 km long. Work began in April 2018.

2.4.3. Market integration

i. National objectives related to other aspects of the internal energy market such as increasing system flexibility, in particular related to the promotion of competitively determined electricity prices in line with relevant sectoral law, market integration and coupling, aimed at increasing the tradeable capacity of existing interconnectors, smart grids, aggregation, demand response, storage, distributed generation, mechanisms for dispatching, re-dispatching and curtailment, and real-time price signals, including a time frame for when the objectives shall be met

Successful transformation of the energy system depends on support for price incentives, energy efficiency and use of renewable energy sources. Competitive pricing mechanisms that take account of tax, duty and incentives will be used to minimise market distortions. Households, commerce and industry will be able to participate actively in the energy market and react to price signals.

Market economy energy system

If the electricity supply is to be based on renewable energy sources by 2030, functioning, cross-border, liquid wholesale markets and common price zones are needed in order to generate the necessary price signals. The required investments will need to be financed primarily via the market. Market-distorting incentives that conflict with the decarbonisation pathway must be

minimised, and undistorted, competitive pricing mechanisms must be (re-)established.

The following cornerstones will need to be taken into account when redesigning the energy system:

- *Ensuring grid stability*
- *Dividing infrastructure costs fairly*
  The cost of maintaining and developing the network infrastructure needed to transform the energy system must be divided fairly between all network users, even in cases of increasing private generation.
- *Sending correct price signals to market operators*
  In order to trigger investment and increase flexibility, the market should send out the right price signals. That means permitting price peaks ('scarcity prices') and limiting intervention in pricing mechanisms. Negative wholesale prices should be avoided in line with European practice.
- *Improving the internal energy market and increasing flexibility. For*

storage facilities, see point 2.3, sub-point ii

ii. National objectives (where available) on non-discriminatory access for renewable energy, demand response and storage, including an indicative time frame for when the objectives are to be met

See point 2.4.3, sub-point i. Beyond that, no specific objectives are currently in place.

iii. National objectives (where available) with regard to ensuring that consumers participate in the energy system and the benefits from self-generation and new technologies, e.g. smart meters

Smart meter roll-out 2019

The introduction of smart meters can be traced back to the EU Electricity Directive from 2009 (Directive 2009/72/EC). In Austria, the legal basis is formed by the Electricity Industry and Organisation Act 2010 and the Smart Metering Regulation (IME-VO). By the end of 2020, 80% of meter points are to be converted to new digital meters and at least 95 per cent of households

should be equipped with smart meters by the end of 2022 where technically feasible.

iv. National objectives with regard to ensuring electricity system adequacy, as well as for the flexibility of the energy system with regard to renewable energy production, including a time frame for when the objectives are to be met

See objectives in points 2.4.2, sub-point i and 2.4.3, sub-point i. Beyond that, no specific objectives are currently in place.

v. National objectives (where available) to protect energy consumers and improve the competitiveness of energy companies

Household customers:
Steps must be taken to prevent climate protection measures from jeopardising the affordability of housing and energy.

In addition, existing efforts for low-income and low-energy households at federal and state level should be supported and improved upon and an overview of the situation should be established. (See 2.4.4., 3.4.4.)

Consumer confidence is key, including in changed energy markets. Where necessary, consumers should therefore be protected and strengthened. For example: Ensure the quality of energy service providers supplying households; take legal action against unfair and misleading practices; local and district heating law, which also includes consumer protection rules; investment in data protection and data security. Care should be taken to ensure that e-charging stations are built so as to be accessible.

2.4.4. National objectives to prevent energy poverty (including a time frame for implementation), where applicable

A key objective of the Austrian Federal Government's Climate and Energy Strategy is social affordability. Efforts must be made to ensure that all sections of the population can meet their basic energy and mobility requirements. Consumers should be able to manage this now and in future at a socially affordable cost. High energy costs put low-income households in particular at risk of poverty. It is important to incorporate energy poverty into climate and energy targets.

Economists, politicians and civil society can work together to find social solutions to help mitigate hardship cases. Maximum transparency in the form of easy and fast access to information and further training should be guaranteed in order to increase social acceptance.

Definition of energy poverty

> *'A household is considered energy poor if its income is below the at-risk-of-poverty threshold and, at the same time, it has to cover above-average energy costs.'*

In principle, this definition[17] is one of several possible approaches to the issue of energy poverty. The definition chosen here has already been used in several projects in the energy sector in cooperation with Statistics Austria, and has been discussed during meetings on energy poverty and during a consultation process. It is also the subject of the recent publication Studie zur Eruierung einer Definition von Energiearmut in Österreich aus Sicht der sozialwirtschaftlichen und energiewirtschaftlichen Praxis"[18] [Study establishing a definition of energy poverty in Austria from the perspective of socio-economics and the energy sector] by the Vienna University of Economics and Business on behalf of the Federal Ministry of Labour, Social Affairs, Health and Consumer Protection (BMASGK).

Key analysis results[19]

In an 'energy-poor'[20] household, household energy consumption (heating, hot water, cooking, overall use of electrical energy and other energy uses for the building) is more than 140% of the average household energy consumption. Energy used for mobility is not included in this definition. According to this definition, in Austria in 2013-14, some 117,000 households — around 20.3% of households at risk of poverty, or 3.2% of all households — were affected by energy poverty.

While non-energy-poor households exhibit an average final household energy use of 18,200 kWh per year, this value for energy-poor households is 23,373 kWh (28% higher; for heating the final energy use is 49% higher). While in non-energy-poor households, 66% of final energy is used for heating, in energy-poor households this figure is 77%. The use of electricity is also 9% higher in energy-poor households than in non-energy-poor households.

The average annual energy costs for energy-poor households, in the period in question, is EUR

[17] eControl (2013), Report 'Energy poverty in Austria (revised version)' https://www.e-control.at/en/publikationen/fachpublikationen-endkunden/energiearmut

[18] Vienna University of Economics and Business (2018) https://www.sozialministerium.at/cms/site/attachments/2/9/7/CH3434/CMS1535520882546/studie_energiearmut_endversion.pdf

[19] The analysis of the situation of 'energy poverty' in Austria was carried out by the Federal Environment Agency in 2018 on behalf of the BMNT.

[20] See https://www.e-control.at/en/publikationen/fachpublikationen-endkunden/energiearmut

2,593, 39% higher than the average for all households, which is EUR 1,868. The difference in the average share of energy costs compared to household income is equally high: the average share for non-energy-poor households is around 4.5%, while for energy-poor households it is 22.8%. The difference between relative share of each energy source within the overall energy costs for both groups of households is particularly high for heating oil: in the period in question, 2013-14, non-energy-poor households show a share of energy costs for oil heating of 14%, while for energy-poor households this share is 21%. On top of the high costs for energy-poor households with mostly oil heating, the high volatility of heating oil prices in comparison with other energy sources leads to increased uncertainty regarding future costs. In general, the main reason for the high energy costs incurred by energy-poor households is the poor thermal quality of the building envelope and the use of an expensive energy source for heating.

According to statistics (EU-SILC), as well as households with oil heating systems, those more heavily affected by energy poverty are households in buildings built prior to 1960, households in one- and two-family houses, households with larger heated living areas, single households and homeowners.

During the period in question, 2013-14, while in buildings built prior to 1960 around 5.1% of households were affected by energy poverty, for buildings built between 1991 and 2005 this figure was only 1.5% and for post-2006 buildings it was 0% (average for all buildings: 3.2%). The percentage of energy-poor households in one- and two-family houses during 2013-14 was 3.8%, while in multi-family houses it was 2.6% (average for all buildings: 3.2%).

Analysis of structural parameters, final energy use and energy costs from the micro-census 'Household energy use' for the different energy sources confirms these results (primarily based on EU-SILC) and also shows that households with oil heating, but also households with natural gas heating, belong to the group of households with high specific energy consumption values (kWh annual final energy use/m² of living space), i.e. buildings with poor thermal energy efficiency.

2.5. Dimension 5: research, innovation and competitiveness

i. National strategies and financial objectives (public and private, where available) relating to research and innovation in the energy sector

The Climate and Energy Strategy adopted by the Federal Government in April 2018 clearly sets out the key role that research and technological development have to play in Austria in terms of global decarbonisation.

Mission-oriented research and innovation by business and the government, in collaboration with research institutes and users, is needed to support the development and trialling of ground-breaking energy innovations. The strategic considerations required to implement the objectives of the Climate and Energy Strategy are as follows:

Cooperation between business and government

Close cooperation between the government and business is a key factor for success in Austria. Intense collaboration between the state and private investors opens up major opportunities in Austria. Austria's approach is therefore to use public funds to trigger the broadest industrial research investment possible. A particular feature of Austria's innovation activities is the strong link with business and implementation.

Creation of a research-friendly environment

Transformation of the mobility and energy systems depends on firms and (research) institutes having sufficiently qualified staff. The aim, therefore, is to significantly increase the number of energy researchers in universities, polytechnics and non-university research institutions. Developing and expanding targeted measures to attract young researchers to the energy sector and creating or developing education services along the research/innovation/market value added chain should help to achieve this. Even though the majority of questions are technical/scientific questions, care must be taken to ensure that questions relating to the design of socio-technical and socio-economic systems and interfaces and social science questions (acceptance of techniques, system transition and change in the economic system) are also answered. Networking between the people involved in theoretical research and practical application is important in terms of increasing the relevance of research results. Improving the transfer of knowledge and technology, especially from universities to industry, should help to generate socially relevant applications or added market value from the research results obtained. Creating or developing joint research infrastructure in the energy system and an integrative approach between research and transition to market (e.g. in terms of economic, legal and regulatory requirements) will help Austrian energy researchers and firms to position themselves better on the European and global market.

Integrated funding portfolio from basic research through to transition to market

Breakthrough technologies are used both to save energy and, increasingly, when using energy. In order to boost these advances, a new environment needs to be created for oriented basic research, alongside ways of increasing integration of the innovative capacity of entrepreneurs and start-ups in RTI initiatives.

In particular, between 2021 and 2030, impact network approaches will also be developed, which enable cooperation between international, national and regional players in relation to solutions and technology providers, users, and enablers and decision-makers in relation to the choice of technology. These approaches will also encourage closer links between various European,

national and regional measures and programmes in terms of research, technology and innovation, and implementation.

Mission-oriented research priorities

Future energy systems will comprise connected sub-systems which will need to integrate several parties and types of technology. By pooling actors, resources and expertise, research, development and innovation can be implemented in a mission-oriented way for specific challenges in the energy system.

Development of key technologies

A further objective is that of modernising the energy systems by developing key technologies. The aim is to develop successful technologies and solutions that will allow Austrian industry to position itself as an innovation leader on the global technology markets.

Sector coupling

Development of integrated system solutions for coupling infrastructure, technologies and services for power, gas, heat and mobility.

Digital and smart energy: ensuring system integration of new energy storage and energy supply system flexibility technologies as basic enablers for a high proportion of renewable energy, coupled with security and resilience.

Marketable comprehensive solutions and technology-based services: developing new business models in connection with digitalisation, taking account of new social trends.

Contribution to European and international initiatives

As innovative firms cannot afford not to internationalise, not least due to globalisation and the relatively confined home market, they are supported in this challenging growth phase. The successful positioning of Austrian energy technology suppliers depends, first, on active networking of and collaboration between Austrian operators in international RTI initiatives (e.g. by participating in the global initiative 'Mission Innovation', the EU Strategic Energy Technology (SET) Plan or International Energy Agency collaboration programmes) and, second, on strategic pooling of individual strengths to give comprehensive solutions that can be easily presented and communicated.

The BMVIT energy and mobility research programmes and the Climate and Energy Fund

In order to implement the energy research initiative set out in #mission2030 under the Austrian Climate and Energy Strategy, it is necessary not only to increase the energy and mobility research budget but also to participate in the development of European value chains (IPCEI on batteries and hydrogen), which should trigger up to another billion euros in private investment. Thanks to public spending to implement the energy research initiatives ('Flagship Projects 9 and 10') anchored in the Climate and Energy Strategy, it should be possible to leverage around EUR 2 to 2.5 billion of private investment in energy and mobility innovation in Austria by 2030. The *implementation plan for the Energy Research Initiative in the Climate and Energy Strategy (see Chapter 3.5)* involved a comprehensive consultation process with Austrian companies in this regard. This budget will be used for Flagship Projects 9 and 10 of #mission2030 in particular.

Flagship Project 9: Future energy systems will comprise interconnected sub-systems, which will need to integrate several parties and types of technology. Through the use of mission-oriented research and development priorities, it should be possible to develop successful technologies and solutions that will allow Austria to position itself as an innovation leader on the global markets.

Plus energy areas which, by optimising civil infrastructure, are able to cover all energy needs via renewable energy - the highest possible efficiency in all areas of end energy consumption and the development of suitable business models (**Smart Cities**).

Integrated regional energy systems which will enable the local and regional energy supply to become up to 100% renewable in the foreseeable future and help businesses and private individuals become part of regional value chains and inter-regional markets.

Breakthrough technologies for industry which enable raw material and energy consumption to plummet, emissions to fall significantly and raw material and energy independence to increase whilst maintaining constant output.

Flagship Project 10: The aim is to develop innovative Austrian technologies into model solutions for smart, safe and affordable energy and transport systems for the future. In order to stimulate implementation on European domestic markets and to increase the international visibility of Austrian solutions on global markets, large-scale testing of technologies and solutions must take place under real operating conditions.

Development and exemplary application of domestic energy and energy-relevant transport technologies for large-scale practical testing of smart system solutions under real operating conditions.

Strengthening and developing Austria as a leading market for innovative energy technologies and energy-relevant transport technologies as well as technology-based services.

ii. National 2050 strategies for promoting 'clean energy technologies', where available

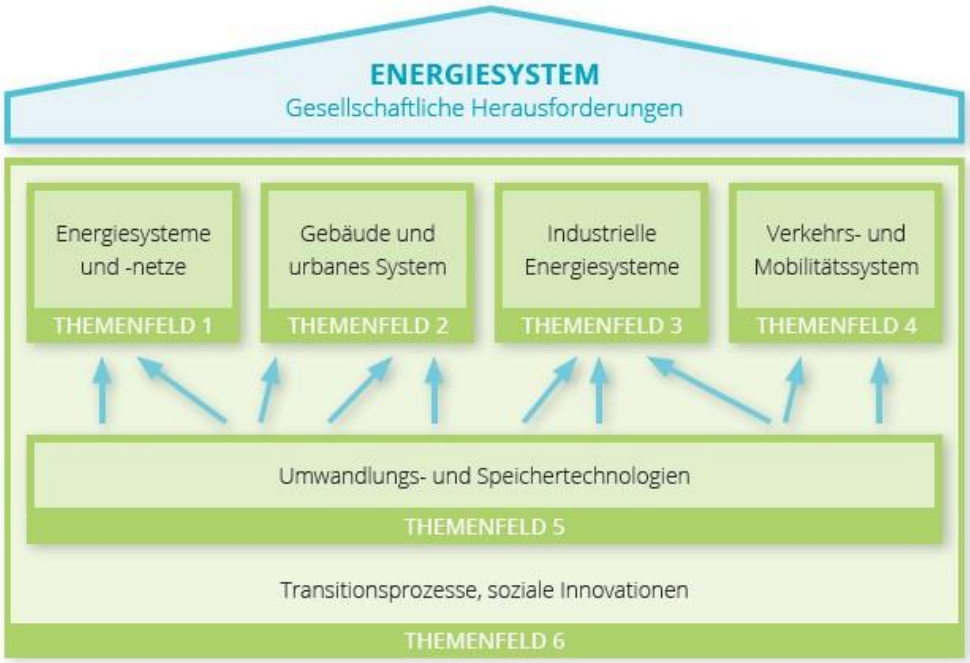
The immense task of making the decarbonisation agenda technically feasible, economically viable and socially acceptable depends on a long-term research, technology and innovation (RTI) policy.

Alongside #mission2030, which, as already mentioned, sets out a decarbonisation pathway and guides the way towards 2050, the '2050 Energy Research and Innovation Strategy' drawn up by the BMVIT aims to exploit the economic opportunities of transforming the energy system to promote energy research and innovation as a central pioneer in the gradual decarbonisation of the energy system, thereby enabling Austria to make a significant contribution towards a future with clean, safe and affordable energy.

The further development and future direction of energy research and innovation is characterised by an integrated perspective based on a systemic approach. In addition to technological changes, research will also be carried out into the potential for a socio-ecological transition towards sustainable energy use and the methods of achieving this. In order to allow for long-term decision-making and room for manoeuvre, the following innovation systems, referred to here as 'thematic areas', address the need to define the framework for the future direction of energy research.

Technological development and smart system solutions will aim to generate a corresponding demand for technology on the Austrian and European domestic markets and address the competitiveness of Austrian businesses making products for worldwide export. The adjustment of market and regulatory frameworks and changes in the roles of actors and how they interact are inextricably linked, and require multi-dimensional innovation strategies.

Figure 10: Thematic areas in energy research and innovation in Austria



Source: BMVIT 2050 Energy Research and Innovation Strategy (2017)

ENERGIESYSTEM	ENERGY SYSTEM
Gesellschaftliche Herausforderungen	Societal challenges
THEMENFELD	THEMATIC AREA
Energiesysteme und -netze	Energy systems and grids
Gebäude und urbanes System	Buildings and urban system
Industrielle Energiesysteme	Industrial energy systems
Verkehrs- und Mobilitätssystem	Transport and mobility system
Umwandlungs- und Speichertechnologien	Conversion and storage technologies
Transpositionsprozesse, soziale Innovationen	Transposition processes, social innovations

These priorities are set out in concrete terms in Flagship Project 9, 'Building blocks for energy systems of the future', and Flagship Project 10, 'Mission Innovation Austria', of the Federal Government's Climate and Energy Strategy, #mission2030 (see Chapter 3.5.).

iii. National objectives on competitiveness, where available

The implementation of a decarbonisation pathway is a long-term process. A technologically open framework needs to be put in place which is tailored to the pathway, is in keeping with European targets and takes account of competition. This applies to all sectors of the economy that impact on current and future jobs in Austria as a business location. Public resources must be used efficiently, effectively and in a targeted manner along the entire decarbonisation pathway and explicit account must be taken of the principle of budgetary sustainability.

Successful implementation of climate targets must parallel international targets in order to ensure a level playing field and maintain the competitiveness of the Austrian economy in general, and its energy-intensive industry in particular, and thus maintain or expand Austria's share of industry. At the same time, outlets for innovations and environmental and climate technologies from Austria to growing export markets must be increased. The objective is to ensure that Austrian businesses will still be able to obtain energy services at economically affordable prices. Comprehensive carbon leakage protection provides an important short- and medium-term basis for the conversion to zero-emission processes by energy-intensive businesses and plants that are highly efficient compared to their international counterparts. The emissions trading system should effectively support full decarbonisation of our energy system by 2050.

3. POLICIES AND MEASURES

The following section contains the main policies and measures which are necessary for achieving the objectives of the Energy Union. They are all planned measures to be implemented in the period up to 2030. In several of the areas of action, similar measures have already been implemented which will need to be adapted appropriately and further reinforced or supplemented by additional instruments (e.g. funding mechanisms in the agriculture or construction sectors). Other areas of action will include completely new measures, in particular in those areas which require tools adapted appropriately for the use of new technologies and solutions (e.g. storage solutions for surplus electricity, producing 'green gas' and feeding this into existing natural gas grids).

The objectives and guidelines in the Federal Government's Climate and Energy Strategy (#mission2030) and the strategies adopted by the provinces provide the main basis for future policies and measures. It is also essential that the objectives and measures up to 2030 are made consistent with the trajectory for 2050 (to be determined by the end of 2019 in Austria's long-term strategy in accordance with the Regulation on the Governance of the Energy Union and Climate Action), in particular to prevent 'lock-in' effects and to enable adequate and flexible transitional solutions, for instance by constructing future-proof infrastructure.

3.1. Dimension 1: Decarbonisation

3.1.1. Greenhouse gas emissions and carbon sequestration

i. Policies and measures for achieving the objectives of the Effort Sharing and Land Use Regulation (taking into account all major sectors, and considering the long-term objectives of the Paris Agreement)

Transport

The Federal Government's Integrated Climate and Energy Strategy (#mission2030) focuses in particular on transport. Alongside the overarching Federal strategy, all nine provinces have also committed themselves to the objective, and some have already submitted provincial strategies. In order to ensure that the objectives in the transport sector are met, Austria identified eight strategic task fields in #mission2030, ranging from developing infrastructure, creating necessary economic and legal frameworks, adjusting the subsidy and levy system, boosting research and raising awareness to the use of new technologies and climate-friendly spatial planning.

In terms of the taxation of energy products, Austria is towards the lower end of the middle range of EU Member States.[21] Tax rates on petroleum products are consistently lower than in neighbouring countries, which means that a significant proportion of the diesel fuel sold in Austria is used abroad (fuel exported in fuel tanks).

The Federal Government, provinces and municipalities have so far announced around 300 specific measures for the National Energy and Climate Plan, covering the following areas:

[21] An overview of the taxation of energy products, including electricity, is provided in the following publication from the European Commission (as of 1 January 2018):
https://ec.europa.eu/taxation_customs/sites/taxation/files/resources/documents/taxation/excise_duties/energy_pro ducts/rates/excise_duties-part_ii_energy_products_en.pdf

The public sector leading by example

In public procurement and public fleets, the public sector will lead by example by switching to zero-emission or low-emission vehicles as part of routine procurement of replacement equipment (without special operational requirements[22]). Vehicles will be procured according to the total cost of ownership (TCO) principle. Appealing infrastructure for cycling and charging electric vehicles will be created for employees. Future investment requirements for local authorities are still to be ascertained in this regard.

- Implementation of the Clean Vehicle Directive by cities, municipalities, provinces and the State
- Implementation and subsequent further development of the Sustainable Procurement Action Plan and the core criteria therein for vehicle procurement:
  - Continued development of the minimum number of zero-emission vehicles in new procurement (zero emission quotas);
  - Further annual reduction of fleet CO_2 upper limits for procurement of conventional vehicles;
- Master plan for equipping and retrofitting federal buildings: creating attractive infrastructure in the form of e-charging stations, bicycle parking facilities, etc. for employees and guests at public buildings. Use of innovative public procurement tools for determining where needs exist and for implementation;
- Mobility management towards a climate-neutral public administration: incentives for climate-friendly travel to work by public transport, on foot, by bike or carpooling. This principle will also apply first and foremost to business trips, and unavoidable flights will be offset.

Significantly increasing the proportion of cyclists

Half of all car journeys in Austria are shorter than five kilometres and more than half of all motorised journeys for the conveyance of goods in towns and cities could in fact be made by bicycle. This reveals considerable potential for more cycle lanes.

The Federal Government's Cycling Masterplan 2015-2025 identifies six priority areas with a total of 24 measures, which will form the basis for increasing the share of bicycle use across Austria from the current 7% to 13% in 2025. Measures range from budgetary safeguarding of funding for cycling at all administrative levels, the expansion or construction of high-quality infrastructure for moving and stationary traffic, to the implementation of awareness-raising measures. The measures can be found in all provincial strategies and will be implemented by the provinces,

[22] Requirements of emergency response services and tasks of general interest service provision, including in the event of a crisis, are to be taken into consideration.

towns/cities and municipalities. The reinforced implementation of measures to achieve this objective should be jointly agreed in an agreement between the Federal Government, provinces and municipalities for promoting cycling at the Austrian Cycling Summit in early 2020. The package of measures and necessary investments are being worked out by the nationwide task force for cycling at State, provincial and town/city level. In order to achieve the objective, current estimates suggest that investment totalling around EUR 2.2 billion between 2020-2030 will be necessary from all local authorities to develop cycling in Austria. Around 80% of these estimated resources will be provided at provincial and municipal level, with a maximum share of 20% coming from the Federal Government (Federal Ministry for Sustainability and Tourism, Federal Ministry for Transport, Innovation and Technology).

- Subsequent implementation of the Cycling Master Plan by provinces, municipalities, public companies and the Federal Government, and the priorities and measures defined therein;
- Investment campaigns by the Federal Government, provinces and municipalities to promote cycling and to expand cycling infrastructure in towns/cities and municipalities (e.g. cycle lanes, bicycle parking facilities, etc.) as well as extending regional cycle paths. At federal level, the focus on promoting cycling in the climate protection programme [**klimaaktiv mobil**] is to be developed and the necessary resources secured through EU funds and support mechanisms — e.g. EAFRD, ERDF, including for the next funding period. Towns and cities with over 30,000 inhabitants are also to receive extended klimaaktiv mobil support.
- Further improvement of the legal, organisational and economic framework and incentives to increase the use of bicycles;
- Raise awareness of cycling and healthy active mobility by expanding the joint motivation campaign 'Austria cycles' [*Österreich radelt*] and rolling out the JobRad model (a scheme whereby employees can lease bicycles through their employer);
- Further support through the funding programme 'Digital and networked mobility' [*Digitale und vernetzte Mobilität*] of particularly innovative and pilot implementation measures in the fields of micro-public transport, the funding programme Intermodal Interfaces for Cycling [*Intermodale Schnittstellen - Radverkehr (ISR)*], walking and digitalisation of the transport system;
- Increasing research into cycling to strengthen knowledge capacities and promote cycling innovations.
- Recognition of active mobility in the health sector.

Improvements in relation to walking

Walking is a form of mobility which people throughout society can afford and practice regardless of age, whereby all individuals can make a contribution towards reducing CO_2 emissions caused by transport. Walking also has an important tie-in role with transport and forms the basis for engaging in multi-modal transport. Promoting walking also has the effect of increasing the number of people who cycle and use public transport in particular.

The Federal Government's 2015-2025 Walking Masterplan sets out 26 measures grouped into 10 areas for action. These range from improving walking infrastructure and a corresponding investment campaign through to the promotion of pedestrian-friendly transport arrangements, the improvement of traffic safety and necessary raising of awareness.

The primary objective is to create conditions for walking which, in the context of increased bicycle use, do not result in this increase being brought about by a switch from walking, but from private cars.

- Subsequent implementation of the Walking Masterplan by provinces, municipalities, public companies and the Federal Government, and the priorities and measures defined therein;
- Investment campaigns to develop footpath infrastructure and pedestrian-friendly, safe street design with traffic calming, increased introduction of pedestrian priority zones and pedestrian areas in towns, cities and municipalities;
- Further support through the funding programme 'Digital and networked mobility' of particularly innovative and pilot implementation measures in the fields of micro-public transport, the funding programme Intermodal Interfaces for Cycling, walking and digitalisation of the transport system;
- Raise awareness of healthy active mobility and further improvement of the legal, organisational and economic framework and incentives to increase walking.

Enhancing public transport

In Austria, an average of 14.6% of all roads on an average working day are reserved for public transport. The percentage varies on a local level and increases the higher the population density. The highest proportion of roads reserved for public transport is generally found in urban areas, notably the capital city. The greatest potential for CO_2 savings is by switching from private cars to public transport. Public transport has additional potential depending on occupancy rate and also on the use of energy-efficient and alternatively-powered public transport. The highest energy efficiency comes from rail mounted and electrified transport such as public trams, underground and suburban railways in the public transportation network and local and long-distance electrified railways. However, a significant contribution to reducing CO_2 emissions from transport can also come from the electrification of public road transport by means of battery-electric buses or trolleybuses.

Rail infrastructure plan for the Austrian Federal Railways network

Investments in railway infrastructure in recent years and the railway coverage this has resulted in has made Austria a leader in rail passenger transport in the European Union. Nevertheless, looking towards mobility in the future, additional focus is still needed on enhancing efficient public transport, in addition to making use of the opportunities offered by digitalisation and placing far greater focus on better services.

According to the framework plan of Austrian Federal Railways, current annual investment by the Federal Government of just under EUR 2 billion is set to increase gradually to EUR 2.5 billion over the coming years up until 2030 in order to improve infrastructure.

- The objective is the accelerated implementation of the Austrian Federal Railways target network: Increasing resources in comparison to the 2018-2023 framework plan with a view to implementing the 2025+ target network, including some additional measures which are intended to be particularly effective in terms of climate, in particular in metropolitan areas.
- Furthermore, swift progress is to be made on work on the 2040 target network, which will form the basis of infrastructure development up to 2040. In this context, special emphasis is to be placed on further development of regular-interval timetables, reducing travel times, ensuring sufficient capacity in metropolitan areas for developing local transport, and improving competitiveness of freight transport.

Providing greater and more attractive mobility options

Alongside robust infrastructure which must meet future requirements in terms of both quality and quantity, care must also be taken to simultaneously provide a corresponding range of services. Accordingly, provision of public transport will be gradually increased at federal and provincial level from 2019 to 2029. There are also plans to make accompanying improvements in the provision of long-distance transport. These go hand-in-hand with the planned fleet modernisation which will focus on energy efficiency, accessibility and easy mobility.

Rail transport in Austria is publicly funded (by the Federal Government and provinces), with a few exceptions, e.g. on the western line between Salzburg and Vienna. This takes place by way of transport service contracts with ÖBB-Personenverkehrs AG and private railways. With a view to achieving climate targets, public transport will be more attractively designed, with services being gradually extended and becoming more regular (particularly with the commissioning of new lines) and (e.g. through the use of new vehicles) the quality of service increasing.

- 'New' transport service contracts (federal law by means of which the establishment of prior commitments by the Federal Minister for Transport, Innovation and Technology is approved): On the basis of the Prior Commitment Authorisation Act [*Vorbelastungsermächtigungsgesetz*], adopted in October 2019, a 37% service increase in the ordered rail capacity (period 2015-2029) is guaranteed.
- There are also plans to agree transport service contracts for private railways for the next decade.
- Potential funding needs to be clarified for additional orders going beyond this for expansion of local transport services, which are advisable for climate protection reasons, e.g. in order to be able to optimally exploit the potential of new and improved infrastructure.
  - The aim would be to further develop long-distance, overnight and international transport: In many cases, there is still track capacity available for long-distance transport. Attractive offers can tempt passengers away from air travel, which is particularly harmful for the climate, in addition to the necessary true-cost pricing of air travel.

Enhancing regional public transport

In addition to steadily expanding connections across Austria, additional measures are being implemented at federal, provincial and municipal level with a view to improving regional public transport. At federal level, this covers in particular funding for private railways, urban-regional public transport, the expansion of underground rail services and decarbonisation of the vehicle fleet. At provincial and municipal level, a number of projects have been planned for improving

both infrastructure and the provision of public transport regionally and in metropolitan areas. From an infrastructure perspective, projects cover the creation of mobility hubs and the extension of regional rail and bus lines. From a service perspective, funding will be provided for regular transport services and micro-public transport. Additionally, the fare structure will be optimised.

- Funding for private railways: The objective would be to increase resources for the medium-term investment programme for private railways;
- Urban-regional railways: First planned federal subsidy for the creation of tramway and tram-train projects, such as in Linz, Graz and Innsbruck, with an urban-regional impact.

Electrification plan

- The intention is to increase the level of electrification of the railways. Electrification of the Austrian Federal Railways network is planned to increase from its current level of 73% to 85% by 2030. In addition to this tried and tested electrification by means of overhead lines, the use of battery technology or fuel cells in conjunction with renewable hydrogen in rail vehicles can be an option for replacing diesel, at least for some regional railways.
- New research priority for decarbonising the railways (batteries or fuel cells for traction purposes);
- Shunters are sometimes still powered by diesel. By 2025, these will have been replaced by electric vehicles as part of procurement of replacement equipment.
- At provincial and municipal level, alternatively powered – and therefore electric – vehicles are increasingly being added to the bus fleet (electric buses, trolleybuses and hydrogen buses).

At municipal level, it will also be possible to make better use of existing instruments. These include, for example, parking regulations as an effective instrument for managing demand for individual means of transport. At provincial level, effective additional measures and instruments will be available, such as spatial/urban planning, housing subsidies and restructuring of the requirement to provide parking spaces.

Increasing the multiplier effects of infrastructure investments by the Federal Government

Particularly with regard to federal investment, there are plans for towns, cities, municipalities and provinces to work together to link federal support measures to the transport requirements of

towns, cities, municipalities and provinces. These might include additional demonstrable investment in walking and cycling, or compliance with spatial and traffic planning aspects.

Strengthening cooperation with public transport system partners

Investment in infrastructure and services can only have its full impact if people make full use of them. In future, there must therefore be even greater focus on making all public transport more easily accessible and comfortable, something which can only be achieved through improved cooperation between public transport partners. Consequently, work is under way on an Austria-wide fare pricing and sales system for public transport. The system will be of added value to users of public transport as various mobility providers' existing databases will be linked up in a way which complies with data protection laws by means of the interfaces which will be developed. As a result, the potential for synergies and modern services due to increasing digitalisation will lead to better services for the customers and, therefore, increased use.

In addition to numerous improvements in cycling, walking and public transport, there are overarching policy areas which need to be addressed. These include the following policy areas and measures:

- The Austria-wide uniform fare pricing and sales system for public transport;
- Trialling the introduction of an Austria ticket (general subscription based on the Swiss model);
- Other fare-related measures, such as reductions applicable throughout Austria and ongoing fare degression;
- Promotion of environmentally friendly travel to major events;
- An improved coordination process for public transport crossing regional borders, i.e. between provinces, towns, cities and municipalities.

Mobility management to promote climate-friendly, clean mobility

Mobility management is a key factor in improving the organisation of transport in the home and business environment, in towns and cities and in regions, and makes an important contribution in terms of the change to sustainable mobility and decarbonised transport. Mobility management enables a better choice of eco-friendly transport options, both for commuters and leisure travellers. Mobility management supports the introduction and use of new, eco-friendly technology so that full use can be made of its potential and counter-productive developments can be avoided. Numerous successful measures, taken by the Federal Government through the **klimaaktiv mobil** programme as well as by provinces and municipalities, to support Austria's towns and cities, municipalities and companies in the area of mobility management and raising awareness can be cited. In future, these must be safeguarded, further developed and strengthened. All Austrian companies, towns and cities, municipalities, regions and other relevant operators in the mobility system will be encouraged to introduce zero-emission sustainable mobility solutions under mobility management schemes and will be supported in the implementation thereof. Changing attitudes towards other modes of transport or mobility patterns in general can make a significant contribution towards acceptance and increased use of public transport, active mobility and new forms of mobility.

An evaluation of the 2013-2020 programme is to be carried out as a basis for further development and for reflection on the strategic orientation, structures, content and previous successes of the **klimaaktiv mobil** programme. The results of this evaluation, particularly in relation to efficiency and success in ecological and economic terms, are an important basis for the required expansion and reorientation of activities where necessary, which are to be carried out in accordance with the budgetary requirements and with the involvement of the Federal Ministry of Finance.

- Comprehensive expansion of the **klimaaktiv mobil** advisory and funding programmes for mobility management to support Austrian companies, property developers and fleet operators, towns, cities, municipalities and regions, tourism, schools and youth initiatives in developing and implementing climate-friendly, clean mobility projects;
- Creating improved frameworks for mobility management at federal, provincial, municipal and company level, with incentives for employees who use climate-friendly mobility to get to work and on business trips (e.g. promoting the use of public transport), for customers and guests, and for zero-emission vehicle fleets and CO_2-neutral logistics. The Tax Reform Act 2020 [*Steuerreformgesetz*] that has been adopted implements additional ecological measures in the area of mobility and introduces the taxation of sustainable fuels. The intention, among other things, is to provide a price signal as early as the point in time of the decision to make the purchase by introducing a registration tax that is dependent on price and emissions (with a tax rate of up to 32% and a penalty for particularly emission-intensive passenger cars). A CO_2 component will also be introduced in the area of engine-related insurance tax (current motor vehicle tax), thereby steering a

course towards low-emission motor vehicles. In addition, electric bicycles will become eligible for input tax deduction and tax incentives will be provided for biogas, sustainable hydrogen and liquefied natural gas.

- Transition from the provinces' current obligations to provide vehicle parking spaces to multimodal, GHG-saving solutions and regulations (e.g. laws, mobility contracts for companies, property developers and residents focusing on improved public transport and cycling infrastructure connections and services, for e-mobility, bike and e-car sharing, parking space management and eco-driving).
- Creating a framework to reduce travel congestion (consistent utilisation throughout the day promotes efficiency, productivity and capacity), e.g. by providing incentives for companies to offer flexible working hours (e.g. home office) and increased flexibility for the start of lessons in educational institutions.
- Coordinated communication with the population, companies and institutions in relation to practice-oriented consultancy for introducing zero-emission vehicles under the Norwegian model ('elbil')
- Developing measures to increase the car occupancy rate

Spatial planning

The settlement pattern, i.e. the distribution of various land uses has a considerable impact on the transport outlay needed to bring these different uses together. In the past, decision-making processes failed to pay sufficient attention to such links. Spatial development in recent decades has contributed to a significant increase in the distance driven by road traffic, the energy consumption of buildings and, therefore, an increase in CO_2 emissions. Consideration is therefore being given to entrenching climate and energy objectives into spatial planning and geospatial plans and programmes. In this way, land use should be steered more strongly towards limiting soil consumption, preventing sealing, and ensuring condensed, compact settlement and commercial development.

Especially in terms of parking space regulations and structuring of housing subsidies, there should in future be more emphasis on proximity to the town centre and public transport development, as well as alternative mobility services.

- Entrenching climate and energy objectives into spatial planning in the provinces and into building regulations, zoning and development planning in the provinces, towns, cities and municipalities and implementing spatial energy planning to reduce energy consumption and emissions;
- Reform of provincial parking space regulations for climate protection purposes and of

mobility-relevant frameworks, such as housing subsidies, in spatial planning, zoning and building regulations;

- Optimal accessibility of residential areas and industrial estates for public transport, bicycles and pedestrians, promotion of dense, compact residential areas and housing development as well as location development of commercial and industrial enterprises along public transport corridors to reduce urban sprawl, and measures for upgrading town and city centres;
- Promoting the creation of commercial and industrial zones with a connection to the rail network or a combined transport connection.
- As part of the next Austrian Spatial Planning Concept (ÖREK 2030), which is currently in development, the role to be played by spatial planning in achieving climate protection objectives and sustainable development goals (SDGs) is to be developed under the motto 'Space for Change' [*Raum für Wandel*] by the end of 2020, and gradually implemented by the partners of the Austrian Spatial Planning Conference (Federal Government, provinces, association of towns, cities and municipalities, interested parties) in the period 2021-2030.
- The expert recommendations of the ÖROK on the issue of 'strengthening of town and city centres' are to be implemented gradually, especially the aim of increasing subsidies for the creation of housing in town and city centres (reform of housing subsidies).
- Wider application of the grading system for public transport quality in relation to spatial and transport planning;
- Safeguarding relevant areas and routes for the future development of climate-friendly mobility and energy infrastructure.
- Boosting local provision to promote short routes and environmentally friendly mobility.

Goods transport

In 2016, approximately 38% of all transport-related greenhouse gas emissions were caused by goods transport. Nearly all these emissions are attributable to road freight transported by light and heavy goods vehicles, powered almost exclusively by internal combustion engines.

