International Energy Agency

Energy Policies of IEA Countries

Austria

2014 Review

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INTERNATIONAL ENERGY AGENCY

The International Energy Agency (IEA), an autonomous agency, was established in November 1974. Its primary mandate was – and is – two-fold: to promote energy security amongst its member countries through collective response to physical disruptions in oil supply, and provide authoritative research and analysis on ways to ensure reliable, affordable and clean energy for its 28 member countries and beyond. The IEA carries out a comprehensive programme of energy co-operation among its member countries, each of which is obliged to hold oil stocks equivalent to 90 days of its net imports. The Agency's aims include the following objectives:

- Secure member countries' access to reliable and ample supplies of all forms of energy; in particular, through maintaining effective emergency response capabilities in case of oil supply disruptions.
- Promote sustainable energy policies that spur economic growth and environmental protection in a global context – particularly in terms of reducing greenhouse-gas emissions that contribute to climate change.
- Improve transparency of international markets through collection and analysis of energy data.
- Support global collaboration on energy technology to secure future energy supplies and mitigate their environmental impact, including through improved energy efficiency and development and deployment of low-carbon technologies.
- Find solutions to global energy challenges through engagement and dialogue with non-member countries, industry, international organisations and other stakeholders.

IEA member countries:

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Germany
Greece
Hungary
Ireland
Italy
Japan
Korea (Republic of)
Luxembourg
Netherlands
New Zealand
Norway
Poland
Portugal
Slovak Republic
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Sweden
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Turkey
United Kingdom
United States

The European Commission also participates in the work of the IEA.

International Energy Agency
9 rue de la Fédération
75739 Paris Cedex 15, France
www.iea.org

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1. EXECUTIVE SUMMARY AND KEY RECOMMENDATIONS

EXECUTIVE SUMMARY

Austria's energy policy strives to promote economic growth, environmental protection and security of energy supply in a balanced manner. Since the last IEA in-depth review, which was published in 2008, economic growth has been slow while climate policy has had an increasing impact on the energy sector in Austria. The focus on security of supply has expanded from oil to natural gas and, more recently, to electricity.

In 2010, the Austrian Energy Strategy was adopted to help implement the EU 20-20-20 targets (binding targets to reduce greenhouse gas emissions and increase the share of renewable energy in gross final energy consumption, a non-binding target on energy efficiency) and to develop internal EU markets for electricity and natural gas. The Strategy integrated security of supply, energy efficiency and renewable energy sources as the three pillars of Austrian energy policy.

Currently, the European Union is working on the EU 2030 Energy and Climate Package to rebalance the objectives of "competitiveness" with "sustainability" and "security of supply". In relation to the EU 2030 policy framework negotiations, Austria will need to formulate an evidence-based position on how to reach any possible targets cost-effectively.

SECURING ENERGY SUPPLY

Two of the main aims of Austrian energy policy have been to reduce its dependence on energy imports and to strengthen its security of supply. Import dependence has been reduced slightly from 65% in 2000 to 62% in 2012, largely owing to increases in bioenergy supply. Bioenergy and waste now provide around 20% of total primary energy supply (TPES), an exceptionally high share by international comparison. With large hydropower resources, and its reservoir and pumped storage plants, Austria could play a battery role for the wider region. Austria also has ambitious plans for adding more than 3 gigawatts (GW) – equal to roughly 14% of its current total capacity – to its wind and solar power capacity by 2020. Realising these plans will require close monitoring of costs and co-ordination with electricity grid operators.

As is common among IEA member countries, government efforts on security of supply have long focused on oil and, more recently, on natural gas. Oil is the most important fuel in Austria, accounting for 34% of TPES in 2012. Oil security is on a sound basis as the country holds oil stocks equalling more than 110 days of net imports. Also, while most oil products are imported, the sources and routes for these imports are well diversified.

An exception to this diversification can be seen in Austria's sole oil refinery, the Schwechat refinery, which receives its oil supply through one pipeline from Trieste, Italy. To improve the security of crude oil supply, the government should continue to facilitate a pipeline connection to the Slovak Republic in order to gain access to a second crude oil supply route.

Security of a natural gas supply is a more recent area of government focus since the fuel provides around 22% of TPES. Imports cover four-fifths of gas demand, and almost all imports are physically sourced from Russia. At the same time, gas transit volumes through Austria are many times larger than domestic consumption, and the country has never suffered a major gas disruption. Adding to supply stability is Austria's ample storage capacity, which roughly equals 80% of the nation's annual gas demand in 2012 and which is capable of an output rate above peak demand on a cold winter day. In another commendable development, Austria has taken effective steps to prepare for a gas emergency, notably, by enabling physical reversibility of several pipelines with neighbouring countries (Germany to Austria and Italy to Austria) in 2011. Austria should continue to explore the benefits of increasing flexibility and diversity of supply options so as to increase the resilience of energy security.

A potential source for reducing the need for gas imports would be to explore the country's shale gas resources. These are estimated to equal at least 20 years of domestic consumption, but the current regulatory framework effectively discourages the development of these resources since the obligatory environmental impact assessment process for each hydraulic fracturing well takes three to four years. The IEA recognises the sensitivity of this issue and encourages the government to formulate a position regarding the potential use of shale gas resources. This position should be based on a solid scientific understanding of the resources and of new technologies and their environmental impacts. Thanks to its technological know-how, strong environmental awareness and experience with upstream production, Austria is well placed to explore this shale gas potential further.

WORKING TOWARDS AN INTERNAL ELECTRICITY MARKET

The electricity sector in Austria and neighbouring regions is undergoing two simultaneous major developments. On the one hand, the national electricity markets and systems in the European Union are moving towards integration into an EU-wide single electricity market. This is expected to improve security of electricity supply and yield cost efficiencies. At the same time, large increases in variable renewable energy supply, driven by EU renewable energy targets, heighten the need for new, more flexible ways to operate interconnected electricity systems.

The EU-wide electricity market integration is a gradual process. At this stage, Austria's electricity market needs to be developed in a regional, cross-border context. The country should increase cross-border network capacity and extend market coupling. The transmission system operator (TSO) and the regulator should continue to co-operate with and co-ordinate their actions with other national regulators and TSOs of its neighbours and the related EU-level bodies.

While transmission grids are becoming more interconnected across national borders, the push for grid integration of large variable generating capacity from wind and solar, both in Austria and neighbouring countries, implies a need for changes in cross-border electricity systems. For smoother electricity system functioning, re-dispatch measures should be co-ordinated and congestion management improved. Pricing of transmission use should also be discussed in a regional context. These measures are clearly needed since Austria is already affected by loop flows originating in Germany, which also cause significant congestion at the Czech/Austrian border. Also, the establishment of competitive cross-border balancing and intraday markets deserves attention.

New investments in transmission and distribution grids are required as are smarter systems for managing supply and demand. Permitting processes need to become more efficient. The permitting procedures related to infrastructure projects should be streamlined on a federal and provincial level, and the procedures should also ensure transparency and early involvement of civil society. Meanwhile, new investments in pumped storage facilities are under way. Austria deserves to be commended for developing smart grids for electricity distribution.

LIMITING ENERGY-RELATED GREENHOUSE GAS EMISSIONS

Austria's greenhouse gas (GHG) emissions have grown by around 6% from 1990 to 2011, while the country's target under the Kyoto Protocol is to reduce them by 13% from 1990 to 2008-12. The largest source of GHG emissions is CO_2 from energy use, which has risen by around one-fifth from 1990 to 2011, mainly because of increases from the transport and industry sectors. Austria will use flexible mechanisms to bridge the gap between its target under the Kyoto Protocol and its actual emissions. In a positive development, despite higher GHG emissions than in 1990, total emissions peaked in 2005 and have been trending downward since then. This downward trend reflects the reduced CO_2 intensity of Austria's overall energy supply in recent years, with fossil fuels declining from 77% of primary energy in 2002 to 67% in 2012. Both oil and coal use declined in absolute terms over that same period.

As emissions from large power plants and processing industries are covered under the EU Emissions Trading Scheme (EU-ETS), the Austrian government focusses on the sectors outside the EU-ETS. In Austria, transport is by far the largest emitter. Emissions from transport have increased by more than 50% since 1990, owing to an expansion of the car fleet, growing transit freight transport and relatively low fuel prices attracting buyers from the neighbouring countries: fuel sales to foreigners account for up to 30% of total fuel sales. The lower fuel prices are a result of lower fuel taxes, and the tax revenue is several times higher than spending on carbon credits that Austria purchases to offset part of the resulting emissions. Austria has been the third-largest buyer of carbon credits under the Kyoto Protocol (after Japan and Spain), buying up to 80 million tonnes of CO_2-equivalent (Mt CO_2-eq.), roughly equalling all GHG emissions in 2011, at a total cost of more than EUR 600 million since 2007. However, the feasibility of this policy depends on the availability of carbon credits that can be used to help Austria meet its 2020 targets. In the longer term, EU regulations on CO_2 intensity of new cars and freight vehicles will limit emissions from transport. In the short term, the simplest way to limit CO_2 emissions from transport would be to raise fuel taxes to a level that would discourage fuel tourism, but this raise would likely have the perverse impact of reducing overall tax revenue. In any case, the government should enhance efforts to reduce carbon emissions in the transport sector, for example, by supporting alternative fuel vehicles and increased promotion of modal shift.

SUPPORTING ECONOMIC GROWTH

Since 2008, Austria has performed better in macroeconomic terms than most EU member countries, and unemployment is one of the lowest in the region. As an open economy, rising energy prices and costs are a concern in the country since global price shifts are quickly reflected domestically, and decisions on energy prices and costs that affect the competitiveness of industry and the welfare of citizens are only partly in the hands of national decision-makers. This can be seen in the fact that energy prices are

mostly explained by the cost of imported energy. In addition, taxes on many energy products have been increased for fiscal reasons, and these reasons are likely to stay. Tariffs related to grid use may have to be increased to attract the needed investment in the grid. The government, however, has several options to tackle the impact of energy prices and costs. One of these is the promotion of energy efficiency, and Austria has been both ambitious and successful in this area, in particular as regards buildings. Another measure is to promote competition in the retail electricity and gas markets. This could be done by further strengthening the powers of the regulator and by empowering consumers and promoting supplier switching.

EU-wide energy studies show that high import dependence and low diversification of imports can significantly contribute to increasing end user prices for industries and households. Energy efficiency and increasing local energy production would be the obvious answers. The position on shale gas should be considered also from this angle.

Also, in the electricity market, support to less mature renewable energy technologies has in many countries translated into higher electricity prices for both industry and households. To address this point, Austria should comprehensively analyse the cost-effectiveness of the planned investments. Specifically, in the context of an increasing share of renewable energy, it should consider opportunities for demand-side management, and the implications for the need for electricity storage and for extensions and renewal of the grid. The costs of the support mechanisms need to be controlled (in particular feed-in tariffs) and their necessity should be reassessed regularly as the different technologies mature. Austria should review its current feed-in tariff regime and figure out cost-effective options, including gradually decreasing tariffs over time and moving to a premium system.

ENCOURAGING RESEARCH AND DEVELOPMENT

Energy research, development and demonstration (RD&D) is essential for delivering technology solutions for meeting energy policy objectives. Since 2007, the government has more than tripled public funding in this sector, adopted a new Energy Research Strategy and launched several priority programmes. Responsibilities between institutions are clear, and priority setting is based on an open and transparent process. Publicly funded energy RD&D activities are also regularly monitored and evaluated using different approaches. These are impressive developments.

The major increase in public funding is a result of the Climate and Energy Fund to support R&D in renewable energy and energy efficiency as well as market demonstration and deployment. This is to be applauded. The IEA encourages the government to maintain energy RD&D funding at the current levels – or, ideally, to increase it, particularly with regard to incentives and measures to support private sector R&D. As government budgets are under pressure from various directions, the government should consider stronger incentives for more private funding, including venture capital, for energy technology development.

KEY RECOMMENDATIONS

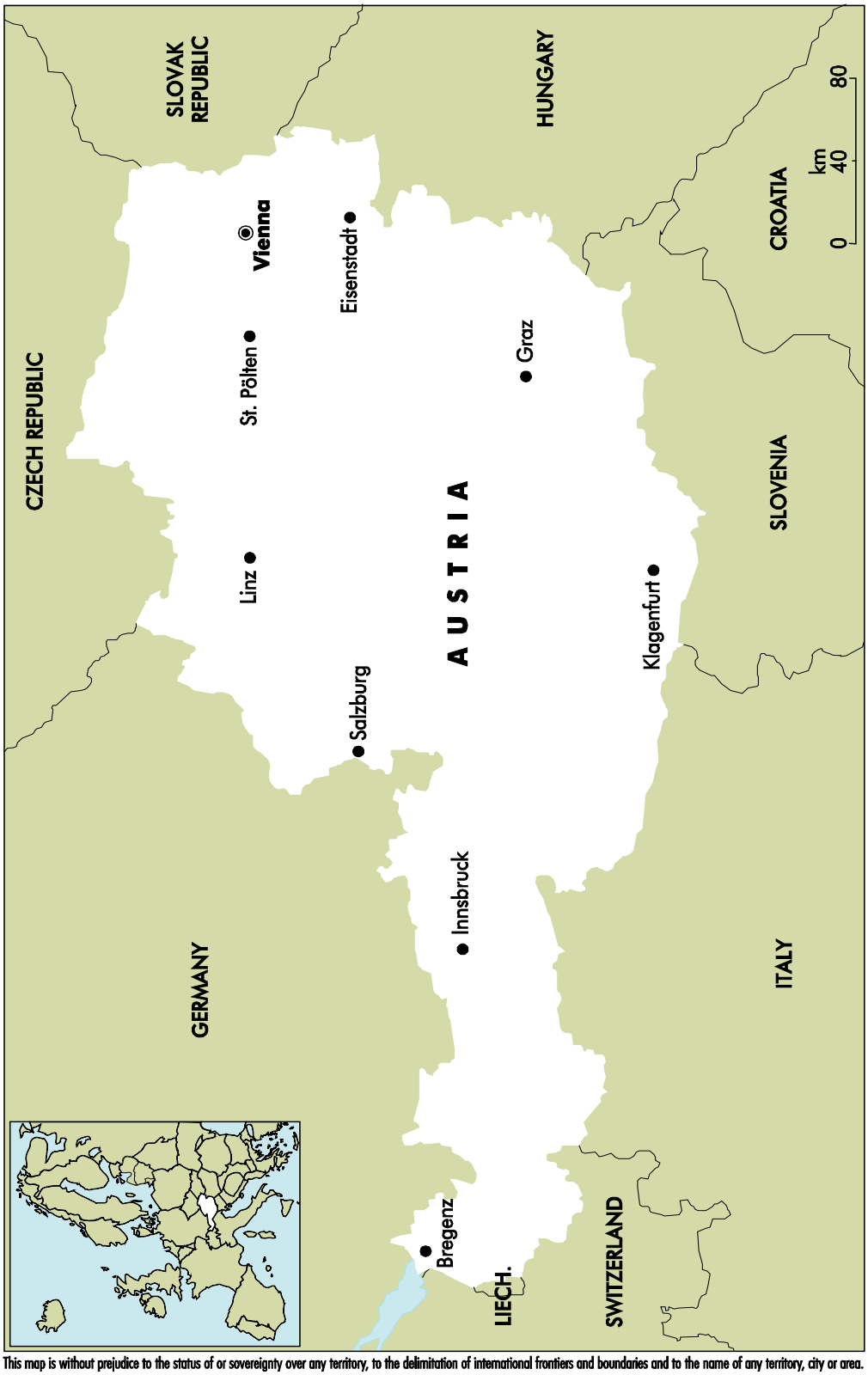
The government of Austria should:

- ☐ *Develop a post-2020 energy and climate strategy that integrates security of supply and internal market dimensions. Specifically, analyse how emissions could be reduced with domestic and EU-wide measures only.*

- *Address concerns over energy prices and costs by further promoting energy efficiency and greater retail market competition.*
- *Continue the drive towards cross-border integration of both electricity and natural gas markets. In doing so, attention should be paid to the need for:*
  - *co-ordination and co-operation with neighbouring countries*
  - *encouraging investment in networks, optimising demand response and integrating variable renewable energy supply in a cost-effective and market-based manner.*

PART I
POLICY ANALYSIS

Figure 2.1 Map of Austria



This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

2. GENERAL ENERGY POLICY

Key data (2012)

TPES: 33.1 Mtoe (oil 34.4%, natural gas 22.4%, biofuels and waste 19.9%, hydro 11.4%, coal 9.8%, wind 0.6%, solar 0.6%, geothermal 0.1%), +8.8% since 2002

TPES per capita: 3.9 toe (IEA average: 4.5 toe)

TPES per GDP: 0.11 toe per USD 1 000 GDP PPP (IEA average: 0.14 toe per USD 1 000 GDP PPP)

Electricity generation: 68.7 TWh (hydro 63.7%, natural gas 14.1%, coal 9.1%, biofuels and waste 7.9%, wind 3.6%, oil 1.1%, solar 0.5%), +13.2% since 2002

Inland energy production: 12.8 Mtoe (biofuels and waste 47.6%, hydro 29.4%, natural gas 12.2%, oil 7.3%, wind 1.7%, solar 1.6%, geothermal 0.3%), +30.2% since 2002

COUNTRY OVERVIEW

The Republic of Austria has a population of 8.4 million and an area of 83 850 km^2. It borders on Germany and the Czech Republic to the north, Switzerland and Liechtenstein to the west, Italy and Slovenia to the south, and Hungary and Slovakia to the east. Almost two-thirds of Austria's territory is mountainous, but the east of the country has lower lying plains. Forests cover about 45% of the country. Austria's climate is alpine in the mountainous western regions with annual rainfalls of more than 1 000 mm, and continental in the north and east with cold winters and hot, humid summers but overall less rain than in the west.

Austria has an open and relatively robust economy. According to Statistik Austria, gross domestic product (GDP) grew by 2.8% in 2011 and by 0.9% in 2012, reaching EUR 307 billion. External trade equalled 83% of GDP in 2012. GDP per person is relatively high, at EUR 36 430 in 2012. In 2013, GDP growth slowed to almost zero, according to preliminary data. The unemployment rate, at 4.3% in 2012, has been one of the lowest in the OECD countries in recent years.

As in all developed economies, services are the largest sector, accounting for 69.8% of GDP in 2012. Industry accounted for 28.6% and the primary sector (agriculture, forestry and mining) for 1.6%. In industry, the largest subsectors by turnover are machinery, basic metals, foodstuffs and chemicals.

Austria is a federal republic, with nine federal provinces (*Bundesländer*). Its bicameral Federal Assembly or *Bundesversammlung* consists of the Federal Council or *Bundesrat* (delegates appointed by provincial parliaments in proportion to population) and the National Council or *Nationalrat* (members elected by popular vote under a system of proportional representation).

The grand coalition government of the centre-left Social Democratic Party (*SPÖ*) and the centre-right Austrian People's Party (*ÖVP*) was renewed in December 2013, following a September 2013 general election (National Council). The next general election is due in 2018. Austria has been a member state of the European Union since 1995 and uses the euro as its currency.

Box 2.1 Austria as host for international energy organisations

Austria hosts several international organisations and institutions. In the energy sector, these include the Energy Community, the International Atomic Energy Agency, the International Institute for Applied Systems Analysis, the International Peace Institute, the Organization of the Petroleum Exporting Countries (OPEC) and the OPEC Fund for International Development, the Organization for Security and Co-operation in Europe, the Renewable Energy and Energy Efficiency Partnership, and the United Nations Industrial Development Organization (UNIDO). These entities are represented in the Vienna Energy Club, an informal platform for discussions and exchange of views on energy.

Source: Vienna Energy Club.

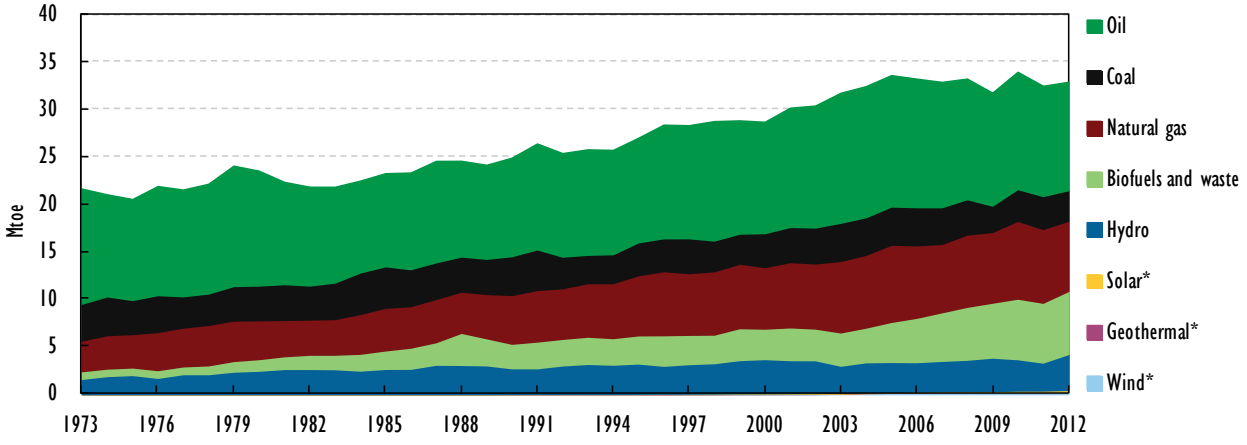
SUPPLY AND DEMAND

SUPPLY

Total primary energy supply (TPES) in Austria was 33.1 million tonnes of oil-equivalent (Mtoe) in 2012, decreasing for a second consecutive year from a record high of 34.1 Mtoe in 2010. Energy supply has been steadily increasing for decades, including by 8.8% from 2002 to 2012. TPES per capita was 3.9 Mtoe in 2012, up 4.6% since 2002.

The energy mix in Austria is dominated by fossil fuels, which account for 66.7% of TPES. Oil is the largest source of energy at 34.4% of TPES, followed by natural gas at 22.4% and coal at 9.8%. Renewable energy is made up of biofuels and waste at 19.9% of TPES, hydro at 11.4%, wind and solar energy at 0.6% each, and geothermal energy at 0.1% in 2012.

Figure 2.2 TPES, 1973-2012



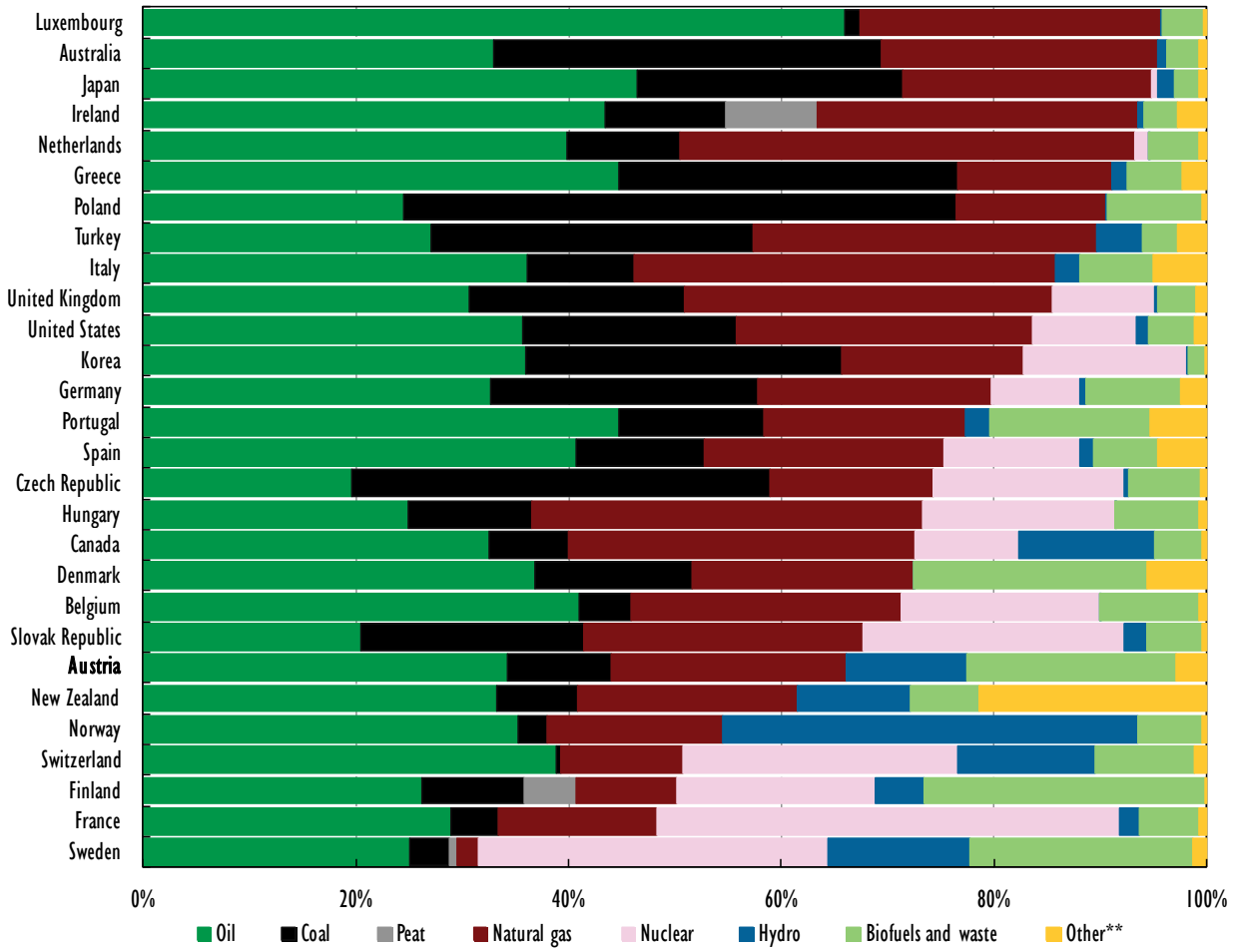
* Negligible.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2013; and country submission.

Since 2002, the share of fossil fuels in TPES has fallen from 77.2% of the total. The supply of oil and coal has declined, while that of natural gas has grown in tandem with TPES. The supply of renewable energy from all sources has surged, with biofuels and waste doubling since 2002, the supply of solar energy nearly tripling and the supply of wind power increasing by 20 times, albeit from negligible levels.

Austria ranks seventh-highest among IEA member countries with regard to the share of fossil fuels in the energy mix, fourth-highest with respect to the share of biofuels and waste in its energy mix, and tenth-highest with respect to the share of other renewables in TPES.

Figure 2.3 Breakdown of TPES in IEA member countries, 2012*



* Actual data for Austria and estimated for other countries.

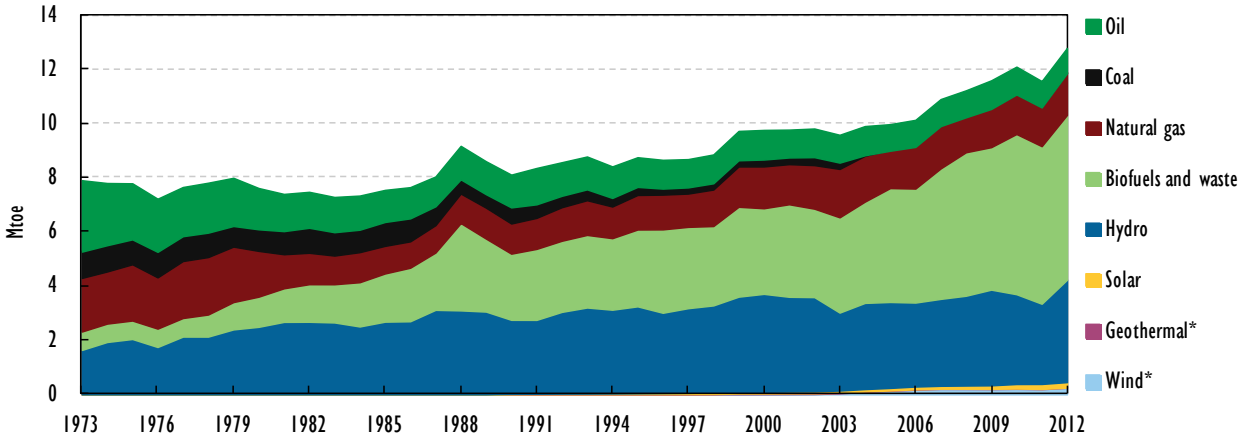
** *Other* includes geothermal, solar, wind, and ambient heat production.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2013; and country submissions.

Around 40% of Austria's energy needs are produced locally, and the country relies on imports of fossil fuels in order to meet its energy demand. Total energy production was 12.8 Mtoe in 2012, largely made up of biofuels and waste (47.6%), hydro (29.4%) and natural gas (12.2%). Austria also produces oil, wind, solar and geothermal at a smaller scale. Depleting fossil fuel reserves have led to a decline in the production of natural gas and oil over the past decade, while the production of coal ceased in 2004. Conversely,

growth in biofuels and waste, wind and solar has been remarkable, resulting in an overall increase of 30.2% in energy production since 2002. The share of domestic production in TPES increased from 32.3% in 2002 to 38.6% in 2012.

Figure 2.4 Energy production by source, 1973-2012



* Negligible.

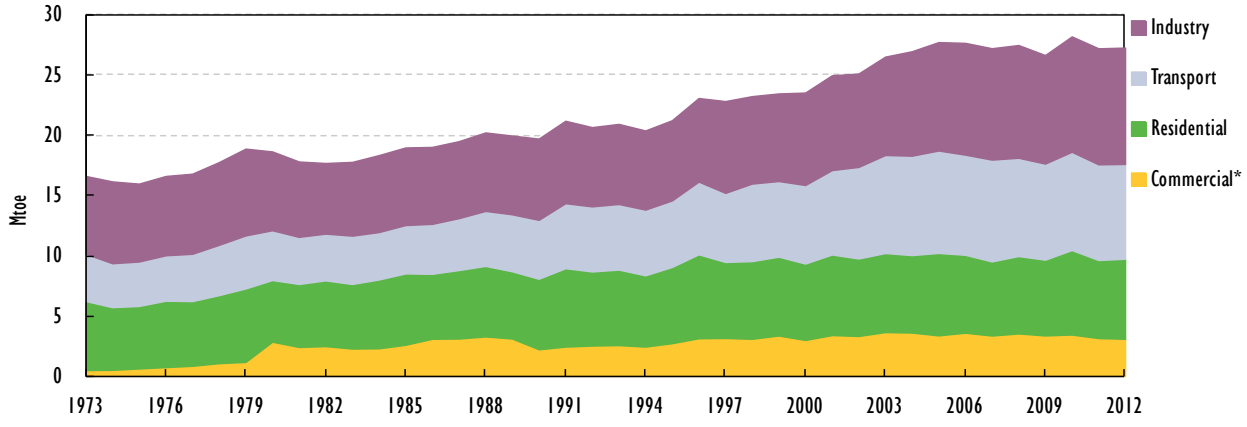
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2013; and country submission.

DEMAND

The industry sector is the largest consumer of energy in Austria, amounting to 9.6 Mtoe in 2012, or 35.4% of total final consumption (TFC). Energy use in this sector has increased by 24.6% since 2002, more than in any other sector of the economy. Energy-intensive subsectors, such as metals and minerals processing, chemicals, pulp and paper, and oil refining, accounted for around 60% of total final energy use in industry. Industry also consumed more than 40% of the electricity in the country.

Transport is the second-highest consumer at 7.8 Mtoe or 28.7% of the total. Energy consumption by the sector has increased by 3.6% since 2002. Residential energy use accounts for 24.3% of TFC, with the level of consumption increasing by 3.2% over the past decade. Commercial and public services represent 11.6% of TFC, and consumption has decreased by 6.9% from 2002.

Figure 2.5 TFC by sector, 1973-2012



* *Commercial* includes commercial and other services, agriculture, forestry and fishing.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2013; and country submission.

Austria is in the mid-range among IEA member countries with regard to the share of industry, transport and residential in TFC. However, the share of commercial and public services in energy consumption is ranked fourth-lowest.

INSTITUTIONS

The **Federal Ministry Science, Research and Economy** (BMWFW; until 1 March 2014, the Federal Ministry of Economy, Family and Youth) is the main body responsible for energy matters at the federal level. Other ministries involved in energy policy matters are the Federal Ministry of Agriculture, Forestry, Environment and Water Management; the Federal Ministry of Transport, Innovation and Technology; and the Federal Ministry of Finance.

Austria is a federation, and, as such, the nine provinces play an important role in designing and implementing energy policy. The governments of the nine provinces have responsibility for policy making, setting subsidy levels and implementing regulatory control of energy companies.

Both at the federal and provincial levels, the responsible public bodies make use of the expertise of organisations usually referred to as "energy agencies" – primarily non-profit organisations dealing with energy efficiency and renewable energies – and of academic institutions. The **Austrian Energy Agency** was established by the federal government and the provinces to promote clean energy use in the country.

E-Control is a federal and independent regulatory body, responsible for overseeing the Austria's natural gas and electricity markets. E-Control has been given increased regulatory powers with the 2010 E-Control Act (*Energie-Control-Gesetz*), enshrining its independence and expanding its authority and sanctioning power.

The **Austrian Competition Authority**, in co-ordination with E-Control, is the government body responsible for enforcing competition law in Austria. The **Cartel Advocate** at the Federal Ministry of Justice is responsible for the initiation of legal action against cartels. The **Federal Economic Chamber** and the **Federal Chamber of Labour**, the statutory representatives of Austrian business and labour, have a right to be heard on important questions of economic decision-making under the system of Social Partnership enshrined in the Austrian Constitution.

KEY POLICIES

Austria's current goals, challenges and measures regarding energy policy are outlined in the government programme (see below). Beyond the federal government, energy policy decisions are also taken at the provincial level. The Federal Constitution allocates responsibilities either to the federal level (e.g. energy taxation, energy statistics, energy metering, energy supply emergency regulations) or to both the federal and provincial levels (e.g. electricity, gas, district heating, energy conservation, subsidies, prohibition of nuclear power). As an EU member state, Austria's energy policy options and targets are to a large extent framed at the EU level.

GOVERNMENT PROGRAMME

The current government programme, adopted in December 2013 and focussing on the next five years, outlines the objectives, challenges and a wide range of measures related to energy policy.

With energy policy, the government's aim is an efficient, affordable and socially responsible energy system that guarantees security of supply, prosperity, competitiveness and a liveable environment. Austria will also maintain its anti-nuclear policy.

The main challenges for national energy policy lie in the following areas: the EU framework, energy transition (decarbonisation), development of network infrastructure, competition, duration of planning and consenting and permitting processes, support systems, security of supply, and affordability of energy.

Regarding general energy policy, the government plans to develop an energy strategy to 2030 with the involvement of all relevant stakeholders, and to strengthen E-Control's focus on regulatory activities.

Regarding energy efficiency, the plans include stabilising final energy consumption at 1 100 petajoules (PJ), or 26.3 Mtoe, per year by 2020 and implementing the EU Energy Efficiency Directive (2012/27/EU).

Regarding security of energy supply and infrastructure, the government plans to, *inter alia*, streamline the consenting and permitting process for energy infrastructure projects, in particular, in the area of environmental impact assessments. It also takes a positive stance on the construction of new hydro and pumped storage plants, on expanding network and transport infrastructure as well as on natural gas as a bridge fuel. The government also aims to expand district heating and cooling capacity and will adjust support systems and speed up related funding decisions.

On renewable energy, the plans include further expansion of renewable energy capacity and an evaluation of the support system for renewable electricity. They also include the development of an environmentally, economically and socially sustainable support system for renewable electricity and increasing the efficiency, transparency and focus of the renewable energy support systems.

The government also plans to strengthen competition in the energy sector by implementing the EU internal energy markets, diversifying energy sources, energy sources and routes, and strengthening Austria's position as an energy hub through international co-operation, infrastructure expansion, gas and pumped storage capacity and energy trading facilities. On the other hand, the government plans to take measures to protect the competitiveness of energy-intensive industries.

The government aims to give energy a stronger role within its strategy on research, technology and innovation. More specific plans on energy research and development (R&D) include the promotion of new materials and technologies for higher energy efficiency, integration of renewable energy sources in the broader energy system (smart grids, storage technologies), new solutions for smart and sustainable renovations, and a stronger development of low carbon technologies in energy-intensive industries.

Energy matters related to climate policy encompass meeting the EU 2020 targets and supporting the introduction of new targets for 2030. Nationally, further measures to reduce GHG emissions are planned for transport (e-mobility, development of public transport and innovative mobility concepts), thermal renovation of buildings and district heating connections.

ENERGY STRATEGY AUSTRIA

Austria's long-term energy policy objectives are outlined in the 2010 Energy Strategy Austria (*Energiestrategie Österreich*). The aim was to "develop a sustainable energy system which makes energy services available for private consumption as well as for businesses in the future while implementing EU rules. Security of supply, environmental compatibility, cost-effectiveness, social compatibility and competitiveness have been fixed as core objectives in the Energy Strategy Austria."

The Energy Strategy Austria (hereafter the Strategy) aims to stabilise final energy consumption in 2020 at its 2005 levels, i.e. 1 100 PJ (26.3 Mtoe), 2% lower than in 2011. The Strategy relies on three pillars to reach this objective – energy efficiency, renewable energy and security of supply. This objective is consistent with the federal government's call for a stronger de-coupling between economic growth and energy consumption.

The Strategy was developed in line with EU energy policy and its specific goals as well as with regard to the international obligations that Austria has towards institutions such as the IEA. Under the current government, an energy strategy to 2030 will be developed.

EU OBLIGATIONS

As an EU member state, Austria's energy policy is strongly influenced by EU regulations, directives and decisions. The most notable pieces of EU legislation pertaining to energy are the Energy and Climate Package, with its 20-20-20 by 2020 goals, and the Third Package for the Internal Energy Market. Other major pieces of legislation introduced in recent years include the directives on energy services and end-use efficiency, on the energy performance of buildings, on the ecodesign of energy-related products, and on the regulation on security of natural gas supply.

The Energy and Climate Package specifically outlined the following goals for Austria: a 34% renewable energy target and an overall indicative 20% energy efficiency target as well as a 20% reduction of GHG emissions. With regard to the renewable target, Austria is well on track to reaching its goal, having achieved a 31% share of renewables in the final energy consumption in 2011. Regarding energy efficiency, significant progress has also been made, as indicated in the National Energy Efficiency Action Plan (NEEAP) 2011. European Union's energy and climate policy objectives for 2030 will be debated intensely in and among EU member states.

With regard to market liberalisation, Austria has implemented the Third Package for the Internal Energy Market, including the enshrining of an independent energy regulator, E-Control, with specific legislation in 2010. The directives on electricity and gas markets have been implemented through the *Elektrizitätswirtschafts- und Organisations-Gesetz 2010* (Electricity Act) and the *Gaswirtschafts-Gesetz 2011* (Gas Act).

ASSESSMENT

Austria's energy policy is guided by the integrated 2010 Energy Strategy Austria, in which security of supply, energy efficiency and renewable energy are designated as the three pillars of energy policy. The aim is to stabilise final energy consumption by 2020 at 2005 levels (1 100 PJ), implying a significant decrease in current energy consumption (by 200 PJ). In order to attain the goal, the Strategy includes indicative sectoral targets.

While Austria is unlikely to face difficulties in attaining its EU-driven 2020 renewable targets, it needs to introduce additional measures to meet the non-ETS GHG target and the non-binding energy efficiency target. So as to comply with its commitments under the Kyoto Protocol, Austria has relied on both domestic actions and carbon credits from abroad (flexible mechanisms). Beyond 2012, however, the conditions for using flexible mechanisms remain unclear. Furthermore, the discussion at the EU level is now turning to targets for 2030. In this context, the government needs to define its position for post-2020. As outlined in its programme, the government should develop a comprehensive energy and climate strategy to 2030 with scenarios to 2050 to help meet the future targets while taking into account the competitiveness of the Austrian economy.

Austria has several initiatives for energy efficiency in industry and for residential buildings, and the Federal Environment Fund provides significant funding, more than EUR 250 million from 2009 to 2012. A key sector for the future is transport, and the government should detail more precisely the expected contribution from it, both in terms of energy and CO_2 emissions. Regarding buildings, the government should carefully review energy savings potential while also paying attention to the costs and benefits. The government could consider simplifying the different support schemes, creating a "one-stop shop" for all types of subsidies and merging the different funds into a single funding scheme for energy- and climate change-related subsidies.

Accelerating the development of renewable energy is a priority for the government. Technology-specific goals for several gigawatts of new installed capacity by 2020 have been introduced and support schemes (mainly feed-in tariffs) to this end set up. Remarkable efforts are therefore under way to increase the national production of renewable energy and, in particular, biomass.

Given the plans to increase the share of renewable energy in the energy mix, the cost of the support mechanisms needs to be controlled (in particular feed-in tariffs) and their necessity should be reassessed regularly, focusing on the maturity of the different technologies and including grid parity. It is also essential to control their impact on the final bill of residential electricity consumers and end users, as current feed-in tariffs represent already more than EUR 60 per year on household bills and amount to more than EUR 300 million per year in total.

Grid integration of large new electricity generating capacity from wind and solar, the output of which varies, implies a need for changes in the electricity system. New investments in transmission and distribution grids are required, but permitting processes remain lengthy. Meanwhile, new investments in pumped storage facilities are under way, and Austria is to be commended for developing smart grids in electricity transmission networks under the umbrella of the "Technology Platform Smart Grids Austria".

Austria's electricity market needs to be developed in a regional, cross-border context. The country is already affected by loop flows originating in particular within the German power system, which results in significant congestion at the Czech/Austrian border and for which a more regional approach, with the help of the European Network of Transmission System Operators for Electricity (ENTSO-E) and the Agency for the Co-operation of Energy Regulators (ACER), should be reached, including the deployment

of new network codes. Austria must reinforce its regional co-operation to cope with these issues, and consider building new electricity interconnections with Italy, Slovenia and Switzerland.

Regarding electricity and gas market reforms, Austria has implemented the Third Package and in the gas sector has brought in a new entry and exit model system in compliance with EU rules (the new Natural Gas Act of 2011) which should facilitate trade. Austria has progressed in fostering competition on its wholesale markets, but in the retail markets competition remains rather limited and the retail prices do not reflect the volatility of the wider regional wholesale markets. Supply switching rates remain very modest among electricity and natural gas consumers, although encouragingly the rate of switching in the two sectors combined increased by 68% from 2012 to 2013, according to E-Control. The government should consider measures for further improving competition in the retail markets.

Austria's federal system of government implies shared responsibilities on energy and climate change policies between the federal government and the nine provinces. The government should assess the costs and benefits of the current division of these responsibilities. Following Switzerland's example, it should be justifiable to harmonise energy requirements in building codes at a national level without compromising the essence of federalism.

Austria has a long tradition of well-functioning stakeholder engagement also in energy policy. The division of responsibilities between relevant ministries, however, tends to complicate the co-ordination of policies in the interrelated fields of energy and climate change. It may also complicate the implementation and monitoring of such policies, an issue the federal government should again assess.

RECOMMENDATIONS

The government of Austria should:

- *Develop a comprehensive energy and climate strategy to 2030 with scenarios to 2050 to help meet the future targets while taking into account the competitiveness of the Austrian economy.*
- *Ensure that the new energy efficiency targets will be reached, relying as far as possible on cost-effective measures.*
- *Regularly evaluate the costs and the coherence of support mechanisms for renewable energy.*
- *Continue to foster competition within gas and electricity sectors by facilitating supplier switching, without prejudice to protecting vulnerable customers.*

3. ENERGY EFFICIENCY

Key data (2012)

Energy supply per capita: 3.9 toe (IEA average: 4.5 toe), +4.6% since 2002

Energy intensity: 0.11 toe per USD PPP 1 000 (IEA average: 0.14 toe per USD PPP 1 000), -7.4% since 2002

TFC: 27.2 Mtoe (oil 38.5%, electricity 19.9%, natural gas 17.8%, biofuels and waste 14.8%, heat 6.7%, coal 1.7%, solar 0.6%), +8.6% since 2002

Consumption by sector: industry 35.4%, transport 28.7%, residential 24.3%, commercial and other services 11.6%

FINAL ENERGY USE

FINAL CONSUMPTION BY SECTOR

Austria's total final consumption (TFC) was 27.2 million tonnes of oil-equivalent (Mtoe) in 2012. Energy consumption increased by 8.6% since 2002, from 25.1 Mtoe, exhibiting a moderate level of volatility (see Figure 3.1.).