A central issue when switching freight transport from road to rail is the further development of the infrastructural framework, and establishing true-cost pricing in transport by means of more transparency and internalisation of external costs for competitive rail freight transport. In Austria, this is achieved firstly by building base tunnels, especially on the core network lines of the Trans-European Network, to a large extent with a flat track in order to be able to carry heavier and longer freight trains, and secondly, by creating sufficient capacities for rail freight transport. The

upgrading of the western line, the southern line and the Brenner base tunnel are examples of this. Where possible, the Federal Ministry of Transport, Innovation and Technology is also working intensively to expand access routes to neighbouring countries, particularly on the Brenner corridor with Germany and Italy.

The Federal Government is actively implementing measures to switch freight transport to the environmentally friendly railways as part of the traditional rail freight transport subsidy[23] and the subsidy for connecting railways and terminals. Combined with investments in a well-developed infrastructure, these targeted subsidies, amounting to around EUR 120 million annually, have a correspondingly positive impact. In Austria, over 30% of all freight transport, measured in tonne-kilometres, was transported by rail. Austria is therefore among the leaders in this field in the European Union, and the aim is to maintain and further expand this high share of freight transported by rail. The structure of freight transport logistics also plays a key role in achieving climate and energy objectives in urban areas.

[23] Single wagonloads, unaccompanied combined transport, rolling road

For this reason, the Federal Government wishes to work with the provinces, towns and cities and municipalities on the following:

- Continue support for multi-modal goods transport hubs in order to switch trans-shipment from road to rail. Developing infrastructure (according to the framework plan of the Austrian Federal Railways) and increasing the efficiency of rail freight transport is a condition for doing so;
- Develop measures for making urban logistics environmentally-friendly; the aim is to implement CO_2-neutral urban logistics systems by 2030, with a view to making urban logistics systems CO_2-neutral by 2050 through a mix of regulatory, logistical, cooperative and technological measures;
- Create incentives and guidelines in order to make road transport more environmentally-friendly, as well as switching to eco-friendly transport modes;
- Development of a Logistics Action Plan 2.0, to include the following:
  - Sensing and imaging measures
  - eFTI — electronic freight transport information
  - Future-oriented professions (in climate-neutral freight transport)
  - Location (spatial planning)
- New approach to operational aid for connecting railways;
- Possible adjustment of the rail freight transport subsidy towards the maximum permitted under EU State aid law, including considering 100% of the difference to the external costs;
- Innovation programme for combined transport, including for intermodal transport;
- Days of action for combined transport in the provinces;
- Continuation of logistics subsidies;
- Boost the competitiveness of international rail freight transport by improving cooperation at European and bilateral level (e.g. reduced stopping times at borders).
- Promoting the Digital Automatic Coupling (DAC) in European rail freight as a significant factor for the modal shift and climate protection: Increasing capacity by up to 30% with the introduction of ETCS Level 3 (for which DAC offers technical support) and sustainably increasing productivity of rail freight transport, as long processing times and high costs of train composition, shunting and separation by means of manual coupling will be reduced.

Electrification plan (battery-powered, hydrogen, based on renewable energy) for passenger and goods transport — roads and infrastructure

For a clean, safe and affordable transport system, the technology which is used is of particular importance. The cleanest, most efficient technology and transport systems must be introduced, offering a high level of user-friendliness, at a socially and economically acceptable cost. Accordingly, several packages of measures must be implemented as part of an electrification plan, covering new support priorities for vehicles such as electric goods vehicles and electric buses. These will be flanked by a strong infrastructure component (e.g. recharging infrastructure for electric buses) and by continuing the successful support priorities established for electric cars and electric bicycles. The motor vehicle industry will again be involved with promoting electric vehicles by means of the public-private partnership model. Particular emphasis will be placed on promoting e-mobility management, e-logistics and e-fleets in the commercial and municipal sectors. In addition, zero-emissions research is an intended priority in the research, technology and innovation sector. Furthermore, through targeted adaptation of the legal framework, improvements will be made to increase suitability for everyday use and reduce barriers to the use of electric vehicles. This will involve, in particular, establishing incentive systems so that manufacturers more quickly introduce zero and low-emission vehicles onto the market at EU level, introducing incentives for electric vehicle users and modifying housing legislation as soon as possible (potentially as early as the first half of 2020) so that charging points can be fitted in apartment buildings. For new registrations, it is intended that focus will thereby shift to zero-emission cars and light goods vehicles by 2030. The aim is for a significant increase in the number of zero-emission lorries and buses by 2040.

Electrification plan — vehicles

- Continuing the purchase bonus for private individuals who switch their vehicles to zero-emission cars, bikes and load-carrying vehicles, as a public-private partnership with the vehicle industry;
- Continuing the purchase bonus for companies, provinces and local authorities who switch vehicles, particularly for cars, bikes, e-bikes, buses and goods vehicles, as a public-private partnership with the vehicle industry;
- Continuing the focus on promoting e-mobility management, e-logistics and e-fleets (e.g. driving school fleets) in the commercial and municipal sectors (e.g. along with support for switching to zero-emissions taxis — see legal framework);
- Switching of driving school training vehicles to zero-emission vehicles.

Electrification plan — infrastructure

- Needs-based expansion of publicly accessible charging infrastructure at rest stops on motorways and expressways, with the aim of achieving 100% network coverage by 2030;
- Continuing the needs-based expansion of park-and-ride facilities with infrastructure for e-charging stations (target horizon 2025);
- Continuing the interoperable roll-out of the concept of 'multimodal hubs' to other Austrian towns, cities and municipalities: A multimodal hub is a place or area in a public or semi-public space where several means of transport are interlinked. The starting point of a multimodal hub is usually a public transport stop in the immediate vicinity of which additional mobility services are established. The services can range from the integration of walking and cycling to car sharing, taxi services (including dial-a-ride taxis) or car rental services.
- 'E-mobility check' for analysis of the building stock in apartment buildings;
- Continuing to support the construction of private e-charging stations in apartment buildings;
- Continuing to support the construction of e-charging stations, e.g. for employees, customers and guest parking spaces;
- Continuing to support the construction of e-charging stations for company vehicles (tradespeople, etc.);
- Establishing minimum standards, particularly in relation to infrastructure for e-vehicles and infrastructure for new forms of e-mobility (car sharing) in the vicinity of public railway stations, public transport stops and park-and-ride facilities.

Electrification plan and hydrogen initiative — systemic approach for freight transport and buses

- Continuing to support the replacement of diesel fleets with zero-emission vehicles (e.g. battery-powered, hydrogen, trolleybuses), including infrastructure support and producing fuel/hydrogen using renewable energy;
- Systemic approach on a project basis up to 2030 (vehicles, infrastructure, producing renewable fuel) based on the work carried out for the Austrian Hydrogen Strategy.

Electrification plan — legal framework:

- Adapting the Occasional Traffic Act [*Gelegenheitsverkehrsgesetz*] with regard to the fact that newly registered taxi and rental vehicles must operate emissions-free from 1 January 2025;

- Legal certainty for owners of zero-emissions vehicles: Decision to keep tax advantages for zero-emissions vehicles until at least 2025 or until such a time as zero-emissions vehicles account for 10% of all vehicles (whichever comes first);
- Price transparency: Creating price transparency by including the ad hoc price in the e-control charging point register and examining further measures for increasing price transparency for end customers;
- Creating a new sign for e-fuel stations in the road traffic regulations;
- Federal Road Tolls Act [*Bundesstraßen-Mautgesetz*]:
  - Planned: Temporary reduction in toll obligations for zero-emissions vehicles up to 3.5 t, including automatic readjustment to the standard tariff after five years.
  - Already implemented (Federal Law Gazette I No 45/2019): From 1 January 2020, a separate tariff group is to be established for vehicles with a maximum permissible weight of more than 3.5 tonnes which are powered solely by electricity or solely by hydrogen fuel cell, for which the lowest tariff shall be set.
    This lowest tariff will be 50% lower than the highest tariff. Furthermore, there will be no basic per-kilometre charge for traffic-related air pollution set for vehicles powered solely by electricity or solely by hydrogen fuel cell.
- Making it easier to construct e-charging stations in apartment buildings by amending housing law by creating a 'right to plug' solution;
- Cold chain logistics infrastructure on motorway and expressway networks: Clarifying that the operation of secondary power sources (diesel, petrol engines) for refrigerating HGVs at rest stops and rest areas during the legally prescribed rest periods constitutes avoidable air pollution, provided that electricity terminals are available at the respective location to supply the refrigerated HGVs with electricity. Accompanying expansion of all HGV rest facilities with electricity terminals to supply refrigerated HGVs.
- Examining the feasibility of electrification infrastructure on the motorway and expressway networks for recharging on the road.

New mobility services & experimental spaces

- Creating a Car Sharing Preferential Rights Act [*Carsharing-Bevorrechtigungsgesetz*] to allow public parking spaces to be reserved for commercial operators of station-based car sharing. Creating the opportunity for operating costs for car sharing / rental bicycles / alternative mobility services to be included in Section 28 of the Act on the Ownership of Apartments [*Wohnungseigentumsgesetz*] (also the Tenancy Act [*Mietrechtsgesetz*], the Non-profit Housing Act [*Wohnungsgemeinnützigkeitsgesetz*]).

- Controlling the use of automated public mobility services as well as automated private transport and consistently steering activities towards achieving climate-related objectives for transport in line with the 'Automated Mobility Action Package 2019-2022' [*Aktionspakets Automatisierte Mobilität*];
- Continuing the development of smart multimodal traffic management;
- Establishing, in particular, legal bases for experimental spaces to use as test areas for innovation and regulation, in order to gain experience under real conditions of new innovation and technologies that are only partially compatible with the existing legal and regulatory framework. Austria needs legal flexibility instruments in order to implement and create experimental spaces, for example in the form of experimental clauses or experimental laws.
- Establishing nationwide, compatible digital infrastructure for 'Mobility as a Service' (MaaS) with open interfaces to the respective mobility providers;
- Enabling 'Mobility as a Service' (MaaS) and flexible local services: By combining strong existing public transport services (bus and train) with new, flexible local services (taxi services, e-car sharing, ride sharing and car pools, etc.) as well as digital networking of all mobility services (=MaaS), to form an overall service, an alternative to owning a private car is created. As a result, the occupancy rate of the modes of transport concerned will be significantly increased through use of these new services, if the services are designed accordingly. This will lead to massive CO_2 savings which in turn trigger significant positive economic effects.
- Further development of public transport services in the municipalities through a clear legal framework for micro-public transport services.

Review of infrastructure projects for compatibility with 2030/2050 climate protection targets

If there is a potential need to revise, modify, reduce or expand the high-level federal transport network as a basis for infrastructure projects with a view to achieving climate protection objectives, it may be necessary to carry out a Strategic Transport Review [*Strategischen Prüfungen - Verkehr, SP-V*]. In this way, the SP-V can be seen and used as an instrument for an area's transport development and thus also as contributing to achieving climate targets in transport (SP-V Act, SP-V Guidelines).

Existing infrastructure is also to be operated in an energy-saving manner. Further savings are planned for the motorway and expressway networks by means of greater energy efficiency (e.g. LED tunnels and outdoor lighting) or through energy generation at motorway maintenance depots, open spaces in the vicinity of motorways and expressways, noise barriers, etc.

Additionally, legal conditions are to be created to allow new access points to park-and-ride facilities and interconnection of road and rail services.

Increased road transport controls

There are plans to increase weight checks for road freight transport. Furthermore, the aim is to move towards ending the scope for technically unnecessary tolerance limits in speed checks.

Inland waterway transport:

A central issue when switching freight transport from road to waterways is the further development of the infrastructural framework for competitive transport of goods via inland waterways:

- Providing shore-side electricity supply points at public and private moorings (Danube ports) for river cruise ships and their mandatory use;
- Targeting increased competitiveness in inland waterway transport by upgrading moorings so that they can achieve Good Navigation Status in the TEN-T, including shore-side electricity supply for freight transport;
- Examining the feasibility of using alternative fuels in inland waterway transport;
- Improving fairway conditions *west* of Vienna, including the technical condition and operation of Austrian locks, in order to achieve Good Navigation Status in the TEN-T;
- Improving fairway conditions *east* of Vienna in order to achieve Good Navigation Status in the TEN-T to the best ecological standards;

- Continuing the support programme for the use of technologies to reduce GHG emissions in inland waterway transport.

Aviation:

- Continuing the support programme for the purchasing of electrically operated ground-service vehicles and for increasing purchases of electrically operated GPUs (Ground Power Units);
- Implementing Free Route Airspace to save fuel;
- Increasing implementation of the 'Optimised Descent Profile' (ODP) to improve efficiency in vertical flight profiles, resulting in fuel savings and reduction of CO_2 emissions.

Further steps in the transport sector

Achieving climate targets is a particular challenge in the transport sector. This makes it all the more important to implement the policies, strategies and measures necessary to achieve these objectives quickly and in a concerted and determined manner, with joint political effort across departmental and local authority boundaries and together with business and society.

Alongside the existing measures, a larger number of other very intensive activities will be required. The politically agreed measures specifically set out in the current National Energy and Climate Plan are a first important step in this direction. For example, the 'new transport service contracts' [*Verkehrsdiensteverträgen neu*] have created the basis for significantly expanding the range of passenger rail services over the next 10 years. Closing the CO_2 gap requires not only an investment and support package for climate-friendly mobility, which is associated with considerable positive value creation potential and jobs for Austria, but also significant further steps. This also includes, for example, creating legal and organisational frameworks essential for the achievement of objectives, or also creating public acceptance. The following aspects require special attention from a technical point of view:

- Climate targets must be incorporated into all future emissions-related considerations and (political) decisions (mainstreaming), as well as including examination of the impact of infrastructure projects and legal norms on the climate. For the mobility sector in particular, this means that all decisions are to be evaluated according to the principle of 'prevent-switch-improve' and prioritised accordingly.
- The economic framework must be adapted in the interests of a successful climate and energy transition, including the tax system, 'polluter-pays' charging models and

incentives. Attention must be paid both to the budgetary implications, micro- and macroeconomic compatibility, and to meeting mobility needs within the population and the economy.

- Progress with implementation must be precisely determined and reviewed at regular intervals (e.g. annually). Suitable monitoring as a central component of future processes ensures that adjustments can be made quickly in the event of deviations from the target trajectory. Should the objectives not be reached, readjustment measures must be submitted very promptly.
- The measures are to be accompanied, inter alia, by a consistent recycling policy that ensures the long-term and sustainable availability of raw materials. Additionally, there must be a consistent focus on improving energy efficiency in order to be able to meet the demand for renewable energy domestically, as far as (financially) possible. Generally speaking, the mobility transition must be ensured by switching to exclusively renewable energy.

In order to meet these urgent challenges in the transport sector, the Federal Ministry of Transport, Innovation and Technology, in cooperation with the Federal Ministry for Sustainability and Tourism, the Federal Ministry of Finance, the provinces, cities and municipalities, will launch a follow-up process to draw up an action plan 'Pioneering Austria - Clean Mobility 2030' [*Vorzeigeregion Österreich – Saubere Mobilität 2030*]. This process includes the further development of the transport measures within this National Energy and Climate Plan within the framework of the above-mentioned aspects and should include at least the following elements:

- Strategic control by the Federal Government and the provinces;
- Joint development of a 2030/2050 target vision compliant with the Paris Agreement in terms of the necessary future infrastructure, technologies, forms of mobility and mobility management etc., based on the respective CO_2 targets;
- Professional communication and marketing support in developing the target vision and in implementing specific packages of measures;
- Joint financing of accompanying measures (including communication and marketing) by the Federal Government and the provinces;
- Continuous monitoring and annual reporting on the progress of the implementation
- Readjustment mechanism for deviations from the target trajectory;
- Developing a uniform GHG and energy efficiency evaluation system at measure level, including providing an adequate modelling database;
- Development, agreement and coordinated implementation of specific packages of measures, including definition of areas of responsibility;
- Establishing new formats (experimental spaces) and forms of cooperation between the

public sector, civil society and business (public-private partnerships, green deals);

- Developing suitable instruments to increase the competences of local authorities and their political decision-makers;
- Using existing cooperation structures (European level, federal government, provinces, towns and cities, municipalities, working groups, science & experts), e.g. in relation to GHG emissions / emission inventories.
- Establishing and further developing cooperation with other pioneering countries and regions. Participating in European and international initiatives and involving domestic actors in specific EU missions and partnerships.

Buildings and heating

Between 2005 and 2015, it was possible for greenhouse gas emissions to be significantly reduced. Due to population growth, increasing specific living space and a growing desire for comfort, there has been a sharp rise in the construction of new housing and commercial buildings. At the same time, renovation works have been on the decline. Overall, this has resulted in emission levels stabilising. In order to return to a continuing downward trend in emissions, additional measures are now being planned. The Federal Government's Climate and Energy Strategy and the strategies adopted by the provinces represent an important cornerstone. Specific measures and instruments as part of a 'Heating Strategy' are under discussion between the Federal Government and the provinces.

The following priority areas have been earmarked for the building sector:

Construction of new buildings

- The technologies are already available to ensure that as far as possible, buildings constructed after 2020 will not require fossil fuels for heating, hot water or cooling. These include, for example, component activation, the active use of hot water storage tanks and the use of buildings as storage tanks for load balancing and load flexibility.
- The phasing-out of oil-fired heating systems in new buildings has already been set out in statute. At the end of September 2019, the Austrian National Council passed a federal law prohibiting the fitting of oil-fired boilers in new buildings (Act on the Prohibition of Oil-fired Boilers 2019 [*Ölkesseleinbauverbotsgesetz – ÖKEVG*]). This concerns all new buildings, that is to say residential buildings, public buildings and also commercially used buildings.
- The thermal quality of buildings constructed after 2020 – which will therefore not undergo thorough renovation before 2050 – must be raised to cost-optimal level[24] in accordance with the EU Energy Performance of Buildings Directive.

[24] More specific details will follow as part of the Heating Strategy 2019

Replacement of fossil fuels by renewable energy and efficient district heating (in particular based on renewable energy sources)

- Phasing out liquid fossil fuels: under the Federal Government's Climate and Energy Strategy (#mission2030), approximately half of the estimated 700,000 oil-fired heating systems currently in use are to be replaced by innovative energy systems powered by renewable energy or efficient district heating (in particular based on renewable energy sources). In this way, it will be possible reduce greenhouse gas emissions by approximately 2 million tonnes per year. This will be achieved through a package of incentives which are yet to be defined, comprising fiscal measures, regulatory provisions and subsidies for cushioning the social impact:
  - One specific measure will be the 'Renewable by default' measure[*Erneuerbaren Gebot*]. The aim of this measure is that by 2021 only heating systems powered by high-efficiency alternative energy sources will be used for replacing liquid fossil fuel-powered boilers. Exceptions to this rule will only be possible if justified.
  - A further aim is to replace liquid fossil fuel-powered boilers which are over 25 years old with renewable energy sources or district heating as from 2025.
  - A coordinated mix of instruments will be required in order to move away from liquid fossil fuels. Temporary subsidies which cushion social hardship cases combined with subsidised public advisory services independent of any product, and at the same time the announcement of medium-term regulatory provisions, an increase in the cost of liquid fossil fuels for end consumers and a target of 2040 for phasing out liquid fossil fuel energy sources for heating purposes will help a transition to be brought about as soon as possible.

  As part of the renovation initiative 2019, the Federal Government in conjunction with the provinces introduced a funding priority to phase out fossil-fuel powered heating systems in residential housing ('Oil Phase-Out Premium' [*Raus aus dem Öl-Bonus*]). In 2019, EUR 62.7 million was made available for the 'Oil Phase-Out Premium', including the renovation check and thermal renovation measures in buildings used for commercial purposes. This measure helps to reduce greenhouse gas emissions and to implement a sustainable, competitive energy system by increasing the use of renewable energy and boosting energy efficiency. The 'Oil Phase-Out Premium' (including the renovation check) supports around 13,000 projects. Around 96,000 tonnes of CO_2 can be saved, with an annual final energy saving of around 113,000 MWh expected.

- Replacement of fossil natural gas
  - Where possible, the natural gas grid will no longer be expanded for heating/hot-water purposes. Densification of heating and hot water connections is possible in areas where there is no district heating (if based on renewable energy or coming from high-efficiency cogeneration plants).

- In the long term, fossil natural gas will be replaced by renewable gases in the gas grid.
- The competitiveness of renewable gas is to be promoted by means of tax incentives implemented with the Tax Reform Act 2020 [*Steuerreformgesetz*].
- Fossil natural gas is only to be used in new buildings in duly justified exceptional cases whereby compensatory measures[25] would have to be taken.
- Consistent and harmonised implementation of the requirements of 'alternative testing' for new and renovated buildings. Fossil natural gas will thereby also be gradually replaced by renewable alternatives where reasonable and sensible to do so.
- Spatial planning is intended to identify areas with grid-bound energy infrastructure (e.g. district heating areas) as soon as possible/ by 2025.

- By 2030, liquid fossil fuels will no longer be used in federal and provincial public buildings (owned and used).

Thermal energy renovation

- The Federal Government and the provinces are working together on a definition for the concept 'thermal renovation rate'.
- Based on this definition, the objective is to double the renovation rate for the period 2020-2030. Comprehensive renovation works may also be carried out in stages under multi-annual renovation plans. Given the current decline in renovation works, considerable extra effort and a coordinated mix of measures are required. Cost-optimal levels will apply in any case to renovation (and part-renovation).
  - Targeted funding for building renovation works in the form of investment grants, subsidised financing models and tax measures, is being examined and implemented. The right mix of measures can ensure an efficient and administratively sound system.
  - Part-renovation in particular will also be funded, but only if there is an overall thermal-energy renovation plan and the part-renovation works fit into the overall renovation plan. In this way, it will be guaranteed as far as possible that part-renovation works lead to complete renovation.
  - Regulatory requirements, e.g. socially-responsible renovation requirements and price signals are also under discussion. The possibility of setting price signals is being examined with an overall systematic approach.

[25] More specific details will follow as part of the Heating Strategy

Accompanying measures

- Alongside these measures, information and awareness-raising activities and consultations (product-independent, funded and public) are planned, energy performance certificates are to be enhanced and data on the building stock and on building conditioning technology will be collected in a structured way (e.g. a building and housing register). A major communications campaign will enable a targeted transfer of knowledge, e.g. by means of model buildings that make different construction concepts and technologies researchable and tangible.
- Legal obstacles in housing law (in particular the Act on the Ownership of Apartments and the Tenancy Act) which may impede renovation measures and, inter alia, the construction of solar energy systems (thermal and photovoltaic) and/or e-charging stations must be identified and eliminated.
- Spatial planning, housing development and spatial energy planning are covered under the sections on transport and *horizontal action areas*.
- Aspects of building culture, as indicated inter alia in the Federal guidelines on building culture, should be taken into account.
- Examination of targeted funding for accompanying services and smaller investment measures (hydraulic balancing, heating system check, renovation schedules/overall renovation concepts, improvement of heat distribution and output, etc.).
- There needs to be a targeted qualification for architects, planners and craftspeople in order to create sufficient quantitative and qualitative capacities for the necessary implementation of measures.

Overall, under the Federal Government's Climate and Energy Strategy, measures in the building sector will lead to a further reduction in greenhouse gas emissions of some 3 million tonnes by 2030 as compared to 2016 (as far as possible, complete decarbonisation of the sector is intended by 2050).

Phasing out of coal-fired power generation

Austria has set itself the target of pushing forward with a rapid phase-out of coal-fired power generation. The Dürnrohr power plant, one of the last two remaining coal-fired power plants in Austria, ceased operation in 2019. The last coal-fired power plant in Austria, in Mellach, will be shut down in early 2020. This means that Austria is phasing out coal-fired power generation five years earlier than planned.

Agriculture and forestry

Current climate and energy measures in the agriculture and forestry sector draw on the possibilities provided for under Pillars I and II of the Common Agricultural Policy (CAP) and other national objectives laid down in federal and provincial agricultural law. The Rural Development Programme, which is vital for the implementation of those measures, will be valid until 2020. Support of a competitive, eco-friendly and resource-saving nationwide agriculture based on family farms is a central element of Austrian agricultural policy. The numerous CAP reforms in recent decades have brought the shift towards sustainable agriculture further into focus.

Contribution of the new CAP post 2020 to climate protection

Work is currently under way at both European and national level to shape the new 'CAP post 2020'. Implementation of the 7-year programme is expected to start in 2021. The European Commission's proposal already clearly shows that there will be even greater focus on environmental and climate protection ambitions. Of a total of nine specific objectives, three have been formulated relating to the environment and climate ('contribute to climate change mitigation and adaptation, as well as sustainable energy', 'foster sustainable development and efficient management of natural resources such as water, soil and air' and 'contribute to the protection of biodiversity, enhance ecosystem services and preserve habitats and landscapes'). Additional weight is given by the new 'improved conditionality' which will see more demanding mandatory environmental requirements introduced. In addition, environmental and climate regulations will be implemented more effectively under the first pillar through a new eco-scheme. In order to encourage Member States to make a greater contribution to climate protection in the future, there will be a performance bonus for meeting environmental and climate targets. The planned extension of subsidies should make it easier for the Member States to implement measures in future that are better adapted to country- and site-specific characteristics (and thus also to environmental and climatic conditions). A greater shift towards performance and results orientation and achieving targets is planned as a central element of the new CAP 2020+ — the allocation and use of funds will thus be more closely linked to the achievement of objectives than in the past. Although it is not possible to anticipate the current process, it is already clear from the Commission's proposal that the European Agricultural Policy will in future be geared more strongly towards climate and environmental policy.

Climate protection and climate change adaptation in the CAP 2020+

In May 2019, Austria started to prepare a national strategy plan for the upcoming CAP period. By the end of 2020, the specific interventions (measures) will have been developed by representatives of the Federal Government and the provinces, along with experts and stakeholders. Like all other non-ETS sectors, agriculture will receive a quantitative reduction target (absolute GHG reduction) for the period 2021-2030 as part of an amendment to the Climate

Protection Act. A high level of participation in climate-impacting measures in the Rural Development Programme shows that Austrian farmers are already very willing to implement climate and environmental measures. This strength is to be built on in the future.

It must be considered that the CAP has a total of nine objectives of equal weight, which focus on a variety of issues (e.g. supporting young farmers, promoting sustainable farm incomes, employment and growth in rural areas, etc.), and this sometimes limits the scope for action in the agricultural and forestry sector in favour of a single objective. The economic scope for action is also limited on account of the small and medium-sized structure of holdings in Austria and the typical topography of the country (small field sizes, hillside locations, etc.). In the political statement of intent, priority should be given to voluntary measures which, upon raising awareness amongst managers of agricultural and forestry holdings, should be combined with effective content and incentives. It is up to the respective legislative authority to decide when or to what extent federal or provincial rules should deviate from the target trajectory.

The objectives to be achieved and the possible additional measures to be taken in the agricultural sector are set out below. CAP resources will contribute to some of the targets set, although the extent and specific implementation of CAP measures is still to be decided.

Reduction in the use of mineral fertilisers

The demand for mineral fertiliser is to be reduced by 20% by 2030 compared to the use included in the 'with existing measures' scenario, by improving the overall operational nitrogen management and by compensating for the reduced use. There are already some effective ÖPUL measures for this purpose, which are to be further developed and expanded accordingly.

- Improve dosing to suit requirements by means of fertiliser planning, soil sampling and Agriculture 4.0, and by greater raising of awareness (building on existing training and advisory services). Reducing losses in mineral and agricultural fertiliser management and increased nitrogen efficiency;
- Legislation under the Austrian nitrate action programme will provide additional approaches;
- Further development and expansion of the ÖPUL measures, which
  - will contribute to a reduced use of nitrogen mineral fertilisers, e.g. total elimination of mineral fertilisers on the entire farm (including organic). Furthermore, growing pulse crops can fix air nitrogen and thus reduce the purchase of mineral fertiliser.
  - Further reduce soil erosion and nitrogen losses (e.g. catch crops, environmentally friendly crop rotations, mulch and direct sowing);
  - Aim to generally reduce the use of fertilisers, inter alia by specific measures in areas with an increased load or risk situation.

Reduction of nitrogen excretion

Nitrogen excretion from cattle (except cows), pigs and chickens is to be reduced by 5% by 2030 compared to the levels in the 'with existing measures' scenario. A decisive factor here is the optimising of feed rations and feed quality, because the less excess nitrogen is included in feed, the less potential there is for GHG emissions.

- Expansion of needs-based feeding (adapt multiphase feeding to the animals' needs, do not give them excess quantities of nitrogen);
- Improve the quality of basic feed for cattle;
- Provision of emission-reducing feed additives;
- Raising awareness (educational and advisory services);
- Breeding progress (objective: lifetime yield);
- Increasing the lifetime yield of dairy cows through increased training and information measures;
- Promoting marketing opportunities for old cattle — using an animal for longer leads to reduced emissions, but requires that meat from older cattle be sold on the market (e.g. fattening cull cows).

Increase in grazing of dairy and suckler cows

Grazing involves the separate excretion of faeces and urine and thus a faster infiltration of urea into the soil, resulting in lower GHG and ammonia emissions. Grazing also uses feed with a lower nitrogen content. In addition, grazing is particularly beneficial from an animal welfare perspective.

- Further development and expansion of support for the grazing of animals under the agri-environmental programme ÖPUL, inter alia through a gradual extension of the grazing period (e.g. 60, 120, 150 grazing days);
- Raising awareness (educational and advisory services).

Increase in farm manure fermentation

Agriculture can make a decisive contribution to the energy transition by fermenting more agricultural residues and waste materials for biomethane production in the future. If farm manure

is fermented, not only can energy from fossil fuels be replaced, but GHG emissions from storage of farm manure can also be saved. The aim is that fermentation residue is then widely spread close to the ground, as far as technically possible (hillside locations, field size) in order to enhance the GHG reduction effect. The ambitious goal is therefore to increase the share of national farm manure fermented in biogas plants to 30% (it is currently around 1%). Alongside the measures in the Renewable Energy Expansion Act, which have an impact in this area, the following measures are also possible:

- Identifying locations for the construction of biogas plants with suitable framework conditions (suitable livestock or raw material supply, short distances, possibility of feeding into the gas grid);
- Appropriate incentives in energy price regulations (e.g. slurry bonus) and for raw materials management of agricultural residues;
- Incentives for cooperation between farm holdings, e.g. linking biogas production and fixed farm manure deposits;
- Raising awareness (educational and advisory services);
- Research in the field of substrate use and plant technology.

Maintaining a stable cattle population from 2025 onwards

The cattle population in Austria has been falling since 1990. Although an increasing global demand for animal products and higher contribution margins for farmers are anticipated, both past developments and current production conditions in Austrian agriculture make an increase in cattle stocks unlikely. Difficulties in animal production include competition on the global market (potentially also increased market pressure from Mercosur in the future) and challenges in (re)construction of livestock buildings (constructional requirements in the areas of animal, environmental and emission protection, high costs, complaints from neighbours, logistical challenges, etc.). Furthermore, as a result of breeding progress it is possible to achieve the same 'output' with fewer animals. It is also unlikely that farms that were once set up for this purpose will be able to resume operations. The small-structured family farms in Austria which keep livestock are often an unattractive prospect for offspring in terms of money and employment (migration to cities, increase in part-time farms). It is doubtful that a global increase in demand for meat and milk alone would lead to rising cattle numbers in Austria. It is considered more realistic to maintain a constant cattle population.

- Implementing site-adapted, area-based livestock farming with due regard for animal welfare (and thus maximum moderate density of livestock);
- Decline in demand due to ongoing changes in nutritional and consumer habits, greater awareness of quality and values, reduction in meat consumption;

- Reducing food waste through appropriate design of the food supply chain (policy frameworks, legislative adjustments, process optimisation, changing behavioural and consumption patterns in society, research, promotion, technology). Extending the action programme 'Food is Precious!' [*Lebensmittel sind kostbar!*] into a national strategy;
- Breeding progress, which could lead to the same production volumes from a reduced number of animals.

Use of renewable energy sources in agriculture

Fossil fuels used in agriculture are to be gradually replaced by renewable energy sources by 2030, while maintaining an economically and ecologically sustainable framework.

- In particular, using damaged wood from forestry to produce Fischer-Tropsch diesel for use in tractors up to an extent of 50% of the technical potential by 2030;
- Electrifying applications near farms and stationary applications by means of technical advancement;
- In general, the aim is to increase energy efficiency in the agricultural sector through advisory and technical measures in the rural development programme.

Other approaches beyond primary agricultural production

- Improving technology and raising awareness to prevent waste or unused residues along the value-added chain, especially in agricultural production;
- Implementing the national plant- and animal-based protein strategy by offering suitable, climate-friendly measures to support the on-farm production of animal feed and protein plants, and to reduce climate-damaging imports of such products;
- Impact of food consumption in cooperation with the processing and trade sectors on seasonal availability from domestic production, possibly by appropriate labelling.

Land use, land use change and forestry

With the adoption of the EU Regulation on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry (hereinafter: 'LULUCF Regulation'), for the first time emissions and carbon sequestration from the land use sector will be accounted for as from 2021 and, subject to certain restrictions, will be offset against national effort sharing targets.

When establishing measures, it is important in any case that Austria's national target under Article 4 of the LULUCF Regulation is complied with until 2030.

In the forestry sector, priority will be given above all to the following measures:

- Continuously increase timber harvesting in accordance with the basic principles of sustainable forest management;
- Preserving the carbon pool in forest floors and in biomass through sustainable forest management and, where appropriate, continuously increasing forest growth with a view to improving carbon sequestration in forest stands;
- Creating appropriate conditions for an increase in domestic wood use for material purposes (e.g. building regulations) and for wood to be an optimal substitute for non-sustainable raw materials;
- Creation of appropriate conditions for an increase in the use of domestic wood biomass for energy production (e.g. green electricity follow-up tariffs), taking into account the air pollution control requirements;
- Focusing the future forest support programme (as part of the 'Rural Development 2021-2027' programme) on measures supporting mobilisation of sustainable reserves of wood for use — within the framework of the reference level for forest management according to the LULUCF Regulation;
- Continuing the 'energy wood' [*energieholz*] programme and similar programmes as part of the Federal Ministry for Sustainability and Tourism's **klimaaktiv** climate protection initiative;
- Encouraging forests to adapt to climate change, with the aim of increasing their resilience to extreme weather conditions and maintaining and improving the functionality of forests for society;
- Planting site-adapted and high-performing tree species as part of sustainable forest management to achieve a high level of CO_2 binding, to create stable forest ecosystems and to produce large quantities of wood for material-rich and energy purposes;
- Conserving forests, particular in sparsely forested areas.

In the agricultural sector, the focus will be above all on measures which support targeted creation and preservation of humus in both conventional and organic farming (see humus formation measures of ÖPUL 2015). A further aim is to encourage the preservation of agricultural land (arable and grassland) and its productivity in order to ensure sustainable management.

As there is often a close link between measures to reduce emissions and measures for adapting to the climate crisis, especially in agriculture and forestry, implementation must be carried out in line with the recommendations for action agreed in the Austrian Adaptation Strategy.

Waste management

By avoiding food waste and taking a more responsible approach to food, emissions reductions will not only be possible in waste management but also in upstream processes (farming, transport, industry, energy). The aim of the Federal Ministry for Sustainability and Tourism's 'Food is precious!' initiative and increased action in this area by the provinces is to reduce food waste by raising awareness, to increase the amount of food fit for consumption that producers or traders offer social welfare organisations, to optimise all stages where value is added and to promote research activities to optimise processing and production methods, which are also adopted and supported by the bioeconomy strategy.

By developing projects and networks which increase the useful life of a project (for example repair networks, repair cafes or RE-USE projects), this will help to reduce waste and promote the circular economy.

Biogenic waste will be treated in composting plants according to the latest low-emission operating techniques, but only where the compost produced can demonstrably be used to improve the soil and replace mineral fertilisers. Examining the extent to which the guidelines on the latest composting techniques and standards on IPPC composting systems have been implemented in accordance with the new BREF document, and making specific adjustments to these, where appropriate, to comply with requirements, will exploit all potential for improvement. People's knowledge of efficient and climate-friendly composting will also be improved through advice on garden composting at home.

Biogenic waste without appropriate quality or recycling possibilities should primarily be used to generate energy. The economic viability of turning biogas into biomethane will be improved, e.g. by making it easier to feed it into the natural gas grid where technically and economically feasible to do so. Agricultural or chemical recycling possibilities must be sought for the residual materials following energy recovery.

When entering waste into landfill, the specific requirements of the Landfill Ordinance 2008 [*Deponieverordnung*] must be consistently implemented as regards reducing residual emissions. This applies in particular to the regular maintenance, repair and, where necessary, restoration of technical equipment for capturing and treating gas released from landfill (ensuring the gas capture systems function properly during the entry and after-care phase), controlling the water

balance by means of an optimal surface cover design and, if necessary, irrigating or accelerating the reduction of residual emissions which can no longer be used or eliminated through measures for aerobic *in situ* stabilisation adapted to individual cases.

In line with the EU's Waste Package, continued use of thermal waste incineration plants to help increase the share of recovered renewable energy will increase the share of municipal waste which is recycled, in particular waste from plastic packaging. Measures for implementing this are currently under discussion. In order to reduce the number of disposable plastic products, Austria introduced a ban on the marketing of disposable plastic carrier bags from 1 January 2020. Moreover, implementation of Directive (EU) 2019/904 of the European Parliament and of the Council on the reduction of the impact of certain plastic products on the environment will also be necessary. Austria plans to implement the recycling package together with this Directive by means of an amendment to the Waste Management Act 2002 [*Abfallwirtschaftsgesetz, AWG*]. In addition, there are amendments to the Packaging Ordinance 2014 [*Verpackungsverordnung*], the Battery Ordinance [*Batterienverordnung*] and the End-of-Life Vehicles Ordinance [*Altfahrzeugeverordnung*]. The Austrian Ordinance on Waste Electrical and Electronic Equipment [*Elektroaltgeräteverordnung*] has already been amended (Federal Law Gazette II 137/2019) and already contains implementation elements.

Fluorinated gases

EU law in the area of fluorinated gases is primarily to be implemented by way of Regulation (EU) No 517/2014, in particular by means of enforcement measures in line with the system of indirect federal administration. In particular, measures will be taken in cooperation with customs authorities to combat illegal trade in fluorinated gases and equipment filled with fluorinated gases and to ensure compliance with the EU quota system. In the building sector, demand for cooling during the summer needs to be reduced (thermal renovation and efficiency standards for new buildings). Support will be possible under the funding policy in place for phasing out the use of fluorinated gases with a high global warming potential (GWP) (e.g. refrigeration and air-conditioning units) at an earlier stage.

It will also be ensured (e.g. through contact with trade associations in the refrigeration and air conditioning industry and providing information about new refrigerants) that Austrian companies or persons working at such companies have knowledge available to them regarding alternative refrigerants and working with such refrigerants.