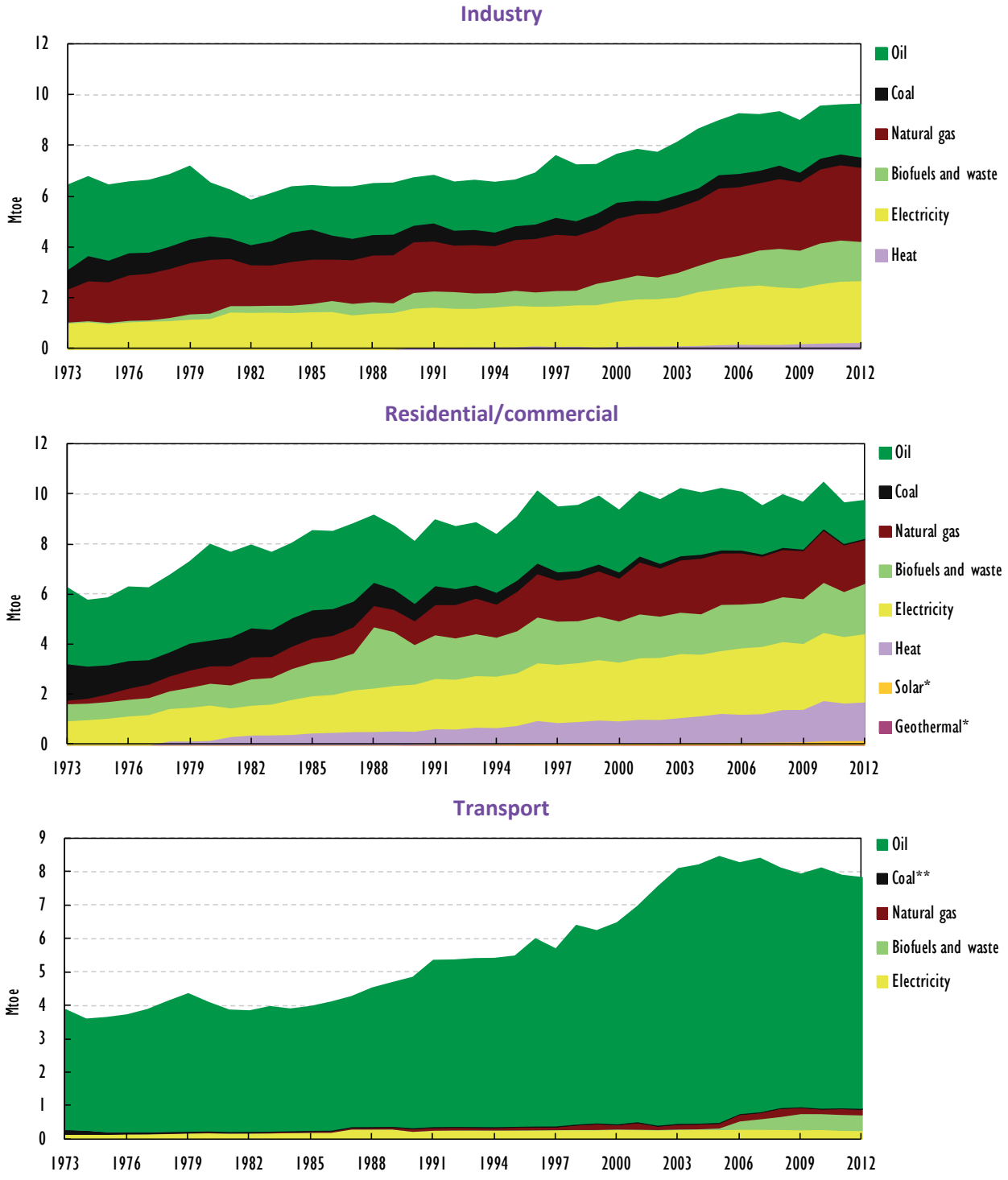
The industry sector is the largest consumer of energy products, representing 35.4% of TFC in 2012. This share has increased from 30.8% in 2002. The energy mix in the industry sector is dominated by natural gas and electricity, namely 30.1% and 25.1% of total industry use, respectively. Oil and biofuels and waste are also significant, accounting for 21.6% and 15.9% of the total, respectively. Since 2002, there has been a strong increase in the use of biofuels and waste as well as electricity and heat, while the consumption of coal and oil in industry has declined. Austria's main energy-intensive industries are pulp and paper, chemicals, and iron and steel production.

The transport sector accounted for 28.7% of TFC in 2012, decreasing slightly from 30.1% of TFC in 2002. Oil represents more than 88% of fuel used in the sector, while the remainder is accounted for by biofuels and waste at (6.1%), electricity (3.4%) and natural gas (2.3%). Austria has the largest percentage of biofuels and waste in transport among IEA member countries, followed by Sweden and France. Biofuels have increased from 0.2% of total in transport in 2002, at the cost of oil which has decreased from 94.5%.

The residential sector accounted for 24.3% of TFC in 2012 while the commercial/services sector accounted for 11.6%. These two sectors are mainly fuelled by electricity (27.9% of the total) and biofuels and waste (20.5%) as well as natural gas (18%) and heat (15.7%). Oil represents a further 15.5%, while solar, coal and geothermal energy account for a combined 2.3%. Since 2002, consumption of oil and coal in the residential and commercial sectors has fallen, while the strongest growth has been in biofuels and waste and heat.

Compared to other IEA member countries, Austria's share of industry, transport and residential sectors in TFC are mid-range, while the share of the commercial and services sector is fourth-lowest.

Figure 3.1 TFC by sector and by source, 1973-2012



* Negligible.

** Coal use in transport ceased in 2003.

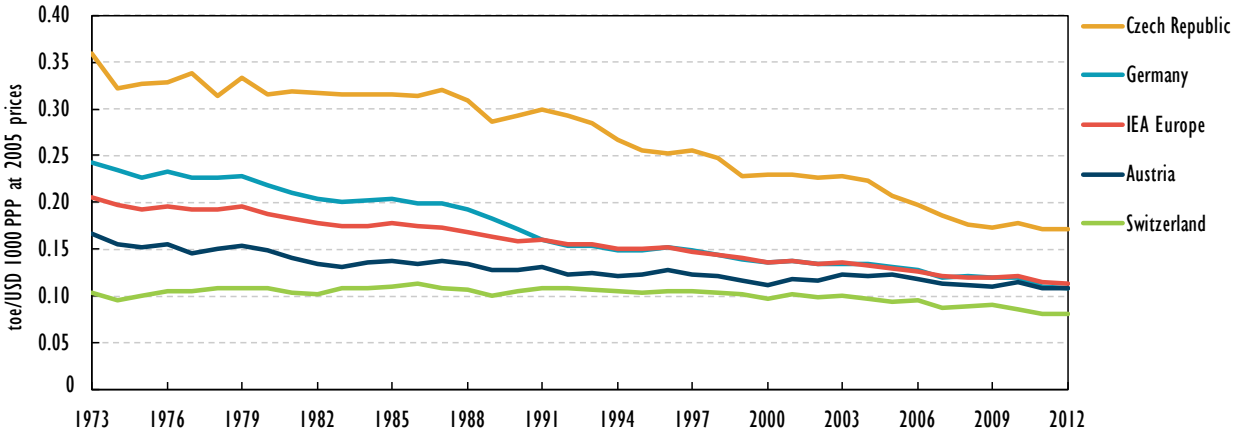
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2013; and country submission.

ENERGY INTENSITY

Energy intensity, measured as the ratio of total primary energy supply (TPES) by real GDP, was 0.11 tonnes of oil-equivalent per USD 1 000 at purchasing power parity (toe/USD 1 000 PPP) in 2012. This is the ninth-lowest energy intensity among IEA member countries, higher than Greece on the one side and lower than Germany on the other. Energy intensity in Austria has been on a moderate downward trend for decades, decreasing by 7.4% since 2002. The average IEA intensity has fallen by 16.7% over the same period, yet remaining higher than in Austria at 0.14 toe/USD 1 000 PPP in 2012.

A further common indicator for international comparisons is energy consumption per capita (see Figure 3.3.). Austria's rate of 3.9 toe per capita per year is at the IEA median.

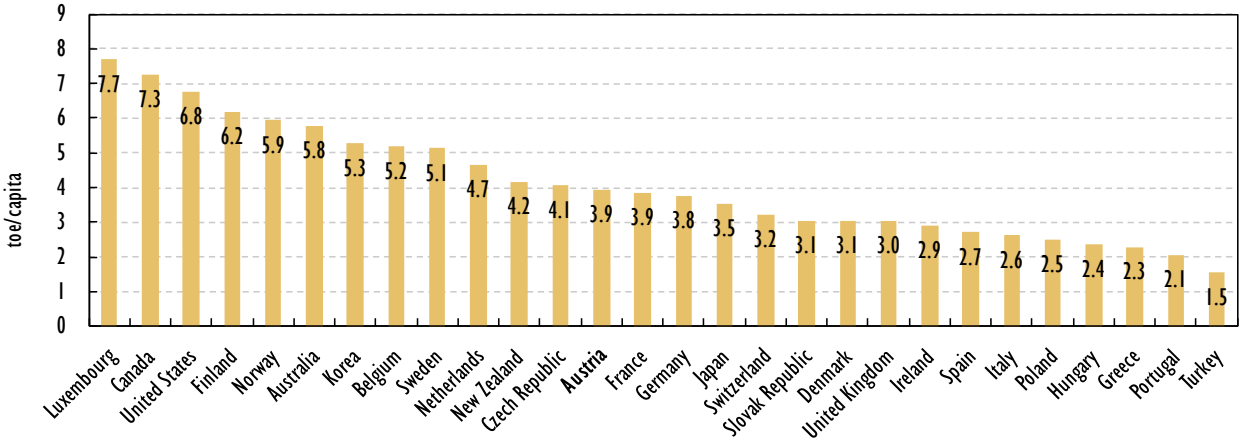
Figure 3.2 Energy intensity in Austria and in other selected IEA member countries, 1973-2012



Note: actual data for Austria and estimated for 2012 for other countries.

Sources: *CO_2 Emissions from Fuel Combustion, IEA/OECD Paris*, 2013; and country submission.

Figure 3.3 TPES per capita in IEA member countries, 2012



Note: actual data for Austria and estimated for other countries.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2013; and country submissions.

INSTITUTIONS

Austria is a federation, and as such the Federal Constitution provides no explicit energy legislative competence that is assigned to only one of the legislative authorities. Matters pertaining to energy efficiency are thus split between the federal government and the local governments. Both are authorised to adopt laws in the field of energy efficiency.

The federal government has clear oversight and regulatory powers in the fields of the economy and transport, each of which is administered by a specific federal ministry, BMWFW and bmvit, respectively.

In the case of buildings, for example, local governments are exclusively responsible for building laws and regional planning (with the exception of federal buildings). As such, the buildings sector, with a notable potential for energy efficiency, is not harmonised at a federal level.

However, the government can circumvent this kind of problem by adopting a so-called "competence coverage clause" in an act approved by parliament. This clause has constitutional status and thus allows the government to regulate matters which actually do not fall within their legislative competence. In reality, however, such measures are only taken in rare circumstances. Yet, in implementing the European Union's 2012 Energy Efficiency Directive (EED 2012/27/EU), the government resorted to including such a competence coverage clause in its new Austrian Energy Efficiency Act, to ensure that the interference with the provinces' legislative competences would not lead to the Act being declared unconstitutional.

Of note, the Austrian Institute for Construction Engineering (*Österreichisches Institut für Bautechnik* – OIB) was established by the federal government to co-ordinate work on building regulations. The OIB is the platform where uniform building efficiency standards are negotiated at a federal level. The OIB-Richtlinie 6 *Energieeinsparung und Wärmeschutz* (energy saving and heat insulation), which covers the main part of the implementation of the European Buildings Directive, was approved by all nine provinces in October 2011.

TARGETS

EUROPEAN UNION TARGETS

Since Austria's accession to the European Union in 1995, its energy policy targets – including in the field of energy efficiency – is embedded in the Community's energy activities. The elements of the Energy Strategy Austria have therefore to be seen in the context of energy efficiency activities of the European Union, including the implementation of the Energy Services Directive (ESD), with its national Energy Efficiency Action Plans (2007 and 2011), and the implementation of the recent Energy Efficiency Directive (EED) in 2012.

Directive for Energy Efficiency and Energy Services

The Directive for Energy Efficiency and Energy Services (ESD) aims at reducing final energy consumption by 9% from the 2001-05 annual average to 2016. The target is indicative, not binding. The national energy-saving target for Austria amounts to 80.4 PJ, or 22.34 TWh. In order to demonstrate the progress made towards achieving this target,

national Energy Efficiency Action Plans (NEEAPs) had to be developed and submitted to the European Commission, in 2007 and then in 2011.

The first Austrian NEEAP was submitted to the European Commission in June 2007. It contained a set of 378 energy efficiency measures that have been or will be implemented and will help to achieve the Austrian energy-saving target. The second Austrian NEEAP, submitted to the European Commission in June 2011, contained the results of the first monitoring period (from 2008 to 2010, including early actions) as well as qualitative information on energy efficiency measures in place.

Both NEEAPs were compiled by the Austrian Energy Agency, on behalf of the Federal Ministry of Economy, Family and Youth. The third NEEAP must be submitted to the European Commission by 30 June 2014.

Energy Efficiency Directive

The Energy Efficiency Directive (EED 2012/27/EU) establishes a common framework of measures for the promotion of energy efficiency, with a view to ensuring the achievement of the European Union's 20% by 2020 target on energy efficiency (in 2012 the European Union was not on target), and sets out an appropriate framework for further energy efficiency improvements beyond 2020.

The EED does not include binding targets, but only provides for the establishment of indicative national energy efficiency targets. However, there are a number of binding measures included in the directive to be reviewed. For the time being, these binding national measures include:

- setting indicative national energy efficiency targets for 2020
- 3% of the total floor area of heated and/or cooled public buildings must be renovated each year to meet at least minimum energy performance levels
- purchasing of highly energy-efficient products, services and buildings by public bodies
- energy efficiency obligation schemes, including an annual obligation upon energy distributors and/or retail energy sales companies to reduce sales of end-use energy to final customers of all energy by 1.5% per year
- energy audits and energy management systems
- metering and informative billing
- promotion of combined heat and power (CHP) and district heating and cooling (DHC)
- efficiency in energy transmission and distribution
- qualification, accreditation and certification schemes for energy service providers
- promotion of energy services market and access for small and medium-sized enterprises (SMEs)
- review and monitoring.

NATIONAL TARGET

Energy Strategy Austria

In its government programme for the 24th legislation period, the federal government called for a "stronger de-coupling between economic growth and energy consumption in order to improve energy intensity." Therefore, an integrated strategy for energy and climate policy, the Energy Strategy Austria (*Energiestrategie Österreich*), was launched in 2010, singling out energy efficiency and the economical use of energy as core topics for achieving this goal. An absolute priority is to stabilise final energy consumption at its 2005 levels (1 100 PJ, or 26.3 Mtoe) by 2020. This represents a reduction of energy consumption by 200 PJ (4.8 Mtoe) compared to a development of final energy consumption without additional measures (the business-as-usual scenario).

The implementing measures proposed are divided into distinct categories – industrial buildings, production and services as well as trade and small-scale consumption, mobility, energy provision, security of energy supply and general measures.

The Energy Strategy Austria outlines specific measures, such as the adoption of an energy efficiency law, a survey of potentials for improving energy efficiency and the promotion of particularly efficient lighting systems, measures to reduce energy consumption for "stand-by" appliances, and an energy check of Austrian households.

Austrian Energy Efficiency Act

New national measures – with a view to implementing the European Union's Energy Efficiency Directive, and notably its target of 1.5% annual increase in energy efficiency with regard to end-user sales from 2014 to 2020 – will be introduced by a new Austrian Energy Efficiency Act which will be discussed and decided by parliament before June 2014.

As of 1 January 2014, energy suppliers (possibly with the exception of very small businesses) must implement demonstrable measures to increase energy efficiency.

Medium- and large-scale consumers must either implement an energy management system or be subject to an energy audit every four years. Small businesses are exempt from these requirements, but can choose to voluntarily introduce energy-saving measures.

SECTORAL POLICIES AND MEASURES

As part of a study ordered by the Federal Ministry of Economy, Family and Youth in 2008, the Austrian Energy Agency calculated the energy savings potential for various measures. The study put this potential at 93.6 PJ per year for the period until 2020. To realise this savings potential, around EUR 1.8 billion per year in new investments is needed. The investments would generate EUR 23.8 billion in added value and create 380 000 full-time jobs.

If systematically implemented in an ambitious way, the savings measures would be enough for meeting both Austria's 2016 goal of Directive 2006/32/EG and its 2020 EU target. The largest savings potentials identified are in the building and transport sectors.

BUILDING SECTOR

Savings in the building sector determined by means of bottom-up methods result mainly from measures to improve the thermal quality of the building shell, the efficiency of heating systems, including promoting the use of alternative energy systems and tightening the requirements set by building regulations. Table 3.1 provides an overview of the measures and the resulting savings.

Table 3.1 Measures for energy savings in the building sector

Number	Energy efficiency measure	Affected energy consumption	Final energy savings 2010 (TJ)	Expected final energy savings 2016 (TJ)
G.1.	Residential building subsidy – building shell	New buildings and renovation of buildings	13 905	22 705
G.2.	Residential building subsidy – efficient heating systems	New buildings and renovation of buildings	10 922	18 821
G.3.	Tightening construction requirements	New buildings and renovation of buildings	14 805	18 676
G.4.	National recovery plan/renovation voucher	Renovation of buildings	Technical measures still in process of implementation	Technical measures still in process of implementation
G.5.	Statutory provisions to promote district heating	Residential and non-residential buildings	Savings cannot be projected by bottom-up calculations	Savings cannot be projected by bottom-up calculations
G.6.	Energy advice for households	Private households	145	145
Total			**39 777**	**60 347**

Source: Austria 2011 NEEAP, p. 21.

In addition to the measures listed above, the government estimates that 278 TJ of savings (relative to the 2010 target) could come from the renovation programmes for public buildings.

INDUSTRY

With regard to industrial businesses and SMEs, the investment and advice subsidies for businesses were ranked as top measures. In this sector, theoretical bottom-up savings amounting to 2 675 TJ (with regard to the 2010 target) could be achieved.

Savings should occur in all categories, including notably process heat, electricity consumption, space and water heating.

The government is providing businesses around EUR 90 million per year to subsidise investment and advice related to energy efficiency, in addition to further funding from the provinces (between EUR 20 000 and EUR 1 million, depending on the province).

In 2010, as part of the transposition of the ESD into national law, the Federal Ministry of Economy, Family and Youth (BMFWJ) concluded voluntary agreements with utilities to motivate them to deliver energy savings for their final customers. Utilities agreed to set energy efficiency measures that saved 832 GWh in 2011, and they are targeting more than 3 000 GWh in savings in 2016. The Austrian Energy Agency is responsible for the appraisal, surveillance and monitoring of these voluntary agreements.

SMART METERING

Smart meters and informative billing were introduced in Austria on the basis of the Electricity Industry and Organisation Act (EIWOG), adopted in 2010, and smart meter pilot projects were initially introduced in three provinces. Installation of nearly 24 000 smart meters complying with the necessary requirements, as part of the voluntary agreements, was reported at the end of 2010. The smart metering programme is thus far reported to bring about an estimated saving of 14 TJ per year.

TRANSPORT

In the field of mobility, the government indicates that it is hard to estimate quantitative savings, but that bottom-up measures from the Austrian Climate and Energy Fund and the *klima:aktiv* climate protection initiative are yielding successes, and so are broader measures from the federal and provincial governments.

The annual programme of the Austrian Climate and Energy Fund includes the improvement of the intermodal interface – bicycle traffic/public passenger transport, investment subsidies for the new construction, extension or upgrading of existing connection lines and multi-modal transport systems to enhance the attractiveness and efficiency of combined transport. Measures to enhance the attractiveness of public passenger transport systems is supported by means of regional traffic concepts and technical projects in the form of non-repayable grants to the clients of public passenger transport services.

The *klima:aktiv* climate protection initiative includes transport measures focusing on environment-friendly, sustainable traffic development and soft mobility – e.g. vehicles with alternative drives, promotion of bicycle and pedestrian traffic, traffic information and logistics system, reduction of the traffic volume, promotion of public traffic, etc., are subsidised.

The federal government and the provinces are also promoting energy efficiency in transport by a wide range of measures, including speed restrictions, park & ride, the expansion of public passenger transport systems, bicycle infrastructure, shifting transport of goods, electromobility, car sharing and bicycle parking stations.

Regarding private vehicles, Austria has had a vehicle taxation system that creates permanent incentives for reduced CO_2 emissions from new vehicles since 1992. The Federal Minister of Finance is responsible for the implementation of this Federal Law on Standard Fuel Consumption Tax (*Normverbrauchsabgabe* – NoVA). The tax burden is proportionally linked to fuel consumption of the vehicle, and is imposed at the moment of the first registration of motor vehicles for traffic within the national territory.

Another tax instrument for the promotion of energy efficiency is the engine-related insurance tax. The insurance tax has to be paid every month in which the vehicle is publicly registered. As it depends on engine performance, vehicles with lower fuel consumption are favoured and the insurance tax creates permanent incentives for reduced CO_2 emissions for all vehicles.

The efficiency of new vehicles will be improved through EU regulations. From 2015, new passenger cars sold in the European Union should not emit more than 130 grammes of CO_2 per kilometre. There is a further provisional longer-term target of 95 g CO_2 per km by 2020, representing a 40% reduction on 2007 levels. For new vans, these mandatory

limits are 175 g CO_2 per km from 2017. A limit of 147 g CO_2 per km by 2020 has also been specified, representing a 28% reduction on 2007 levels.

HORIZONTAL MEASURES

Horizontal measures are cross-cutting measures that have an impact across various sectors of the economy and society. These measures related to taxation, research and training as well as energy labelling. Savings from measures to enhance the efficiency of lighting are included in the horizontal measures listed in Table 3.2.

Table 3.2 Horizontal measures for energy savings

Number	Energy efficiency measure	Affected energy consumption	Final energy savings 2010 (TJ)	Expected final energy savings 2016 (TJ)
H.1	Energy and transport taxes	All energy consumption categories	Savings cannot be projected by bottom-up calculation	Savings cannot be projected by bottom-up calculation
H.2	Standard consumption excise duty	Individual motorised transport	Savings cannot be projected by bottom-up calculation	Savings cannot be projected by bottom-up calculation
H.3	Research and development	All energy consumption categories	Savings cannot be projected by bottom-up calculation	Savings cannot be projected by bottom-up calculation
H.4	Education, training and information/raising awareness	All energy consumption categories	Savings cannot be projected by bottom-up calculation	Savings cannot be projected by bottom-up calculation
H.5	Energy labelling	Electricity consumption for refrigerating, freezing and washing	1 099	3 296
H.6	Directly measured projects	All energy consumption categories	4 219	4 771
H.7	Lighting	Electricity consumption for lighting	149	418
Total			**5 467**	**8 485**

Source: Austria 2011 NEEAP2, p. 43.

ASSESSMENT

Austria is well advanced with the transposition of EU Energy Efficiency Directives into domestic legislation, but could be doing more to scale up domestic efforts in improving energy efficiency, in order to mitigate climate change and reduce dependence on energy imports. Considerable energy savings potential remains in all sectors of Austria's economy, the largest of which, according to the government, are transport and building refurbishments.

Energy efficiency is one of three key pillars in the 2010 Energy Strategy Austria, which sets an overarching goal to stabilise final energy consumption at 2005 levels (1 100 PJ) by 2020. This implies a reduction of energy consumption by 200 PJ compared to a business-as-usual scenario. To reach this target, the second National Energy Efficiency Action Plan (NEEAP2), submitted to the European Commission in 2011, lists energy efficiency policies and measures to be implemented across sectors by 2020. The NEEAPs aim to improve energy efficiency by 9% from 2001-05 to 2016. Commendably, many of

Austria's measures go beyond the EU requirements, particularly the Energy Performance of Buildings Directive (EPBD).

The Austrian Federal Constitution provides no explicit authority for the general oversight of the field of energy efficiency. Both the federal government and the local governments are authorised to adopt laws in this field. Whereas building regulations are often established on a local level, the Federal Ministries of Science, Research and Economy and of Transport (BMWFW and bmvit) are responsible for economic- and transport-related measures respectively. In order to ensure a smooth implementation of the Energy Efficiency Act, a competence coverage clause (allowing the federal government to regulate matters which actually do not fall under its legislative competence) will be included in the legislation.

In 2008, the Austrian Energy Agency had identified the largest potential for energy savings to lie in transport and building refurbishments. However, the cost-efficient measures have not been prioritised as planned, and certain measures are not believed to be cost-effective. An update of this study is under preparation.

An important way of realising energy savings in the building sector is through tightening the building codes. It is noteworthy that building codes are not standardised across Austria, as the legal competence lies with the provinces. These have established the Austrian Institute for Construction Engineering, called OIB, to assist the provinces' work on building codes. OIB has issued non-obligatory guidelines on how to tighten building codes, which include both requirements for an overall energy consumption of the buildings per square metre and minimum requirements on U-values.[1] All provinces have changed their building codes, yet there still remain some differences on U-values between them.

Regarding existing buildings, refurbishments still offer notable potential. Austria has a whole number of initiatives in this area that are working well, including several subsidy schemes. However, there is a need to focus on security of funding for building refurbishment. According to the building industry, around 1% of the existing buildings are being refurbished every year. This calls for new ways of funding cost-efficient projects, if they are not all to be covered by the Austrian government. This could for instance be carried out through easily accessible bank loans or other loans available for transparent uniform refurbishment projects, with an emphasis on security of payback on the investment.

Regarding appliances and lighting, energy efficiency is enforced through harmonised EU regulations, mainly under the Ecodesign Directive and Energy Labelling Directive. Energy requirements for numerous products covered under the Ecodesign Directive (2005/32/EC) have entered into force, and Austria is transposing the October 2009 Ecodesign Directive recast (2009/125/EC), which includes energy-related products, such as building components. Austria is also transposing the 2010 Labelling Directive (2010/30/EU), which requires labelling and standard product information on the consumption of energy and other resources by energy-related products. The government should ensure the implementation of industry-wide protocols that minimise the energy consumption of network-connected electronic devices.

1. The U-value represents the rate of heat loss, i.e. how much energy passes through one square metre of material by a difference of one degree in temperature. It is measured in watts per degree Kelvin per square metre.

Whereas Austria has had a long-standing strong policy in the area of energy efficiency in buildings, it is less obvious how initiatives in the transport sector will contribute substantially to realising the energy-saving target set out in the Energy Strategy Austria. Austria is doing comparatively well in ensuring a continued role of efficient and clean modes of transport, such as rail. Regarding road transport specifically, Austria is implementing EU regulations to lower rolling resistance and promote appropriate tyre inflation pressure. It is also implementing EU regulations to reduce the average CO_2 intensity of new passenger cars. Taxation policy could be improved by a stronger link between vehicle tax and vehicle efficiency. Also, Austria has lower motor fuel taxes than the neighbouring countries, which encourages road transport demand. Finally, the government should push the European Union to require mandatory fuel-efficiency standards for heavy-duty vehicles.

In the industrial sector, minimum energy performance requirements (MEPs) for motors are improving energy efficiency, in line with EU regulations. Austria could introduce incentives for SMEs to adopt least life-cycle cost capital acquisition procedures. It could also speed up efforts to adopt and publicise common energy efficiency savings and verification measures, as this would more likely boost private sector investment in energy efficiency. Austria should also consider progressively phasing out favourable tax treatment of energy-intensive industries' purchases of oil products (and electricity, gas and coal), although this should be considered in the context of industrial competitiveness.

Voluntary agreements between the government and industry associations, companies and communities are also used in Austria and continue to form a core part of energy efficiency improvements. They have proven to be a success. New national measures, with a view to implementing the European Union's Energy Efficiency Directive – and notably its target of 1.5% annual increase in energy efficiency with regard to end-user sales from 2014 to 2020 – will be introduced by a new Federal Energy Efficiency Act which will be discussed and decided by parliament before June 2014.

The government places commendable emphasis on the monitoring and evaluation system of energy efficiency measures, and forecasts to achieve the energy efficiency targets. The existing monitoring system is regularly updated, and new measures continue to being developed when relevant. The IEA encourages the government to continue this work.