Horizontal action areas

Bioeconomy

Bioeconomy is an economic concept which aims to replace fossil fuel resources (raw materials and energy sources) with sustainable raw materials in as many areas and applications as possible. It covers all industrial and economic sectors that produce, handle, process or use biological resources. In order to move towards achieving a knowledge-based bioeconomy with the involvement of the relevant stakeholders and using the full range of policy instruments, as part of #mission2030 the Federal Government committed to creating an Austrian bioeconomy strategy. This Austrian bioeconomy strategy will be an essential cornerstone of the climate and energy strategy and will support the decarbonisation of the economic system. Around 60 fields of action have been identified in total and have already been adopted by the Federal Government in the bioeconomy strategy.

The bioeconomy strategy identifies fields of action in all sectors, for which specific measures will be discussed in order to meet the defined goals of the strategy. For this purpose, following adoption of the strategy in March 2019, a series of workshops were held with stakeholders throughout Austria, in order to further promote the bioeconomy concept and work on specific bottom-up measures.

The aim is to complete a bioeconomy action plan by the end of 2019. For the best possible implementation of bioeconomy, it is necessary to create a mix of measures at all levels. Specific measures relating to bioeconomy which have already been implemented include, for example: the newly created Bioeconomy Centre at the University of Natural Resources and Life Sciences, the statutory ban on plastic carrier bags and the 'Oil Phase-Out Premium' to reduce the use of fossil energy sources in the construction sector.

Land use and land take

Use of land resources is an important long-term factor in terms of achieving climate goals and making economical use of energy resources. In Austria, 12.9 ha of land is newly taken every day (2015-17 average). Land being newly taken for construction, commercial and transport purposes across many municipalities of Austria is increasing urban sprawl, thereby leading to significant 'land use', or more simply 'land take'. This level still greatly exceeds the original target reduction under the Sustainable Development Strategy of 2.5 ha per day.

Consequently, it is essential for land take to follow more of an approach towards actually limiting 'land use', preventing sealing, and ensuring condensed, compact settlement and commercial development. Urban regeneration also has positive socio-political effects. Land must be developed in coordination with catchment areas for public transport stops and promote the best possible mix of functions such as housing, work and recreation. Spatial planning helps to reverse the rising trend in the distance being travelled by road, and thus the corresponding increase in CO_2

emissions seen in the mobility sector in recent years.

A major concern for Austria is to reduce or stop urban sprawl. To address this it is essential for buildings to be constructed within existing settlement structures, for settlement areas to have a functional mix and for those areas to be served by public transport. Building regulations and parking space regulations are further important factors in making mobility climate-friendly.

Furthermore, greater use will be made of support for housing construction and other investment management instruments for settlement development purposes and energy spatial planning. This should be done during future negotiations between local authorities.

Energy spatial planning

Energy spatial planning is an integral part of spatial planning which comprehensively addresses the spatial side of energy consumption and energy supply.

Forward-looking energy spatial planning which is coordinated at an inter-regional level, especially with regard to large infrastructure projects, leads to a reduction in potential for conflict and therefore greater acceptance among the public.

Energy spatial planning in particular enables innovative energy concepts to be implemented focusing on locally available and cheaper renewable energy, use of waste heat and integrated mobility systems. Analysis and localisation of energy consumption, energy storage and transport, and the potential for energy-savings and recovery, offers vital insight into these areas from a spatial perspective with a view to climate-friendly planning.

Modern, integrated energy concepts in spatial planning can be used to make decisions on land allocation, investment in infrastructure and the allocation of funding, such as support for housing construction. It is also important for energy spatial planning to be enshrined in spatial planning laws and provincial building regulations. Successful examples of this already exist.

Supplying buildings and businesses with efficiently generated district heating will continue to play an important role in the future, in particular in metropolitan areas. Feed-in of waste heat from the plants where it is produced is also of major importance alongside the generation of energy from various renewable sources (biomass, geothermal, solar thermal, photovoltaic, wind, etc.) and highly efficient cogeneration. Austria is still far from fully exploiting its potential in this area. In future, increased incentives will be offered for using waste heat by way of energy spatial planning instruments.

Climate and energy model regions and smart cities – for which support is granted under the Climate and Energy Fund – are successfully demonstrating these new systems and technologies in real-world conditions so that the transformation of energy and mobility systems can be brought onto the market quickly.

To improve coordination between the parties involved in spatial planning — in particular the provinces — and energy experts and regional development services, the ÖREK (Austrian Spatial Development Concept) energy spatial planning partnership II was established in 2018. Work on implementing priority action recommendations and on applying and developing the energy spatial planning instruments which already exist will be carried out by the Federal Ministry for Sustainability and Tourism as lead partner.

ii. Regional cooperation in this area (where applicable)

During the process of drawing up the draft National Energy and Climate Plan, regional cooperation has taken place with Austria's neighbouring States: Germany, Czechia, Slovakia, Hungary, Slovenia and Italy, as well as with Poland, Croatia and Belgium. As part of this, the majority of Member States, including Austria, have chosen to invite each other to cooperation meetings. Each of these meetings saw several Member States come together to inform one another of the contents of their respective draft NECPs and to identify possible connecting factors enabling closer cooperation.

For further details, also see point 1.4, Regional cooperation

iii. (National and EU) financing measures, where applicable

To implement the planned measures under the National Energy and Climate Plan, there will be considerable need for investment, which must equally comprise contributions from public authorities (Federal Government, provinces, EU) and the private sector within the meaning of the long-term objectives of the Paris Agreement (in particular Article 2.1.c PA). The auction of certificates in the EU Emission Trading Scheme generates income for Member States which may constitute a significant source for financing climate protection measures. The overall investment volume ultimately expected for achieving the targets is decisively determined by the assumed mix of regulatory, support and tax measures. The cost-effectiveness of the climate- and energy-relevant support landscape has an equally determining effect on investment as the expected effect of regulatory plans and/or the degree of effectiveness of new instruments (e.g. in the area of 'green finance'). Regulatory measures do not necessarily or directly have to trigger investment-relevant financing flows, but can also constitute directly relevant contributions to adhering to the Energy Union objectives.

In light of the objective of budgetary sustainability, accompanying counter-financing strategies must be developed for the period 2021-2030. A process for identifying and gradually removing counter-productive incentives and subsidies is an important cornerstone of the strategic

accompanying measures for achieving objectives in a budget-friendly way. Last but not least, the coherence of the future shape of the European Union's multi-annual financial framework and relevant provisions of EU law with the objectives of the Energy Union also represents a relevant cost factor.

Austria will therefore focus on the following issues at both international and national level:

International and European level:

- General support for the work at European level to implement the measures proposed by the European Commission as part of the Action Plan for a Sustainable Financial System of March 2018;
- Rapid conclusion of the ongoing co-decision procedure on the 'Taxonomy Regulation' and the associated delegated acts; intensive involvement at expert, Member State representation and supervisory level on the content of the European Commission's 'Level II Regulations';
- Finalising the work relating to the supervision of financial markets on risk identification and measurement of climate change-related risks;
- Supporting the European Commission's cooperation with third countries which support the achievement of the Paris climate targets;
- Promoting work on sustainable finance within the framework of the Capital Market Union and further development (current working title: 'next CMU' (Capital Market Union));
- Use of financial resources from the 'International Financial Institutions' to achieve climate targets.

Austria:

- Developing and implementing a 'Green Finance Agenda', in particular
  - Developing new products within existing support structures (e.g. 'Exportinvest green');
  - Promoting Green Bonds from government and government-related issuers;
  - Reviewing the regulatory framework to provide incentives for green or sustainable financial products;
  - Modernising the Covered Bonds Law [*Pfandbriefrecht*] to enable green or sustainable issuing of covered bonds;
  - Review of how existing portfolio analysis tools (e.g. PACTA - Paris Agreement Capital Transition Assessment) can be used on the Austrian market;

- Investigating the extent to which supervisory guidelines can support the improved recording of climate-related risks in investment portfolios;
- Initiatives to bring companies together to form a common strategy for a green and sustainable investment policy;
- Boosting financial market education in relation to 'green financial literacy' (education in risk management for investors, but also in advising bank customers and intermediaries of investment products).

3.1.2. Renewable energy

i. Policies and measures to achieve the national contribution to the binding 2030 Union target (including sector- and technology-specific measures where appropriate)

Renewable Energy Expansion Act

Austria requires an energy system that is secure, sustainable, innovative, competitive and, consequently, affordable. There are considerable opportunities and challenges presented by consistently pursuing the 100% target, to which the Renewable Energy Expansion Act will make a significant contribution. Building on the Green Electricity Act 2012, which is responsible for some 17.3 percentage points of the approximately 73% of renewable energy in Austria, the new rules will continue developing the system in a positive way. Consequently, the aim of the Renewable Energy Expansion Act is to transform Austria's existing energy system.

This omnibus Act comprising several articles is scheduled to enter into force in 2020 and will lay down the framework for expanding renewable electricity generation and introducing renewable gases into our energy system at a far quicker rate. In addition to adapting renewable electricity generation and therefore the Green Electricity Act 2012 to EU state aid rules, measures will be established for expanding and better incorporating renewable energy which will be dependent on the recast of the European Directive on the promotion of the use of energy from renewable sources (Renewable Energy Directive 2018) but also, in particular, on ambitious national targets.

An accompanying integrative approach aimed at achieving decentralised power generation in renewable energy communities, necessary sector coupling, integration of storage technologies and the use of digitalisation, and for which network infrastructure needs to be developed further, is dependent on parallel adjustments being made on a number of other legal issues:

In order to develop the necessary market structure, the Electricity Industry and Organisation Act 2010 and the Gas Act 2011 will be revised. In terms of sectoral coupling, it is necessary not only to consider interface issues in other areas, such as heating, mobility and energy efficiency, but also to lay the foundations for linking these areas which were previously partly considered in isolation. Furthermore, issues such as heating and measures needed in the area of transport and energy efficiency must be addressed primarily through additional legislative initiatives.

The development of an integrated network infrastructure plan should also be mentioned. On the one hand, the Energy Intervention Powers Act (EnLG 2012) transposes EU rules, such as in particular the Regulation concerning measures to safeguard the security of gas supply. On the other hand, modifications and information coming from experience with ongoing processes are

being taken into account in order to maintain the high level of supply security in Austria.

System responsibility

From a systemic perspective, the two regulatory areas of financing and aid processing – as previously enshrined in the Green Electricity Act 2012 – need to be supplemented in particular by the principle of system responsibility, which is gaining in importance as a result of the expansion of volatile forms of energy generation:

a. Direct or own-marketing of renewable electricity

At present, renewable electricity must be taken from the settlement centre, irrespective of the time, and may therefore be fed into the grid by producers at any moment, even at negative prices. In future, a self-marketing principle will apply to larger, renewable energy generation installations. This is intended to create incentives for exploiting opportunities in new market segments with innovative partners and technology, and covers, for example, local energy communities and energy balancing and reserve markets. In this way, the grid load will be reduced and therefore the cost of operating the grid. At the same time, supply security will also be increased.

If renewable energy generation installations are cleared for direct and self-marketing, operation on all segments of the electricity market should be possible. In addition to general electricity trading, this applies in particular to the balancing and reserve market and subsequently to mechanisms for securing the grid reserve. Operating exclusions and market entry barriers such as pooling factors should be eliminated as far as possible or tailored to new entrants onto the market.

Small-scale producers are not required to operate on the market but are able to do so. In future, the settlement centre will also offer them an institutional purchaser 'of last resort' who they will be free to choose. The purchaser 'of last resort' would not only market the volume potentially delivered by small-scale producers and enable them to obtain representative market prices, but would be available on the direct marketing segment and, therefore, to larger installations, in the event of unpredictable transactions (bankruptcy, etc.). In this way, firstly the transformation of the system would be supervised and secondly no renewable energy would be lost.

In order to qualify for support, facility operators must, in return, guarantee at an early stage that the principles of controllability and adjustability are observed by grid operators in order to optimise the system as a whole. Installations covered by existing funding agreements which currently do not provide for or may even forbid market operation, should also be helped to switch to this new system.

b. Renewable energy communities (see also point 3.2, sub-point viii)

As part of the further development of Section 16a of the Electricity Industry and Organisation Act 2010, which first permitted in 2017 that energy-generating installations in renewable energy communities could form part of a single property, renewable energy communities must be established in accordance with the Renewable Energy Directive 2018. These communities enable bilateral supply contracts to be set up and, likewise, cooperative-type structures for the generation, storage and supply of renewable electricity, even beyond property boundaries. In so doing, it is possible to set up and operate local grid structures (microgrids) cost-effectively.

So that disincentives are not introduced — meaning the creation of unnecessary grid structures in parallel to grids which have already been set up and financed – appropriate options must be made available when further developing existing tariff systems for renewable energy communities and the financing mechanisms behind them. This must be ensured, for example, by means of local tariffs or corresponding rolling cost models in the system fee structure. Regionalisation and decentralisation of renewable electricity generation, taking advantage of progressive digitalisation in the interests of establishing 'smart grids' will also improve supply security and the robustness of the system in general.

During the conception and design phase, the following parameters for the concrete implementation of renewable energy communities in a national context became apparent:

- Renewable energy communities must be organised as associations, cooperatives or other partnerships with legal personality.
- The members and the general conditions of membership comply with the requirements of the Renewable Energy Directive 2018.
- In order to meet the proximity criterion of the Renewable Energy Directive, in the electricity sector the consumption systems of the members or shareholders must be connected to the generation installations of the community by means of a low-voltage galvanically connected distribution network in the same network area.
- The main focus is common use of the energy produced.
- With regard to the grid costs to be paid, the Electricity Industry and Organisation Act 2010 creates a basis for the adoption of a pro rata preferential grid tariff for shared use of the public grid ('local tariff').
- It is envisaged that communities will have access to the new support system.
- Tax relief for energy produced and consumed by photovoltaic systems within a community was adopted in the Electricity Tax Act.
- By the end of 2022, the responsible ministry is to prepare an analysis of existing obstacles and development potential of renewable energy communities outside the electricity

sector.

Regarding the framework for self-consumption of energy from renewable sources within the meaning of Article 21 of the Renewable Energy Directive, it should be noted that several measures have already been taken to promote self-consumption with the amendment of the Green Electricity Act in 2017:

- The share of self-consumption is the ranking criterion for applications for operational subsidies. The average level of self-consumption was 42% in 2018.
- The investment support for photovoltaics was extended to include storage technologies.
- The introduction of community energy generation facilities in Section 16a of the Electricity Industry and Organisation Act 2010 enables several parties within an apartment building or business premises to come together and jointly operate a generation facility and jointly use the energy generated for the community according to a self-selected key. Intra-community energy flows do not qualify as supply and are not subject to any duties or charges.

Apart from this, there has been tax relief available since 2014 for electricity generated from renewable energy sources and self-consumed up to an amount of 25,000 kWh. The tax relief — mentioned above and already adopted — also applies to energy generated and consumed within community energy generation facilities pursuant to Section 16a of the Electricity Industry and Organisation Act 2010.

c. Integrated grid infrastructure plan (see also point 3.4.2, sub-point i)

A coordinated, integrated grid infrastructure plan will be drawn up with the involvement of the provinces and municipalities (taking into account spatial-planning concerns, etc.). For this to be done, legal amendments to the Electricity Industry and Organisation Act 2010 and the Gas Act 2011 will also be required.

d. Grid reserve and demand-side measures

In future, grid reserve will be enshrined in the Electricity Industry and Organisation Act 2010. Units of grid reserve will be reduced to 250-500 kW so that smaller renewable generation units and industrial plants can be integrated. This will apply to industry 'demand-side' measures and enable aggregated dispatch from decentralised structures by means of pooling.

e. 'Greening the gas'

In future, a significant share of natural gas will be replaced by renewable gas ('greening the gas') by means of biomethane from biogenic residue, hydrogen and other renewable gas production

methods (synthetic methane, etc.). Under the Renewable Energy Expansion Act, feed-in of renewable gas into the natural gas distribution system will be encouraged, for example by means of a — potentially gradual — quota system.

Feeding in gas rather than generating electricity from biomethane, as enshrined in the last amendment of the current Green Electricity Act 2012, makes the overall system more robust at the interface between electricity and gas. This is because the gas grid itself can act as a storage facility as it does not depend on absolute temporal synchronisation between generation and consumption as in the electricity system.

In order to guarantee the quality of renewable gases and its provision in the necessary quantities in a comprehensible and transparent way, the electricity sector's system of guarantees of origin must be transformed in an evolutionary manner. Not least as a requirement for transposing the Renewable Energy Directive 2018, guarantees of origin must be established not only for electricity and gas but also for heating and cooling.

The Renewable Energy Expansion Act will lay down that on the basis of certain criteria gas grid operators will have to take over parts of subsequent investments in renewable gas generation installations. The aim is for renewable gases to be produced locally and be fed directly into the natural gas grid. The sustainability of renewable gases will be governed by guarantees of origin.

As regards hydrogen and renewable gases in general, powers to regulate will be conferred based on the Renewable Energy Expansion Act 2020 which will allow an incorporation rate no greater than the level provided for in the applicable standard of the Austrian Association for the Gas and Water Industries (n.b. ÖVGW G 31).

The scope of the Mineral Raw Materials Act is to be extended to cover mining-related aspects of synthetic gas production in geological structures.

The long-term storage of electricity using hydrogen should be enabled and encouraged. It therefore is to be examined whether future investments related to the hydrocarbon industry (e.g. power-to-gas) can be taken into account when calculating the subsidy interest (Mineral Raw Materials Act).

To avoid promoting fossil fuels and to provide legal certainty for investors, hydrogen – and similarly biogas and any other renewable gases – should be classified under the Natural Gas Tax Act as part of the Tax Reform Act 2020, and included for tax relief.

f. Digitalisation potential and system support measures

In conjunction with measures under the Renewable Energy Expansion Act 2020 and the Electricity Industry and Organisation Act 2010, installation and operating conditions and the general user-friendliness of storage facilities and recharging infrastructure relating to the expansion of

renewable energies should to be optimised.

This work will ensure the best possible controllability and adjustability of decentralised smaller and medium-sized storage facilities, particularly in the interests of supporting the system. System services would also be possible through recharging points, i.e. through vehicle batteries themselves. This would enable grid load to be optimised and the development of sustainable mobility to move ahead.

Support scheme

The existing support for green electricity will be overhauled as from 2020 so that more renewables can benefit from support and, at the same time, more electricity will be produced cost-effectively for every euro of funding. Even more than before, renewables will be made fit for the market and the market fit for renewables. This will be done through market premiums, investment support and, where appropriate, tenders. Funding efficiency will be optimised and adaptation of the electricity market, e.g. through new storage technologies, digitalisation or decentralisation will be increasingly required. By redesigning the support scheme, renewable electricity generation will become more easily integrated into the market. At the same time, a positive climate for investment (due to legal certainty and predictability) will be ensured and administrative obstacles removed.

Transformation processes applying workable solutions should accompany the transition from the old support scheme to the new support scheme, particularly for carrying out projects which are well into maturity.

a. Basic instruments – market premiums and investment support

The transition from the current tariff support system and isolated (or in combination) investment subsidies to a market-driven and competitive support system will be rolled out under the Renewable Energy Expansion Act. It will build on market premiums and investment support and, where appropriate, include competitive and non-competitive tendering models.

The operational support variant, to be implemented in future as a market premium, is intended to have a 20-year term, as compared to the current situation. The specific basis in the sense of the average market price from a technology-based perspective and the exact conditions of the respective tenders are to be laid down in regulations.

The basic requirements for accessing funding will only change compared to the current situation where necessary based on previous experience. Pre-qualification and basic criteria in terms of predictability and legal certainty will therefore remain unchanged where possible or be subtly adapted or expanded.

Despite the existence of funding, it must be ensured that through the transition to self or direct marketing, every provider is able to participate in the market in a way which is economically acceptable. Moreover, the aim of cost-efficiency will be achieved through tenders with the highest possible number of providers. Under these conditions, it is possible for producers to take responsibility for their product as market operators (price volume, energy balancing and reserve cost risk, grid services, etc.) and for support costs to be kept close to the economic optimum in a way which can be predicted. Consequently, despite the increased market risk posed by companies producing renewable energy, the standard for increasing technological leadership and implementing innovations in this area can be raised as much as possible.

Renewable electricity generation installations with a capacity limit of less than 250 kW qualify in principle for possible investment support. Any funding volumes, as with operational support, must be laid down in a regulation.

b. '100,000 rooftops' flagship project

The '100,000 rooftops' solar panel and small-scale storage programme is intended to encourage private individuals and businesses to make greater use of roof areas for photovoltaic modules. Moreover, focus will implicitly be on a combination of solar panels and storage by applying a self-supply rate as a ranking criterion for investment support.

In future, buildings will not only have high energy standards but, in particular, will play an active role in providing energy and storing it for self-consumption purposes. To do so, the best possible use will be made of usable areas (on the roof and façades) of buildings (in particular new and renovated buildings) for installations and integrated solar panels. Increasing the number of solar panels in conjunction with storage technology, particularly in buildings, will also help to systematically reduce the pressure on the distribution and transmission network.

Abolishing the tax on self-produced electricity: Currently, the first 25,000 kWh of self-produced electricity is exempt from tax. As such, small-scale producers (private and smaller companies) currently benefit from tax relief. Commercial operators and private individuals will make more use of photovoltaic modules on their rooftops in order to produce energy. The tax on self-produced electricity was abolished as part of the reform of the tax system. This decision gives a tax advantage for energy produced and consumed by PV installations within a community.

By removing barriers to investment under legislation on residential buildings and installations, the role of buildings as platforms for generating energy will be supported. This includes, inter alia, amending the conditions under residential civil law on the use of shared photovoltaic systems.

c. Photovoltaics in general or on construction sites and on land

In principle, photovoltaic systems on buildings and built structures should be given priority so that

other uses are not prevented on valuable land, in particular arable land and grassland. In addition to exploiting fallow land, land on commercial sites constitutes space which is similarly identified specifically for developing photovoltaics. Consequently, alongside the '100,000 rooftops' programme, another priority will be to develop larger photovoltaic systems, especially those using innovative solutions on land. With the experience gained in 2018 from awarding funding, it is possible to envisage extending the new system to sites used for landfill (and transport). Discussions are focusing on potentially extending the system further to include traffic embankments, noise protection walls, landfill sites and all types of industrial and commercial premises. As a strong incentive for installing solar panels in these areas, large photovoltaic systems with a capacity of 250 kW or more will also in principle be able to participate in tenders as an alternative to investment support.

d. Existing installations

In principle, renewable energy generation installations, from solar panels to biomass plants, will continue to contribute towards the 100% renewable electricity target and towards a renewable heating supply. In particular, this covers existing wind and hydroelectric installations, and high-efficiency biomass plants in agriculture and industry. Land and resource take is minimised by retaining existing high-efficiency plants, thereby transforming the energy system in an environmentally-friendly way.

As such, biomass plants expiring in 2020 or later will be provided with a succession plan following the principles of the new support system. This will guarantee continued support for high-efficiency biomass plants when green electricity procurement and purchase contracts with such plants have expired.

In terms of modernising wind turbines, previous investments in existing sites will be maintained and can continue to be used, where technically and economically feasible to do so. 'Repowering' by increasing output volume will therefore be possible. By participating in tenders, projects which can be carried out at existing locations will be able to benefit from market premiums.

For environmental reasons, revitalisation is also the preferred option for hydropower. This will need to be provided for accordingly in the support scheme.

Existing installations will be able to optionally switch to self-marketing. This will offer operators of such installations new opportunities and flexibility. Changes would involve extending the contract period to a maximum of 20 years and enabling operators to engage in direct or self-marketing in all market segments.

e. New (biogas and biomass) installations dependent on raw materials

In order to meet the 100% renewable electricity target, high-efficiency cogeneration technology (CHP plants) based on solid biomass will also play a role in future. Such installations can play a

stronger role than in the past by helping to maintain the electricity and heating supply in metropolitan areas, in particular by helping to support the (electricity) grid, for example through bottleneck management and generally through energy balancing and reserves by means of market mechanisms.

To that end, a separate technology-specific tender for awarding market premiums to solid biomass installations will be held. In terms of biogas plants, the system launched under the 2017 amendment to the Green Electricity Act 2012 will be systematically developed, particularly in line with the 'Greening the gas' initiative. For both solid biomass-based and biogas-based energy generation technology, the approach to raw materials will have to be adapted, whether relating to the generation of renewable electricity or renewable gas. In general, an approach which considers waste or residue and by-product recycling should be taken so that the proportion of sustainable biomass plants can continue to be operated. In connection therewith, the aim of flagship project 5 (renewable heating) under #mission2030 is to implement measures with a view to more renewable energy in the heating sector, e.g. development of biomass, solar thermal, heat pumps, micro-CHP, etc. Optimal use of existing high-efficiency installations using the intended raw material mix – as described – is to be laid down as a principle so as to encourage transforming the energy system in an environmentally-friendly way.

e.1 Biomass Funding Enabling Act [Biomasseförderungs-Grundsatzgesetz]

In view of the expiry of many biomass funding agreements, green electricity plants based on solid biomass were threatened with closure, which would have led to 'erosion' of this sustainable basic contribution towards 100% (nationally balanced) renewable electricity. In order to prevent this from happening, a follow-up tariff regulation based on the principles of the Green Electricity Act 2012 was enacted in May 2019 as the Biomass Funding Enabling Act. The scope of application of the Biomass Funding Enabling Act extends to all solid biomass-based green electricity plants which have a funding agreement at the feed-in tariff under the Green Electricity Act 2012 which expires between 1 January 2017 and 31 December 2019. A maximum subsidy period of 36 months is envisaged, with the tariff amount to be defined in accordance with the principles of the Green Electricity Act 2012 for the determination of feed-in and follow-up tariffs within the framework of the provincial implementation laws.

f. Transformation management

Projects suitable for funding under the existing system must be assimilated into a new system in order to capitalise on this potential in a cost-efficient and timely manner. This may be done, for example, by making it possible to participate in tenders (under certain pre-qualification conditions), or by simplifying other participation or award criteria.

g. Guarantees of origin for renewable energy

Not least as a requirement for transposing the European Renewable Energy Directive 2018, guarantees of origin must be established not only for renewable electricity and gas by way of a tradable good for energy sources but also for renewable heating and cooling. This change in the labelling of renewable energy sources and transformation products will develop the existing system of certification and guarantees of origin further, involving all relevant stakeholders associated with the regulatory authority Energie-Control Austria, and the current or future settlement centre.

h. Cross-border feed-in of renewable energy

Renewable electricity installations which can be set up through a direct connection with the Austrian grid will be treated in the same way as installations to be constructed in Austria and will in principle be able to participate in tenders in order to obtain operational support. On the one hand, this transposes the requirements of the Renewable Energy Directive and, on the other hand, it must be implemented in a way which supports the serviceability of the system. Any prerequisites in terms of bilateral agreements for establishing a certain degree of reciprocity with neighbouring states have yet to be evaluated.

Further conditions

a. Administrative simplification of power line regulations (for more details see point 3.4.2, sub-point i)

Power line regulations are due to be simplified by way of an exemption from approval under electricity law for medium-voltage power lines of up to 45 kV, whereby the current threshold of 1 kV will be increased to 45 kV.

b. Transposition of European solidarity mechanisms for electricity and gas

Amendments to the Energy Intervention Act 2012 and the Gas Act 2011 are required by virtue of the EU's Security of Gas Supply Regulation. Areas covered by the amendments will include the definition of protected customers, solidarity measures (authorisation to conclude agreements, arrangements for domestic implementation) and penalties for reporting breaches.

Amendments to the Electricity Industry and Organisation Act 2010 and the Energy Intervention Act 2012 are required by virtue of the EU Regulation on risk-preparedness in the electricity sector. Areas covered by the amendments will include determining a competent authority to carry out the tasks entrusted to Member States under the risk-preparedness Regulation. The most important area where amendments will be required is that of responsibility for drawing up risk-preparedness plans.

c. Institutional issues concerning settlement and statistics

Under the Renewable Energy Directive 2018, a designated contact point, in the form of a 'one-

stop-shop', is required for the expansion of renewable energy. The contact point would also cover several spatial planning and licensing-related issues before actual funding which may potentially be invested in such projects is started. The future body responsible for settlement (currently OeMAG) must have the appropriate basis and instruments to enable it to carry out the vital role of passing on information to the stakeholder group. In future, in view of the volume of financial resources in circulation, the Federal Public Corporate Governance Code (B-PCGK), which was essentially set up to cover how government shareholder and supervisory functions are carried out, will apply to the activities of the body responsible for settling the financing of renewable energy expansion.

A key focus for renewable energy funding is that of increasing self-supply, in particular from a system-based point of view by the producers themselves and through renewable energy communities. So that this continually increasing share of renewable energy can be precisely taken into account and included in the strategic planning for funding itself and in reporting on targets, appropriate rules for statistical recording must be laid down by the regulatory authority or settlement centre.

Timetable:

The Renewable Energy Expansion Act is set to enter in 2020.

Green Electricity Act Amendment 2019 (ÖSG Amendment)

The Green Electricity Act amendment adopted in October 2019 contains the following key points:

- Wind power
    - All plants already approved by 2020 should be completed.
    - In order to reduce the existing waiting list for wind turbines, the support funding for 2021 will be brought forward and used for additional contracts during 2020. *(Wind power quota 2021: EUR 11.5 million; remaining quota 2021: EUR 9 million).*
    - A total of 622.4 MW of new wind power capacity will be created. The total amount of support funding is EUR 266.5 million.
- Photovoltaics and small-scale storage systems
    - Extending subsidies both for photovoltaic systems and for storage systems for a further three years, taking self-consumption into account.
    - A total of EUR 108 million will be made available in investment subsidies for this purpose over the next three years *(per year photovoltaics: EUR 24 million, storage*

systems: EUR 12 million).

- Subsidy limits for electricity storage: 50 kWh per plant (threshold in favour of small plants remains as already included in IA); 30% of investment amount; 200 EUR/kWh.
- Photovoltaics and storage system quotas are exchangeable in cases of non-use and transferable to the following year; EUR 36 million for 2020, 2021, 2022.

- Medium-sized hydropower plants
  - Additional resources (investment support) from EUR 30 million to a total of EUR 80 million.
  - Of the investment required to construct a plant, 15% will be provided.
  - The cap on the maximum subsidy amount is increased (from EUR 400 per kW) to EUR 650 per kW and (from a maximum of EUR 6 million per installation) to EUR 10 million per installation.

- Small-sized hydropower plants
  - Due to a new quota calculation, no additional funds are necessary for queue reduction.

- Biomass and biogas
  - Follow-up tariffs for biomass and biogas plants, with an estimated total of EUR 60.9 million for biomass (special quota for the follow-up tariffs of EUR 8.7 million) and for biogas a total volume of EUR 73.52 million.
  - Change in the calculation of the quota, allowing 14 new plants to be built in 2019 (instead of 11) and 21 in 2020.

The proposed measures represent an important bridging measure for the period before the Renewable Energy Expansion Act comes in to force.

Hydrogen Strategy

The Austrian Climate and Energy Strategy #mission2030 provides for the development of a hydrogen strategy. In order to achieve the desired restructuring of the energy system, renewable hydrogen can make a decisive contribution in the future as a key technology for sector integration and linking.

The Federal Ministry for Sustainability and Tourism, in cooperation with the ministries responsible, has been developing an Austrian hydrogen strategy since March 2019. A steering group consisting of representatives of the Federal Ministry of Transport, Innovation and

Technology, the Federal Ministry of Finance and the Federal Ministry of Sustainability and Tourism has overall control of the process. In the course of developing the strategy, four working groups were set up, consisting of representatives of companies, science, associations, NGOs, ministries and the provinces. Stakeholder recommendations for development of the strategy were developed under the chairmanship of selected companies.

The four working groups dealt with the following topics:

1. *Generation, infrastructure and storage*

Discussions will focus primarily on the necessary framework in the areas of generation, storage and infrastructure for establishing renewable hydrogen as a strategic measure for securing supply, in order to be able to use surpluses in electricity production in the future, as well as on an optimal design of the future market model, including the future roles of market participants.

2. *'Greening the gas'*

Among other things, discussions will focus on the framework for the increase and long-term substitution of natural gas with renewable gas in the gas grid, mechanisms for generating demand, identifying suitable locations, H2 fitness of the gas grid and obstacles to the feed-in of renewable gases.

3. *Hydrogen in industrial processes*

Discussions will focus on the necessary regulatory framework and economic conditions for the use of renewable hydrogen in industrial processes, both at European and national level. This takes place both in relation to research (e.g. creation of experimental spaces) and to application.

4. *Mobility and buildings — fuel cells in final consumption*

The working group Mobility. discusses the prerequisites for a roadmap for using renewable hydrogen to contribute to sustainable mobility, identifying timely fields of application especially for specific 'use cases' (heavy traffic, public transport, buses, trains). In the building sector, the necessary regulatory and economic framework conditions for the further development of renewable hydrogen in the building sector are outlined.

Each working group will draw up a final conclusion paper, which contains data-based objectives and, in addition, potentials and recommended measures, and which will be incorporated into the development of the Austrian hydrogen strategy. The strategy to be drawn up will also be subject to a public consultation process and decided upon by the Austrian Council of Ministers.

Additional incentives for renewable energy expansion

Biofuels in the transport sector

The 14% renewable energy target for transport under the Directive on the promotion of renewable energy (RED II), will be implemented by promoting e-mobility with electricity and hydrogen from renewable energy sources and, in relation to fuel, by promoting the use of biofuels by increasing the share of bioethanol in petrol and, in relation to diesel, by using synthetic diesel fuels from renewable sources with a proportion in the form of advanced biofuels.

Domestic Environmental Support

The Domestic Environmental Support scheme [*Umweltförderung im Inland, UFI*] is the central support instrument under Austrian environment policy. It supports Austrian companies and public institutions with investment measures in particular for adoption of renewable energy sources and carrying out demonstration projects, in line with #mission2030.

In 2018 alone environmental funding supported 630 renewable energy projects. This triggered investments of around EUR 122 million and made around 278,000 MWh/a of renewable energy sources possible.

The Federal Ministry for Sustainability and Tourism also supports the use of heat from renewable energy sources through environmental funding. By far the largest share of funding goes to constructing and operating regional, sustainable and climate-neutral heat supply systems. A separate quality management system for heating plants is obligatory in terms of environmental funding for all plants whose installed nominal biomass boiler output reaches or exceeds 400 kilowatts or whose network length reaches or exceeds 1,000 route metres. Accompanying quality control during the planning, construction and operation of biomass heating plants helps to improve the technical quality and efficiency of the plants. However, many other technologies for heat production in plants are also being promoted. Therefore, environmental support is also the most important instrument for the conversion of process heat in plants. The environmental impact of renewable energy sources was almost 113,000 megawatt hours per year.

For the target trajectory to 2030, an increased funding commitment from the UFI for the period 2021 to 2030 is to be made available for operational and municipal projects to improve energy efficiency, use renewable energy or save energy. The Government funds are also intended to be used for thermal renovation measures on buildings. By securing these subsidies, the use of funds will be continually optimised.

ii. Regional cooperation in this area (where relevant) and — optionally — estimates of surplus energy production from renewable energy sources which may be transferred

to other Member States.

During the process of drawing up the draft National Energy and Climate Plan, regional cooperation has taken place with Austria's neighbouring States: Germany, Czechia, Slovakia, Hungary, Slovenia and Italy, as well as with Poland, Croatia and Belgium. As part of this, the majority of Member States, including Austria, have chosen to invite each other to cooperation meetings. Each of these meetings saw several Member States come together to inform one another of the contents of their respective draft NECPs and to identify possible connecting factors enabling closer cooperation.

In the scope of the decarbonisation dimension, there was above all discussion of the following subjects for closer cooperation:

- Transport;
- Opportunities for cooperation and joint projects in the field of renewable energy expansion;
- Coordinated implementation of existing EU directives (e.g. RED II) and
- Exchange of best practice methods in the field of decarbonisation and energy efficiency.

For further details, also see point 1.4, Regional cooperation

iii. Specific measures on financial support, where applicable, including Union support and the use of Union funds, for promoting the production and use of energy from renewable sources in the electricity, heating and cooling, and transport sectors

Renewable Energy Expansion Act

Despite the steady expansion of renewable energy, the amount of funding which will be allocated and, therefore, the cost burden on households, businesses and industry will not be increased significantly compared to current levels. Further expansion of renewables will be cost-efficient and in line with the market. In so doing, aspects of the overall cost can and will be taken into account from a system responsibility perspective when considering how funds are allocated.

a. Fund allocation structure

Funds will continue to be allocated on the basis of a metering-based system comprising the green

electricity flat rate (not linked to consumption) and the green electricity support payment (linked to consumption). Likewise, a relief mechanism will remain in place for socially vulnerable households.

b. Energy balancing and reserves financing framework

The guideline on system balancing in the electricity supply system will prompt changes, including to the cost settlement method for the energy reserve rule ('78:22 rule'). The regulatory authority, Energie-Control Austria, and, primarily, the transmission system operator, Austrian Power Grid (APG), are working to implement individual sub-stages which are currently expected to include an additional accounting method ('ZAM') or 'special account' as a solution. The Electricity Industry and Organisation Act 2010 requires that further rules be adapted and a long-term framework established which enables costs to be allocated in a clear and transparent way to all parties active in the electricity system. Any funds from the special account must be transferred to the system of financing renewable energy systems in a way which reduces the cost impact.

c. Tax aspects and cost volumes

Assessments by the Federal Ministry of Finance and the subsequent implementation of preferential tax treatment for hydrogen, biogas and other renewable gases and for self-produced electricity were undertaken.

The following measures will be implemented in accordance with #mission2030, by means of the Tax Reform Act 2020:

- Tax advantage for biogas and hydrogen
    - Favourable tax treatment due to the allocation of hydrogen and biogas to the Natural Gas Tax Act
- Tax exemption for sustainable biogas
- Tax exemption for sustainable hydrogen
- Tax advantage for liquefied natural gas
- Tax exemption for self-produced electricity
    - Tax exemption for self-produced and self-consumed electricity if this was generated by a photovoltaic system.

In accordance with #mission2030, there are no other funds (from public budgets) associated with this project – save where otherwise defined in detail – other than the costs generated by funds allocated and therefore covered under the Renewable Energy Expansion Act 2020.

Other key financing instruments for promoting renewable energy in Austria, along with the

existing Green Electricity Act and the planned Renewable Energy Expansion Act, are:

- The Domestic Environmental Support scheme (under the Environmental Support Act) for operating investments in the heating sector in the non-ETS sector
- The renovation plan for thermal renovation of buildings through replacement of heating systems in the private and business sectors ('Oil Phase-Out' premium) as part of the Domestic Environmental Support scheme (non-ETS sector)
- Climate and Energy Fund (photovoltaic, solar thermal, bioenergy)
- Provincial support for housing construction.

iv. Where applicable, assessment of support schemes for electricity from renewable sources which Member States are to carry out pursuant to Article 6 of the Renewable Energy Directive

Support schemes for electricity from renewable energy sources will be assessed in accordance with Article 6 of the Renewable Energy Directive when drawing up the Renewable Energy Expansion Act (which is currently taking place).

v. Specific measures to streamline administrative procedures, provide information and training, and facilitate the uptake of power purchase agreements.

A central point of contact and settlement centre for green electricity support, OeMAG Abwicklungsstelle für Ökostrom AG, was established under the Green Electricity Act 2012. Also, in order to relieve the burden on green electricity installation operators, administrative procedures were able to be reduced and simplified, for example by establishing a register of installations or by limiting the requirement to submit an application in respect of decisions of recognition.

Specific measures to streamline administrative procedures and provide information can also be found in the measures under 3.1.2 i 'renewable energy communities'

vi. Assessment of infrastructure measures needed for district heating and cooling produced from renewable energy sources

An assessment of infrastructure measures needed for district heating and cooling from renewable

energy sources will be carried out during the ongoing drafting of the Renewable Energy Expansion Act. The maintenance and optimisation of existing biogenic district heating networks is the subject of funding within the Domestic Environmental Support scheme and, due to the great importance and number of plants in Austria, is a funding priority area for which EU funds from the CAP will continue to be used.

In addition, an integrated network infrastructure plan *(see also Point 3.1.2 i)* is currently being prepared.

vii. Where applicable, specific measures on the use of biomass, including resource availability; measures on sustainable forestry

See point 3.1.1.i.

3.1.3. Other aspects of the 'decarbonisation' dimension

i. Where applicable, measures affecting the EU ETS sector and assessment of the complementarity and impacts on the EU ETS

In accordance with Section 5(1)(9) of the 2015 support guidelines for the Domestic Environmental Support scheme, measures are only eligible if 'all direct effects [...] count towards the corresponding derived national priorities (from the EU's 2020 climate and energy objectives)'. Climate and energy measures relating to ETS installations are *not* eligible for funding under those rules as not all of their achieved effects may count towards national objectives.

Based on Section 7 of the Energy Efficiency Act (monitoring report on climate and energy objectives), the Federal Minister for Sustainability and Tourism, in agreement with the Federal Minister for Digital and Economic Affairs and the Federal Minister for Finance, may introduce provisions which no longer rule out funding 'if the contribution made by the Domestic Environmental Support scheme towards the EU 2020 objectives is not hampered to any great extent' (second sentence of Section 5(1)(9) of the 2015 support guidelines for the Domestic Environmental Support scheme).

In summer 2018, an exemption was agreed between the three Ministries:

ETS installations may also be granted project support under the Environmental Support scheme provided that the support is for eco-innovation within the meaning of Section 3(2) of the 2015 support guidelines for the Domestic Environmental Support scheme.

Furthermore, the following eligibility criteria apply to eco-innovation in relation to ETS installations:

- Support is limited to improving existing installations. Support is not granted for new installations.
- The technology being tested has specific, quantifiable potential for circulation. The multiplier effect of the eco-innovation benefiting from support is clear.
- Only one demonstration project is granted support for every eco-innovation benefiting from support. Project funding for ETS installations with comparable content in other locations or by other applicants will not be funded under the Domestic Environmental Support scheme.
- The intended environmental impact (energy and CO_2 savings) is significant, i.e. improvements made exceed the extent of effects which are known to occur through ordinary development of the latest techniques. The environmental effects underlying the support can be demonstrated and permanently monitored once the project has been implemented.

Initially, support for eco-innovation related to ETS installations is only possible for applications submitted up to 31 December 2020 and limited to a maximum of EUR 2.5 million of federal funding per year within the total annual commitment framework under Domestic Environmental Support. Eco-innovation support is being continued in the scope of Domestic Environmental Support.

ii. Measures to achieve other national targets, where applicable

Measures relating to the energy system and measures for reducing greenhouse gas emissions may have an impact on atmospheric pollutant emissions.

In respect of five atmospheric pollutants, *Directive (EU) 2016/2284 on the reduction of national emissions of certain atmospheric pollutants* ('NEC Directive') contains commitments to reducing emissions from 2005 to 2020 and 2030 by fixed percentages; this concerns sulphur dioxide, nitrogen oxides, non-methane volatile organic compounds and fine particulate matter ($PM_{2.5}$). The following table shows the reduction commitments:

Table 10: Emission reduction commitments pursuant to the NEC Directive for Austria

Atmospheric pollutant	Reduction compared with reference year 2005 from 2020	Reduction compared with reference year 2005 from 2030
Sulphur dioxide (SO_2)	26%	41%
Nitrogen oxides (NO_x)	37%	69%
Non-methane volatile organic compounds (NMVOC)	21%	36%
Ammonia (NH_3)	1%	12%
Fine particulate matter ($PM_{2.5}$)	20%	46%

In order to fulfil their emission reduction commitments, the Member States had to draw up a national air pollution control programme, which was to be reported to the European Commission by April 2019. The national air pollution control programme was therefore to be completed significantly earlier than the final National Energy and Climate Plan. Coordination with other commitments, particularly in the field of energy and climate, was an important element when drawing up the air pollution control programme. It can be clearly determined from previous model-based scenarios that, viewed as a whole, measures for reducing greenhouse gas emissions also have positive impacts on the development of atmospheric pollutants. A related evaluation of the 'with additional measures' scenario drawn up for this plan is currently still pending.

iii. Measures to achieve low-emission mobility (including e-mobility)

With the 'National policy framework: clean energy for transport' adopted in 2016, Austria committed to significantly reducing diesel and petrol consumption in particular during the coming decade, carrying on until 2030 and beyond. A shift in focus in the case of new registrations to emission-free cars and light commercial vehicles was set as a target for 2030 by #mission2030. At EU level, additional impetus for the introduction of alternative vehicles through the new fleet targets, negotiated under the Austrian presidency of the EU Council, for manufacturers of cars and light and heavy commercial vehicles is expected by 2030. An important step towards low-emission mobility is therefore promoting the switch to alternative fuels (hydrogen from renewable energy, bio-CNG/bio-LNG and biofuels) in transport and electromobility using renewable energy. Under Austrian transport policy, the focus is on electrifying modes of transport as a building block for a modern and efficient transport system overall. A number of support measures, including expanding the necessary infrastructure, have been and continue to be used to promote the development of the market in alternative fuels for the transport sector and electromobility. Measures will be devised at all levels of government and implemented in close dialogue with stakeholders and businesses. The following areas will be covered: legal, tax and

support measures, non-financial incentives, simplification of technical and administrative procedures, further infrastructure development, R&D support, and a variety of specific municipal measures.

E-mobility plan

In order in particular to enhance electromobility using renewable energies, a new e-mobility plan is being implemented in 2019 and 2020 by the BMNT and BMVIT together with car import companies, two-wheeled vehicle import companies and sports retailers, established as one of the 12 flagship projects under #mission2030. As 99% of CO_2 emissions in Austria's transport sector are caused by road traffic, a decisive contribution to achieving climate goals is made by supporting the conversion to zero-emission and low-emission vehicles (purely electric, plug-in, hydrogen/fuel cell) and setting up the recharging infrastructure.

Enhancing electromobility by increasing transparency with regard to public recharging infrastructure

The spread and availability of public recharging infrastructure are decisive factors influencing the user-friendliness of such infrastructure and are therefore factors in successfully establishing electromobility nationwide. In order to gain an overall picture of public recharging infrastructure in Austria, an official list of all public recharging facilities for electric vehicles in Austria is provided online at the initiative of the BMNT. The list provides information on the technical equipment, recharging options and charging power available at every public recharging site. The list of recharging points will increase transparency regarding the availability of public recharging infrastructure, stimulate competition between recharging infrastructure operators, boost the confidence of potential vehicle purchasers in electric mobility and counter 'range anxiety' which is currently prevalent.

iv. Where applicable, measures and timeline for the phase-out of energy subsidies, in particular for fossil fuels

Developmental pathways in relation to the development of greenhouse gas emissions are essentially determined by the form of the future framework conditions (in particular incentive and support system and economic parameters).

In order to ensure compliance of the incentive and support system with Article 2(1)(c) of the Paris Agreement, an intensive evaluation of the existing tax and incentive system is taking place in particular in the area of taxation. In addition to the identification of counterproductive measures and the measures already taken, it is currently being examined at expert level to what extent a stronger price signal for CO_2 emissions in the non-ETS area could be efficiently and effectively implemented in the current configuration of the incentive and support system. This work firstly

involves internally establishing intensive dissemination of specialist knowledge on the subject of climate, in order to create corresponding targeted and linked specialist knowledge. Lively professional exchanges are also taking place with experts in the field of economics and climate science in order to obtain corresponding expertise here too. In addition, the measures in the field of budget, tax and regulatory policy in other EU states are also being recorded and analysed with regard to their effect with the help of external and independent expertise.

Evaluation of all incentive and support systems

In Austria, both at Federal Government and provincial level, there are numerous incentive and support instruments which either implicitly or expressly serve to reduce greenhouse gas emissions, increase the share of renewable energy or improve energy efficiency. The following instruments are to be particularly emphasised here.

- Domestic Environmental Support scheme – including renovation initiatives in housing construction for private individuals, businesses and municipalities (also see point 3.1.2., sub-point i, Support scheme)
- Energie.Frei.Raum: The Energie.Frei.Raum support programme of the Federal Ministry for Sustainability and Tourism supports the testing of a systematic implementation of new market models for the integration of technologies in the field of renewable energy sources and of storage and energy efficiency technologies.
- Introduction of energy management systems in SMEs: Subsidy support for the establishment and/or certification of an energy management system in SMEs.

Identification and gradual removal of counterproductive incentives and subsidies

Under the leadership of the BMF and in consultation with the Federal Ministry for Sustainability and Tourism (BMNT) and the Federal Ministry for Transport, Innovation and Technology (BMVIT), a list of incentives and subsidies which are an obstacle to the climate and energy targets, including the associated implications for Austria, is to be drawn up.

The interministerial process for identifying and gradually removing counterproductive incentives and subsidies takes a sector-based approach here. On the basis of the most recent emissions data in the non-ETS area ('Nowcast' of the Federal Environment Agency), an investigation is being carried out into the ecological and financial effect of measures counteracting the climate and energy targets, starting with the 'transport' sector. The further non-ETS sectors are being analysed in order of decreasing greenhouse gas intensity (agriculture, buildings, energy and industry, waste management, etc.). Location and socio-economic data are likewise considered here, where available. The following parameter categories are taken into consideration in any case in this regard: (i) ecological effect (including released greenhouse gas emissions in the ETS and non-ETS area, contribution to the rate of renewable energy, contribution to energy

efficiency), (ii) budgetary effect (including direct effect on the state budget, relevant subdivision of the federal budget, indirect cost effects) and (iii) other effects (including employment effect, risk of lock-in or stranded investments).

The sector-based list of counterproductive incentives and support measures (for the ETS and non-ETS area) shall be continuously updated, including beyond 31 December 2019, and serves as a starting point for the gradual removal of measures classified as counterproductive. Where there are no counter-arguments (in particular of a location-related nature), the identified measures will be gradually removed in the scope of the 2021-2030 period, achieving a reduction of at least 2 million t of CO_{2eq} in 2030.

The following working definitions of the terms 'counterproductivity' and 'measure' have been developed in this regard:

Working definition of counterproductivity:

'Within the meaning of the Integrated Climate and Energy Strategy, a public measure is to be described as a counterproductive incentive or direct or indirect support measure/subsidy when its effects counteract compliance with the climate and energy targets that are binding under international and EU law and the implementation of the measure therefore results in (i) an increase in the greenhouse gas emission level, (ii) a reduction in the share of renewable energy in gross final energy consumption and/or (iii) a reduction in energy efficiency. Negative effects on the greenhouse gas emission level (now and in the coming years, including long-term effects) are of particular relevance in this regard.'

Definition of a measure (complete list):

'Measures within the meaning of the working definition of counterproductivity may include the following support measures/subsidies or incentives: (i) direct subsidies (targeted subsidies and loans), (ii) indirect subsidies (including tax breaks) and other tax incentives, (iii) unused sureties/guarantees and (iv) targeted benefits in the scope of state regulation and other regulatory incentives.'

Specific tax-ecological measures

Tax measures form a central component in the area of greening.

The incentive and support system also in particular has a multiplier function for regulatory measures. That means that only overall strategic approaches guarantee that the highest possible amount of CO_2 can be cut.

As a further important step towards the greening of the tax system, essential measures which are also part of #mission2030 were agreed in the scope of the Tax Reform Act 2020. Further tax prioritisations will also be the subject of government negotiations in the next few weeks.

Further (tax) measures in the field of electromobility, hydrogen and greening of the commuter allowance are in particular currently under discussion.

The following measures have been agreed or already implemented in the area of the greening of tax law:

Transport

- Tax exemption in the scope of the registration tax (standard fuel consumption tax) for electric vehicles.

- Tax exemption in the scope of the current motor vehicle taxation (motor vehicle insurance tax) for electric vehicles.
- Cars and motorcycles are fundamentally excluded from the input tax deduction in the area of turnover tax. Exceptions are made for cars and motorcycles with a CO_2 emission level of 0 grams. These are subject to a full input tax deduction in the case of acquisition costs up to EUR 40,000; between EUR 40,000 and EUR 80,000 the deduction is made proportionally, and from EUR 80,000 an input tax deduction is excluded. This measure applies to ongoing operational expenditure and acquisitions.
- In the case of private use of company cars, monthly benefits in kind (in the area of the Income Tax Act) of 1.5% or 2% of the costs of acquiring the car are to be fixed, depending on the car's CO_2 value. That means that the preferential rate of 1.5% is to be applied to cars with a low CO_2 emission level. No benefits in kind are to be fixed for cars with a CO_2 emission level of 0 grams (electric vehicles).
- The measure, implemented in the Tax Reform Act 2020, of consideration of the CO_2 emission level as a basis for assessing the current motor vehicle taxation (motor vehicle insurance tax) for motorcycles and cars in respect of first registrations from October 2020 creates a (further) tax incentive for lower-emission motor vehicles.
- Furthermore, the taxation, valid since 2014 and based on CO_2 values, of the standard fuel consumption tax for cars is being amended with the Tax Reform Act 2020. An ecological reconfiguration of the standard fuel consumption tax is taking place in this regard. This is fundamentally intended to lead to an additional burden for cars with a higher CO_2 emission level and relieve the burden on owners of vehicles with lower CO_2 emissions. The increased consideration of the CO_2 emission level in the standard fuel consumption tax will in future also apply in relation to motorcycles (account was previously taken of the cubic capacity here).
- Hydrogen (as a fuel) currently falls under the taxation according to the Mineral Oil Tax Act. The Tax Reform Act 2020 provides for more favourable taxation of biogas and hydrogen through application of the rate of taxation of the natural gas duty (which is lower than the mineral oil tax). With regard to storage of biogas in a natural gas network, the blend is to be tariffed as a natural gas and the mixture as such subjected to the natural gas duty. There is also tax exemption for renewably produced hydrogen and sustainably generated biogas.
- The Tax Reform Act 2020 will apply taxation comparable to the tax rate for (gaseous) natural gas under the Natural Gas Duty Act to liquefied natural gas (LNG). The tax rate will also apply to biogas and comparable liquefied hydrocarbons, where these are subject to the Mineral Oil Tax Act. Liquefied natural gas will also be exempt from tax where certain sustainability criteria (bio-LNG) are met.

- Cross-border train passenger transportation is subject to the reduced tax rate of 10% (domestic part of the transport route).
- The reduced tax rate of 13% applies to passenger transportation services which are not exempt (not cross-border).

Energy

Tax treatment of alternative forms of energy:

- In continuation of the exemption, existing since 2014, for self-produced and self-consumed electrical energy from renewable energy sources (up to 25 000 kWh per year), the Tax Reform Act 2020 is introducing complete exemption from the tax on self-produced electricity (electricity duty) where electricity is produced for self-consumption by means of photovoltaic installations. Additional examination of tax exemption, including for further renewable energy sources.
- Examination of exemption from electricity duty for rail electricity coming from renewable energy sources which is used as fuel for passenger and freight transportation in railway, underground, tram and overhead line transport.
- Gaseous hydrocarbons from the utilisation of waste in the area of agriculture (including livestock farming, landfills, wastewater purification) and used oils (recovered, reprocessed mineral oils) using mineralogical methods or in non-energy use are completely exempt from mineral oil tax in the interest of safe disposal.

Public authority participations

Public authority participations have a direct exemplary function when it comes to implementing the long-term objectives of the Paris Agreement. Against this background, a strategy for aligning the public participations of the Federal Government with the long-term objectives of the Paris Agreement will be completed by 31 December 2020. In this context, attention should in particular be paid to ensuring that cost-intensive lock-in effects and/or stranded investments are avoided in the course of the gradual alignment with the climate and energy targets. Potential measures which will be examined in this regard include:

- Promotion of green finance instruments as a tool for bolstering sustainable behaviour,
- Green electricity generation through hydroelectric, wind and solar energy, and generation of the renewable energy sources biomethane and hydrogen
- Gradual decarbonisation of industrial production processes,

- Conversion of their own fleet of vehicles towards electromobility and hydrogen technology and
- Greenhouse gas-reducing recycling of waste.

3.2. Dimension 2: Energy efficiency

i. Planned measures and programmes to achieve national energy efficiency contributions and for energy efficiency obligation schemes under Article 7a and 7b of Directive 2012/27/EU in the version of Directive 2018/2002/EU, including measures in the building sector

Improving energy efficiency and thereby reducing energy consumption in the long term is an important lever in achieving long-term climate goals, alongside the use of renewable energy. In Austria's Climate and Energy Strategy special emphasis is therefore placed on policies and new technology which may greatly help to improve energy efficiency. This includes, for example, continuously improving the energy efficiency of the building stock (thermal renovation and high standards for new buildings) and focusing on electromobility in transport. These and other initiatives will be stepped up over the coming years in order to comply with the 'energy efficiency first' principle under the Regulation on the Governance of the Energy Union and Climate Action.

Austria believes it is essential for primary energy intensity to be continuously reduced (energy/GDP). Austria has set itself a target of improving primary energy intensity by between 25% and 30% as compared to 2015. In order to meet this target, the following measures are laid down in the Climate and Energy Strategy (#mission2030) and in the current government programme:

A number of these measures for promoting energy efficiency have already been discussed under point 3.1., sub-point i on transport, buildings and heating. The most important areas are outlined below:

- Evaluate and develop the Energy Efficiency Act. Much of the Energy Efficiency Directive will be transposed by the Federal Energy Efficiency Act. In addition to the energy saving obligation scheme, provisions are being laid down in respect of Austria's overarching efficiency target, the example being set by the public sector and rules on combating energy poverty (minimising energy poverty in accordance with climate and energy targets). Compliance with the implementation obligation under EU law (25 June 2020) is being strived for.
- By pushing for SMEs to introduce energy management systems, energy consumption will

be reduced and competitiveness bolstered as a result.

- A support programme for implementing energy and environment management systems for SMEs;
- Use of commercial and industrial waste heat through geographically tailored information on existing waste heat potential (a Heat Map in accordance with Article 14 of the Energy Efficiency Directive) and through cost-benefit analyses on the use of waste heat potential and support;
- Preparation/implementation of pilot projects for 'energy efficient towns/cities' and 'energy efficient villages';
- Investment in thermal building renovation, high-efficiency home technology and energy management systems in buildings (see also point 3.1., sub-point i on buildings and heating);
- Examining a reduction in the depreciation period for investments in certain energy efficiency measures;
- Including energy efficiency and climate protection in learning curricula and technical training programmes;
- Greater integration of energy use, energy efficiency, resources and climate protection in education overall will make energy-saving attractive;
- Improving training for professionals;
- Extensive awareness-raising initiatives will familiarise all members of society with the importance of climate protection, energy efficiency and of using energy resources carefully;
- Promoting energy advisory services in all sectors will enable efficient use of energy;
- The 'Energie.Frei.raum' support programme will be implemented by the BMNT in coordination with the BMVIT as a preparatory phase for the experimental clause. It will provide an experimental space for companies to test the systematic application of new integration and market models for system integration of renewable energy technology, storage and energy efficiency technology;
- Further development of support for commercial energy efficiency improvements and energy-saving measures;
- Public authorities (Federal Government, provinces, municipalities) setting an example as regards energy efficiency and energy savings under the Energy Efficiency Act (Federal Government), agreements (Federal Government and provinces) and support (municipalities);
- Applying the best tenderer principle by incorporating life cycle energy consumption into

public procurement (total cost of ownership).

ii. Long-term renovation strategy (residential and service buildings, public and private)

Residential buildings:

The renovation strategy will be prepared at national level and submitted to the European Commission by 10 March 2020 in accordance with Article 46(1) of the Regulation on the Governance of the Energy Union and Climate Action.

Service buildings:

The renovation strategy will be prepared at national level and submitted to the European Commission by 10 March 2020 in accordance with Article 46(1) of the Regulation on the Governance of the Energy Union and Climate Action.

Public buildings (Federal Government):

A new energy saving target for the period 2021-2030 was set for central government buildings, i.e. buildings owned and used by the Federal Government, in the amount of 84.7 GWh on the basis of the currently available building data in accordance with Article 5 of Directive 2012/27/EU in the version of Directive 2018/2002/EU. This is a provisional value, as the survey of the building data of the central government and the associated saving target are being updated in 2020.

iii. Description of measures to promote energy services (e.g. contracting) in the public sector

The savings obligation for federal buildings (buildings owned and used by the Federal Government) under Section 16(1) of the Federal Energy Efficiency Act (EEffG, BGBl. I No 72/2014) is a major incentive for savings contracting measures. The target for the period 2014-2020 is 48.2 GWh. The Federal Energy Efficiency Act refers to energy savings contracting, energy management measures and renovation measures. Projects are established in an action plan. Notably, energy savings contracting measures have been successful to date, resulting in the savings achieved representing further incentives for future energy savings contracts. Support instruments are in principle open to such owners and forms of service. Further savings obligations and energy efficiency measures are provided for the period 2021-2030 on the basis of the 2020 building survey.

iv. Other planned measures for achieving the indicative target by 2030

The national Energy Efficiency Act, which transposes, amongst other legislation, the new Energy Efficiency Directive, was evaluated between September 2018 and July 2019. The transposition of the Directive is currently still in preparation. Consequently, no specific measures have yet been

put in place.

v. Measures for improving the energy efficiency of gas and electricity infrastructure

At present, no specific measures are planned.

vi. Regional cooperation in this area (where applicable)

Under the draft National Energy and Climate Plan, no regional cooperation has yet been agreed in this area. Austria would refer to the derogation provided for under Article 11 of the Regulation on the Governance of the Energy Union and Climate Action according to which regional cooperation shall not be necessary until finalising the Plan in 2019. A meeting on regional cooperation took place on 20 November 2018 in Bratislava with the involvement of Slovakia, Czechia, Hungary and Poland.

vii. (National and EU) financing measures

To implement the planned measures under the National Energy and Climate Plan, there will be considerable need for investment, which must equally comprise contributions from public authorities (Federal Government, provinces, EU) and the private sector within the meaning of the long-term objectives of the Paris Agreement (in particular Article 2.1.c PA). The auction of certificates in the EU Emission Trading Scheme generates income for Member States, which may constitute a significant source for financing climate protection measures. The overall investment volume ultimately expected for achieving the targets is decisively determined by the assumed mix of regulatory, support and tax measures. The cost-effectiveness of the climate- and energy-relevant support landscape has an equally determining effect on investment as the expected effect of regulatory plans and/or the degree of effectiveness of new instruments in the area of 'green finance'. Regulatory measures do not necessarily or directly have to trigger investment-relevant financing flows, but can also constitute directly relevant contributions to adhering to the Energy Union objectives.

viii. Measures for supporting local energy communities

E5 programme

The e5 programme offers support for municipalities looking to use energy in a more efficient and environmentally-friendly manner and to step up their use of renewable energy. To this end, each province has a programme promoter who is available to help municipalities. Ideas, knowledge and personal commitment to energy matters from residents are, above all, an important pillar of the programme. Each e5 community forms an e5 team composed of residents, experts, representatives of environmental groups, companies, municipalities, etc. who are not associated with political structures. As an initial step, the e5 team examines which options for improving energy use are already in place on the basis of a list of measures. Subsequently, suggestions are made as to how energy efficiency could be further improved. E5 municipalities undergo regular

independent reviews and are awarded a rating of between one and five 'e's, with the best rating being 'eeeee'. Approximately 220 Austrian municipalities are already on the e5 programme.

Climate and energy model regions

Extending beyond municipalities, the Climate and Energy Fund's programme 'climate and energy model regions' helps regions make optimal use of their local renewable energy resources, harness the potential for energy savings, and sustain their economies. Climate and energy model regions promote cooperation between municipalities. A key factor behind the success of the programme is that the regions bring about procedural and structural change due to the close ties with decision-makers and citizens. Moreover, they are able to initiate a considerable number of measures. Domestic Environmental Support and the Climate Fund offer tailor-made investment support for climate and energy model regions, resulting in more than 4,000 successful projects so far in fields such as renewable energy, energy efficiency, sustainable mobility and awareness-raising. The *in situ* driving force behind every climate and energy model region is the model region manager. Model region managers initiate and organise projects so as to successfully implement the climate and energy policy objectives of regional plans and act as the central contact person. There are currently 91 climate and energy model regions in Austria.

Since 2016, the methodology applied under the e5 programme has also been used to ensure the quality of climate and energy model regions. Currently, some 3 million people live in an eS municipality or climate and energy model region.

Austrian Climate Alliance

The Climate Alliance is a global partnership dedicated to combating climate change. It was founded in Frankfurt in 1990 and now brings into contact over 1,700 municipalities and towns/cities in 26 European countries with the indigenous peoples of Latin America. Through this partnership, Climate Alliance Austria has been supporting the indigenous peoples of the Upper Rio Negro, in the extreme northwest of Brazil, since 1993.

With its eight regional offices, Climate Alliance Austria is active in every province of Austria (Vienna/Burgenland, Lower Austria, Upper Austria, Salzburg, Styria, Carinthia, Tyrol and Vorarlberg). Provinces, municipalities, businesses and educational institutions are able to join the Climate Alliance. The common objectives of the Climate Alliance are to reduce greenhouse gas emissions in Europe - with their negative impact on the climate - by supporting indigenous partners in implementing local climate protection measures and preserving the rainforest in South America. The core work of Climate Alliance Austria consists of information and awareness-raising, networking, training of Climate Alliance partners, and carrying out projects and campaigns.

Renewable energy communities under the Renewable Energy Expansion Act (see point 3.1.2, sub-point i for further information)

The Renewable Energy Directive 2018 requires that renewable energy communities are established. This Directive is transposed by the Renewable Energy Expansion Act. These communities enable bilateral supply contracts to be set up and, likewise, cooperative-type structures for the generation, storage and supply of renewable electricity, even beyond property boundaries. In so doing, it is possible to set up and operate local grid structures (microgrids) cost-effectively. Regionalisation and decentralisation of renewable electricity generation, taking advantage of progressive digitalisation in the interests of establishing 'smart grids' will also improve supply security and the robustness of the system in general.

3.3. Dimension 3: Security of energy supply

i. Policies and measures related to diversifying energy supply (including third countries), reducing dependence on imports and increasing the flexibility of the national energy system, in particular through the deployment of domestic energy sources, demand response and energy storage

Maintain efficient existing installations

Key to integrated urban development is a central heating and cooling supply to conurbations which uses waste heat from existing high-efficiency CHP plants, waste incineration, industrial waste heat and the efficient use of heat from biomass plants. Existing wind and hydroelectric installations, and high-efficiency biomass plants in agriculture and industry will continue to contribute towards the 100% renewable electricity target and towards a renewable heating supply. Land and resource take is minimised by retaining existing high-efficiency plants, thereby transforming the energy system in an environmentally-friendly way.

Long-term supply security, in particular in energy-intensive industries, is largely based at present on natural gas, which will only be partially possible to substitute in the medium term. Sufficient quantities of stored natural gas will also be available in the future in order to help overcome any crisis situations.

Storage capacity

Significant investment in storage infrastructure and transmission and distribution networks will be made which is adapted to increased demand. Previous economic investment (e.g. in infrastructure facilities, pipelines, storage facilities, power plants) will contribute towards transforming the energy system. It is essential for existing capacity to be used and for available energy infrastructure to take on additional tasks (e.g. power-to-gas, power-to-heat,

wind-to-hydrogen, power-to-liquids).

Austria also plays an important role as a key hub in the European gas market, including for gas storage. It will continue to play this role in the context of overall supply security in Europe. Austria works closely with international energy organisations in multilateral energy policy matters, actively participating in order to ensure secure, transparent, competitive and sustainable energy markets and systems.

Furthermore, electrochemical energy storage facilities will be promoted as both large- and small-scale storage units represent a possible solution to balancing the supply-dependent generation characteristics of renewable energy.

Storage facilities will also be remunerated for operating in the interests of the system. Given that new storage technology makes a significant contribution towards transforming the energy system, the flexibility of the technology will be recognised in how grid tariffs are designed. Storage facilities will be exempt from fees applicable to end consumption and will benefit from support for green electricity.

Storage facilities in deep geothermal energy systems will also benefit from support. Geothermal energy as a renewable energy source which is capable of feeding into baseload capacity can contribute considerably to supply security. Contrary to shallow geothermal energy, deep geothermal projects allow higher temperatures to be used. Use of existing oil and natural gas wells in exhausted deposits offers potential synergies, in particular by minimising the risk of unsuccessful drilling and high drilling costs. Increased use of geothermal energy requires adaptation of the legal framework conditions.

Energy storage facilities are also a focus of the Austrian energy innovation plan. The availability of competitive energy storage facilities able to store renewable electricity on a larger scale for longer periods of time is becoming very important. Special emphasis will therefore be placed on promoting applied research projects with pilot plants demonstrating the marketability of scalable storage technology.

Demand response

See point 3.4.3, sub-points ii and v.

ii. Regional cooperation in this area

During the process of drawing up the draft National Energy and Climate Plan, regional cooperation has taken place with Austria's neighbouring States: Germany, Czechia, Slovakia, Hungary, Slovenia and Italy, as well as with Poland, Croatia and Belgium. As part of this, the

majority of Member States, including Austria, have chosen to invite each other to cooperation meetings. Each of these meetings saw several Member States come together to inform one another of the contents of their respective draft NECPs and to identify possible connecting factors enabling closer cooperation.

In the scope of the energy security dimension, there was above all discussion of the following subjects for closer cooperation:

- Cooperation in the scope of existing EU regulations (Security of Gas Supply Regulation/Regulation on risk management in the field of electricity, etc.)
- Exchange on scenarios and assumptions for the expected use of different energy sources.

For further details, also see point 1.4, Regional cooperation

iii. (National and EU) financing measures

To implement the planned measures under the National Energy and Climate Plan, there will be considerable need for investment, which must equally comprise contributions from public authorities (Federal Government, provinces, EU) and the private sector within the meaning of the long-term objectives of the Paris Agreement (in particular Article 2.1.c). The auction of certificates in the EU Emission Trading Scheme generates income for Member States, which may constitute a significant source for financing climate protection measures. The overall investment volume ultimately expected for achieving the targets is decisively determined by the assumed mix of regulatory, support and tax measures. The cost-effectiveness of the climate- and energy-relevant support landscape has an equally determining effect on investment as the expected effect of regulatory plans and/or the degree of effectiveness of new instruments in the area of 'green finance'. Regulatory measures do not necessarily or directly have to trigger investment-relevant financing flows, but can also constitute directly relevant contributions to adhering to the Energy Union objectives.

3.4. Dimension 4: Internal energy market

3.4.1. Electricity infrastructure

i. Policies and measures to achieve interconnectivity of the electricity grid taking into account EU interconnectivity targets

In 2017, the electricity interconnection level in Austria was 15.3%, and was therefore already above the EU's 2030 target of 15%. As a result, no further explicit interconnectivity target has been set for 2030 in Austria. However, it is to be expected that, in view of the national target of 100% renewable electricity generation by 2030, Austria's electricity generation capacity will increase. Austria will therefore also continue to drive forward the socially and environmentally compatible development of the network infrastructure *(also see point 3.4 in this regard).*

ii. Regional cooperation in this area

During the process of drawing up the draft National Energy and Climate Plan, regional cooperation has taken place with Austria's neighbouring States: Germany, Czechia, Slovakia, Hungary, Slovenia and Italy, as well as with Poland, Croatia and Belgium. As part of this, the majority of Member States, including Austria, have chosen to invite each other to cooperation meetings. Each of these meetings saw several Member States come together to inform one another of the contents of their respective draft NECPs and to identify possible connecting factors enabling closer cooperation.

In the scope of the internal energy market dimension, there was above all discussion of the following subjects for closer cooperation:

- Cooperation in the scope of implementing the EU electricity market design package
- Exchange on integration projects and cross-border infrastructure

For further details, also see point 1.4, Regional cooperation

iii. (National and EU) financing measures, where applicable

To implement the planned measures under the National Energy and Climate Plan, there will be considerable need for investment, which must equally comprise contributions from public authorities (Federal Government, provinces, EU) and the private sector within the meaning of the long-term objectives of the Paris Agreement (in particular Article 2.1.c PA). The auction of certificates in the EU Emission Trading Scheme generates income for Member States, which may constitute a significant source for financing climate protection measures. The overall investment volume ultimately expected for achieving the targets is decisively determined by the assumed mix of regulatory, support and tax measures. The cost-effectiveness of the climate- and energy-

relevant support landscape has an equally determining effect on investment as the expected effect of regulatory plans and/or the degree of effectiveness of new instruments in the area of 'green finance'. Regulatory measures do not necessarily or directly have to trigger investment-relevant financing flows, but can also constitute directly relevant contributions to adhering to the Energy Union objectives.

3.4.2. Energy transmission infrastructure

i. Measures related to the elements set out in point 2.4.2, including Projects of Common Interest (PCIs)

Accelerating, reducing bureaucracy and simplifying licensing procedures

Innovation and investment require a suitable framework. In order to resolve underinvestment, it is crucial to provide planning and legal certainty and to reduce bureaucracy. This applies in particular to infrastructure projects which are essential for energy transition.

At present, the procedures in place are too complicated and lengthy. This is slowing the transformation of the energy system and, in the medium term, is a risk to supply security. The aim is therefore to accelerate, reduce bureaucracy and simplify licensing procedures in line with civil rights and relevant EU legislation. In this way, obstacles will be removed and investment in the energy system increased.

Integrated grid infrastructure plan (see also point 3.1.2, sub-point i)

At present, European law requires that long-term plans be put in place to expand gas and electricity grids within the overall transmission network. Not only are those plans currently being drawn up separately, meaning that fundamental issues in terms of a strategically positive balance between the two energy sources are being overlooked, no consideration is being given to challenges at the level of the distribution network and potential consistency.

In order to exploit existing potential for optimisation by way of closer mutual consideration of the electricity and gas system, an integrated grid infrastructure plan will act in future as a cornerstone of the supply strategy, demonstrating the interfaces and potential to be found. It will do so, for example, by identifying optimal locations for large storage and conversion facilities such as power-to-gas and similar options.

For this to be done, legal amendments to the Electricity Industry and Organisation Act 2010 and

the Gas Act 2011 will also be required. These amendments will include definitions of the roles of the Federal Ministry for Sustainability and Tourism, the involvement of the provinces and municipalities (for example with regard to the consideration of spatial-planning concerns), the transmission system operators and the regulatory authority. Moreover, they will lay down the planning period for provisions and establish how this plan is evaluated.

Simplification of power line regulations (see also point 3.1.2, sub-point i)

Power line regulations are due to be simplified by way of an exemption from approval under electricity law for medium-voltage power lines of up to 45 kV, whereby the current threshold of 1 kV will be increased to 45 kV. This is hugely important as there will be increased demand in the coming years to expand the medium-voltage sector due to the need for charging points in the field of e-mobility, a greater number of installations for generating renewable energy and grid infrastructure which is adapted to greater decentralised production and increased flow rates. Exempting transmission installations of up to 45 kV from approval would result in fewer approval procedures under power line regulations, thereby relieving the processing burden on operators of such installations (in particular distribution system operators) and the approval authorities (in particular provincial governments responsible under provincial legislation on power lines).

Legislation establishing district heating transmission rights

District heating is disadvantaged by the fact that transmission rights may not be established by issuing a decision where approval is denied by the owner of the land. This creates unnecessary additional costs, resulting in a cost barrier for connections.

Planned measures in relation to PCIs

With regard to PCIs, it is necessary to refer to the procedure for approving PCIs at national level established under Regulation (EU) No 347/2013. That procedure includes a rapid approval process, streamlined administrative structures and stakeholder participation. Austria has yet to approve any projects under this procedure as no corresponding applications for approval have been received.

ii. Regional cooperation in this area

During the process of drawing up the draft National Energy and Climate Plan, regional cooperation has taken place with Austria's neighbouring States: Germany, Czechia, Slovakia, Hungary, Slovenia and Italy, as well as with Poland, Croatia and Belgium. As part of this, the majority of Member States, including Austria, have chosen to invite each other to cooperation meetings. Each of these meetings saw several Member States come together to inform one another of the contents of their respective draft NECPs and to identify possible connecting factors enabling closer cooperation.

In the scope of the internal energy market dimension, there was above all discussion of the following subjects for closer cooperation:

- Cooperation in the scope of implementing the EU electricity market design package
- Exchange on integration projects and cross-border infrastructure

For further details, also see point 1.4, Regional cooperation

iii. (National and EU) financing measures, where applicable

At EU level, financial aid for PCIs can be applied for through the Connecting Europe Facility (CEF). The Innovation and Networks Executive Agency (INEA) is the settlement centre for CEF support. However, this is due to be replaced by a new Regulation (see proposal for a Regulation of the European Parliament and of the Council establishing the Connecting Europe Facility and repealing Regulations (EU) No 1316/2013 and (EU) No 283/2014, 2018/0228 (COD)). In addition to CEF energy, other EU support funds such as EFSI (in future investEU) and cohesion policy funding (in particular ERDF) are also available for PCIs.

Nevertheless, financial aid is possible to obtain from the EIB or EBRD under different criteria.

3.4.3. Market integration

i. Measures related to the elements set out in point 2.4.3

Regulations concerning the internal electricity market (Internal Electricity Market Directive) - Transposition into new Austrian Electricity Market Act [Strommarktgesetz]

The current legal framework concerning the electricity industry requires fundamental renewal on the basis of the new Directive containing common rules for the internal market for electricity (2019/944) and in view of crucial changes to the electricity industry situation (AT/DE price zone separation, price developments).

Essential elements of a new Electricity Market Act are:

- Strengthening customer rights: dynamic electricity tariffs, special rights of active customers, definition and measures for combating energy poverty.
- Definition of new actors: storage facilities, PtX installations, aggregators, community models, active customers; plus associated amendment of the unbundling rules.
- Reconfiguration of the network charges: connection charges, work-power adjustment, G component (transposition of the EU Balancing Guideline), charges for new actors, flexible charges.
- Demand Response concept: developing flexibility markets, facilitating market access for consumption systems (in particular control reserve, bottleneck management).