RECOMMENDATIONS

The government of Austria should:

- *Strengthen the energy efficiency target by exploiting potential savings in the transport sector.*
- *Secure appropriate forms of financing for the refurbishment of buildings.*
- *Continue to regularly monitor the progress of energy efficiency measures to ensure that sectoral targets are achievable, and allow for regular adjustment of requirements where necessary.*

4. CLIMATE CHANGE

Key data (2012)

Total GHG emissions (excluding LULUCF) (2011)*: 82.8 Mt CO_2-eq, +6% since 1990

Total GHG emissions (including LULUCF) (2011)*: 79.4 Mt CO_2-eq, +16.3% since 1990

2008-12 target: -13% from 1990

CO_2 emissions from fuel combustion: 64.7 Mt, +14.8% since 1990

CO_2 emissions by fuel: oil 47.3%, natural gas 26.4%, coal 21.5%, other 4.8%

CO_2 emissions by sector: transport 32.9%, power generation 22.9%, manufacturing and construction 19.1%, other energy industries 11.2%, residential 10.3%, commercial and other services 3.5%

* Source: UNFCCC.

TARGETS AND OBJECTIVES

Austria is a signatory to the United Nations Framework Convention on Climate Change (UNFCCC) and a party to the Kyoto Protocol. Its international commitment under the Kyoto Protocol was to reduce its average annual greenhouse gas (GHG) emissions by 13% in relation to 1990 levels − 78.2 Mt CO_2-eq excluding land use, land-use change and forestry (LULUCF) − in the five-year compliance period 2008-12.

In 2011, GHG emissions in Austria amounted to 82.8 Mt CO_2-eq. While emissions have dropped since peaking in 2005 at 93.2 Mt CO_2-eq, domestic measures have proven to be insufficient to meet the Kyoto targets. The country remains around 6% above the 1990 level, and 20% above its Kyoto commitment target.

Furthermore, the European Union has set out a mandatory target of 20% reduction by 2020, as part of the 20-20-20 by 2020 targets. The EU-ETS is expected to deliver the majority of emission cuts in the European Union, but this is to be supplemented by measures in sectors not covered by the ETS. Austria's obligation for the sectors outside the ETS is a 16% emissions reduction by 2020 compared to emissions in 2005.

The IEA *World Energy Outlook* publication highlights the fact that the European Union's present target to cut emissions for 2020 is not consistent with the goal of limiting the average global temperature increase to two degrees. Austria supports the EU policy drive to extend the EU emissions reduction target to 30% as long as the other industrialised countries commit to similar reductions and the main fast-growing economies also take adequate action to do the same, where possible. Emissions reduction targets post-2020 must be in line with the 2°C objective.

INSTITUTIONS

Climate policy, including core implementation policies like emissions trading, is led by the **Federal Ministry of Agriculture, Forestry, Environment and Water Management**. The **Federal Ministry of Science, Research and Economy** is responsible for the overall co-ordination of all elements of the Energy Strategy Austria. Vertically, the federal government, the provinces and the municipalities share responsibility for the actual implementation of measures to reduce GHG emissions.

In 2007, the government-owned and funded **Klima und Energiefond** (KLI.EN), or Climate and Energy Fund, was established. The objective of the Fund is to help Austria reach its climate mitigation targets through the funding of climate- and energy-related projects. It has an annual budget of around EUR 120 million.

The **Federal Environment Fund** supports energy efficiency measures and the promotion of renewables in both the industrial sector and residential buildings, with a total annual budget of more than EUR 190 million for the period 2011-16, resulting in annual climate- and energy-related investments in the private sector of around EUR 1.4 billion. The government estimates that this corresponds to a reduction of CO_2 emissions totalling around 12 Mt.

Also of note, the government's **klima:aktiv** is an initiative for active climate protection, whose primary objective is to introduce and promote the rapid spread of climate-friendly technologies and services on the market and everyday life. The initiative gained international recognition and was awarded the trophy for best practice in the 2011 European Public Sector Award (EPSA).

ENERGY-RELATED CO_2 EMISSIONS

TYPE OF EMISSIONS

According to the United Nations Framework Convention on Climate Change (UNFCCC), the main GHG in Austria 2011 was carbon dioxide (CO_2), accounting for 85% of total GHG emissions, followed by methane (CH_4) for 6.5% and by nitrous oxide (N_2O) for 6.4%. Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 2.1% of the overall GHG emissions in the country.

UNFCCC data show that Austria's energy sector accounted for 74.8% of total GHG emissions, followed by the industrial processes sector (13.6%), the agricultural sector (9.2%) and the waste sector (2.1%).

SOURCES OF CO_2 EMISSIONS

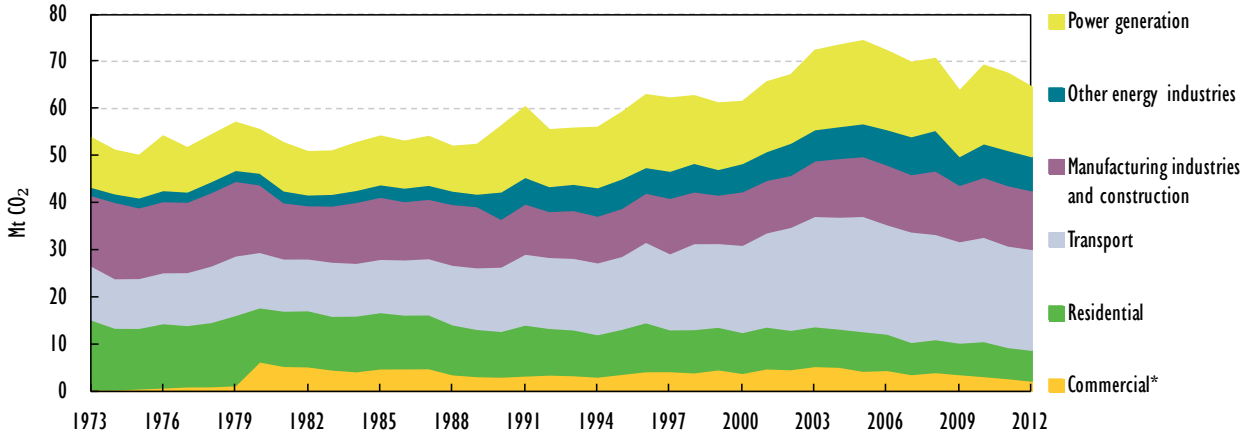
Energy-related CO_2 emissions were 64.7 Mt CO_2 in 2012, increasing by 14.8% since 1990. However, since peaking at 74.6 Mt CO_2 in 2005, they have declined by 13.3% to 2012. All sectors of the economy reduced emissions during that period except for energy industries other than power generation (such as oil refining).

Transport is the largest emitting sector in Austria. It accounted for 32.9% of energy-related CO_2 emissions in 2012. Over the 22 years since 1990, emissions from the transport sector have increased by 56.7%, more than double the rate of increase in total CO_2 emissions. As such, the share of transport has risen from 24.1% in 1990. Since 2005, emissions in transport have declined by 12.6%.

Electricity and heat generation accounted for 22.9% of energy-related emissions in 2012, manufacturing and construction amounted to 19.1% and other energy industries to 11.2%. The share in total emissions from these sectors has remained relatively unchanged since 1990, with CO_2 emissions per sector increasing by more than 14%. Since 2005, emissions in other energy industries have increased by 2.9%, but they decreased by 16.2% in power generation and by 1.9% in manufacturing and construction.

The residential sector accounted for 10.3% of energy-related emissions in 2012. Emissions in the residential sector have declined by 32.7% compared to 1990 and the share of total emissions has fallen from 17.4% of the total in 1990. Commercial and other services emit around 4%. Since 1990, emissions from the commercial sector have declined by 27.8%, down from 5.5% of the total.

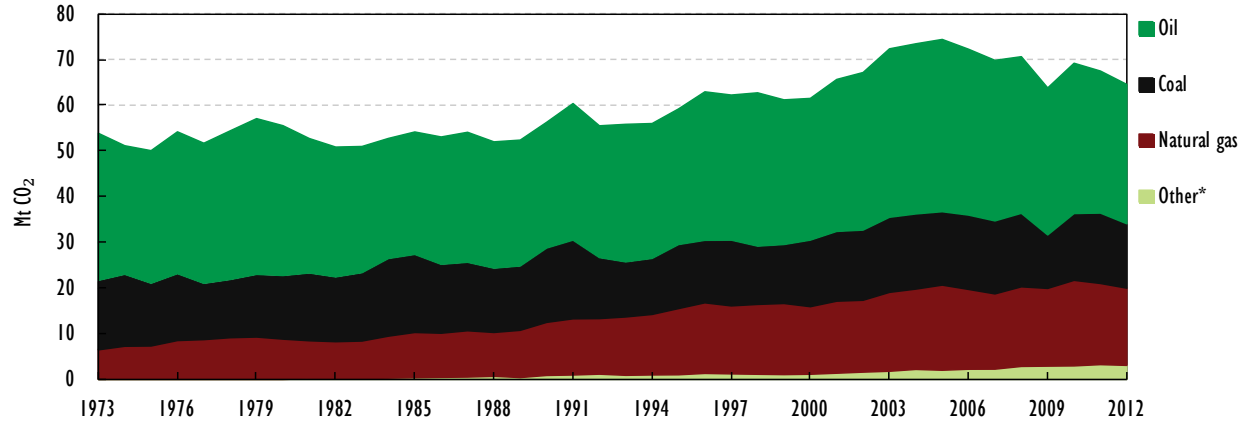
Figure 4.1 CO_2 emissions by sector, 1973-2012



* *Commercial* includes commercial and public services, agriculture/forestry and fishing.

Sources: *CO_2 Emissions from Fuel Combustion*, IEA/OECD Paris, 2013; and country submission.

Figure 4.2 CO_2 emissions by fuel, 1973-2012



* *Other* includes industrial waste and non-renewable municipal waste.

Sources: *CO_2 Emissions from Fuel Combustion*, IEA/OECD Paris, 2013; and country submission.

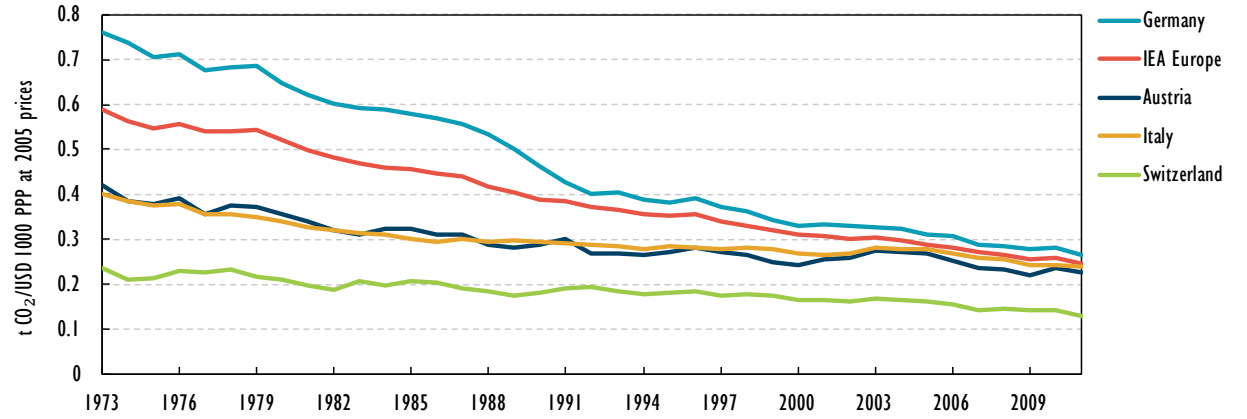
Oil and oil products produced 47.3% of energy-related emissions in Austria in 2012, while natural gas accounted for 26.4% and coal for 21.5%. More than 88% of fuels used in transport are oil products, leading to higher emissions by this sector. Since 1990, emissions from coal use have declined from 28.5% of the total, while emissions from natural gas have increased from 21%.

Emissions from industrial and non-renewable municipal waste have also grown from 1.6% in 1990 to 4.8% in 2012, owing to a boom in the use of waste products.

CARBON INTENSITY

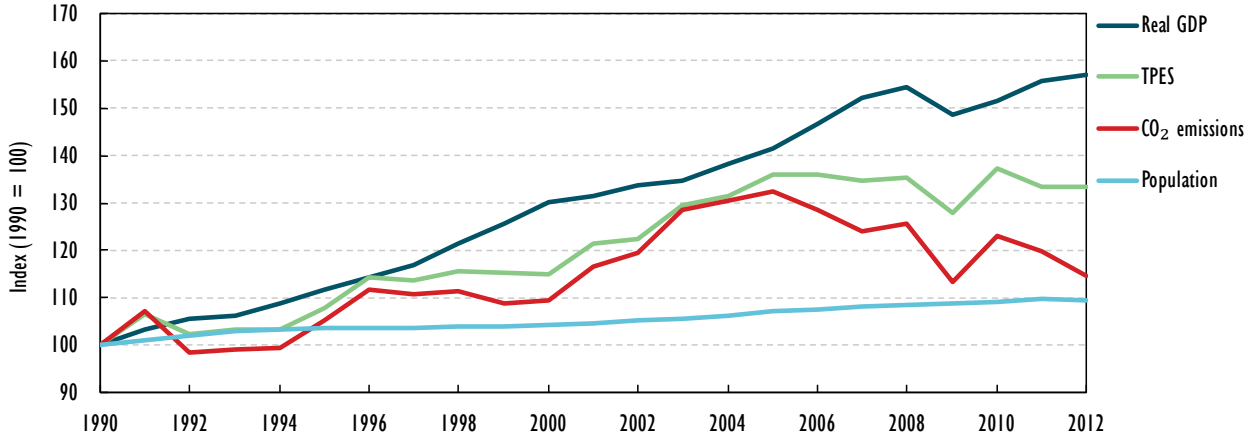
Austria's carbon intensity, measured as CO_2 emissions per real GDP at purchasing power parity (PPP), was 0.21 tonnes of CO_2 per USD 1 000 PPP (t CO_2/USD 1 000 PPP) in 2012. This is lower than both the IEA average of 0.33 t CO_2/USD 1 000 PPP in 2011 and the average for European IEA member countries of 0.24 t CO_2/USD 1 000 PPP in 2011. Despite an increase in total CO_2 emissions since 1990, carbon intensity in Austria has declined by 26.9% from 1990 to 2012, down from 0.29 t CO_2/USD 1 000 PPP. However, the rate of decline is slower than the IEA Europe average which contracted by 36.7% from 1990 to 2011.

Figure 4.3 Energy-related CO_2 emissions per unit of GDP in Austria and in other selected IEA member countries, 1973-2011



Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2013; and *National Accounts of OECD Countries*, OECD Paris, 2013.

Figure 4.4 CO_2 emissions and main drivers in Austria, 1990-2012



Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2013; *National Accounts of OECD Countries*, OECD Paris, 2013; and country submission.

ASSESSMENT

"Environmental compatibility" is an explicit goal of Austrian energy policy, and the government's climate change policy is directed by the 2010 Energy Strategy Austria. The strategy explicitly states that the efficient use of limited resources must be the general guideline and that the transfer of emissions to other countries and the total impact on the environment should be minimised. The Energy Strategy Austria foresees an emissions reduction of 16% by 2020 compared to 2005 levels in the non-ETS sector, including the implementation of all measures proposed.