Timetable:

The Internal Electricity Market Directive will be transposed by 31 December 2020 (1st half of 2020: Drafting/2nd half of 2020: Legislation)

Further measures in the field of market integration

Sending correct price signals to market operators

This implies, above all, allowing price spikes (scarcity pricing) and limiting interference with pricing mechanisms. Negative wholesale prices should be avoided in line with European practice.

Making entry into the energy balancing and reserve market more attractive

Important measures include amending regulatory requirements, helping to reduce intervals and encouraging the entry of new participants. This will also prevent counterproductive incentives in relation to climate and energy targets.

Introducing annual flexibility reporting

In order to better understand the energy balancing and reserve market, each year it is essential to examine the potential for flexibility, the number of flexibility providers on the energy reserve markets and the number of industrial customers providing flexibility.

Promoting stable conditions and reduction of bureaucracy for aggregators

Aggregators will be supported by stable conditions and a reduction in bureaucracy involved in

participating in the market. To do so requires a clear legal framework for aggregators and third parties.

Dividing infrastructure costs fairly

The cost of maintaining and expanding the grid infrastructure needed to transform the energy system must be distributed fairly between all network users, even in cases of increasing private generation. Non-balancing of meter points will be ensured in this regard.

ii. Measures to increase the flexibility of the energy system with regard to renewable energy such as smart grids, aggregation, demand response, storage, distributed generation, mechanisms for dispatching, re-dispatching and curtailment, real-time price signals, including the roll-out of intraday market coupling and cross-border balancing markets

Making energy systems more flexible

To maximise the use of renewable energy when making efficient use of existing and new infrastructure, flexibility in the energy system must be encouraged, including:

- Flexibility in the area of energy provision (sector coupling, targeted temporal use of non-volatile sources such as biomass, etc.)
- Flexibility in consumption (e.g. buffering of thermal energy for heating and cooling building stock, adapting industrial and commercial processes)
- Flexibility through storage (e.g. electricity, heating and gas storage facilities)
- Flexibility through smart grid management (e.g. smart electricity grids, flexible heating grids)

Sector coupling

Sector coupling is a vital part of developing a decarbonised energy system. This means linking together previously separate systems (electricity, heating, mobility, industry). Through renewable energy sources which supply electricity in particular, sector coupling will help decarbonise all sectors of the economy. Furthermore, through the use of energy-efficient technology, e.g. heating powered by heat pumps, electric vehicles, etc., energy consumption will be reduced significantly. Sector coupling makes it possible for large, cost-effective energy storage facilities to be used outside of the electricity sector and for the flexibility of electricity demand to be increased significantly. In this way, fluctuations in variable renewable energy sources, such as wind and solar energy, can be offset without having to rely too much on more expensive electricity storage. The following coupling is currently in use or being tested: power-to-

gas, power-to-heat, power-to-chemicals and cogeneration.

Storage capacity

See point 3.3, sub-point i

Extending alternative financing instruments and citizen participation

'Green finance' is one of the flagship projects of the Austrian Energy and Climate Strategy. Further details are expected to follow at the end of 2019. In this regard, an 'energy transition bond' for renewable energy and efficiency projects is being considered. Österreichische Kontrollbank (OeKB) has also successfully issued its first sustainability bond. This bond has a term of 7 years, and the amount is € 500 million. The yield mark-up in respect of the Austrian federal bond was 10 basis points.

iii. Where applicable, measures to ensure non-discriminatory participation of renewable energy, demand response, etc.

See point 3.4.3, sub-points ii and v.

iv. Where applicable, measures to protect consumers, especially against energy poverty

In addition to generally applicable consumer law, numerous energy-specific measures have already been put in place to protect consumers, and in particular low-income households in energy poverty (see 3.4.4. in this regard):

- Basic supply for household customers is mandatory (see Section 77 of the Electricity Industry and Organisation Act 2010 (= contracting obligation));
- A tariff calculator has been set up by the regulatory authority so that price-related data and conditions are published in a way which is transparent and non-discriminatory in order to also make it easy to switch supplier (see Section 65 of the Electricity Industry and Organisation Act 2010);
- A rigorous electricity labelling system is in place aimed at providing end electricity consumers with a breakdown of the share of each energy source (primary energy sources) found in the energy mix used by suppliers the previous year. In this way, end customers are also able to assess the electricity supplied on the basis of qualitative characteristics (see in particular Section 79a of the Electricity Industry and Organisation Act);
- Dynamic pricing: Smart meter rollout + accompanying measures such as a right to

monthly billing in accordance with Section 81(6) of the Electricity Industry and Organisation Act 2010

- In the case of green finance instruments for consumers, ensuring that the information provided by the companies to the consumers is easily comprehensible.

As an integral part of end customer services, E-Control has set up an arbitration body - notified by the Federal Ministry of Labour, Social Affairs, Health and Consumer Protection (BMASGK) to the European Commission - through which electricity and gas customers may seek help in the event of difficulties with grid operators or suppliers.

Furthermore, in order to strengthen market integration and as a 'service and advice' initiative, guidelines, for example, have been developed for consumers, electricity traders and suppliers by the regulatory authority in order to explain more clearly the complex legal bases and correlations in the form of an overview and as regards the processes carried out.

Measures for combating energy poverty

See point 3.4.4.

v. Description of measures to enable and develop demand response, including those addressing tariffs to support dynamic pricing[26]

Balanced tariff structure

Flexible grid tariffs which work in the interests of the system can have a balancing effect on the energy system and thus reduce overall system costs. Grid tariff structures will be simplified and made more transparent for consumers so that they can also take future dynamic pricing into account.

Adapting the grid tariff structure: Promoting smart meters and prosumer grid tariffs for households and businesses

To exploit grid stabilisation and load balancing potential, households and businesses applying innovative business models using interruptible installations, such as heat pumps, photovoltaic systems, electricity storage facilities and electric vehicles, should be able to benefit from low-cost 'prosumer grid tariffs'. Opportunities to join up to electricity or heat generation installations will be extended on a voluntary basis. All prosumers will be entitled to a smart meter and will therefore have the right to join up to such innovative models.

Smart meter roll-out 2019

The introduction of smart meters can be traced back to the EU Electricity Directive from 2009 (Directive 2009/72/EC). In Austria, the legal basis is formed by the Electricity Industry and Organisation Act 2010 and the Smart Metering Regulation (IME-VO). By the end of 2020, 80% of meter points are to be converted to new digital meters and at least 95 per cent of households should be equipped with smart meters by the end of 2022 where technically feasible.

The IME-VO 2017 amendment brought about a significant strengthening of the rights of end consumers. They were granted the right to determine the configuration of the meters themselves, and can also make use of the opt-out right. However, there is no legal right to keep the mechanical meter (Ferraris meter). The meters are the property of the grid operators. These are also obliged to comply with the provisions of the Calibration Act [*Eichgesetz*]. The grid operators are obliged to immediately remove non-calibrated equipment from the system, regardless of whether a Ferraris meter or digital meter is involved. In such cases, conversion to a smart meter is then naturally carried out. The users are also to be guaranteed appropriate recording of the consumption values of the meters assigned.

There is also a right to receive a smart meter ahead of schedule. End consumers can be equipped with a smart meter upon request at any early stage (within six months), regardless of the grid operators' roll-out plans.

[26] In accordance with Article 15(8) of Directive 2012/27/EU.

The roll-out of smart meters will be used in order for a large proportion of the population to participate in the new energy market. Smart meters play a major role in the conversion to new energy technologies (PV or energy communities). The conversion to a decarbonised energy world will be clearly explained to households.

3.4.4. Energy poverty

i. Where applicable, policies and measures to achieve the objectives set out in point 2.4.4.

In Austria, the Federal Government and provinces have support instruments suited to directly or indirectly combating energy poverty. These include, in particular, minimum income instruments, housing subsidies (subject support) and building support granted for housing construction and renovation works. The latter is object-specific support, which in many cases may be supplemented by subject-specific characteristics (in particular, income ceilings, families, etc.).

In line with the analysis under section 2.4, long-term effective investment in the building stock is needed to overcome energy poverty in Austria, targeting both building envelopes and heating and hot water systems. Such measures usually involve high investment costs which those households living in or near poverty would especially struggle to manage using their own resources. Measures involving relatively modest investments can often also have a significant impact. Such measures should offer households sufficient information which is easy to put into practice and financial support. In addition to adapting support, accompanying measures of an informal and organisation-legal nature are needed to improve access to independent and public information and advice, and to reduce organisational barriers (e.g. liabilities for renovation loans) for households in energy poverty.

3.5. Dimension 5: Research, innovation and competitiveness

i. Policies and measures related to research targets (including the 2050 targets for certain types of clean technology)

In order to implement Austria's Energy Research and Innovation Strategy, an energy research plan was laid down under the Climate and Energy Strategy (#mission2030) with the following priorities, financed through corresponding priorities set in the scope of the existing research budget. The budgetary resources provided for research, innovation and competitiveness could be

used for the already ongoing programmes or alternatively in a corresponding amount for new priorities.

Energy research initiative 1 – Building blocks for energy systems of the future

(Flagship 9 of the Austrian Climate and Energy Strategy – #mission2030)

Future energy systems will comprise connected sub-systems which will need to integrate several parties and types of technology. Under these measures, technology and solutions for particular challenges in the energy system will be developed on a targeted basis as part of mission-oriented research and development.

In addition to integrating energy sources and infrastructure, the interplay between different fields and sectors (mobility, business and industry, agriculture, etc.) in this mission-oriented approach is as important as the interaction between different innovation systems (e.g. regional players and global start-ups). Socio-economic and socio-technical issues will need to be solved in conjunction with technical issues. New business models, processes for gaining acceptance and user behaviour need to be better understood and taken into account. Involving future users in co-creation processes at an early stage will be crucial to long-term success.

The following 'building blocks' of the future energy system will be developed:

Plus energy areas which, by optimising civil infrastructure, are able to cover all energy needs via renewable energy - the highest possible efficiency in all areas of end energy consumption and the development of suitable business models. They are an important prerequisite for CO_2-neutral towns/cities and urban areas. In this way, energy generated locally will mainly be used locally by making end consumption more flexible whilst exploiting storage facilities and synergy effects from infrastructure.

Smart systems and grids which will enable the local and regional energy supply to become up to 100% renewable in the foreseeable future and help businesses and private individuals become part of regional value chains and inter-regional markets. Such systems and grids are key to making energy systems more flexible in the interests of integrating sectors, energy sources and infrastructure, and providing and using a noticeably high percentage of renewable energy. They enable municipalities and regions to set ambitious energy targets, create regional value chains and trade energy between regions.

Breakthrough technologies for industry which enable raw material and energy consumption to plummet, emissions to fall significantly and raw material and energy independence to increase whilst maintaining constant output. It is key to decarbonising industrial processes and products, in particular in energy-intensive industries. New products and processes will focus on energy and

resources being used in a highly efficient and, as far as possible, hierarchical manner and will enable the energy needs of industrial installations and the supply of energy from fluctuating renewable sources to be matched. Issues related to CO_2-neutral steel production play just as important a role as processes and products using bio-based raw materials.

Energy-efficient mobility systems of the future: To meet the EU's mandatory targets and avoid purchasing emissions allowances, intensive research into mobility is needed. At the same time, the competitiveness of the Austrian car and aeronautics industries will need to be safeguarded by promoting R&D as technology continues its revolution towards zero- and low-emission vehicles, lightweight construction and automated transport. Moreover, organisational and social innovation will also need to be applied. It is also important to support EU initiatives, such as battery cell production in Europe, through complementary national funding programmes so that e-mobility achieves its breakthrough. The domestic industry must also be integrated into international value chains across the entire battery/vehicle/energy supply system, from production to recycling.

Energy research initiative 2 – 'Mission Innovation Austria' programme

(Flagship 10 of the Austrian Climate and Energy Strategy – #mission2030)

An additional package of measures on transforming the energy system will be implemented through the 'Mission Innovation Austria' programme under flagship project 10 from #mission2030. This programme was set up by the Ministry for Transport, Innovation and Technology (BMVIT) and the Ministry for Sustainability and Tourism (BMNT).

In order to increase the international visibility of Austrian solutions on global markets, to introduce incentives for investing in the domestic economy, to stimulate implementation on domestic European markets and to prepare as best as possible for new challenges posed by Horizon Europe and the SET Plan, large-scale testing of technology and solutions is essential in real operating conditions, with the involvement of users and building on previous R&D findings. The 'Energie.Frei.Raum' support programme will be set up by the Ministry for Sustainability and Tourism with the agreement of the Ministry for Transport, Innovation and Technology in preparation for the experimental stage in order to test the systematic application of new integration and market models for system integration of renewable energy technology, storage and energy efficiency technology. This 'living lab' approach is important for the required transformation of energy and mobility systems as research results often fail when implemented in real-world environments or when scaled up.

In large test areas, innovative energy technology from Austria will be used to develop and demonstrate model solutions for smart, safe and affordable energy and transport systems for the

future. Projects will be developed with a wide range of innovators from business, science, regional actors and stakeholders. Model energy regions are intended to show that a 100% renewable energy supply using Austrian innovation is feasible. Innovative energy technology will be tested in model regions and subsequently rolled out nationwide through market programmes under the Climate and Energy Fund.

Three model regions (in place between 2018 and 2025) are already up and running. The Austrian Federal Government's Climate and Energy Fund, financed by the Ministry for Transport, Innovation and Technology in the scope of the future budgetary resources, will invest up to EUR 120 million by 2021 in three model regions: WIVA P&G (hydrogen/methane), NEFI (100% renewable energy supply for domestic industry) and GreenEnergyLab (smart grids/demand side management/demand response).

These model regions will bring new technology and applications to market maturity through joint research, technology and innovation by stakeholders in the Austrian research field. Significant financing will also be provided by the private sector. More than 200 project partners from business, science and research (companies representing 60%) are working on how our energy will be in the future and are successfully positioning Austria at the forefront of international efforts. The following issues are vital for the 'energy model regions' research, technology and innovation initiative:

- Applying Austrian energy innovations which will enable energy to be 100% renewable;
- Sector coupling and system integration;
- Making Austria more of a leading market in innovative energy technology;
- Achieving the greatest possible use and acceptance of the public.

Plan for implementing the energy research initiative in the Austrian Climate and Energy Strategy (energy research field)

A plan for implementing the energy research initiative was drawn up in 2019 for the 2020-2030 period together with experts from 63 Austrian companies and research facilities. (https://nachhaltigwirtschaften.at/de/e2050/highlights/mission-innovation-austria-fokusgruppen.php)

This includes

- the formulation of three missions for developing essential components of the future energy systems for the priorities set out in the Climate and Energy Strategy;

- the identification of 14 innovation targets for completing these missions;
- the description of 39 specific development plans which will be driven forward in the next 5 years (prospectively in the next 10 years) by the companies involved using private and public funds, in order to achieve the formulated targets.

The implementation plan was drawn up following and with reference to the development of the implementation plans in the European SET Plan. The missions set out in 1 and 2 are in particular virtually identical to missions in SET Plan Actions 3.2 and 4. The similar structure allows mapping of the development plans (corresponding to 'Innovation Actions' – see SET Plan Implementation Plan Action 4) with the development targets formulated at both national and EU level. This firstly allows simple assignment of Austrian contributions to the SET Plan and secondly allows Austrian actors from particular fields to be integrated in a targeted manner with the respective stakeholder groups at European level[27].

Mission 1: Development of Plus Energy neighbourhoods which, by optimising civil infrastructure, the highest possible efficiency in all areas of end energy consumption and the development of suitable business models, are able to cover all energy needs via renewable energy and offer their residents the highest possible quality of life. Some of the renewable energy is generated in the neighbourhood itself. By making end consumption more flexible in connection with the use of storage facilities and synergy effects of infrastructures, this is predominantly used locally and Plus Energy neighbourhoods are at the same time integrated in an optimal manner at overall system level. The energy transition at district level is supported through transparent and forward-looking integrated planning, construction and operation processes. The exploitation of digitalisation options and the use of Plus Energy buildings plays an essential role in the development and implementation. Plus Energy neighbourhoods are a prerequisite for CO_2-neutral towns/cities. The solutions developed will be realised and tested in three zero carbon model towns/cities by 2025.

Mission 2: Development of integrated regional energy systems and grids which will enable the local and regional energy supply to become up to 100% renewable in the foreseeable future and help businesses and private individuals become part of regional value chains and inter-regional markets. Such systems and grids contribute towards making energy systems more flexible and make it possible to integrate sectors, energy sources and infrastructure, and to provide and use a noticeably high percentage of renewable energy. Effects of intermittent generation from solar and wind energy are only slightly passed on at overall system level through activation of flexibility

[27] The digital cooperation platform 'expera' developed in the European Joint Programming Platform ERA-Net Smart Energy Systems was used in adapted form for the development of the Austrian implementation plan, so that the assignment and integration of stakeholder groups could be correspondingly supported electronically at least in the scope of SET Plan Action 4. This instrument could be used particularly effectively if other countries were to follow the Austrian example.

potentials. The systems promote system behaviour with regard to efficiency and costs and with regard to resilience and security under the amended framework conditions of high dynamics in the capture, distribution and use of energy and the increasing decentralisation and digitalisation of energy systems. They enable municipalities and regions to implement ambitious energy targets and create regional value chains. At the same time, they make a constructive contribution towards cross-regional balancing mechanisms and value chains.

Mission 3: Breakthrough technologies for industry which enable raw material and energy demand to plummet whilst maintaining constant output, emissions to fall significantly and value to increase by means of the value chains in Austria overall. It is key to decarbonising industrial processes and products - particularly in energy-intensive industries - and strengthens Austria as a base for high-technology in the industrial sector. Industrial and commercial processes make an active contribution in an energy system with a high proportion of renewable and partly intermittent energies. In this case, in consideration of broad technology neutrality, use is made of a wide range of solutions, which include change of energy sources (such as with largely CO_2-neutral steel production) or value chains based on sustainable (i.e. bio-based, recyclable, low-emission, etc.) raw materials.

The **innovation targets at a glance**:

Mission	Innovation targets	
Plus Energy neighbourhoods	1.1	Availability of neighbourhood- and building-integrated energy production and conversion technologies
	1.2	Energy efficiency of buildings and neighbourhoods, with simultaneous short building time and low construction costs through digitised, transparent planning processes
	1.3	Performance optimisation of building networks and neighbourhoods through digitalisation and controllability
	1.4	Flexibility and resilience of neighbourhoods through sector coupling and medium-term and seasonal transferability of energy
	1.5	Integration of neighbourhoods into regional and cross-regional energy systems and grids through optimised self-consumption and collaboration in balancing mechanisms
Integrated regional energy systems	2.1	Flexibility of all kinds of conversion installations for the capture and use of energy
	2.2	Stability and resilience through self-regulating sub-systems with smartly interacting components, grids and actors using digitalisation options
	2.3	Synergies and sector coupling through integrative crossovers between energy sources and infrastructures on different system levels
	2.4	Efficient and effective heating and cooling using available energy supplies (including waste heat) and portfolio offer of thermal services
	2.5	Marketable storage solutions for short-, medium- and long-term energy balancing, which contribute towards minimising the overall system costs
Breakthrough technologies for industry	3.1	Industrial installations, processes and products which are optimised for the use of emission-free and bio-based resources
	3.2	High-efficiency industrial processes which make maximum use of the potentials of energy recovery and energy cascades and set suitable temperature levels
	3.3	Smart industrial processes which use digital process control methods to allow

	3.4	participation in the sector-coupled and flexible energy network Future-oriented business cases for energy innovations which secure the position and competitiveness of Austrian industry in a climate-friendly society.

The **Development Plans** ('Innovation Activities') at a glance:

Mission Plus-Energy Neighbourhoods		
No	Abbreviated name	Name of Innovation Activity
PEQ.1	Facades for buildings	Energy-efficient, energy-generating and energy-saving facades for new buildings and renovations
PEQ.2	Marketable solutions for Plus-Energy Neighbourhoods	Marketable solutions for Plus-Energy Neighbourhoods for new buildings and renovations (including control)
PEQ.3	Component activation	Active building components for saving energy and creating flexibility
PEQ.4	Planning and testing tools for Plus-Energy Neighbourhoods	Innovative planning and testing tools for building clusters and neighbourhoods
PEQ.5	Efficiency with raw materials when building	Efficiency with raw materials when building, using renewable energy and minimising grey energy
PEQ.6	Synergetic solutions for Plus-Energy Neighbourhoods	Synergetic solutions to increase efficiency in neighbourhoods
PEQ.7	Neighbourhood storage	Intelligent, flexible energy storage for local use in city neighbourhoods
PEQ.8	Financing and operating models in Plus-Energy Neighbourhoods	Innovative financing and operator models for sustainable urban energy system solutions at neighbourhood level
PEQ.9	Using waste heat in Plus-Energy Neighbourhoods	Use of local waste heat sources in densely built-up neighbourhoods
PEQ.10	Low-tech solutions for Plus-Energy Neighbourhoods	Innovative low-tech solutions for Plus-Energy Neighbourhoods with high level of solar coverage

Mission Integrated Regional Energy Systems		
No	Abbreviated name	Name of Innovation Activity
IRE.1	Large-scale thermal storage	Development of large-scale thermal storage and seasonal thermal storage as a central component of portfolio management
IRE.2	Hydrogen- and gas-based storage	Development of short- and long-term hydrogen- and gas-based storage
IRE.3	Electrical application DSM	Making electrical consumers flexible for load shifting purposes in industry, commerce and households
IRE.4	Electricity distribution networks	Development of electricity distribution networks that can be monitored and controlled

IRE.5	DC production cells	Active DC microgrid, especially for industrial applications and hybrid systems at distribution network level
IRE.6	Flexible generation	Making electricity generation installations flexible
IRE.7	SUN TO X	Optimising the conversion of solar energy into energy sources for heat, mobility and electricity
IRE.8	Local Energy Communities	Development of technology and solutions for Local Energy Communities and energy regions
IRE.9	Digital services	Development of digital services for Integrated Regional Energy Systems
IRE.10	Efficient electrical energy conversion	Basic technology and system solutions to increase the energy efficiency in the area of electrical energy conversion
IRE.11	Digital sector coupling	Creating flexibility in sector interfaces through digitalisation
IRE.12	Low-temperature heating networks	Optimising hybrid low-temperature and energy networks
IRE.13	Heating and cooling systems	Development of components and systems for heating and cooling supply
IRE.14	Chemical energy storage	Development of chemical power stores for mobile and stationary applications
IRE.15	Interoperability in networked systems	Guaranteeing interoperability in networked ICT systems

Breakthrough technologies for industry		
No	Abbreviated name	Name of Innovation Activity
BTI.1	CO_2-free steel	Development of processes and methods for CO_2-free steel
BTI.2	Carbon capture and usage	Manufacture of chemical products and storage media from carbon cycles in industrial processes and energy conversion processes
BTI.3	Large-scale PV installations	Technologies and components for large-scale roof- and facade-integrated PV installations in industrial applications
BTI.4	Intermediate products used for energy storage	Utilisation of intermediate products in industrial processes as energy storage facilities
BTI.5	Organisational innovations for resource-efficient value-added chains	Development of organisational innovations in industrial companies and throughout the value-added chain for energy-intensive industries
BTI.6	Innovations in industrial processes	Process redesign and optimisation in the process industry and in discrete manufacturing
BTI.7	DSM in industrial processes	Creating flexibility in industrial production systems and making adjustments to satisfy needs
BTI.8	Biogenic raw materials and fuels in industry	Biogenic raw materials and fuels in industrial processes
BTI.9	Minimum resource use in industrial processes	Minimising the use of resources in production

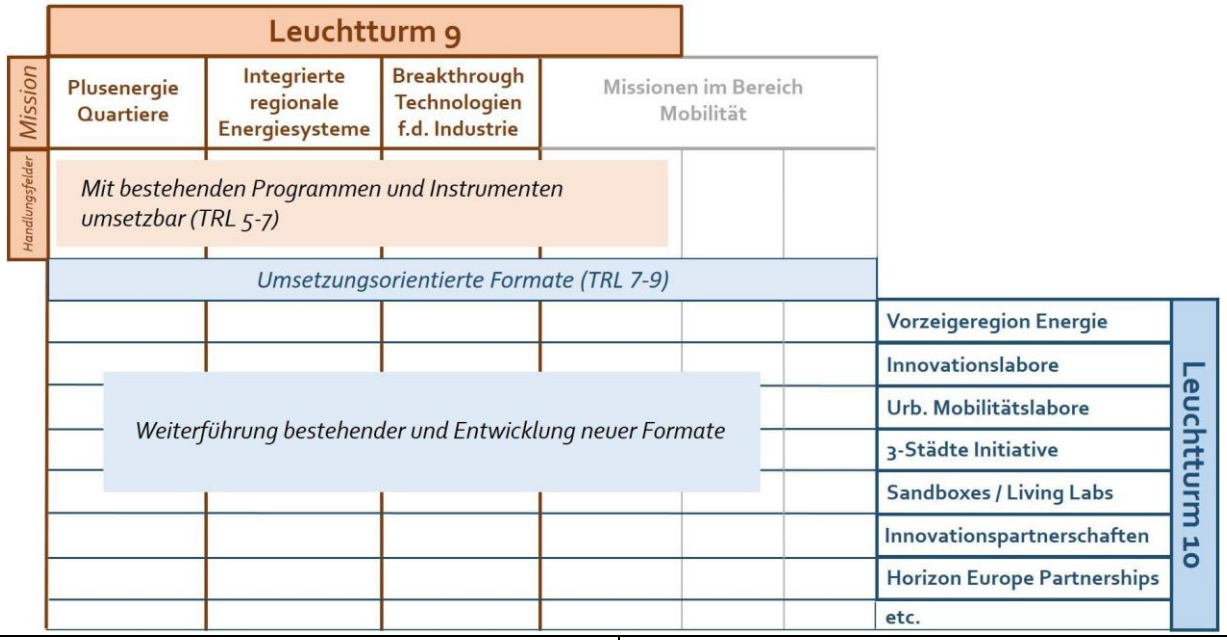
BTI.10	Using waste heat in industrial processes	Development of components and technologies for the use of low-exergy waste heat and usability of contaminated waste heat flows
BTI.11	Policy and incentivising	Measures in politics and society to push for energy and resource efficiency in industry
BTI.12	Digitalisation and regulation	Digitalisation as a basis for efficient production, inclusion of industry in the Smart Grid and regulation that encourages innovation
BTI.13	Circular economy in industry	Development of technologies and processes that close material cycles and thereby reduce the use of primary energy and raw materials. Depolymerisation of 'hard-to-recycle' used plastics

Specific implementation measures:

With a view to mobilising the innovation potential of Austrian companies identified in the implementation plan, implementation measures focus on the following key factors:

- **Mission-oriented priorities** – together with industry, focusing on areas in which Austria is strong and developing these areas in a goal-oriented way (successful examples: solar thermal power, passive house, smart grids, e-mobility, energy-efficient mobility systems);
- **Removing investment barriers** so that innovative implementation projects can be implemented on a living lab scale from an early stage and so that Austrian solutions are frontrunners leading the way to market success;
- **Impact Network Approach** – actively building bridges between interested parties/technology users and innovators/technology providers/entrepreneurs. The energy transition is a joint learning process that must be shaped. It requires new cooperation and funding formats that take into consideration elements such as co-creation, innovation procurement and innovation partnerships;
- **Multilateral cooperation** – working with research partnerships to address the European domestic market, optimising internal development costs by sharing expertise and creating access to prosperous markets in other regions of the world.

Figure 11: Implementation of Flagship Projects 9 and 10 of the Austrian Climate and Energy Strategy



Leuchtturm 9	**Flagship Project 9**
Mission	*Mission*
Plusenergie Quartiere	**Plus-Energy Neighbourhoods**

Integrirte regionale Energiesysteme	**Integrated Regional Energy Systems**
Breakthrough Technologien f.d. Industrie	**Breakthrough Technologies for Industry**
Missionen im Bereich Mobilität	**Missions in the field of mobility**
Handlungsfelder	*Areas for action*
Mit bestehenden Progremmen und Instrementen umsetzbar (TRL 5-7)	*Can be implemented with existing programs and tools (TRL 5-7)*
Umsetzungsorientierte Formate (TRL 7-9)	*Implementation-oriented formats (TRL 7-9)*
Weiterführung bestehender und Entwicklung neuer Formate	*Continuing with existing formats and developing new ones*
Vorzeigeregion Energie	**Energy Model Region**
Innovationslabore	**Innovation Labs**
Urb. Mobilitätslabore	**Urban Mobility Labs**
3-Städte Initiative	**3-City Initiative**
Sandboxes / Living Labs	**Sandboxes/Living Labs**
Innovationspartnerschaften	**Innovation Partnerships**
Horizon Europe Partnerships	**Horizon Europe Partnerships**
etc.	**etc.**
Leuchtturm 10	**Flagship Project 10**

Continuing with existing formats:

Energy research programme implemented by the Climate and Energy Fund and the Federal Ministry for Transport, Innovation and Technology – City of Tomorrow programme:
By establishing mission-oriented programme priorities, it is possible to support the research and development of future-oriented energy solutions throughout the entire energy value-added chain, from primary energy to functionality. Significant contributions are also being made to modernise the economy and secure Austria's position as a location of industry. This requires the strengthening of technological skills, the development of export opportunities for innovative energy technologies and the take-up of new trends, such as digitalisation.

Mission 1 'Development of Plus-Energy Neighbourhoods':

- Area for action - Plus-Energy Neighbourhoods
- Area for action - System integration

Mission 2 'Development of Integrated Regional Energy Systems and Networks'

- Area for action - Creating flexibility in and securing local/regional integration of renewable energies
- Area for action - Intelligent, integrated systems and infrastructures, sector coupling
- Area for action - Storage solutions

Mission 3 'Breakthrough Technologies for Industry'

- Area for action - Solutions for a CO_2-free industry
- Renewable energy in industry

Impact: provision of innovative 'made in Austria' energy technologies and solutions. (TRL 5-7)

Plans for 2020 onwards: ongoing mission-oriented tenders, potential departure from one-off annual calls, participation in transnational tenders and upskilling of Austrian stakeholders for participation in European programmes

'Smart Energy Systems' and 'Urban Europe' multilateral partnerships

Thanks to the two Joint Programming Platforms, central European initiatives were developed in Austria's priority areas (Missions 1 and 2) and have effectively and efficiently operationalised the collaboration with European and associated countries at programme and project level. Preparations are under way for the further development towards Co-funded European Partnerships as part of the post-2020 Horizon Europe initiative.

'Energy Model Region' research, technology and innovation initiative

This forms an essential element for the implementation of Flagship Project 10 of the Climate and Energy Strategy. Over 200 organisations are involved in three subject-based model regions: 'Green Energy Lab', 'NEFI – New Energy for Industry' and 'WIVA P&G Wasserstoffinitiative Vorzeigeregion Austria Power & Gas [Austria model region hydrogen initiative – Power & Gas]'.

'Zero Emission Mobility' programme

Continuation and strengthening of the programme that aims to increase the competitiveness of Austria's (vehicle) industry and test systemic solutions in high-volume pilot projects.

'Mobility of the Future' programme

This research, technology and innovation programme, which was launched in 2012 and focuses on surface transport, addresses both transport/environmental/technological and economic objectives, with a view to achieving multiple pay-offs. By stimulating R&D and implementing new technologies in the areas of vehicle technology, transport infrastructure and personal/goods mobility, the programme contributes to overcoming mobility-related, ecological and societal

challenges and develops the skills and international competitiveness of one of Austria's core sectors. Research into alternative drives and fuels, materials, intelligent traffic systems, ICT and digital technologies form the central areas of research. Furthermore, the programme also addresses organisational and social innovations in the area of personal and goods mobility and the transformation of the mobility system towards sustainability. Cooperative research projects, relevant research infrastructures and innovation labs all receive funding to enable them to test innovative solutions in systemic and real-life traffic environments.

In 2016, a horizontal research priority focusing on automation was introduced to approach research into autonomous driving both on the roads and on the railways. The intention is to develop and expand not only the safety of the transport system, but also Austria's expertise in this important field of technology.

The research, technology and innovation programme has received around EUR 25 million per year for the last few years and will run until the end of 2020.

At present, work is being carried out as part of a research, technology and innovation strategy on mobility to further develop the programme, which will continue from 2021 with the same level of funding. This is on the assumption that the research budget framework for this programme remains at the current level.

Mobility Labs programme activity

The Mobility Lab initiative has enabled the development of six new innovation ecosystems in Austria (five urban mobility labs and one overarching transformation lab), which are making significant contributions to bridging the gaps between research and social practice. The labs offer processes and structures that run alongside the research to involve the public, establish networks with the necessary stakeholders and research (test) infrastructures, and form the required framework conditions for the diffusion of innovations and technology.

In future, the labs will form key elements for entrenching and supporting innovation measures for decarbonisation and relevant mobility research both nationally (Living Lab approach in LT10, #mission2030, following up with the Mobility of the Future programme), and internationally (Mission 'Climate neutral and Smart Cities' and relevant partnerships under Horizon Europe). Plans are in place to expand the lab activity portfolio to include decarbonisation measures and to transfer the lab structures to further cities/regions.

<u>Battery initiative</u>

Intensive research and support of future energy and mobility systems, such as batteries and hydrogen, are essential in order to establish Austria as an innovation leader on global technology markets. The development and production of batteries will secure the competitiveness of the Austrian vehicle industry. Furthermore, it is a critical factor in establishing a sustainable vehicle transition towards electromobility and therefore a priority for technological funding from the Federal Ministry for Transport, Innovation and Technology and Austrian Federal Government. The national battery initiative is a complementary Austrian initiative implementing the European battery initiative. The goal of both initiatives is to prepare national vehicle industries for a technological upheaval in drive technologies in good time. In parallel to the battery initiative, Austria's industry is also involved in the IPCEI on batteries (Important Project of Common European Interest), which aims to establish comprehensive European battery cell production.

Austrian hydrogen strategy

The objectives of the Austrian Climate and Energy Strategy (#mission2030) require huge expansion of renewable energies. In future, renewable hydrogen will play a critical role in achieving the conversion of the energy system. This strategy is being drawn up by the Federal Ministry for Sustainability and Tourism, assisted by the Federal Ministry for Transport, Innovation and Technology, in collaboration with business, industry and research and is set to be completed by the end of this year. Following a stakeholder consultation, the strategy is scheduled to be accepted by the Council of Ministers in 2020 and includes measures to transform today's society into a hydrogen-based society free of fossil-fuel energy. In parallel to the Austrian hydrogen strategy, an IPCEI is also being considered here to help represent and sell Austria's expertise in this key future issue of hydrogen with clarity on a global scale. Suitable resources will also be required for market launch and research.

TAKE OFF

The aviation research, technology and innovation programme supports the implementation of the research, technology and innovation strategy of the Austrian aviation sector. The aim is to strengthen the competitiveness and growth of this highly dynamic and innovative sector. This involves supporting research that contributes to reducing emissions in aviation and delivers important solutions for a user-friendly, sustainable and efficient aviation system. Over the last few years, around EUR 10 million has been invested annually in Austria's areas of expertise, including drive systems, new materials, air traffic management and drones.

As is the case for all sectors, the aviation industry is also required to contribute to achieving the climate protection goals (see CORSIA). On that basis, plans are in place to include an additional research priority looking at CO_2-free fuels (entitled 'Kerosene phase-out') as part of the TAKE OFF programme from 2020.

Possible new formats (example list):

Energy infrastructure innovation partnership

This innovation partnership supports public-sector procurement agents in developing 'Made in Austria' innovations and performing initial prototype testing in the field.

Energy Model Region

This project builds on the experience gained from the Energy Model Region research, technology and innovation initiative to develop and implement an innovation programme for extensive testing of innovative technologies and business models under real conditions. By using experimentation clauses or other flexibility tools, it will be possible to test business model technologies, even if no provision has been made for this in the legal framework that generally applies.

3-City Initiative

This initiative aims to launch demonstration projects to test future-ready solutions in order to prepare Austria's towns, cities and industries for the upcoming major EU projects: Mission 'Climate-neutral and Smart Cities'. This should result in considerable investment boosts from industry, the real-estate sector and cities and greater visibility for Austria's areas of strength.

Process:

1. Development of the concept, sponsorship and funding decision on the part of users and industry partners
2. Development of a master and funding plan (1st stage, initial exploration of options)
3. Selection of three pilot cities and implementation (2nd stage, 3-5 year living labs)

Competitions to promote disruptive innovations

Competitions are a new approach to innovation policy that aim to promote the development of disruptive innovations. The intention is to help innovators develop their ground-breaking ideas into highly innovative products, processes and services that can be used to open up new high-tech fields, markets, sectors and new business models for the Austrian economy. Suggested subjects: innovative storage technologies, Plus-Energy demonstration buildings, innovative

materials for high-temperature applications in industry.

Scale Up - Austrian energy innovations from small series to market launch

One of the goals of the Climate and Energy Strategy is to test innovative energy technology in model regions and subsequently roll this out nationwide through market programmes under the Climate and Energy Fund. Scale Up promotes Austrian innovations that show significant climate protection potential and which have, to date, only been produced on a small scale. The aim is to help selected technologies transition from small-series production and support Austrian companies in launching their innovations on the market.

'IÖB-KLIMA' innovation-promoting public procurement for the climate - new technologies for our climate

Increased acceleration of procurement and use of 'climate-friendly' innovations in the public sector by means of an investment subsidy under the Climate and Energy fund for the acquisition (public procurement) of innovative, climate-friendly mobility and energy technologies and solutions.

Research, technology and innovation for infrastructure transformation/climate change adaptation

Supporting infrastructure operators (transport, energy, etc.) in transforming infrastructure in relation to climate change.

'Innovative energy storage at home and abroad' research, technology and innovation priority

In future, more flexible energy systems will have to integrate different energy sources (solar, wind, biogenic sources) and various means of transport and storage (electricity, heating, gas) and make available different energy products for the corresponding domains in which they are applied (mobility, heating, industrial applications, etc.). To do so, Austria requires new energy storage technology with a capacity of some 5 TWh, in particular for electricity and heating in the housing, industry and mobility sectors.

The issue of storage systems (including hydrogen technology) is currently being treated as a top priority and cross-cutting issue, interwoven with mission-oriented priorities and broad implementation initiatives.

Austria already plays a key role in the field of storage, a role which needs to be developed and strengthened through research and development, through the creation of research infrastructure and pilot installations, and by providing market entry support to companies. Model projects which can be taken further already exist in the residential sector, e.g. through 'component activation' for individual buildings or seasonal large-scale storage facilities connected to district heating networks, and in the industrial sector in the field of 'hydrogen/ammonia'.

Alongside the Climate and Energy Fund, the Federal Ministry for Transport, Innovation and Technology has developed recommendations with respect to innovation and for the stages

involved in implementing the 'Innovative energy storage at home and abroad' priority. As part of this initiative, research, technology and innovation priorities are planned for stationary and mobile applications.