During the 2008-12 compliance period of the Kyoto Protocol, Austria, under the Burden-Sharing Agreement of the European Union, was required to reduce its average annual GHG emissions by 13% from the 1990 levels of 78.2 Mt CO_2-eq. (excluding LULUCF). In 2011, GHG emissions in Austria amounted to 82.8 Mt CO_2-eq. While emissions have dropped in recent years and Austria's current emissions are clearly lower than the 2005 level of 93.2 Mt CO_2-eq thanks to enhanced energy efficiency, increasing deployment of renewables, and decreasing use of fossil fuels, these domestic measures have proven to be insufficient to meet the Kyoto targets. Austria remains around 6% above the 1990 level. There are several reasons why Austria has not attained its agreed targets.

First, Austria's emissions in the 1990 base year were already low, and industrial production has since increased considerably (almost doubling). Emissions from industry as a whole have thus grown substantially.

Second, emissions have risen dramatically in the transport sector. The country's vehicle fleet has grown by around 50% since 1990. Furthermore, the entry of Austria into the European Union, followed by its subsequent enlargement of the European Union to Austria's eastern neighbours, has led to increased transit through Austria. This has been exacerbated by Austria's competitive motor fuel pricing, which has resulted in significant price-induced fuel exports in vehicle tanks ("fuel tourism") to neighbouring countries. The government indicates that at its peak, fuel tourism can account for close to a third of motor fuel sales. Road transport has become one of the largest emitters in Austria, surpassed only by industrial output-related emissions.

Third, Austria has relied on market mechanisms, including the effective functioning of the EU Emissions Trading Scheme (ETS), to compel Austrian power and industry sectors to invest in emissions reduction schemes rather than purchasing compliance credits. Yet GHG emissions in the sectors covered by the EU-ETS have declined substantially in recent years, leading to a low price of carbon which has not provided the necessary financial incentives to boost investment into low carbon technologies in the power and industry sectors.

As a result, the gap of 14 Mt CO_2-eq per year between the 2011 emission figure and the reduction target will be closed by using the international flexibility mechanisms under the Kyoto Protocol – Joint Implementation (JI) and Clean Development Mechanism (CDM). Despite not meeting its targets with domestic policies and measures alone, Austria's continuing commitment to international climate objectives is commendable. As the global negotiation on climate change evolves, the cost-effectiveness of government measures to reduce GHG emissions should be regularly assessed.

Austria has an active JI/CDM purchase programme for the first (2008-12) commitment period of the Kyoto Protocol. According to the most recent assessment, the quantitative

contribution of the Kyoto mechanisms for the first commitment period is worth up to 80 Mt CO_2-eq, with a budget of EUR 611 million. Austria has been the third-largest buyer of emission permits (after Japan and Spain), allocating close to EUR 500 million since 2007 on buying CDM permits in order to meet its emission targets.

Regarding the ETS for years ahead, the focus of the third period (2013-20) was to adopt an EU-wide cap on emissions, instead of the national cap in the first and second phases. The cap for 2013 has been determined at just under 2.04 billion allowances, and this cap will decrease each year by 1.74%. More importantly, an auctioning system will gradually replace the free allocation mechanism of emission permits.

In the Austrian context, that will have an impact on carbon-intensive power plants and energy-intensive industries. Austria submitted the preliminary free allocations to Austrian installations – referred to as the NIM (national implementation measures – for the period 2013-20 to the European Commission in March 2012. In the new EU-ETS system, electricity generators will only receive free allowances for the production of heat in case of combined heat and power (CHP). The allocations for manufacturing industry are subject to the cross-sectoral, EU-wide correction factor that the European Commission has applied as the total of the free allocations that were submitted by member states exceeded the share of free allocations to industry in 2013-20. Following the Commission's decision on 18 December 2013, Austria may now allocate free allowances to the manufacturing industry.

A major change since the last in-depth review (2007) is the Austrian Climate Change Act (*Klimaschutzgesetz* – KSG), a federal act which entered into force in 2011. This Act provides for compliance with GHG emission ceilings – such as the target path for 2013-20 laid down in the Effort-Sharing Decision – and the development of effective climate change measures, whereby measures need to be negotiated on a sectoral basis to achieve compliance with sectoral emission ceilings. The responsibility to lead the negotiations lies within the competent federal ministries for the respective sectors. Two bodies – the National Climate Change Committee and the Climate Change Advisory Board – are established, consisting of representatives of relevant federal ministries, of the provinces and representatives of the political parties in parliament and of several governmental and non-governmental organisations, which will monitor the progress towards compliance with GHG emission ceilings. In 2013, the government adopted an action programme for the years 2013-14. In addition, different institutions are sharing responsibilities on reporting and statistics. However, collaboration between federal ministries and federal/provincial governments is hard to achieve without any legally binding arrangement. In order to achieve the original legislative goals, the introduction of binding responsibilities should be explored among stakeholders. Close cross-ministry co-ordination is central to developing an effective climate policy in Austria.

An earlier development to achieve the national climate energy targets under the Kyoto Protocol, and to develop and implement the national energy and technology strategies, was the establishment of the Austrian Climate and Energy Fund (KLI.EN Fund) in 2007 by the Climate and Energy Fund Act. The KLI.EN Fund supports mission-oriented programmes that reduce carbon emissions, increase energy efficiency, foster renewable R&D, and support the marketability of new technologies. From 2007 to 2012, the Fund invested a total of EUR 730 million, which resulted in an economic impact of EUR 1.82 billion. The KLI.EN Fund spurs innovation and growth in areas that will determine Austria's energy and climate future, which receives positive responses from business. In order to accelerate the economic impact of the KLI.EN Fund, alternative

measure regarding the financial support scheme should be considered (e.g. Carbon Trust Investment Partners).

RECOMMENDATIONS

The government of Austria should:

- *Regularly assess the long-term cost-effectiveness of climate-oriented measures to achieve greenhouse gas emissions reduction targets.*
- *Explore options to introduce binding domestic obligations among stakeholders in the revised Climate Change Act.*
- *Enhance efforts to reduce carbon emissions in the transport sector, in light of its significant contribution to emissions among the non-ETS sectors, in particular in supporting alternative fuel vehicles and increased promotion of modal shift.*

PART II
SECTOR ANALYSIS

5. NATURAL GAS

Key data (2012)

Production: 1.9 bcm, -3.9% since 2002

Share of natural gas: 22.4% of TPES and 14.1% of electricity generation

Imports (for domestic use): 14.2 bcm, +105% since 2002

Exports:[1] 6.4 bcm

Inland consumption: 9 bcm (industry 39.2%, power generation 29.6%, residential 15.6%, commercial and services 7.2%, other transformation 4.9%, transport 2.4%)

OVERVIEW

Natural gas supply in Austria was 7.4 million tonnes of oil-equivalent (Mtoe) or 9 billion cubic metres (bcm) in 2012, accounting for 22% of the country's total primary energy supply (TPES), equalling the OECD average share. The supply of natural gas has increased by 7.5% since 2002, similar to growth in TPES over the same period. Natural gas accounts for 14% of Austria's electricity production, and 18% of the final energy consumption of households.

The government projects natural gas to continue to play an important role in Austria's energy mix and its share of TPES to remain at about 23% in 2020.

SUPPLY AND DEMAND

DOMESTIC PRODUCTION

Conventional gas production

Austria has modest gas reserves, estimated at 16.1 bcm as of 1 January 2011. Indigenous production of natural gas was 1.9 bcm in 2012, representing 21.1% of total inland consumption. Over the ten years since 2002, natural gas production has been somewhat volatile, while averaging 1.9 bcm. In that period, production has varied from 17.3% to 23.4% of total demand. Domestic production is likely to remain stable in coming years, covering about 18% of the country's consumption. Proven domestic reserves are slowly declining, and are likely to be close to depleted by 2030.

As is the case for oil, two companies are active in natural gas extraction in Austria: the national incumbent, OMV, with around 87% of production as of end-2012, and RAG, another oil and gas company, with the remaining 13%.

1. Transit gas is not included. Exports are not reported figures, because of statistical confidentiality. Instead, they are calculated as *imports for domestic use* plus *domestic production* plus or minus *stock changes* minus *reported domestic supply.*

Shale gas

According to estimates from OMV, Austria holds about 300 bcm of recoverable shale gas resources – enough to cover domestic production during at least 20 years. A project to drill two wells north of Vienna recently failed because of public protest and new legislation requiring a mandatory environmental impact assessment for each well using hydraulic fracturing, a procedure taking about three to four years or more that *de facto* discourages any such drilling. The government is yet to develop a strategy or position at the federal and regional levels on shale gas opportunities and risks.

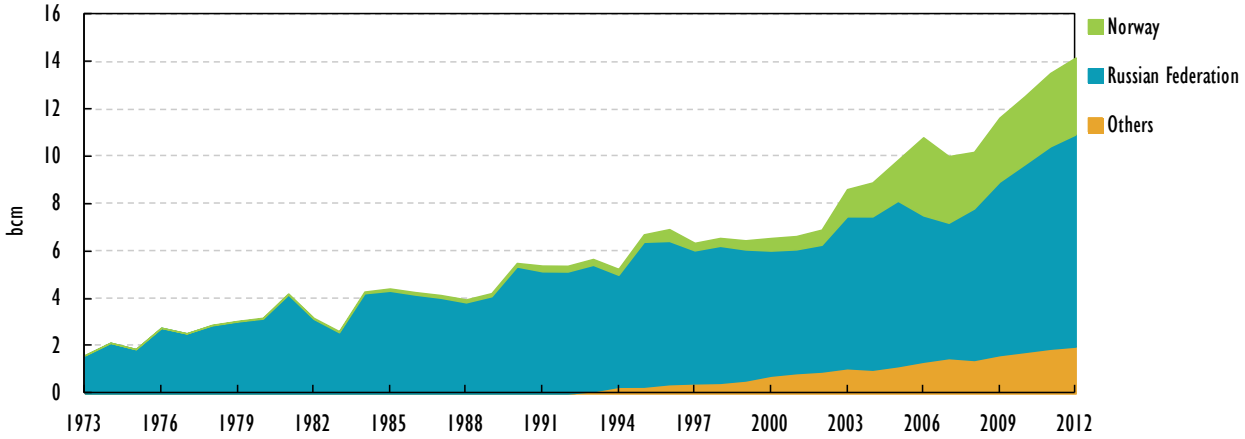
IMPORTS AND EXPORTS

Austria is highly dependent on gas imports as domestic production meets only around 20% of demand. Thus, around 80% of the gas consumed in the country is imported. Contractually, Austria indicates that some 14% of gas imports come from Norway (2012). In terms of physical molecules entering the country, however, almost all gas supply is sourced from Russia from a single supplier, Gazprom, and a single supply route, via Ukraine and Slovakia.

In 2012, imports for domestic consumption were 14.2 bcm, which is 105% higher than in 2002. Gas imports have been steadily increasing for decades, as the infrastructure and gas markets have expanded in the region.

Austria is also a significant transit country for natural gas. It is well-located along gas routes from Russia to Italy and southern Germany, and its transit capacity helps secure the energy supply of its neighbours. Also according to E-Control, the regulator, total gas imports amounted to 43.6 bcm in 2012, so transit volumes were some three times larger than domestic consumption. According to E-Control, total exports amounted to 34.4 bcm in 2012. Because indigenous production was modest, Austria began exporting gas only in the early 2000s, when regional markets started developing.

Figure 5.1 Contractual natural gas imports for domestic use by country, 1973-2012

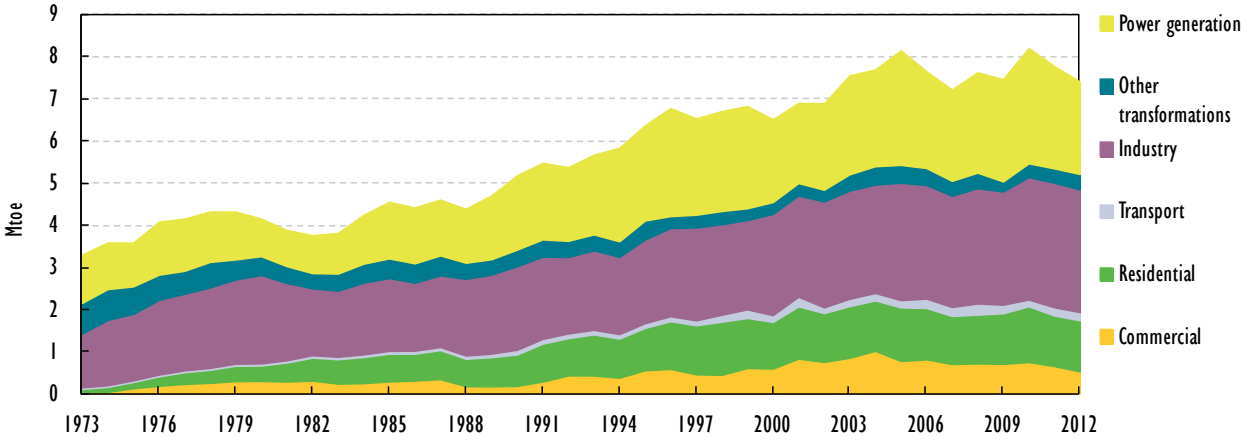


Sources: *Natural Gas 2012*, IEA/OECD Paris, 2013; and country submission.

The long-term future of Austria as a gas transit country will depend on gas export volumes and routes of Russian gas to Europe as well as the possibility to have access and transit alternatives to gas supply sources from the Caspian Sea and the Black Sea, for example. Current trends indicate that gas volumes in transit through Ukraine/Slovakia

have been decreasing, not least following the commissioning of the Nord Stream gas pipeline and in the wake of the economic crisis affecting European gas consumption.

Figure 5.2 Natural gas supply by sector*, 1973-2012



Note: *Other transformations* includes energy sector consumption. *Industry* includes non-energy use. *Commercial* includes commercial, public services, agriculture, forestry, fishing and other final consumption.

* TPES by the consuming sector.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2013; and country submission.

DEMAND

Gas consumption stood at 9 bcm in 2012. This is a decline from 9.5 bcm in 2011 and 10 bcm in 2010 and may indicate an end to the slowly increasing long-term trend in demand. According to the reference scenario in the 2013 update of the *EU Energy, Transport and GHG Emissions Trends to 2050*, gross consumption of natural gas in Austria will be 8.8 bcm in 2015 and will then decline to around 7.5 bcm towards 2050.