Priorities for Austrian participation in developing European value chains

IPCEI on batteries:

Against the backdrop of European efforts to develop European value-added chains and production capacity in strategically important areas, Austria is looking to take part in the IPCEI on batteries, headed up by Germany. Negotiations with Austrian companies have been resumed on the basis of a commitment from the Minister of Finance and the Federal Ministry for Transport, Innovation and Technology. Austria's contribution from 2020 to 2023 will total EUR 50 million.

The development of a European value-added chain for batteries is not only strategically important for the European automobile industry, but is also an important component for the electrification of mobility and the associated CO_2 reduction in road traffic. Alongside fuel cells, batteries are a core technology in the decarbonisation of road traffic.

IPCEI on hydrogen

Hydrogen, which is a core resource required for the decarbonisation of traffic and industry in Europe, is another strategically important European value chain. To highlight this, the Hydrogen Europe trade association held the 'Hydrogen for Europe Action Day' on 9 October 2019 in Brussels together with EC representatives to mark the launch of the IPCEI initiative on hydrogen.

A total of eight projects requiring overall private and state investment of up to EUR 60 billion were presented at the event. These projects may become part of an IPCEI on hydrogen. Austria's contribution from 2021 to 2030 will total EUR 300 million. In future, the IPCEI may also include 'Carbon Direct Avoidance' projects.

The central themes of the projects presented to date revolve around the production and provision of hydrogen from renewable energies, the development of a European hydrogen infrastructure with a network of fuel stations, and the decarbonisation of delivery and heavy goods transport via hydrogen-powered trucks and transporters.

On 20 September 2019, the Federal Ministry for Sustainability and Tourism held an informal discussion on the IPCEI on hydrogen to provide domestic industrial companies with information

on current developments in this field and explore national potentials.

ii. Where applicable, cooperation with other Member States and how the SET Plan objectives are being translated into national policy

For the purposes of implementing the Federal Government's Climate and Energy Strategy, European and international cooperation are key factors in, on the one hand, bringing Austrian stakeholders together and, on the other hand, joining forces and developing a range of comprehensive solutions. This is happening through international initiatives such as the Strategic Energy Technology Plan (SET Plan), collaboration programmes organised by the International Energy Agency, and participation in Mission Innovation.

European cooperation through the SET Plan

The Strategic Energy Technology Plan (SET Plan) is considered an essential mechanism within European energy technology policy aimed at developing low-carbon technology and improving its competitiveness. Financing is provided by the EU, Member States and the private sector according to the 'public-public-private' principle. Through active participation, considerable opportunities are being opened up for businesses.

Austria takes the view that an essential driver for implementing the SET Plan are the energy research calls for tender under the European Framework Programme for Research and Innovation ('Horizon 2020') and multilateral research funding cooperation between European countries, e.g. under 'Joint Programming Initiatives' or 'ERA-NETs'. Austria is represented in energy-related areas of Horizon 2020 and the SET Plan by the Federal Ministry for Transport, Innovation and Technology and the Federal Ministry for Sustainability and Tourism.

Austria is actively involved in selected SET Plan key actions currently focused on:

- new technologies and services for consumers
- resilience and security of the energy system
- new materials and technologies for buildings
- energy efficiency for industry

Transnational cooperation

In view of the fact that more than 80% of research funding in Europe is provided publicly by

national authorities, mainly through national and regional research programmes, more coordination and agreement between national and regional research programmes is intended in order to achieve Europe's major strategic goals. Following this basic idea, ERA-NET was developed under the 6th and 7th EU Framework Programmes and further enhanced under Horizon 2020 in order to continue facilitating cross-border cooperation in research and technology issues. The Federal Ministry for Transport, Innovation and Technology is currently coordinating the 'ERA-Net Smart Grids Plus' and 'ERA-NET Smart Cities and Communities' initiatives and is involved in further energy-related action covered by ERA-NET.

One example of a successful international venture is the transnational Smart Energy Systems Joint Programming Platform based on an Austrian initiative. The Federal Ministry for Transport, Innovation and Technology is coordinating a network of 30 national and regional research, technology and innovation grant schemes in 23 European or associated countries covering smart and digital energy systems and integrated regional energy systems. The Joint Programming Platform has already become an integral part of SET Plan Action 4. The 'National Stakeholders Coordination Group' organised by Member States under the European Technology and Innovation Platform 'Smart Networks for the Energy Transition' (ETIP SNET) ensures that discussions are continuing with industry. The SET Plan Action 4 Working Group, also organised by Member States, has developed a joint implementation plan in close cooperation with ETIP SNET, ETIP Renewable Heating and Cooling, ETIP PV and ETIP Geothermal.

The objective of the ERA-NET Smart Energy Systems Joint Programming Platform is to initiate and promote transnational research, technology and innovation projects in co-creation with regional operators and users in participating countries. Cooperation under transition-to-market programmes in participating countries and with private investors has begun.

To date, four tenders have been organised on 'Smart Grids' and 'Integrated Regional Energy Systems' corresponding to total funding in excess of EUR 100 million of public funds from participating countries. In 2019, a joint tender on storage solutions was organised, with first-time involvement of non-European countries in the global Mission Innovation initiative. For 2020, preparations for a digital transformation of energy systems are under way. Further development of the priorities and additional annual tenders are envisaged as part of budget made available for this. Preparations are likewise under way to transfer the 'Smart Energy Systems' and 'JPI Urban Europe' Joint Programming initiatives into Horizon Europe co-funded partnerships.

Global initiatives

By joining 'Mission Innovation' in 2018, a global clean energy initiative, another step was taken towards increased international cooperation and coordinated research and development efforts. Together with the Austrian Chamber of Commerce, a governance structure was set up in Austria for the purposes of participating in Mission Innovation. With the agreement of Austrian stakeholders, participation in Mission Innovation will initially focus on Smart Grids

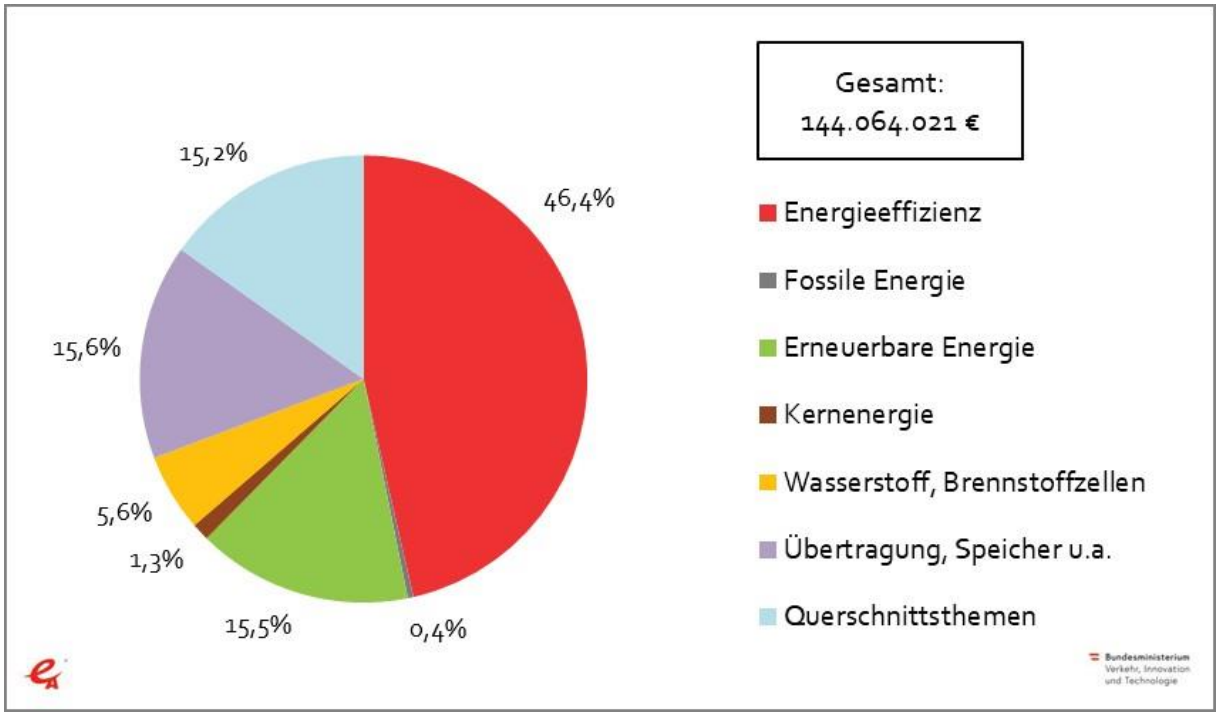
(IC1), Heating and Cooling of Buildings (IC7) and Hydrogen (IC8). The organisation of the first project call for tenders ('MICall19') by the Smart Energy Systems Joint Programming Platform enabled Austria, as the platform's coordinator, to make an active contribution to the initiative in 2019, together with 30 funding partners from 23 countries.

Austrian experts and businesses are also active in numerous technology programmes organised by the International Energy Agency ('IEA Technology Collaboration Programmes') and their committees. These are another important mechanism for Austria to assert its global position in the field of energy and environmental technology. Every year, approximately EUR 4 million in funding is currently provided by the Federal Ministry for Transport, Innovation and Technology so that Austrian stakeholders are able to participate. The intention is to continue providing this funding on an annual basis in future.

iii. (National and EU) financing measures, where applicable

In 2018, public spending on energy research in Austria amounted to EUR 144 million. This means spending in 2018 remained at similar levels to previous years, slightly exceeding the previous peak in 2014 in nominal terms (though not when adjusted for inflation). The priorities for state-funded energy research in Austria are energy efficiency, transmission
/ storage technology (smart grids) and renewables.

Figure 12: Total spending on energy research in Austria in 2018 classified according to IEA codes



Source: Austrian Energy Agency, BMVIT

Gesamt: 144.064.021 €	Total: EUR 144 064 021
Energieeffizienz	Energy efficiency
Fossile Energie	Fossil fuels
Erneuerbare Energie	Renewable energy
Kernenergie	Nuclear energy
Wasserstoff, Brennstoffzellen	Hydrogen, fuel cells
Übertragung, Speicher u.a.	Incl. transmission, storage
Querschnittsthemen	Cross-cutting issues

SECTION B: ANALYTICAL BASIS

4. Current situation and projections 'with existing measures' (WEM)

4.1. Projected evolution of main exogenous factors influencing energy system and GHG emissions

i. Macroeconomic forecasts (GDP and population)

Table 9: Population and GDP growth

WEM parameter scenario	2016	2030	2040
Population [million]	8.74	9.33	9.56
GDP growth [%]	2.0	1.5	1.5

GDP 2020: 1.8%

Source: Federal Environment Agency 2018

ii. Sectoral changes expected to impact the energy system and GHG emissions

The existing trends from previous years are continuing, resulting in an increase in power generated from coal in Austria's energy supply. Renewable energy sources (water, wind, photovoltaics, biomass) are being used to generate power together with electrical energy, instead of fossil fuels. Energy efficiency in buildings is improving thanks to thermal renovation and replacement of old boilers. In the transport sector, the efficiency of the vehicle fleet is increasing due to the switchover to new vehicles (Euro V, Euro VI). Electric cars are set to reach price parity from 2023, which will lead to increased sales.

iii. Global energy trends, international fossil fuel prices, EU ETS carbon

price

Table 11: European Commission price recommendations

WEM parameter scenario	2016	2030	2040
International oil price [USD 16/boe]	47.5	121	134
International gas price [EUR 16/GJ]	4.7	10.5	11.6
Allowance price [EUR 16/t CO_2]	7.8	34.7	51.7

Source: Federal Environment Agency 2018

iv. Evolution of technology costs

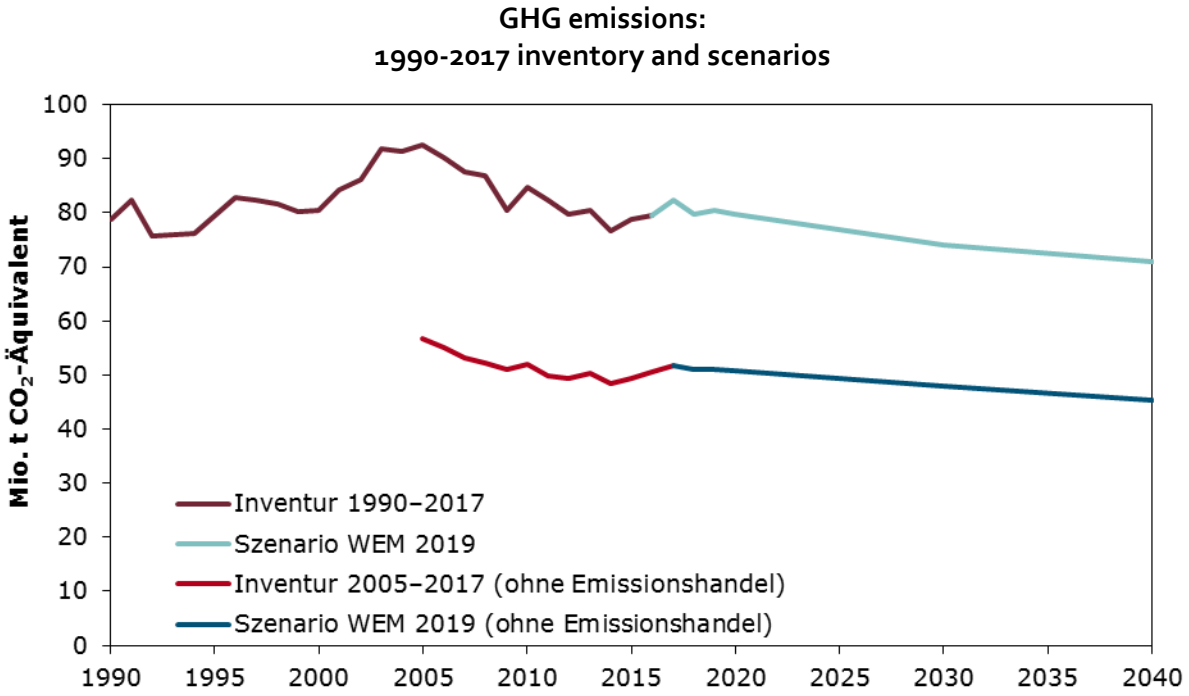
No in-house studies were conducted into the evolution of technology costs. For information on this matter, please refer to a study conducted on behalf of the European Commission as part of its long-term strategy (ASSET - Technology pathways in decarbonisation scenarios: https://ec.europa.eu/energy/sites/ener/files/documents/2018_06_27_technology_pathways_-_finalreportmain2.pdf) and the parameters of the European Commission's models for determining energy and climate targets.

4.2. Dimension: Decarbonisation

4.2.1. GHG emissions and removals

i. Trends in current GHG emissions and removals in the EU ETS, Effort Sharing and LULUCF sectors and different energy sectors

Table 12: GHG emissions inventory and WEM scenario with and without emissions trading



Source: Federal Environment Agency 2019

Mio. t CO_2-Äquivalent	**mt CO_2 eq**
Inventur 1990-2017	1990-2017 inventory
Szenario WEM 2019	2019 WEM scenario
Inventur 2005-2017 (ohne Emissionshandel)	2005-2017 inventory (without emissions trading)
Szenario WEM 2019 (ohne Emissionshandel)	2019 WEM scenario (without emissions trading)

Table 13: Total GHG emissions and broken down between EU ETS, Effort Sharing and LULUCF (in mt CO2 eq) excluding emissions trading as of 2013 for the WEM scenario

	2005	2010	2015	2020	2030	2040
Total (excluding LULUCF)	**92.6**	**84.8**	**78.9**	**79.7**	**74.0**	**71.0**
ETS	35.8	32.7	29.5	28.7	26.1	25.6
Effort Sharing	56.7	52.0	49.3	50.9	47.9	45.4
LULUCF	-10.7	-5.9	-4.6	-4.2	-2.7	-1.2

Source: Federal Environment Agency 2019

N.B.: Differences due to rounding

ii. Projections of sectoral developments with existing national and Union policies and measures at least until 2040 (including for 2030)

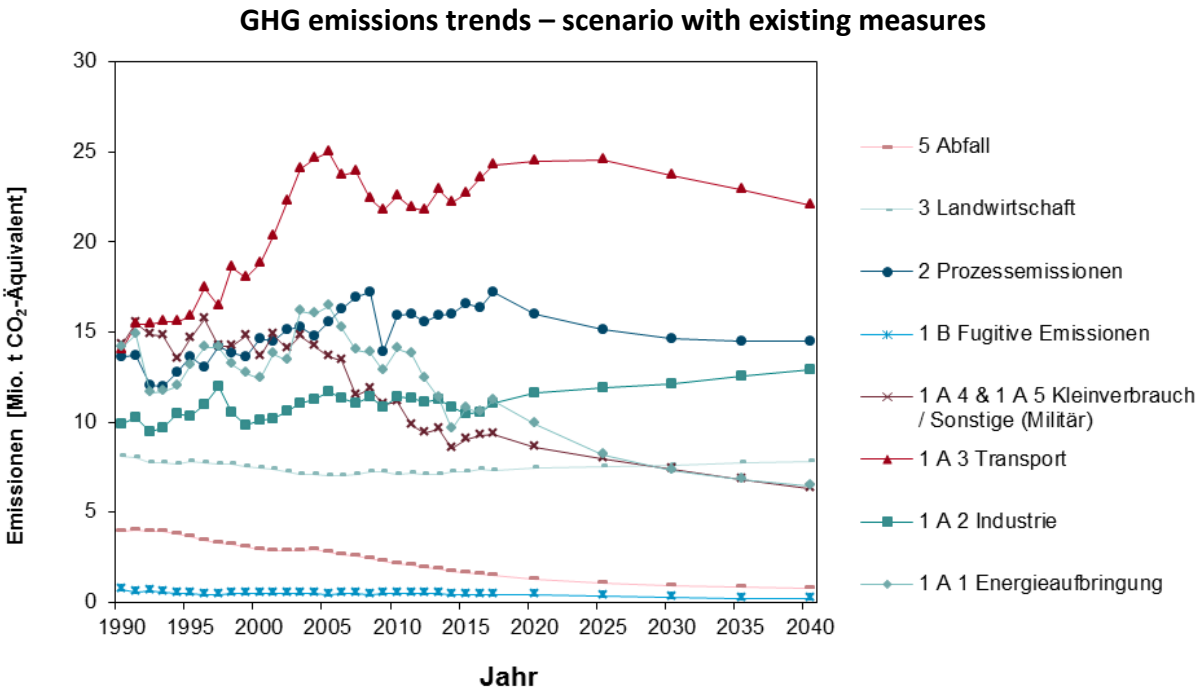
Table 14: GHG emissions according to CRF sector breakdown (including emissions trading) in mt

CRF sector	1990	2005	2010	2015	2020	2030	2040
Total	**78.7**	**92.7**	**84.9**	**78.9**	**79.7**	**74.0**	**71.1**
Total (including LULUCF)	***66.7***	***82.1***	***79.1***	***74.4***	***72.0***	***69.4***	***64.7***
1 A 1 Energy supply	14.1	16.3	14.0	10.8	9.9	7.3	6.5
1 A 2 Industry	9.9	11.8	11.4	10.7	11.6	12.1	12.9
1 A 3 Transport	14.0	24.9	22.5	22.6	24.5	23.7	22.0
1 A 4 Small-scale use	14.2	13.6	11.3	8.8	8.5	7.3	6.3
1 A 5 Other (military)	0.0	0.0	0.0	0.1	0.0	0.1	0.1
1 B Fugitive emissions	0.7	0.4	0.5	0.4	0.4	0.3	0.2
2 Process emissions	13.7	15.6	15.9	16.7	16.0	14.7	14.5
3 Agriculture	8.2	7.1	7.1	7.2	7.5	7.6	7.8
5 Waste	3.9	2.8	2.2	1.7	1.3	0.9	0.8
4 LULUCF	-12.0	-10.6	-5.9	-4.4	-7.7	-4.6	-6.4

Source: Federal Environment Agency 2018

N.B.: Differences due to rounding

Figure 13: GHG emissions according to CRF sector breakdown (including emissions trading)



Source: Federal Environment Agency 2019

Emissions [mt CO_2 eq]	Emissions [mt CO_2 eq]
5 Waste	5 Waste
3 Agriculture	3 Agriculture
2 Process emissions	2 Process emissions
1 B Fugitive emissions	1 B Fugitive emissions
1 A 4 & 1 A 5 Small-scale use/other (military)	1 A 4 & 1 A 5 Small-scale use/other (military)
1 A 3 Transport	1 A 3 Transport
1 A 2 Industry	1 A 2 Industry
1 A 1 Energy supply	1 A 1 Energy supply
Year	Year

4.2.2. Renewable energy

i. Current share of renewable energy in gross final energy consumption and in different sectors (heating and cooling, electricity and transport) as well as per technology in each of these sectors

In Austria in 2016, the share of renewable energy within the gross final consumption of energy was 33.5%. The target of 34% by 2020 is therefore already in sight.

With regard to energy use for heating and air conditioning, the share of renewable energy in 2016 was 33.3%.

With regard to gross electricity consumption, the share of renewable energy in 2016 was 72.6%.

With regard to energy use in transport, the share of renewable energy in 2016 was 10.6%.

ii. Indicative projection of developments in existing policies and measures by 2030 (looking forward to 2040)

Table 15: Developments in renewable energy and share, expressed as total

	2016	2020	2030	2040
Final energy consumption (PJ)	1,121	1,155	1,180	1,203
Gross inland consumption (PJ)	1,435	1,464	1,474	1,498
Renewable share	33.5%	34.3%	35.8%	37.1%

Source: Federal Environment Agency 2019

Table 16: Electricity supply from renewable energy sources and fossil fuels

Supply (TWh)	**2015**	**2020**	**2030**	**2040**
Fossil	15	14	11	9
Hydroelectric power	37	42	42	44
Biomass	4	5	5	6
Ambient heat, etc.	0	0	0	0
Photovoltaics	1	2	3	5
Wind energy	5	8	9	16
Total	**62**	**70**	**71**	**81**
Imports	10	6	14	15
Supply	**72**	**76**	**84**	**95**

Source: Federal Environment Agency 2019

N.B.: Differences due to rounding

4.3. Dimension: Energy efficiency

i. Current primary and final energy consumption in the economy and per sector (including industry, residential, services and transport)

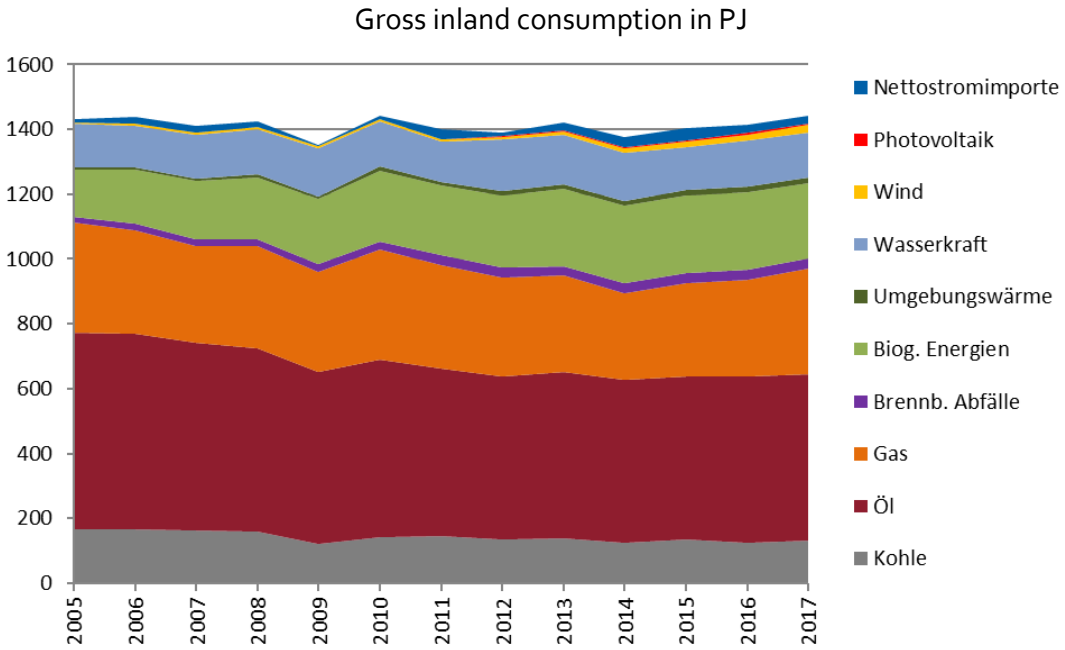
Total economy: See sub-point iii.

Table 17: Final energy consumption 2016 (1,121 PJ); share of all energy sources by sector

2016	Fossil	Renewable	Electricity	District heating
Industry	50%	18%	28%	3%
Transport	91%	6%	3%	0%
Residential	35%	29%	24%	12%
Services	23%	8%	45%	24%
Agriculture	45%	33%	19%	2%

Source: Federal Environment Agency 2019

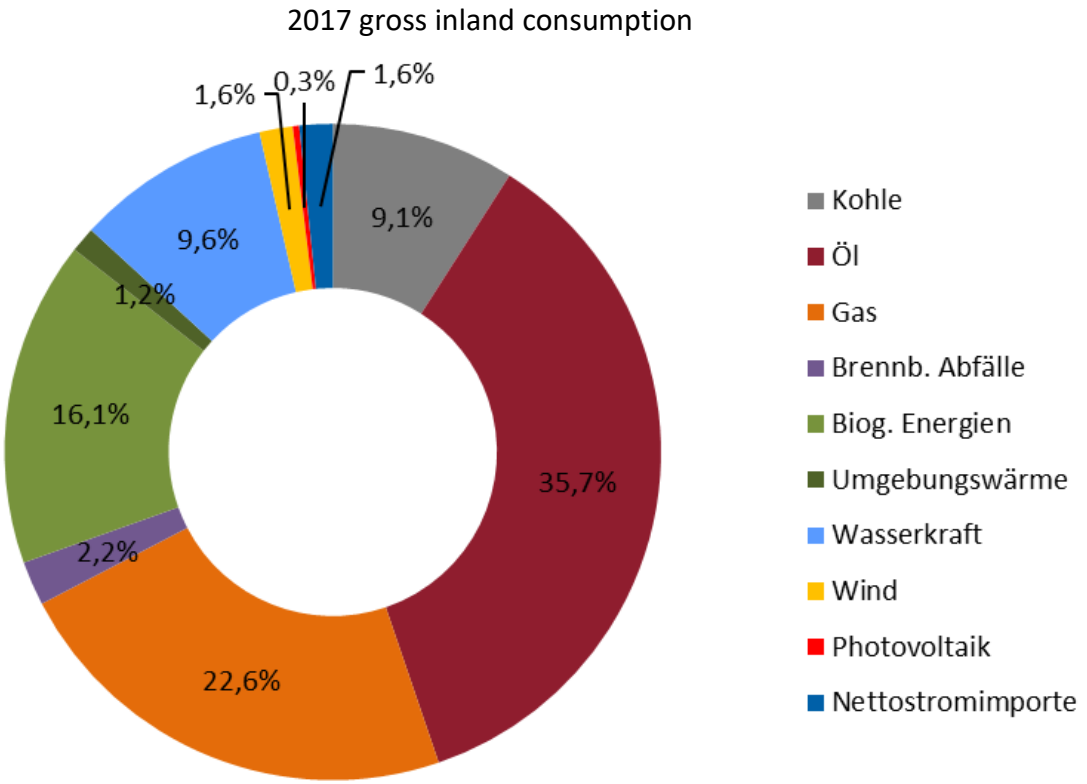
Figure 14: 2005-2017 gross inland consumption by energy source



Source: BMNT, Energy in Austria 2018 – figures, data, facts

Nettostromimporte	Net electricity imports
Photovoltaik	Photovoltaics
Wind	Wind energy
Wasserkraft	Hydroelectric power
Umgebungswärme	Ambient heat
Biog. Energien	Biogenic energy
Brennb. Abfälle	Combustible waste
Gas	Gas
Öl	Oil
Kohle	Coal

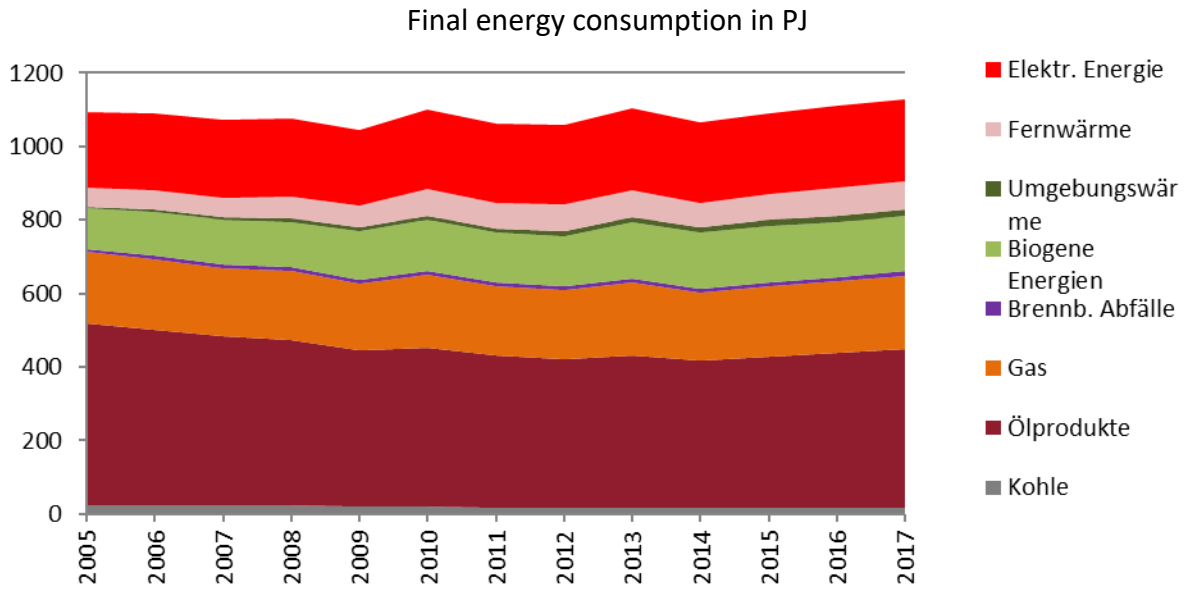
Figure 15: Gross inland consumption (2017, share per energy source)



Source: BMNT, Energy in Austria 2018 – figures, data, facts

Kohle	Coal
Öl	Oil
Gas	Gas
Brennb. Abfälle	Combustible waste
Biog. Energien	Biogenic energy
Umgebungswärme	Ambient heat
Wasserkraft	Hydroelectric power
Wind	Wind energy
Photovoltaik	Photovoltaics
Nettostromimporte	Net electricity imports

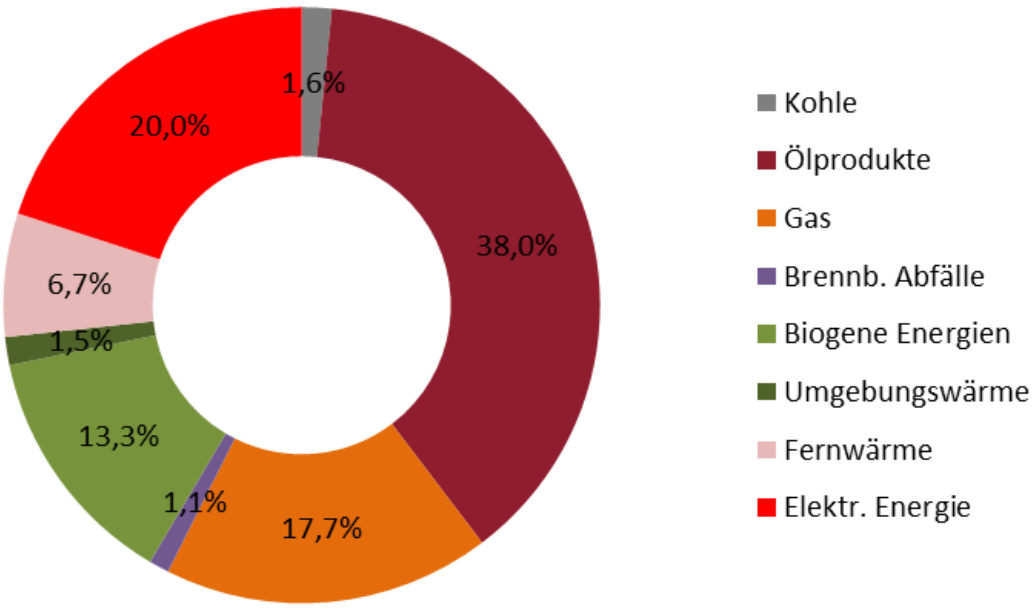
Figure 16: 2005-2017 final energy consumption by energy source



Source: BMNT, Energy in Austria 2018 – figures, data, facts

Elektr. Energie	Electrical energy
Fernwärme	District heating
Umgebungswärme	Ambient heat
Biogene Energien	Biogenic energy
Brennb. Abfälle	Combustible waste
Gas	Gas
Ölprodukte	Oil products
Kohle	Coal

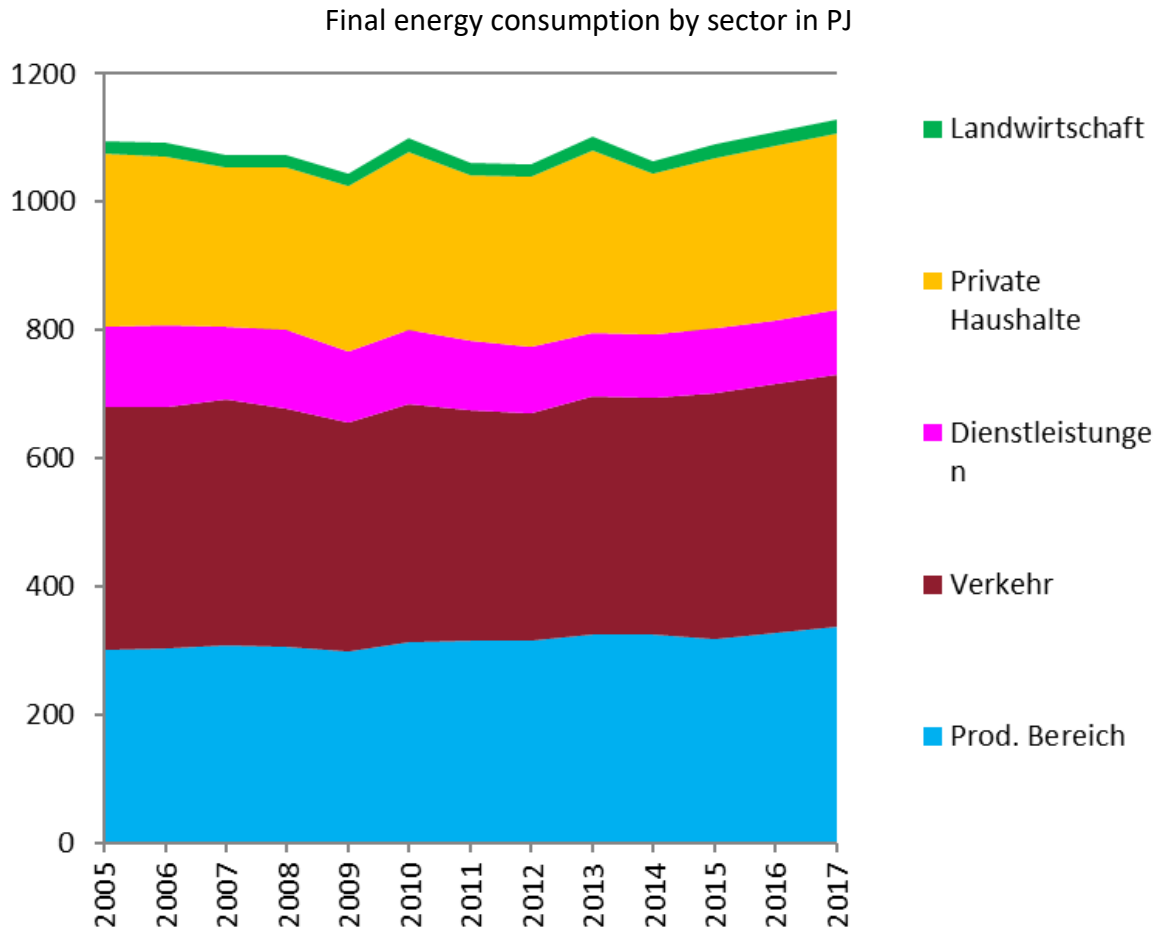
Figure 17: Final energy consumption (2017, share per energy source)



Source: BMNT, Energy in Austria 2018 – figures, data, facts

Kohle	Coal
Ölprodukte	Oil products
Gas	Gas
Brennb. Abfälle	Combustible waste
Biogene Energien	Biogenic energy
Umgebungswärme	Ambient heat
Fernwärme	District heating
Elektr. Energie	Electrical energy

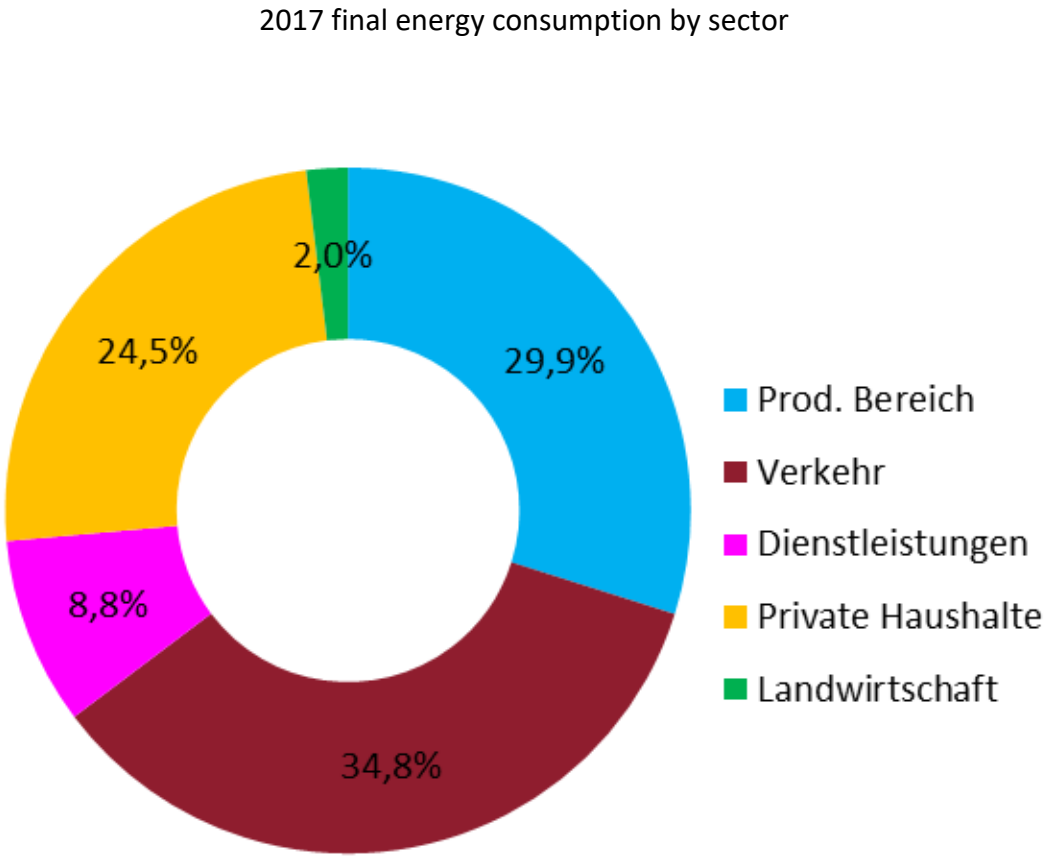
Figure 18: 2005-2017 final energy consumption by sector



Source: BMNT, Energy in Austria 2018 – figures, data, facts

Landwirtschaft	Agriculture
Private Haushalte	Private households
Dienstleistungen	Services
Verkehr	Transport
Prod. Bereich	Production sector

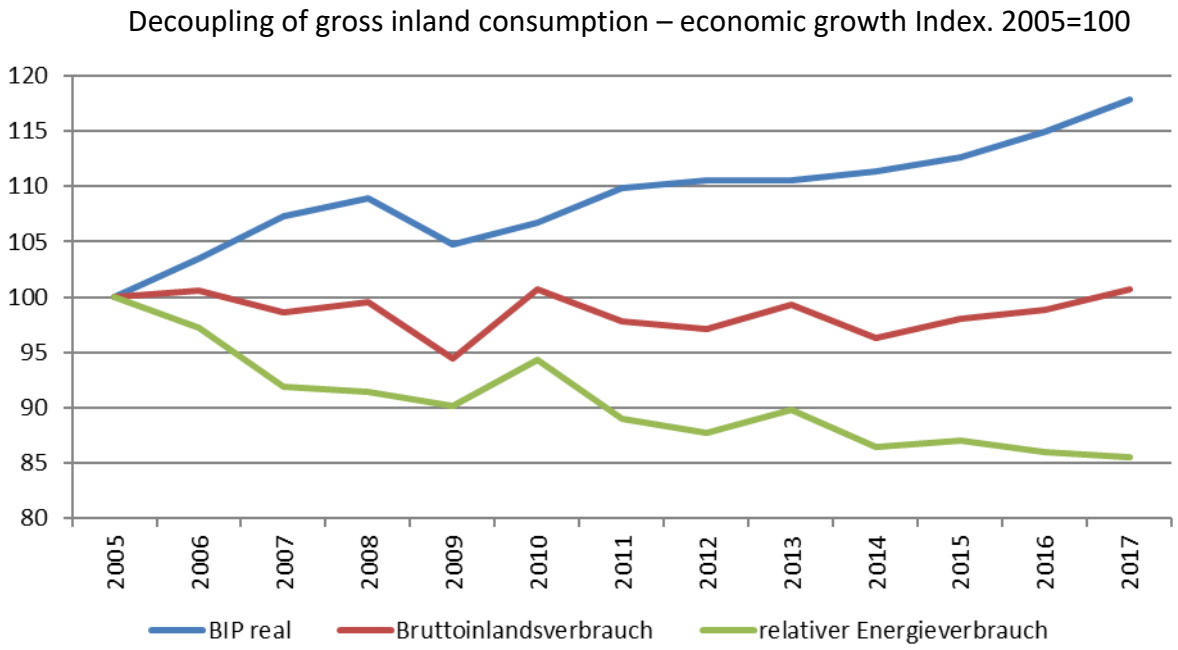
Figure 19: Final energy consumption (2017, share per sector)



Source: BMNT, Energy in Austria 2018 – figures, data, facts

Prod. Bereich	Production sector
Verkehr	Transport
Dienstleistungen	Services
Private Haushalte	Private households
Landwirtschaft	Agriculture

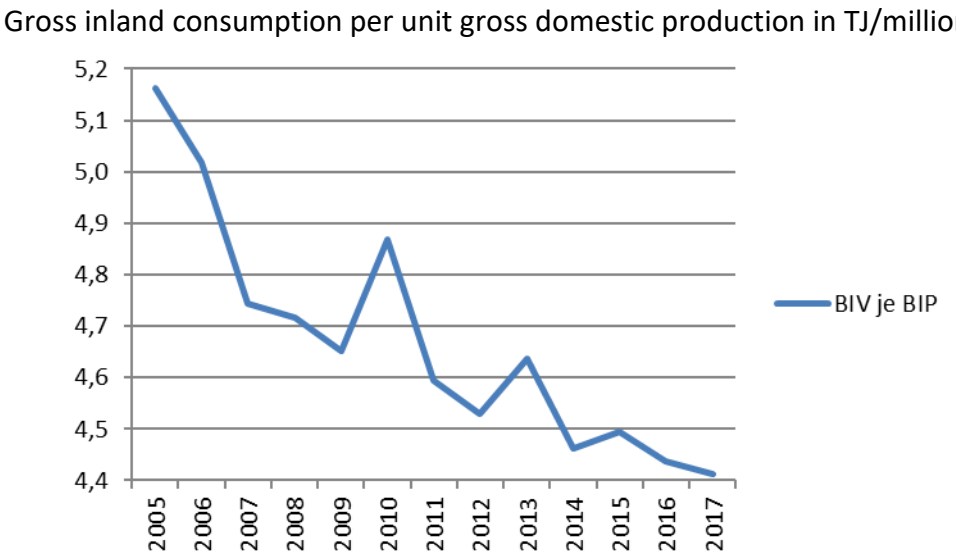
Figure 20: Developments in GDP, gross inland consumption and relative energy consumption 2005-2017 (2005=100)



Source: Federal Ministry for Sustainability and Tourism, 2018

BIP real	Real GDP
Bruttoindlandsverbrauch	Gross inland consumption
relativer Energieverbrauch	Relative energy consumption

Figure 21: Gross inland consumption relative to gross domestic production, 2005-2017



Source: Federal Ministry for Sustainability and Tourism, 2018

BIV je BIP	GIC per unit GDP

ii. Current potential for the application of high-efficiency cogeneration and efficient district heating and cooling

In Austria, significant use is already being made of high-efficiency cogeneration and efficient district heating and cooling. Grid densification is ongoing. The area of households and services includes a further slight increase in district heating in the 'with existing measures' scenario.

iii. Projections considering existing energy efficiency policies, measures and programmes as described in point 1.2, sub-point ii for primary and final energy consumption for each sector at least until 2040 (including for the year 2030)

Table 18: Projection of final energy consumption and gross inland consumption (total)

	2016	2020	2030	2040
Final energy consumption (PJ)	1,121	1,155	1,180	1,203
Gross inland consumption (PJ)	1,435	1,464	1,474	1,498

Source: Federal Environment Agency 2019

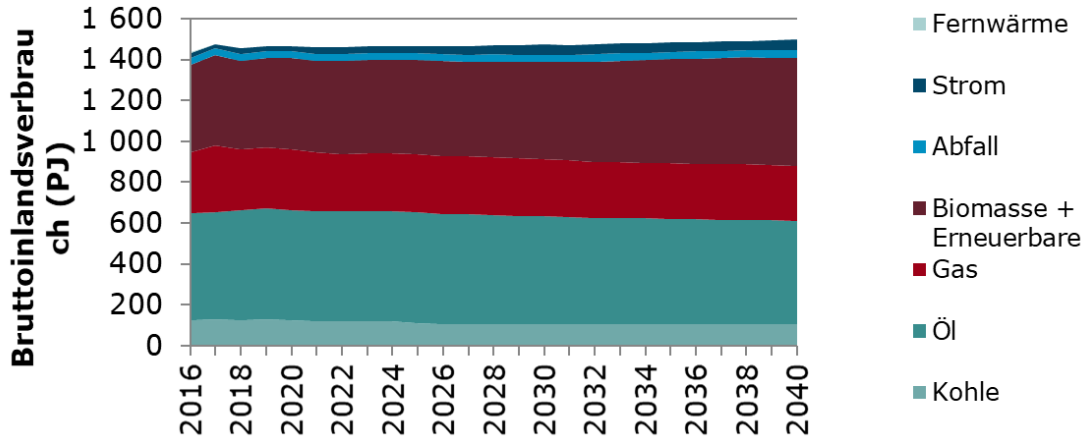
Table 19: Projection of final energy consumption by sector

in PJ	Balance	Scenario	Scenario	Scenario
	2015	**2020**	**2030**	**2040**
Transport incl. off-road	403	429	439	434
Industry	301	337	370	413
Households and services	375	377	358	341
Agriculture	12	12	13	14
Total	**1,091**	**1,155**	**1,180**	**1,203**

Source: Federal Environment Agency 2019

N.B.: Differences due to rounding

Figure 22: Gross inland consumption by energy source, 2016-2040



Source: Federal Environment Agency 2019

Bruttoinlandsverbrauch (PJ)	Gross inland consumption (PJ)
Fernwärme	District heating
Strom	Electricity
Abfall	Waste
Biomasse + Erneuerbare	Biomass + renewables
Gas	Gas
Öl	Oil
Kohle	Coal

iv. Cost-optimal levels of minimum energy performance requirements resulting from national calculations in accordance with Article 5 of Directive 2010/31/EU

In February 2018, the Austrian Institute of Construction Engineering (OIB) headed up a project to update a study on cost-optimal levels, which can be used to determine the requirements in terms of thermal insulation for thermal energy renovations (and also for defining nearly zero-energy buildings in new buildings). (OIB 2018)

OIB 2018: -Document furnishing evidence of the cost-optimal nature of the requirements established in OIB Guideline 6 and/or the National Plan pursuant to Article 5 of Directive 2010/31/EU.

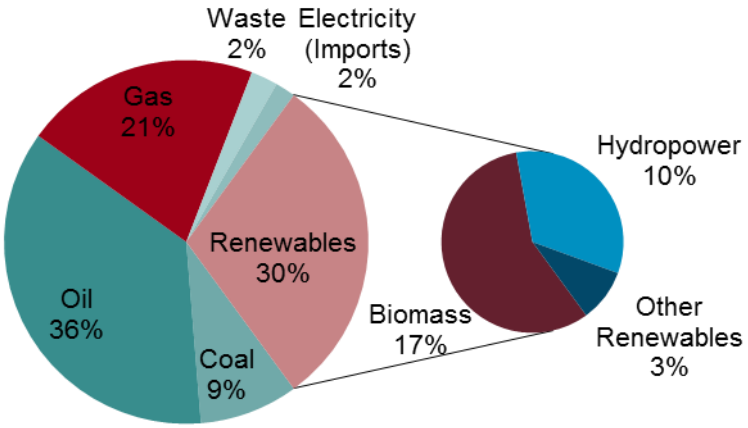
4.4. Dimension: Security of energy supply

i. Current energy mix, domestic energy resources, import dependency, including relevant risks

- 2016 gross inland consumption: 1,435 PJ (2017: 1,442 PJ)
- Share of renewable energy in gross final energy consumption: 33.5% (2016), share of renewable energy in gross electricity consumption: 72.6% (2016)
- In 2016, renewable energy already accounted for almost 80% of all domestic primary energy production.
- Dependence on energy imports: 64% in 2016

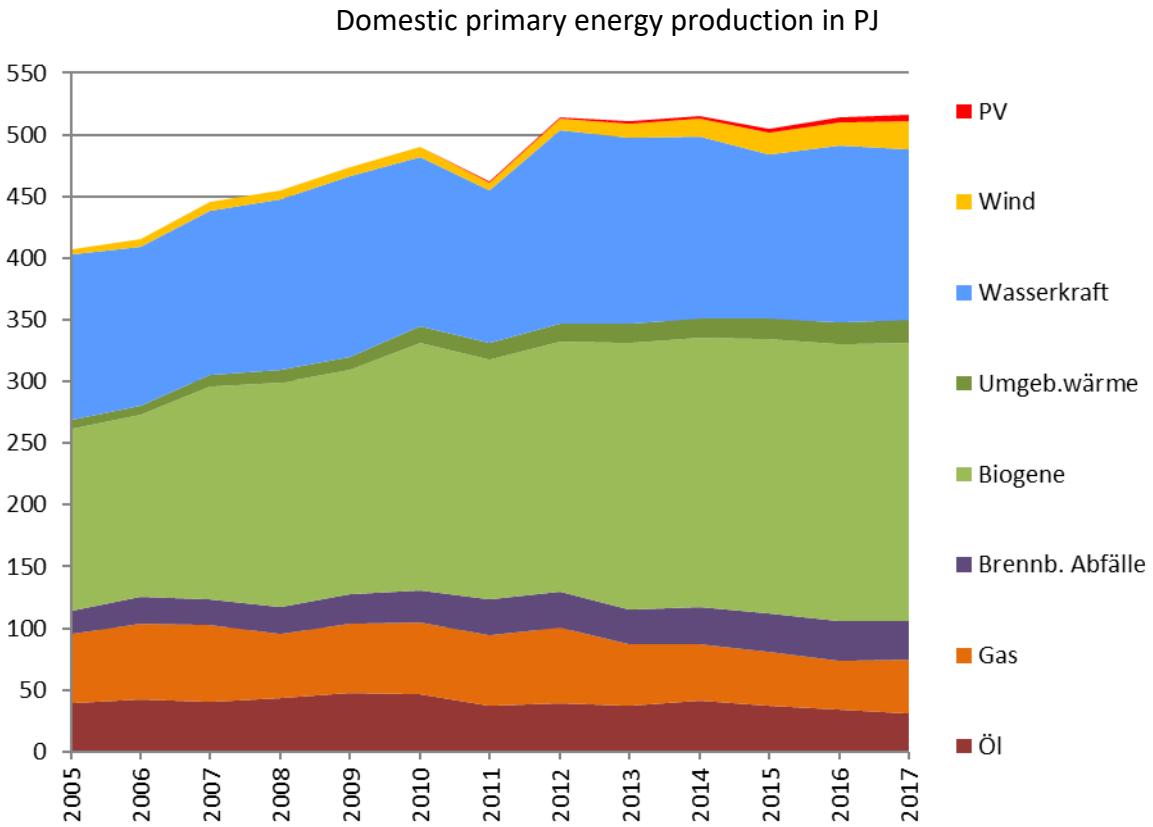
- Coal: 100%
- Oil: >90%
- Gas: >80%
- Renewables: high degree of self-sufficiency

Figure 23: 2016 gross inland consumption by energy source



Source: Statistics Austria, Energy Balance, Chart: Federal Environment Agency

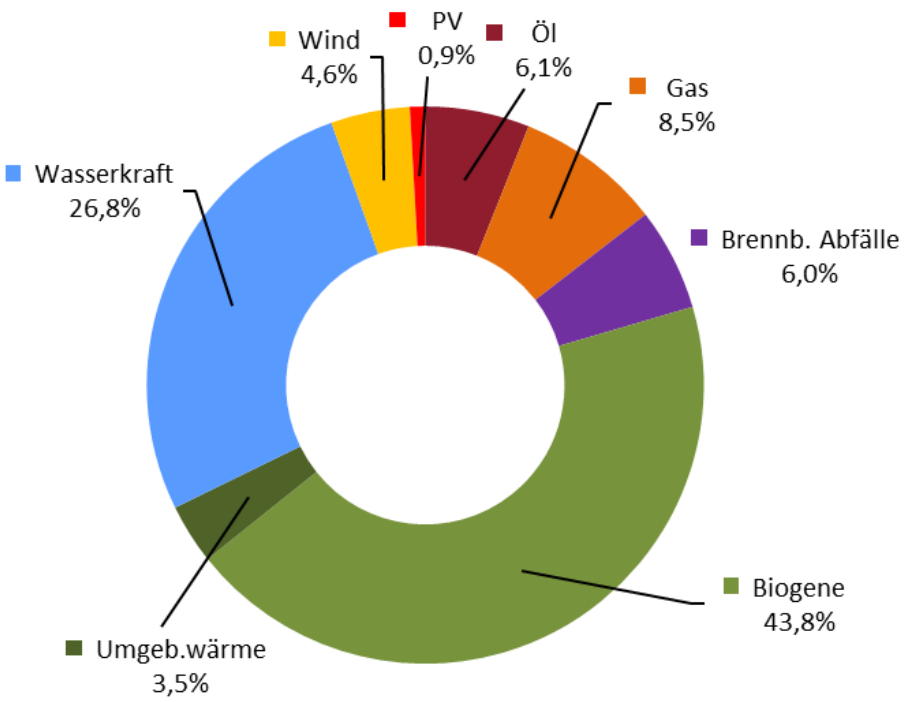
Figure 24: Domestic primary energy production, 2005-2017



Source: BMNT, Energy in Austria 2018 – figures, data, facts

PV	Photovoltaics
Wind	Wind energy
Wasserkraft	Hydroelectric power
Umgeb.wärme	Ambient heat
Biogene	Biogenic energy
Brennb. Abfälle	Combustible waste
Gas	Gas
Öl	Oil

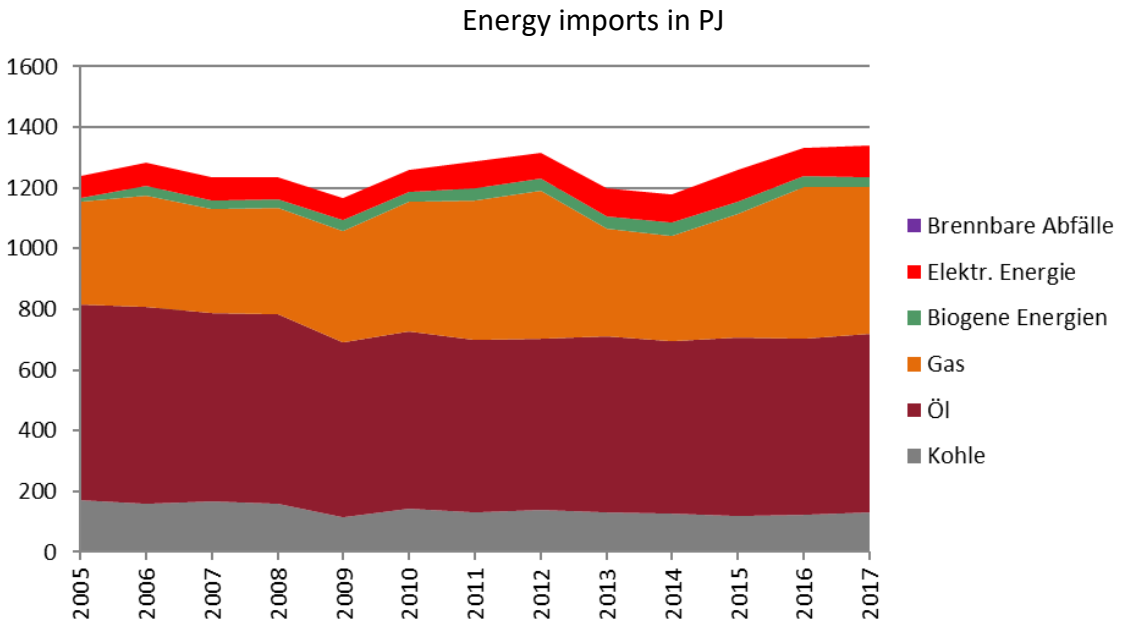
Figure 25: 2017 domestic primary energy production (share per energy source)



Source: BMNT, Energy in Austria 2018 – figures, data, facts

PV	Photovoltaics
Öl	Oil
Gas	Gas
Brennb. Abfälle	Combustible waste
Biogene	Biogenic energy
Umgeb.wärme	Ambient heat
Wasserkraft	Hydroelectric power
Wind	Wind energy

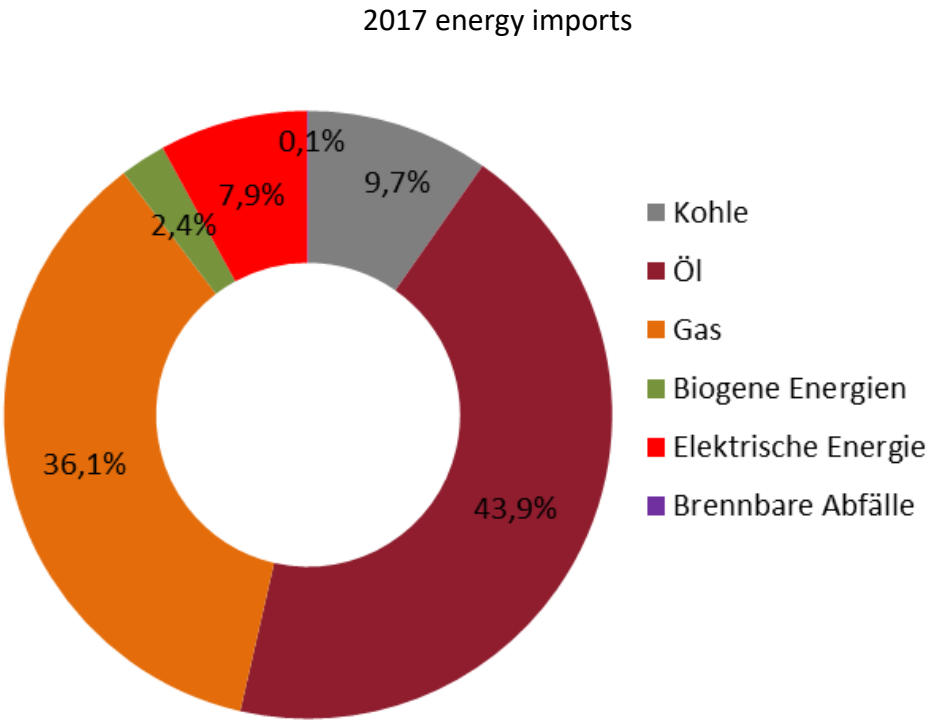
Figure 26: Energy imports by energy source, 2005-2017



Source: BMNT, Energy in Austria 2018 – figures, data, facts

Brennbare Abfälle	Combustible waste
Elektr. Energie	Electrical energy
Biogene Energien	Biogenic energy
Gas	Gas
Öl	Oil
Kohle	Coal

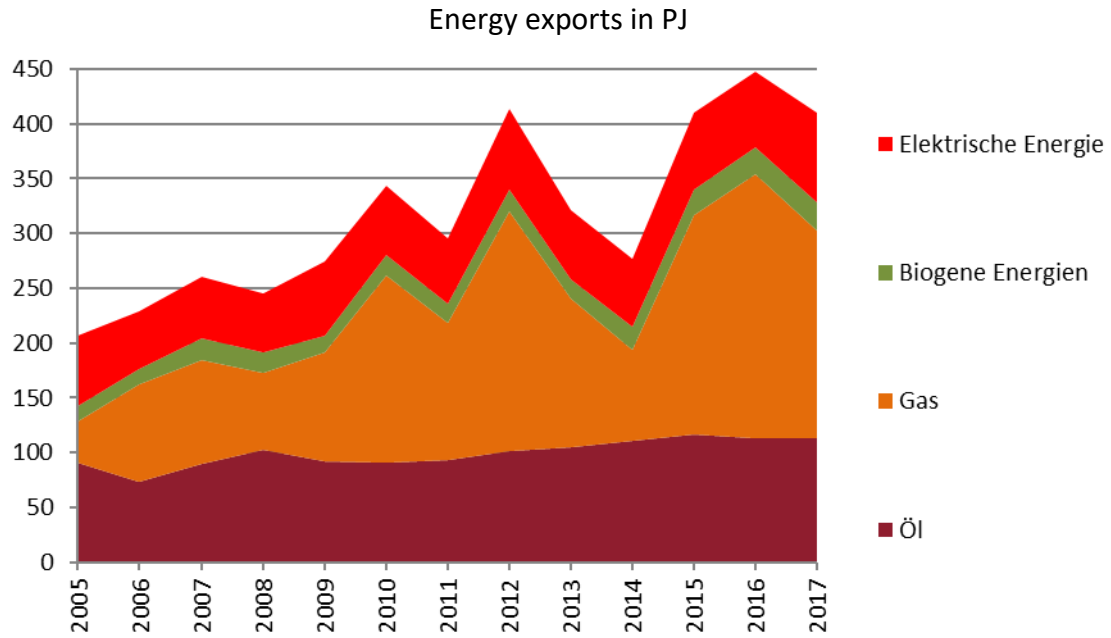
Figure 27: 2017 energy imports (share per energy source)



Source: BMNT, Energy in Austria 2018 – figures, data, facts

Kohle	Coal
Öl	Oil
Gas	Gas
Biogene Energien	Biogenic energy
Elektrische Energie	Electrical energy
Brennbare Abfälle	Combustible waste

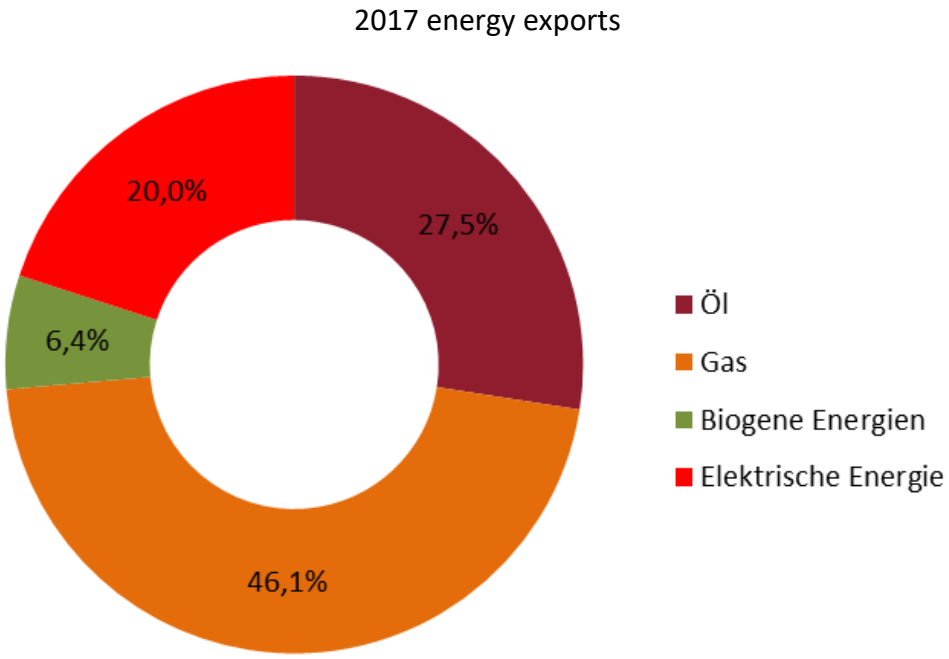
Figure 28: Energy exports by energy source, 2005-2017



Source: BMNT, Energy in Austria 2018 – figures, data, facts

Elektrische Energie	Electrical energy
Biogene Energien	Biogenic energy
Gas	Gas
Öl	Oil

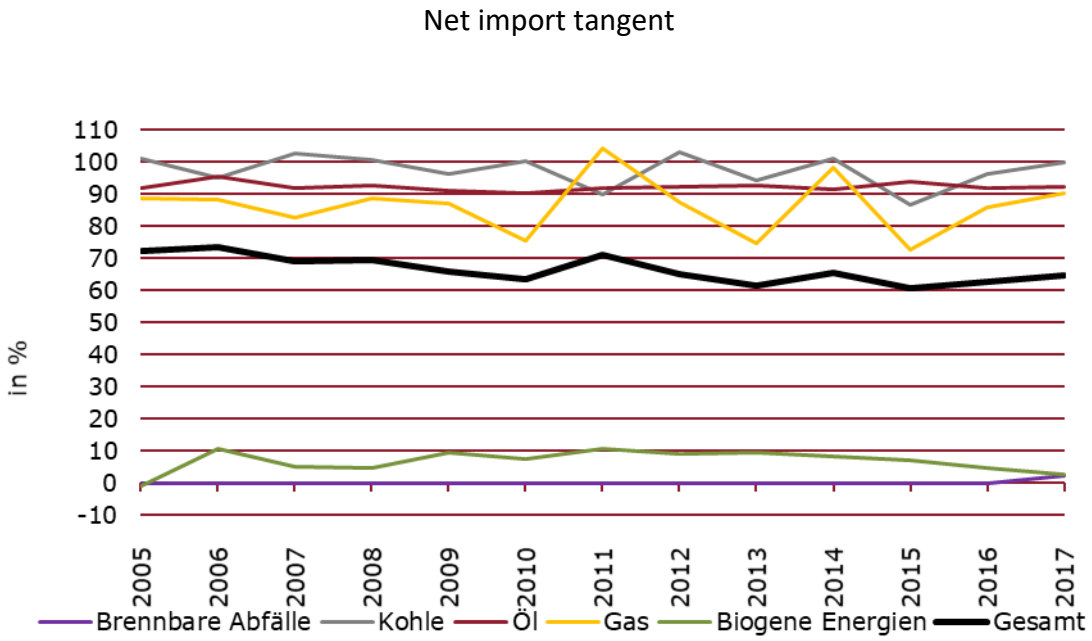
Figure 29: 2017 energy exports (share per energy source)



Source: BMNT, Energy in Austria 2018 – figures, data, facts

Öl	Oil
Gas	Gas
Biogene Energien	Biogenic energy
Elektrische Energie	Electrical energy

Figure 30: 2005-2017 net import tangent by energy source



Source: BMNT, Energy in Austria 2018 – figures, data, facts

Brennbare Abfälle	Combustible waste
Kohle	Coal
Öl	Oil
Gas	Gas
Biogene Energien	Biogenic energy
Gesamt	Total

ii. Projection of developments with existing policies and measures at least until 2040 (including for 2030)

Table 20: Projection of final energy consumption and gross inland consumption (total)

	2016	2020	2030	2040
Final energy consumption (PJ)	1,121	1,155	1,180	1,203
Gross inland consumption (PJ)	1,435	1,464	1,474	1,498

Source: Federal Environment Agency 2018

Table 21: Projected electricity supply (domestic production plus net imports)

Supply (TWh)	**2015**	**2020**	**2030**	**2040**
Fossil	15	14	11	9
Hydroelectric power	37	42	42	44
Biomass	4	5	5	6
Ambient heat, etc.	0	0	0	0
Photovoltaics	1	2	3	5
Wind energy	5	8	9	16
Total	**62**	**70**	**71**	**81**
Imports	10	6	14	15
Supply	**72**	**76**	**84**	**95**

Source: Federal Environment Agency 2019

N.B.: Differences due to rounding

4.5. Dimension: Internal Energy Market

4.5.1. Electricity interconnectivity

i. Current interconnectivity level and main interconnectors

For details see Section A, point 1.2, sub-point ii, Dimension 4: market integration.

ii. Projections of interconnector expansion requirements (including for the year 2030)

For details on PCIs, see Section A, point 1.2, sub-point ii, Dimension 4: market integration.

4.5.2. Energy transmission infrastructure

i. Key characteristics of the existing transmission infrastructure for electricity and gas

For details see Section A, point 1.2, sub-point ii, Dimension 4: market integration.

ii. Projections of network expansion requirements at least until 2040 (including for 2030)

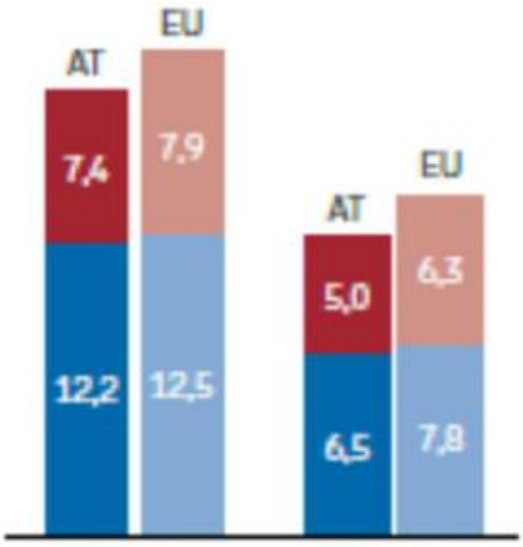
For details on PCIs, see Section A, point 1.2, sub-point ii, Dimension 4: market integration.

4.5.3. Electricity and gas markets, energy prices

i. Current situation of electricity and gas markets, including energy prices

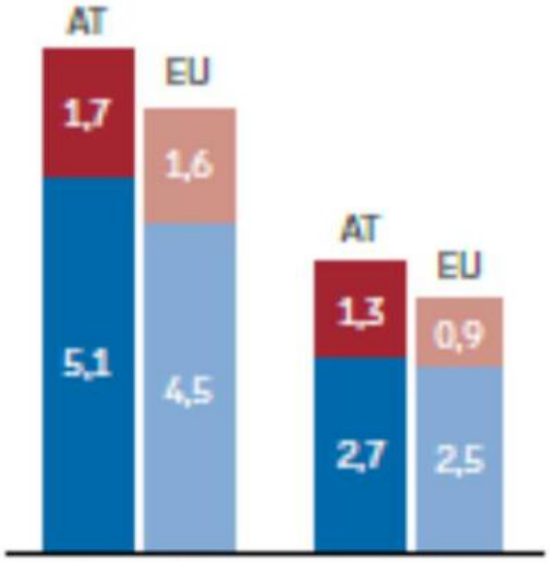
Figure 30: 2017 electricity and gas prices

2017 industry and household electricity prices
by component, in cents/kWh
● Tax and duty
● Energy components, incl. grid*



Household **Industry**
* Energy and grid components shown as totals
Source: Eurostat

2017 industry and household gas prices
by component, in cents/kWh
● Tax and duty
● Energy components, incl. grid*



Household **Industry**
* Energy and grid components shown as totals
Source: E-Control und Statistics Austria

Source: BMNT, Energy in Austria 2018 – figures, data, facts

ii. Projection of developments with existing policies and measures at least until 2040 (including for 2030)

Table 22: Projected electricity supply (domestic production plus net imports)

Supply (TWh)	**2015**	**2020**	**2030**	**2040**
Fossil	15	14	11	9
Hydroelectric power	37	42	42	44
Biomass	4	5	5	6
Ambient heat, etc.	0	0	0	0
Photovoltaics	1	2	3	5
Wind energy	5	8	9	16
Total	**62**	**70**	**71**	**81**
Imports	10	6	14	15
Supply	**72**	**76**	**84**	**95**

Source: Federal Environment Agency 2019

N.B.: Differences due to rounding

4.6. Dimension: Research, Innovation and Competitiveness

i. Current situation in the low-carbon-technologies sector and, to the extent possible, its position on the global market (that analysis is to be carried out at European and/or global level)

Roadmaps and research strategies

Energy Research and Innovation Strategy

In order to bring the Energy Research and Innovation Policy on course, the Ministry for Transport, Innovation and Technology and the Climate and Energy Fund have been working hard since 2016 to prepare the new Energy Research and Innovation Strategy. As part of a multi-stage dialogue process, a strategy paper was developed with economics, administration and research experts. The paper sees the wholesale transformation of the energy supply system as an opportunity for domestic companies and lays down the future strategic pathway for energy research and innovation.

https://nachhaltigwirtschaften.at/de/e2050/publikationen/energie-forschungs-innovationsstrategie.php

For various sectors and types of technology, national technology roadmaps are in place. These present the development status of the technology and markets in question and describe development scenarios:

Technology roadmap - energy storage systems at home and abroad (2018)

https://www.klimafonds.gv.at/wp-content/uploads/sites/6/Technologieroadmap_Energiespeichersysteme2018.pdf

R&D roadmap for district heating and cooling (2015)

https://www.klimafonds.gv.at/wp-content/uploads/sites/6/FEFahrplan-FernwaermeFernkaelte.pdf

R&D roadmap for energy efficiency in industry (2014)

https://www.klimafonds.gv.at/wp-content/uploads/sites/6/KLIEN2014FuE-FahrplanEnergieeffizienzinderenergieintensivenIndustrie.pdf

Solar technology roadmap (2016)

https://nachhaltigwirtschaften.at/de/e2050/publikationen/technologie-roadmap-fuer-photovoltaik-in-oesterreich.php

Photovoltaics have seen a breakthrough in recent years, from a marginal technology to a key part of the energy supply. The roadmap describes the potential for photovoltaics in Austria, focusing in particular on industry, the development of buildings and towns/cities, and energy infrastructure.

Heat pump technology roadmap (2016)

https://nachhaltigwirtschaften.at/de/e2050/publikationen/oesterreichische-technologieroadmap-fuer-waermepumpen.php

Heat pumps are a versatile technology in terms of making use of renewable energy and energy efficient technology. The roadmap identifies the considerable technological and economic potential of heat pumps as part of the future energy system and produces recommendations for national research, technology and innovation policy, industry and business.

Research, technology and innovation: power-to-gas roadmap (2014)

https://nachhaltigwirtschaften.at/de/e2050/publikationen/fti-roadmap-power-to-gas-fuer-oesterreich.php

A study of technological and systemic aspects relating to chemical storage of electrical energy in the form of gaseous substances as a possibility for long-term energy storage.

'Solar heat 2025' roadmap – An analysis of the technology and market, with recommendations (2014)

https://nachhaltigwirtschaften.at/de/e2050/publikationen/roadmap-solarwaerme-2025.php

From an energy policy and social perspective, solar heat has an important role to play in terms of future, long-term energy supply. The roadmap comprises an analysis of the technology and market, a discussion of more than 100 targeted recommendations and a presentation of their potential impact in three different development scenarios.

Smart grids technology roadmap 2020 (2015)

https://nachhaltigwirtschaften.at/de/e2050/highlights/fti-strategie-smart-grids-2-0/technologie-roadmap-smart-grids-2020.php

In 2014/15, Austrian Smart Grid experts developed the Smart Grids Austria 2020 technology roadmap as part of the Smart Grids Austria technology platform. The roadmap provides a complete overview of the current development status and presents specific steps forward. It also describes benefits for industry, the e-economy and society as well as education and awareness-raising amongst the public.

Innovative energy technology in Austria – 2017 market developments

Biomass, photovoltaics, solar thermal, heat pumps and wind energy[28]

In 2017, there was a mixed picture in terms of the development of low-carbon energy technology. Biomass fuels, biomass boilers, photovoltaics and heat pumps saw considerable growth, whilst biomass stoves, solar thermal and wind energy saw sales figures fall. A slight increase was observed compared to 2016. Persistently low fossil fuel prices, an increase in the price of solid biomass and competition between certain low-carbon energy technologies were major factors which influenced market activity.

Further details on market developments in individual sectors are presented below:

a) Solid biomass – fuel

Use of solid biomass for energy – of which there is a long tradition in Austria – is one of the central pillars in terms of how renewable energy is used in Austria. Between 2016 and 2017, use of pellets increased by 6.7% to reach 16.3 PJ (960,000 tonnes). There are 32 Austrian pellet producers ensuring the supply of pellets who have built up their production capacity to 1.61 million tonnes/year.

In 2017, 10.2 mt CO_2eq was saved thanks to solid biogenic fuel. The biofuel industry generated a total revenue of EUR 1.606 billion
in 2017, with an impact on employment corresponding to 18,967 full-time jobs in this sector.

[28] Innovative energy technology in Austria – 2017 market developments – biomass, photovoltaics, solar thermal, heat pumps and wind energy, Peter Biermayr et al, published by BMVIT, part of the 'Energy and Environmental Research' series, 4/2018, June 2018, https://nachhaltigwirtschaften.at/de/iea/publikationen/innovative-energietechnologien-in-oesterreich-marktentwicklung-2017.php

The availability of suitable competitively-priced raw materials is critical to the success of bioenergy. Improved measures to increase the use of biogenic residue and waste are also a prerequisite. In addition to its traditional use for heating purposes, bioenergy is increasingly taking on the role of becoming part of an overall system in combination with other renewables.

b) Solid biomass – boilers and stoves

In Austria, the market for biomass boilers experienced sustained, rapid growth between 2000 and 2006. In 2007, sales of all types of boiler fell due to low oil prices. That same year, there was also a shortage of wood pellets, leading to a significant increase in pellet prices. This caused the pellet boiler market to slump by 60%. With the economic and financial crisis in 2009, sales fell by a further 24%. In 2011 and 2012, sales of pellet boilers rose sharply. Between 2013 and 2016, a decline in sales of biomass boilers was again observed. This was caused by rising biomass fuel prices, early investments in the years following the economic and financial crisis, low oil prices and high average temperatures. 2017 saw renewed growth in sales of all types of boiler, with the exception of log wood boilers (-13.4%). Sales of wood chip boilers (<100 kW) rose by 11.8% as compared to 2016, and pellet boilers by as much as 19.3%.

Austrian biomass boiler manufacturers typically sell approximately 80% of their production abroad. Economic activity in the biomass boiler and stove market generated sales of EUR 863 million in 2017, with an impact on employment corresponding to 3,601 jobs. Research into biomass boilers is focused on how to reduce emissions further and how to use biomass as an energy source in industrial and commercial processes with high heat demand. So that success on international markets continues to be possible, it is essential for the cost of installation technology to be reduced further, while at the same time maintaining high technical quality.

c) Photovoltaics

For the first time in three years, 2017 saw a notable increase in newly installed photovoltaic capacity in Austria. Photovoltaic systems connected to the grid with a total capacity of 172,479 kWpeak and self-sufficient systems with a total capacity of 476 kWpeak were installed, which represented an increase of 11%.

In 2017, photovoltaic installations operating in Austria were able to produce electricity of at least 1,269 GWh, thereby reducing CO_2 emissions by 377,392 tonnes.

The Austrian photovoltaic industry is active in the production of modules, inverters and other additional components, the installation of equipment, and in research and development. 2,813 full-time jobs were recorded in this sector in 2017. In Austria, the average system price of a 5 kWpeak photovoltaic system connected to the grid fell from EUR 1,645/kWpeak in 2016 to EUR 1,621/kWpeak, i.e. by 1.47%.

The development of photovoltaic equipment for integration into buildings is of strategic importance to Austria as this is precisely the sector where a particularly high level of national added value is deemed attainable. With building-integrated photovoltaic systems as a research and innovation priority, the Austrian industry may be able to enter a niche market, opening up opportunities on major export markets worldwide.

d) Solar thermal energy

Following considerable growth during the period up to 2009, the Austrian market has seen eight consecutive years of decline. The causes of this initially included the effects of the financial and economic crisis. However, there are now other causes, namely the significant fall in the price of photovoltaic systems, increased use of heat pumps and persistently low oil prices.

In 2017, 101,780 m^2 of new solar panels were installed, corresponding to a capacity of 71.1 MWth. The solar thermal market in Austria therefore saw a decline of 9.1% as compared with 2016. The share of solar panel exports hit approximately 84% which represents a slight increase. The estimated turnover of the solar thermal sector in 2017 was EUR 178 million. Approximately 1,500 full-time jobs can be inferred from this. Large seasonal heat storage projects are being considered an option for the future of solar thermal energy. Many such projects have already been set up in Denmark.

e) Heat pumps

Total sales of heat pumps (domestic market plus export market) increased from 33,094 units sold in 2016 to 36,446 units in 2017. This corresponds to 10.1% growth. Considerable growth was registered on both the domestic market (+9.1%) and export market (+12.5%). In particular, heat pumps with a capacity of up to 20 kW saw strong growth. Domestic hot water heat pumps registered an increase of 7.7% on the domestic market and a decline of 8.5% on the export market.

Research and development efforts in respect of heat pump systems are currently focused on installations which work in combination with other technology, e.g. solar thermal systems or photovoltaic systems. Efforts are also focused on the development of new energy services, e.g. cooling and air-conditioning, and building drainage in the renovation sector. The use of other fuels such as natural gas and its feed-in into smart grids is broadening the scope for innovation.

f) Wind power

In 2017, 63 new wind turbines with a total capacity of 196 MWel were installed in Austria.

By the end of the year, 1,260 wind turbines with a rated capacity of 2,844 MWel were on the grid. This capacity means that between 6.5 and 7 TWh of electricity can be produced each year, corresponding to approximately 10 to 11% of electricity consumption in Austria. Electricity

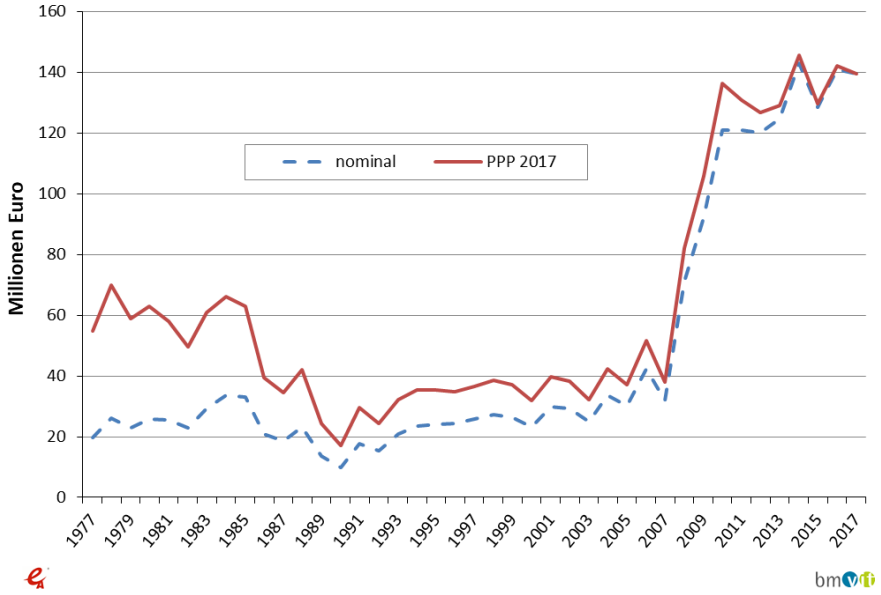
production potential has therefore increased by 19% or 1.3 TWh since the end of 2016. Assuming the substitution of ENTSO-E imports, Austria was able to save more than 1.9 mt CO_2eq in 2017. When substituting the share of fossil fuels in the ENTSO-E mix, savings amount to 4.3 mt CO_2eq.

In 2017, Austrian operators realised just under EUR 551 million through the sale of wind power. Investments of more than EUR 323 million by those companies enabled more than EUR 92 million in domestic added value to be generated. Operating those installations over the next 20 years will make it possible to generate a further EUR 216 million in domestic added value. In 2017, the turnover of the Austrian supply industry was just under EUR 454 million, with the wind power sector generating a total turnover of EUR 1.005 billion. 2017 saw 1,330 people directly employed in the wind power supply industry, with a further 3,074 jobs in the construction, maintenance and demolition of wind turbines. Of those jobs, 372 were with domestic operators. In total, this therefore corresponds to at least 4,404 jobs.

ii. Current level of public and, where available, private research and innovation spending on low-carbon technologies, current number of patents, and current number of researchers.

According to the Austrian Energy Agency, public spending on research, development and demonstration projects in the energy sector amounted to EUR 139.3 million in 2017, down EUR 1.6 million on the previous year.

Figure 31: Time series of public spending on energy research between 1977 and 2017, nominal and adjusted for inflation



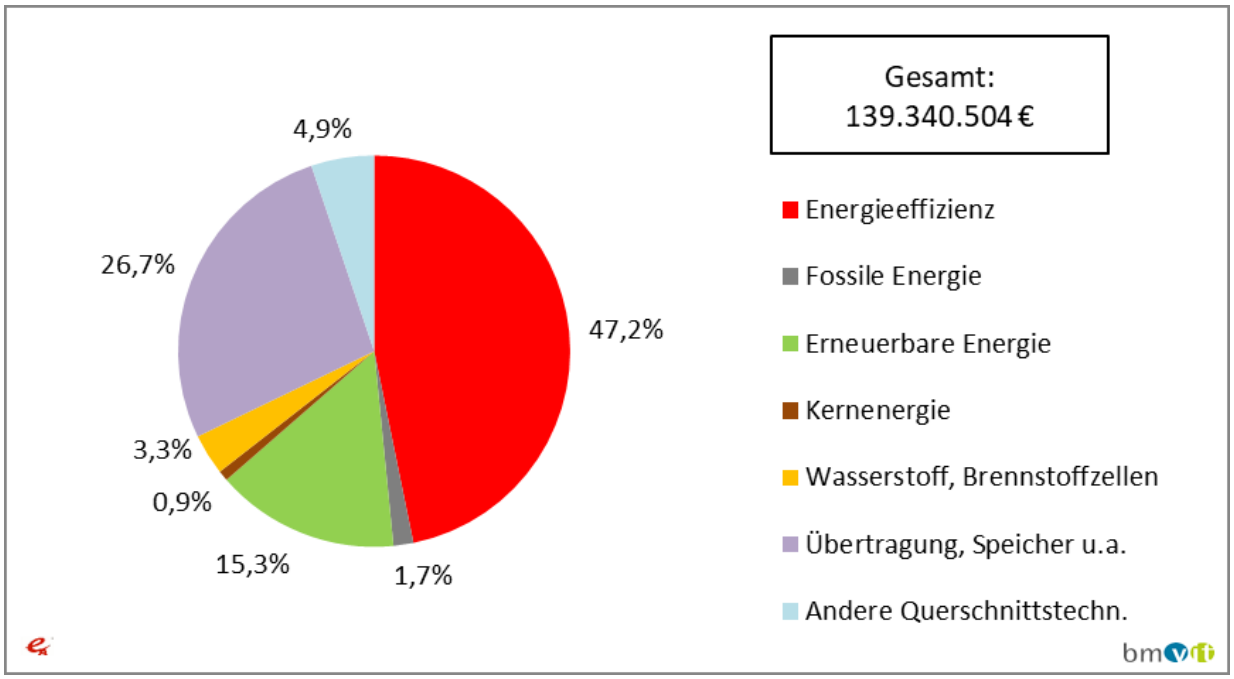
Source CPI: Statistics Austria, 2018

Millionen Euro	Million EUR
nominal	Nominal
PPP 2017	PPP 2017

There were around 850 projects and activities recorded for 2017. 63.9% of funds were used for applied research and 22.8% for experimental development. 8.1% came under 'initial demonstrations'. The smallest share, at 5.2%, went to energy-related basic research.

As in previous years, most expenditure was on 'energy efficiency' (EUR 65.7 million or 47.2%), followed by 'transmission, storage, etc.' which increased in 2017 by EUR 6.2 million to EUR 37.2 million.

Figure 32: Total spending on energy research in Austria in 2017 according to IEA codes

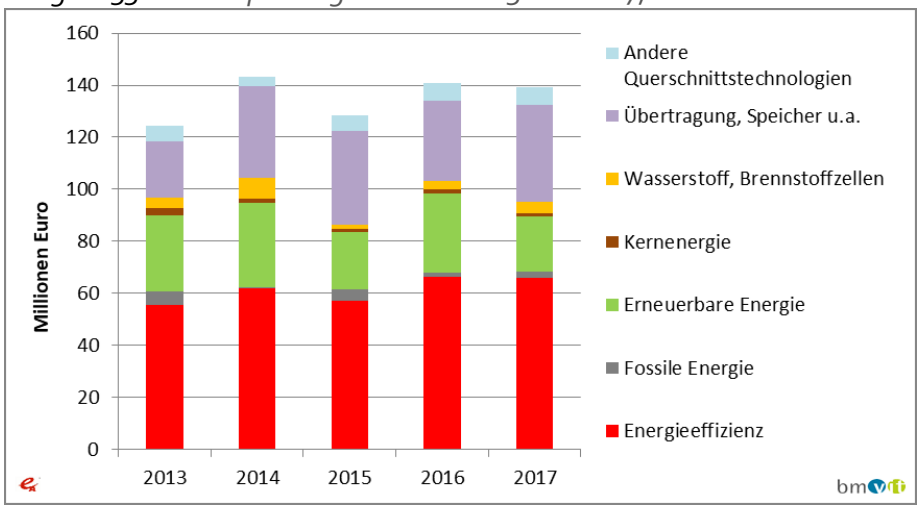


Source: Energy Research Compilation 2017

Gesamt: 139.340.504 €	Total: EUR 139 340 504
Energieffizienz	Energy efficiency
Fossile Energie	Fossil fuels
Erneuerbare Energie	Renewable energy
Kernenergie	Nuclear energy
Wasserstoff, Brennstoffzellen	Hydrogen, fuel cells
Übertragung, Speicher u.a.	Transmission, storage, etc.
Andere Querschnittstechn.	Other cross-cutting technology

Spending on renewable energy sources fell significantly in 2017, with a decline of about one third to EUR 21.4 million. These three areas, corresponding to 89% of spending, clearly reflect Austria's priorities for publicly financed energy research. Comparatively speaking, far less funding went to the other four areas, namely fossil fuels, nuclear energy, hydrogen and fuel cells and other cross-cutting technology.

Figure 33: Public spending between 2013 and 2017, in nominal terms



Source: Energy Research Compilation 2017

Millionen Euro	Million EUR
Andere Querschnittstechnologien	Other cross-cutting technology
Übertragung, Speicher u.a.	Transmission, storage, etc.
Wasserstoff, Brennstoffzellen	Hydrogen, fuel cells
Kernenergie	Nuclear energy
Erneuerbare Energie	Renewable energy
Fossile Energie	Fossil fuels
Energieffizienz	Energy efficiency

Three quarters of the spending from 2017 presented in this report was direct financing through funding bodies (federal, provincial, funds). The remainder was 'own research' financed by the federal or provincial governments (using 'own resources').

In 2017, as has been the case since 2008, the Climate and Energy Fund received the most public funding for R&D, albeit significantly less than the previous year (EUR 38.7 million). The federal ministries made EUR 25.1 million available, which is EUR 5.4 million less than in 2016. Of that EUR 25.1 million, EUR 15.8 million came from the Federal Ministry for Transport, Innovation and Technology. Spending under the research funding companies' basic programmes primarily aimed at companies to carry out experimental development activities was as high as Federal Government spending, reaching EUR 25 million thanks to an increase of EUR 10.8 million. Provincial spending in 2017 increased significantly as compared to the previous year (reaching EUR 10.5 million).

There are currently 22 public universities in Austria. In recent years, nine of those universities announced self-financed spending on energy research. As in previous years, 2017 saw a reduction in self-financed activities.

In contrast to 'traditional' public universities, privately-run technical college [*Fachhochschule*] degree programmes are relatively new. They were first introduced in 1994 as university-level academic vocational training. There are currently 21 technical colleges in Austria. In recent years, 13 of these have announced self-financed spending on energy research, with considerable variation between them.

Among the non-university research institutions included in this compilation, self-financed energy-related R&D rose slightly between 2016 and 2017, in particular because the Austrian Institute of Technology (AIT) was able to increase its own funds investment in the energy sector to EUR 27.4 million in 2017. AIT accounted for the lion's share (97%) of total self-financing used in this sector for energy purposes.

Private spending on research

Whereas data on public spending on energy research in Austria has been gathered on a regular basis for 40 years and is available in detail, only rough estimates had previously been available on the significantly higher spending coming from the business sector. For this reason, detailed surveys and in-depth analyses were carried out by the Austrian Energy Agency in 2017 on behalf of the Federal Ministry for Transport, Innovation and Technology based on Statistics Austria's surveys from 2007 to 2015.

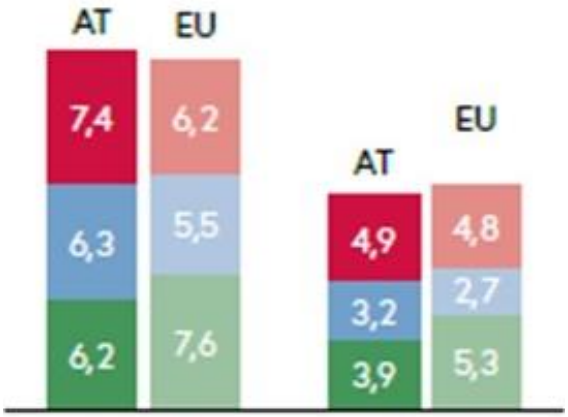
3,611 Austrian companies declared self-funded R&D totalling EUR 7.5 billion in 2015, of which

spending from 571 companies – amounting to EUR 485 million – was classified under the socio-economic priority 'energy'. Energy was therefore the sixth largest of the fourteen areas, corresponding to a share of 6.5%.

Almost half of this amount came from companies in the electrical equipment sector. By quite some margin, mechanical engineering was second with 8.4%, closely followed by manufacturers of electronic components and printed circuit boards. By contrast, energy suppliers contributed just under 2% of energy research spending from businesses.

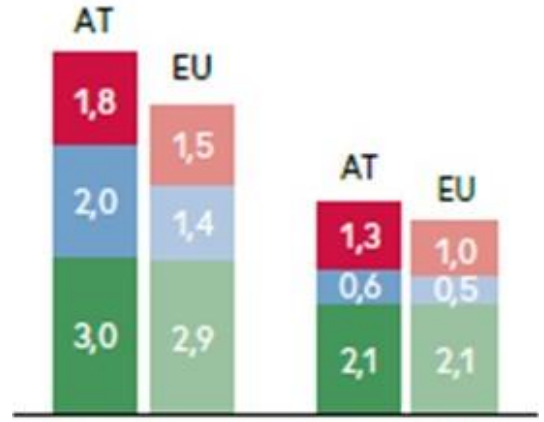
iii. Breakdown of current price elements that make up the main three price components (energy, networks, taxes/levies)

Electricity prices for industry and residential 2018
broken down by component in cent/kWh
- Taxes and duties
- Network costs
- Energy and supply



Source: Eurostat

Gas prices for industry and residential 2018
broken down by component in cent/kWh
- Taxes and duties
- Network costs
- Energy and supply



Source: Eurostat

iv. Description of energy subsidies, including for fossil fuels

Incentives and support measures that have a counterproductive impact are assessed against the Federal Government's Climate and Energy Strategy as part of an internal process led by the Federal Ministry of Finance and discussed with the Federal Ministry of Sustainability and Tourism and the Federal Ministry of Transport, Innovation and Technology. A corresponding sector-based list of counterproductive incentives and support measures (for the ETS and non-ETS areas) is updated on a continuous basis and serves as a starting point for the gradual removal of measures classified as counterproductive set to take place between 2021 and 2030.

5. Impact assessment of planned policies and measures

5.1. Impacts of the planned policies and measures described in Section 3 on the energy system, GHG emissions and GHG phase-out with a comparison against the projections given in the current policies and measures (described in Section 4)

All measures established in the NECP were assessed with regard to their direct and indirect impact on greenhouse gas reduction. The specific assumptions and details of the measures included in these impact assessments (WEM and WAM) are the responsibility of the respective Federal Ministries.

The presentation of the measures for the impact assessments (WEM and WAM) has no prejudicial effect on the question regarding the extent to which they require public funds and where those funds would come from.

The assumptions regarding the development of international energy and allowance prices and those regarding social development were not changed with regard to the WEM scenario (see Tables 9 and 10) and essentially follow the European Commission recommendations.

i. Projected evolution of the energy system and of greenhouse gas emissions and reductions and, where relevant, projected evolution of atmospheric pollutant emissions in accordance with Directive (EU) 2016/2284 with the planned policies and measures until at least 10 years after the period covered by the plan (including the final year of the plan's validity period), taking into consideration the relevant union policies and measures

The 'with additional measures' (WAM) scenario takes into consideration the measures and objectives described in the NECP, as well as the WEM scenario. These measures and objectives will be implemented in the coming months and years using suitable regulatory, fiscal, funding-policy and awareness-raising instruments in order to bring about the effects laid out below. The measures listed as options in Table 1 are the only exception to this. These are not taken into account in the WAM model.

The 'with additional measures' (WAM) scenario points to a reduction in emissions from sources not subject to emissions trading of around 41.5 mt CO_2eq by 2030, which corresponds to a reduction of around 27% when compared with 2005. Despite clear reductions, the transport

sector remains the largest emitter in the non-ETS sector, at 49%, followed by the agriculture sector in second place. Buildings and energy & industry share third place, with similarly high emission levels.

As specified, the measures listed as options in Table 1, in particular

- further greening of the incentive, funding and tax system,
- extension of the emissions trading system (ETS) to other sectors,
- identification and gradual phasing out of counterproductive incentives and subsidies

are not included in the WAM-scenario model.

Due to the complex issues surrounding the climate and the resulting comprehensive mutual impacts on public and private finance flows, correlating with a correspondingly high level of risk for public budgets both in terms of revenue (public levies and subdivision of the federal budget for the environment, energy and climate) and in terms of expenditure (including Federal Budget Category 4, Economy, Infrastructure and Environment), it is critical that efforts are taken to ensure that publicly funded measures are as effective as possible. The critical factor in implementing and prioritising the planned measures and any measures going beyond that is, therefore, the question surrounding the directly or indirectly associated reduction in greenhouse gas emissions.

The results of the WAM model show that using these instruments will be necessary to cover the remaining gaps of around 5.2 million tCO_2eq that will be required to achieve a GHG reduction of 36% by 2030 through domestic measures. The aim is to reduce GHG emissions by at least 2 million tCO_2eq by 2030 by gradually phasing out counterproductive incentives and subsidies. Decisions regarding the exact shaping of this plan and the plan to reduce the remaining 3.2 million tCO_2eq will be taken by a future Federal Government. These measures will also have a considerable impact on energy efficiency and the share of renewable energy sources in the energy system.

In terms of final energy consumption in 2030, the consumption under the WAM scenario is 46 PJ less than that of the WEM scenario. The share of renewable energy sources in the gross final energy consumption is almost 10 percentage points higher thanks to the development of wind power and photovoltaics.

By 2030, primary energy consumption will drop by 45 PJ under the WAM scenario, as compared with the WEM scenario. Primary energy intensity (primary energy consumption/GDP, see point 2.2) will drop by 17% between 2015 and 2030 under the WEM scenario, and by 20% under the WAM scenario.

Table 23: Evolution of the WAM scenario in terms of energy consumption and share of renewable energy overall

	2016	2020	2030	2040
Final energy consumption (PJ)	1,122	1,155	1,134	1,133
Gross inland consumption (PJ)	1,435	1,463	1,426	1,421
Renewable share	34%	35%	46%	49%

Source: Federal Environment Agency 2019

Table 24: Difference between the WEM scenario and the WAM scenario in terms of energy consumption and share of renewable energy overall

	2016	2020	2030	2040
Final energy consumption (PJ)	0	0.3	46	69
Gross inland consumption (PJ)	0	0.3	47	78
Renewable share	0.0%	-0.3%	-9.8%	-11.5%

Source: Federal Environment Agency 2019

Table 25: WAM scenario: Electricity supply from renewable energy sources and fossil fuels

Supply (TWh)	**2015**	**2020**	**2030**	**2040**
Fossil	15	14	11	9
Hydroelectric power	37	42	44	45
Biomass	4	5	6	6
Ambient heat, etc.	0	0	0	0
Photovoltaics	1	2	12	13
Wind energy	5	8	17	20
Total	**62**	**71**	**89**	**92**
Imports	10	5	-4	3
Supply	**72**	**76**	**85**	**95**

Source: Federal Environment Agency 2019

N.B.: Differences due to rounding

Table 26: Difference between the WEM scenario and the WAM scenario in terms of electricity supply.

Supply (TWh)	2015	2020	2030	2040
Fossil	0	0	0	0
Hydroelectric power	0	0	-2	-1
Biomass	0	0	0	0
Ambient heat, etc.	0	0	0	0
Photovoltaics	0	0	-8	-7
Wind energy	0	0	-8	-3
Total	**0**	**-1**	**-19**	**-12**
Imports	0	1	18	12
Supply	**0**	**0**	**-1**	**0**

ii. Assessment of strategic interrelations (between current and planned policies and measures within one policy area and between the current and planned policies and measures of various policy areas) at least until the final year of the plan's validity period, with the particular aim of gaining comprehensive knowledge of how energy efficiency/energy-saving measures affect the required size of the energy system and thereby reduce the risk of stranded investments in the energy supply

The most important planned packages of incentives underlying the WAM scenario are:

- in the transport sector, the increase in fleet efficiency (including massive expansion of electromobility), the improvement of public and goods transport through increased investment in this area, expanded mobility management, increased consideration of climate aspects in spatial planning and increased speed limit controls;
- in the buildings sector, the intensive replacement of fossil energy sources, primarily fuel oil, via appropriate funding-policy and regulatory measures to bring about the switchover to renewable heating systems and an increase in renovation rates and quality;
- in the industrial sector, an increase in energy efficiency through funding-policy and regulatory measures and the replacement of fossil energy sources, primarily replacing natural gas with biogas;
- in the energy sector, the development of renewable energy sources for electricity generation, the generation of renewable methane from biomass and hydrogen from renewable electricity;
- in the agricultural sector, the reduction of mineral fertilisation, changes in feed and pasture grazing and production of biogas from farm manure.

When implementing the measures, efforts must be made to ensure that this results in multiple interrelations between the individual sectors. For example, part of the development of

photovoltaics will be the result of measures implemented in the buildings sector. Likewise, changes in rights of residence are necessary to increase the number of private charging stations for electric vehicles. Electric and hydrogen-powered vehicles require more electricity, which, in turn, needs to be supplied from renewable energy sources. Similarly, a switchover to biomass requires a supply from agriculture and forestry without placing a strain on natural sinks or jeopardising the food supply. Economic growth and higher consumption not only support the production sector, but also goods transport and services. Finally, any rebound effects must not be ignored: for example, average room temperature following a thermal renovation are generally higher and industrial companies will become more competitive and will be able to increase their production due to energy saving measures.

iii. Assessment of strategic interrelations between current and planned national policies and measures and Union climate and energy policy measures

As specified in point 1, achieving the climate and energy goals by 2030 requires, on the one hand, a multitude of national policies and measures and, on the other, effective framework conditions at Union level. On that basis, critical technology pathways, for example, which are partly based on assumptions in this impact assessment, require European fundamental or systemic decisions. This is the case in particular in the transport sector, for example in relation to electromobility or the pricing of the high-level road network in accordance with the polluter-pays principle. The development and implementation of a national hydrogen strategy also needs to take place hand in hand with European strategic objectives and investment flows, as this is closely associated with issues surrounding the internal European and international competition situation and the request to avoid stranded investments.

5.2. Impacts of the planned policies and measures described in Section 3 on the economy and, where possible, on health, environment, employment and education, skills and social conditions including aspects regarding the just transition (in the form of costs, benefits and cost efficiency) at least until the final year of the plan's validity period with a comparison against the projections given in the current policies and measures.

In order to perform the socioeconomic impact assessment of the planned policies and measures, a model-based evaluation of the impacts on employment, gross domestic product and income distribution was carried out. The results of the impact assessment were calculated from the difference between the WAM ('with additional measures') scenario and the WEM ('with existing measures') scenario; the assumptions used in these scenarios were maintained.

Under the WAM scenario, employment is slightly higher than under the WEM scenario, although gross domestic product (GDP) barely changes. Cumulatively, under the planned measures (WAM scenario), employment figures for the 2020 to 2030 period surpass those under the WEM scenario by about 141,000 FTEs. This corresponds to an increase in employment of 0.32% when compared with the WEM scenario. Assuming a WEM sensitivity scenario on the basis of average annual GDP growth of just 1% (instead of 1.5%) there is slightly stronger growth in employment and gross domestic product in the WAM scenario than the WEM scenario, due to the larger free economic capacity.

The drivers behind these developments are the domestic economic sectors that will benefit from the measures established in the WAM scenario. These include, on the one hand, the construction sector, which will be boosted by the planned expansion of infrastructure for public transport, bicycles, buildings, renewable power generation and supply lines, and, on the other hand, production and employment in power generation and supply due to the planned expansion of renewable energy sources. Furthermore, the transport services will also benefit with employment increasing as a result of the planned service extensions in public transport (e.g. recruitment in train and bus transport). In manufacturing, employment will also increase in metal products and electrical equipment manufacturing and in machinery and equipment installation. These positive developments are, however, neutralised by the fact that a substantial portion of the economic activity triggered by these measures will not take place in Austria (e.g. electric and rail vehicle construction).

With regard to social impacts, the impact assessment shows that disposable household income will rise slightly for all income groups as a result of the measures established in the WAM scenario. However, this gain will tend to be greater for higher income groups (household income

distribution deciles) than for lower income groups. This can also true of the measures to be implemented in the buildings sector, which will have a stronger impact on disposable household income among the lower deciles than the higher.

These unequal income effects could be compensated by a tiered, income-based subsidy for private households for the implementation of building measures, which would be coordinated to the strengths of the respective instruments across local authorities. The organisation of this subsidy would need to be checked to ensure that the level of subsidisation of the measures to improve heating systems or building envelopes would increase as household income decreases. Taking the household economic position into consideration would increase the likelihood that households in unfavourable economic situations could also implement measures. Implementation via tax law could also be considered.

In addition to introducing a tiered, income-based subsidy, accompanying, awareness-raising measures of an organisation-legal nature are also needed to improve access to independent and public information and advice, and to reduce organisational barriers for households in energy poverty.

With regard to the environment and health, the planned measures would not only bring about a reduction in greenhouse gas emissions, but would also lead to a reduction in the emission of atmospheric pollutants. The emission reduction measures prioritise reducing NOx and PM 2.5 in the transport and industrial sectors and NH_3 in agriculture. In the buildings sector, the increased use of biomass will result in more emissions from this source. Nevertheless, overall, the majority of the measures proposed are expected to bring about positive impacts on air quality.

The traffic measures described may also reduce noise pollution. The measures to be implemented in the transport, buildings, industry, waste management and agriculture sectors are expected to have positive effects on human health by reducing fine particulate matter. Thermal building renovation and building cooling (including operational buildings) are also relevant for climate change adaptation and have a positive impact on human health (e.g. when the weather is hot).

5.3. Overview of required investments

i. Existing investment flows and assumptions regarding future investments in connection with the planned policies and measures

Considerable investments have already been made in the areas of energy, mobility and climate in Austria over the last few years. This investment focus must be intensified considerably in the period to 2030. The estimated total investment volume for the period to 2030 is around EUR 166 to 173 billion. Public authorities will also be making a contribution, as well as creating appropriate incentives to boost investment. The following table shows the estimated investments required to achieve the objectives established in this plan. Information on additional, public and private investments is given as an indication.

Table 27: Investment requirement and financing sources for achieving the targets by 2030, in EUR millions (general overview)

Investment area	**Overall investments for entire period to 2030**	**Sources of financing/funds for period to 2030**		
		Public		**Private investments and 'green finance'**
		National (Federal government/ provinces/m unicipalities)	**EU**	
	EUR million			
Transport [29]	**97,183**	✓	✓	✓
Passenger transport (VDVs [Association of German Transport Companies]) [30], [31]	18,560	✓	-	
'Nahverkehrsmilliarde' [A billion for local transport] [30]	3,259	✓	-	-
Austrian Federal Railways framework plan [30]	32,279	✓	✓	-

[29] In the area of transport, the table contains only investments that are fully or partially funded by the Federal Government. Investments made exclusively from other local authorities or wholly from private investors are not included. Investments for the Vienna underground train system are also not included.

[30] Total investments in accordance with the WAM scenario.

[31] Traffic services on self-financed routes are not included.

Investment area	Overall investments for entire period to 2030	Sources of financing/funds for period to 2030		
		Public		Private investments and 'green finance'
		National (Federal government/ provinces/municipalities)	EU	
	EUR million			
Goods transport [30]	2,635	✓	-	✓
E-mobility (road) [32]	36,000 [33]	✓	✓	✓
Expansion of cycling [30, 34]	2,200 [35]	✓[36]	✓	
Inland waterway transport [30, 37]	50	✓	✓	
Mobility management	*2,200*	✓	✓	✓
Energy system (electricity, gas, district heating)	**31,547-38,547**			✓
Expansion of electricity generated from renewable energy	20,000-27,000			

[32] Federal Ministry of Sustainability and Tourism share in klimaaktiv mobil (the National Action Programme for Mobility Management) approx. EUR 234 million on the assumption of a gradual increase from the current level of EUR 12.5 million to EUR 30 million by 2030. Remaining national funds from Federal Ministry of Transport, Innovation and Technology amounting to EUR 88 million.

[33] The investment value represents the total volume of newly acquired e-vehicles in all vehicle categories (in particular e-cars, e-utility vehicles, e-buses, including fuel cell technology) and expansion of charging infrastructure in the period to 2030. Public support measures include subsidies for vehicle purchases with renewable energy and charging infrastructure.

[34] According to the WAM scenario, investment totalling around EUR 2.2 billion will be necessary from all local authorities to develop cycling in Austria. Federal Ministry of Sustainability and Tourism share (including EU resources) in klimaaktiv mobil approx. EUR 330 million. These values would be required for a maximum expansion and are taken into account in their entirety in the third WAM model run.

[35] Of which EUR 132 million from the Federal Ministry of Transport, Innovation and Technology budget (connection to public train stations).

[36] 20% of national financing from federal government, 80% from states and municipalities.

[37] Additional measures to improve fairway conditions (not land-based electricity connections) and funding programme for the use of GHG-reducing measures on inland waterway vessels.

Investment area	Overall investments for entire period to 2030	Sources of financing/funds for period to 2030		
		Public		Private investments and 'green finance'
		National (Federal government/ provinces/m unicipalities)	EU	
	EUR million			
Biogas (generation, conversion, feed-in/connection to networks)	1,800			
Expansion of electricity networks	6,000			
Development of hydrogen infrastructure (generation, H2 and synthetic methane storage, IPCEI on hydrogen) *Of which IPCEI on hydrogen*[38]	2,660 *1,160*	✓		✓
District heating and networks (renewable)	1,667	✓	✓	
Heating and cooling (buildings and industry)	**29,728**	✓		✓
Thermal renovation of building envelopes	16,260	✓		
Heating system renovation	8,730	✓		
Industry (non-ETS)	4,000	✓	✓	
Energy efficiency & waste heat usage	738	✓		

[38] IPCEI on hydrogen (EUR 300 million) has been included both under energy systems and under innovation, research and development. These totals are not to be understood cumulatively, but in terms of content, as this IPCEI comprises both energy and innovation aspects.

Investment area	Overall investments for entire period to 2030	Sources of financing/funds for period to 2030		
		Public		Private investments and 'green finance'
		National (Federal government/ provinces/m unicipalities)	EU	
	EUR million			
Other sectors	**1,020**	✓		✓
Agriculture and forestry	220	✓	✓	
F-gases & waste management	800	✓		
Innovation, research & development	**6,971**	✓	✓	✓
Zero Emission Mobility (Climate and Energy Fund, KLI.EN)	250	✓		✓
Mission-oriented mobility priorities (Flagship Projects 9 and 10)	1,500	✓		✓
IPCEIs on hydrogen [36] and on batteries	*1,350*	✓		✓
Mission-oriented energy priorities (Flagship Projects 9 and 10) *Of which Energie.Frei.Raum (Energy.Free.Room)*	2,800 *25*	✓	✓	✓
Domestic environmental support (UFI) pilot projects	175	✓		✓
Bio-based industry (plan of action for the bio-economy) *Of which research, technology and innovation share*	1,366 *66*	✓	✓	
Of which implementation of the bio-economy strategy	*1,300*			

Investment area	Overall investments for entire period to 2030	Sources of financing/funds for period to 2030		
		Public		Private investments and 'green finance'
		National (Federal government/ provinces/municipalities)	EU	
	EUR million			
Innovation-promoting public procurement	55	✓		
Climate change adaptation (research, technology and innovation for infrastructure transformation)	55	✓		
Total	**166,449-173,449**			

ii. Sector/market-specific risk factors or obstacles in the national or regional context

The sensitivity analyses carried out to date have shown that economic growth has a particular impact on the sectors of industry and transport (goods transport). From these analyses, two opposing effects can be determined: Although, on the one hand, energy consumption and greenhouse gas emissions drop with lower economic growth, there is, on the other hand, less capital available for investments. With higher economic grown, both energy demand and greenhouse gas emissions usually increase sharply, though this also creates more capital for investment.

iii. Analysis of additional public financial assistance/resources to fill the gaps established in ii.

With higher economic growth, it can be assumed that Austria will fall some way short from

meeting its energy and climate targets. In that case, additional funding, regulatory measures and Europe-wide solutions will be needed in good time to counter the rise in emissions.

5.4. Impacts of the planned policies and measures described in Section 3 on other Member States and regional cooperation at least until the final year of the plan's validity period with a comparison against the projections given in the current policies and measures

i. Where possible, impacts on the energy system in neighbouring and other Member States in the region

The impact assessment shows that the security of the energy supply under the 'with additional measures' scenario will increase considerably in the sense that imports of fossil fuels (in particular oil, as well as natural gas to a lesser extent) can be significantly reduced. Net imports for electricity can also be decisively reduced, though this does not allow the conclusion to be drawn that cross-border electricity exchange will reduce overall. Rather, it can be assumed that there will be a need for further growth in cross-border power line capacities, in particular in order to better temporarily integrate amounts of electricity from volatile sources onto the market and stabilise the distribution networks. Intensive bi- and multilateral efforts are being made in these areas (and in relation to gas transport) with neighbouring states and beyond.

ii. Impacts on energy prices, supply installations and the integration of the energy market

Under the 'with additional measures' scenario, as under the 'with existing measures' scenario, energy pricing assumptions for internationally traded energy products were made, which comply with the recommendations of the European Commission under the EU Greenhouse Gas Monitoring Mechanism. However, this does not, in any way, allow for the preclusion of the fact that certain policies and measures will lead to additional costs that the end customers will need to bear. This may affect various areas, for example, electricity, gas and fuels. However, no detailed analyses of this were carried out in the impact assessment.

iii. Possible impacts on regional collaboration

As expected, regional, cross-border collaboration in the field of energy will increase considerably over the coming years, in line with the significant rise in (cross-border) challenges. This may (and will) also affect collaboration between the Union and third countries.

Part 2

List of parameters and variables to be reported in Section B of National Plans[39]

[39] This part is drawn up in a separate Excel template provided by the European Commission.

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