Natural gas is primarily used in power generation and the industry sector. In 2012, electricity and heat generation amounted to 29.6% of total demand, half of which was in combined heat and power (CHP) production plants. Total demand in the power generation sector has increased by 7% since 2002, growing at a similar rate to the overall demand for natural gas, which increased by 7.5%. This trend is likely to slow down as the economic viability of gas-fired power generation is challenged by the oil indexation and competition from renewables, coal and electricity imports.

The industry sector consumed 39.2% of natural gas in 2012, up from 36.4% in 2002. Demand for natural gas in industry has increased by 15.8% over the ten years to 2012. Relatively high oil-indexed gas prices impact the competitiveness of energy-intensive industries and may lead some of them to relocate to countries where energy is cheaper.

The residential and the commercial and services sectors consumed 16.6% and 7.2% of natural gas in 2012, respectively. Residential use of natural gas increased by 4.7% over the ten years since 2002, while commercial and services sector consumption contracted by 29.7%. Since overall natural gas demand increased at a faster rate, the share of natural gas in residential and commercial sectors has fallen slightly.

The transport sector accounted for 2.4% of total natural gas demand in 2012, up from 1.7% in 2002. The energy sector's own use accounts for around 5% of total demand.

As gas is largely used for heat and power generation and given Austria's continental climate, seasonality of demand is strong, with consumption being up to three times higher in winter than in summer. Storage withdrawals play a key role in the winter when net imports are lowest. Daily peak gas demand occurs during the winter, when gas consumption increases significantly for heating, and stood at some 55 million cubic metres per day (mcm/d) in 2012.

Gas is used as backup in times of peak demand or low renewable base load production. Austria's thermal gas power plants, including combined-cycle plants and heat and power plants, suffer from high gas prices, lower utilisation rates, competition from hydropower, and lower peak electricity prices as more renewables enter the grid. Gas consumption for power generation is unlikely to increase further but will continue to play a role given its flexibility as a fuel and as a complement to hydropower.

In the residential sector, gas for heating is used by about 26% of Austria's 3.6 million households and the number of households using gas has remained stable over the past ten years. There is a potential for about 900 000 households switching to gas away from oil until 2020, depending primarily on the cost-effectiveness of natural gas compared with both fuel oil and biomass, and also on the commercial rationale to build new distribution networks for gas.

In the industrial sector, high prices affect the competitiveness of gas-intensive industries compared to the United States where gas is much cheaper. Gas demand in this sector is unlikely to increase unless there is a dramatic and sustained reduction of the gas price.

INSTITUTIONS

The **Federal Ministry of Science, Research and Economy** (BMWFW, until 1 March 2014, the Federal Ministry of Economy, Family and Youth) is responsible for energy policy within the government. In the natural gas sector, the ministry determines policy in relation to security of energy supply and the functioning of the market. It is responsible for transposing EU Gas Directives into national law.

E-Control is the independent body responsible for overseeing the liberalisation of Austria's natural gas and electricity markets and the day-to-day operation of those markets. Established in 2001, it works to promote competition in the electricity and natural gas sectors and to ensure that the benefits of competitive pressures on prices and services flow to consumers. E-Control's regulatory powers were increased with the 2010 E-Control Act (*Energie-Control-Gesetz*), enshrining its independence and expanding its authority and sanctioning power.

The **Austrian Competition Authority**, in co-ordination with E-Control, is the government body responsible for enforcing Austrian and European competition laws.

In line with the prerogatives of the EU Third Energy Package, the European Commission has certified Austria's gas TSO **Gas Connect Austria GmbH** as an independent transmission operator (ITO) for a single pan-Austrian market zone, and has also certified the Nabucco project. However, the certification procedures have not yet been finalised for Trans-Austria Gasleitung GmbH (TAG), Baumgarten Oberkappel Gasleitung GmbH (BOG), the two smaller gas grids that are not physically connected to the large gas grid of Eastern Austria.

MARKET REFORM

The natural gas part of European Union's Third Energy Package for Electricity and Gas Markets (2009) has been implemented in Austria through the Natural Gas Act 2011, and E-Control has been given increased regulatory powers.

In early January 2013, Austria implemented a gas market reform with the change from a point-to-point border capacity allocation and pricing system to an entry/exit market model with a virtual trading point operated by the Central European Gas Hub (CEGH). The CEGH is physically located in Baumgarten and was founded by OMV (80% controlling stake) in 2000 with a view to becoming the primary hub for Central European gas trading. Although around a third of all gas exports from Russia to Western Europe passes through Baumgarten, it has so far not met its hub aspirations, with its liquidity (e.g. churn ratio – net traded volumes/physical volumes) standing some one-third to one-fourth of that of other continental hubs, such as the Dutch TTF or German hubs NetConnect and Gaspool.

In 2012, traded volumes at the hub amounted to 47 bcm, benefitting from the start of a spot market and a futures market. In 2012, the churn ratio was comprised between 3.22 (January) and 3.81 (August), with physical volumes sold on the hub comprised between 0.98 bcm/month (lowest) and 1.24 bcm/month (highest). The hub's liquidity is slowly but progressively improving. About 100 to 120 traders are active on the hub (total 160 registered) and the number of registered parties is increasing, a development that can raise liquidity.

The European Union's goal of creating a fully integrated gas market by 2014 is being met by first developing regionally integrated markets under the Gas Regional Initiatives (see Box 5.1). Austria is part of European Union's South/South-East gas region.

Box 5.1 Gas Regional Initiatives (GRI)

In early 2006, the European Regulators' Group for Electricity and Gas (ERGEG) held a public consultation on the creation of a single, competitive, pan-European gas market. As an interim step, and with the support of the European Commission, the Gas Regional Initiatives (GRI) was created. Work is under way in the three designated gas regions (North-West; South/South-East; and South regions) to remove internal barriers to competition by improving interconnection, transparency and balancing tools, as well as bolster security of supply.

In July 2011, ERGEG was dissolved. The Agency for the Co-operation of Energy Regulators (ACER) has now taken over ERGEG work in regard to the Regional Initiatives. ACER is working closely with the European Commission and national regulators to ensure the convergence and coherence of the regions towards the ultimate goal – a single, pan-EU gas market.

The adoption of the EU Third Package on Electricity and Natural Gas Markets in September 2009 and the strong commitment of the European Council in February 2011 to complete the internal energy market by 2014 set a firm regulatory, institutional and political background to defining framework guidelines and network codes to achieve this goal.

Source: ACER and CEER websites.

INFRASTRUCTURE

PIPELINES

The total length of the gas pipeline network in Austria is 38 293 km, of which 2 876 km are transmission pipelines and 35 417 km are distribution pipelines. Austria's gas grid is directly connected to the ones in Germany, Italy and Hungary through the Baumgarten hub where a number of pipelines converge.

Austria is an important transit country for gas to Germany, France and Italy. Domestic transmission pipelines are owned and operated by Gas Connect Austria GmbH, Netz Niederösterreich GmbH, Gasnetz Steiermark GmbH, OÖ. Ferngas Netz GmbH and Netz Burgenland Erdgas GmbH, and they are managed by AGGM (Austrian Gas Grid Management). Transit pipelines are operated by Gas Connect Austria GmbH and managed by BOG GmbH (WAG – 245 km), TAG GmbH (TAG – 382.8 km) and Gas Connect Austria GmbH (SOL – 26 km, HAG – 46 km, Penta West – 95 km, PVS 1 – 330 km).

The Austrian gas transmission system is formed of the following seven pipelines:

- Trans-Austria Gaspipeline (TAG), which supplies Austria, Italy, Slovenia and Croatia
- West-Austria Gaspipeline (WAG) which supplies Austria, Germany, France and Central Europe
- South-East Gaspipeline (SOG) which supplies Italy, Slovenia and Croatia
- Hungary-Austria Gaspipeline (HAG) which supplies Hungary
- Penta West Gaspipeline (PW) which supplies Germany, France and Central Europe
- Kittsee-Petržalka Gaspipeline which supplies the Slovak Republic
- Primärverteilungssystem 1 (PVS 1) which supplies the Vienna region.

In the aftermath of the 2009 Ukraine-Russia gas supply disruption, Austria and other EU member states decided to increase the number of bidirectional cross-border pipelines. Of Austria's six interconnection points with neighbouring countries, four are now bidirectional (Oberkappel, Überackern/Burghausen, Tarvisio/Arnoldstein and Baumgarten).

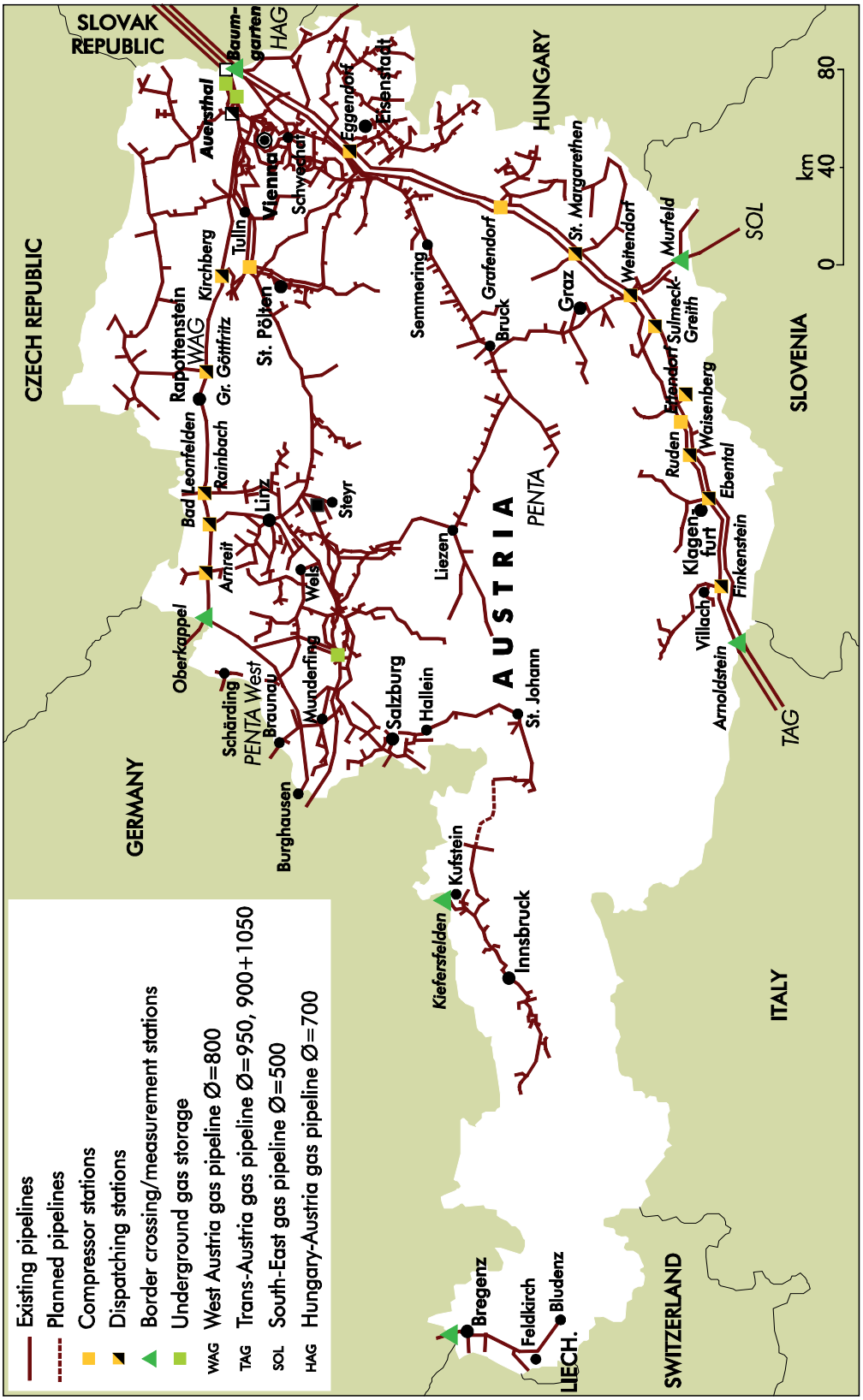
Regarding the interconnection points at Mosonmagyárovár (Hungary) and Murfeld/Ceršak (Slovenia), the regulatory authorities and the TSOs concerned concluded that there is currently no demand for bidirectional capacity. Consequently, Austria has requested the European Commission to exempt these connections to Slovakia and to Slovenia from bidirectionality.

SUPPLY INFRASTRUCTURE PROJECTS

Austria has sought to diversify its supply routes and sources by encouraging gas projects along the Southern Corridor(s), prioritising Nabucco and its Nabucco-West shortened version while also supporting the South Stream gas pipeline project and its arrival at the Baumgarten hub.

The Nabucco-West pipeline project aimed at bringing gas from Shah Deniz 2 to Baumgarten and onwards to the Austrian and other regional markets. In June 2013 however, the Shah Deniz 2 consortium decided to choose the TAP pipeline project over Nabucco to supply gas from Azerbaijan to Europe.

Figure 5.3 Natural gas infrastructure



This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

As a consequence, a new opportunity to develop a gas pipeline from Bulgaria to Austria via Romania and Hungary could arise as more Azeri production is developed beyond Shah Deniz 2 and if the TANAP pipeline across Turkey is built with a scalable capacity. OMV is currently active in Black Sea offshore projects in Romania and Ukraine. Over time, a new transport route from Romania to Austria may be considered, be it based on a new pipeline or on interconnections.

The South Stream project is aimed at strengthening the regional security of gas supplies to Central and South-East Europe – albeit not diversifying gas supply source – while the plans for its route remain to be finalised.

As a landlocked country, Austria cannot build a domestic liquefied natural gas (LNG) terminal. However, it is currently promoting the development of an LNG terminal in Krk in Croatia, in order to further diversify its import sources by using cargoes via the Mediterranean basin.

STORAGE

Austria has significant storage capacities, primarily from depleted natural gas fields which were redeveloped on a commercial basis. The growth in storage capacity has been rapid in recent years, with working gas storage volumes rising from 4.1 bcm in 2008 to 4.5 bcm in 2009 and up to 7.4 bcm as of 2012, on nine operational sites.

OMV owns three facilities with a total capacity of 2.4 bcm, or 32% of the total. RAG owns 19%, and the rest is owned by various companies (Wingas, Gazprom and E.ON).

Table 5.1 Natural gas storage facilities (July 2012)

Storage	Input capacity (Nm^3/h)	Share of total capacity	Output capacity (Nm^3/h)	Share of total capacity	Working gas volume (million m^3)	Share of total capacity
OMV – Schonkirchen	650 000	21%	960 000	30%	1 780	23.95%
OMV – Tallesbrunn	125 000	4%	160 000	5%	400	5.38%
OMV – Thann	115 000	4%	130 000	4%	250	3.36%
OMV total	**890 000**	**29%**	**1 250 000**	**39%**	**2 430**	**32.7%**
RAG – Puchkirchen	520 000	17%	520 000	16%	1 080	14.53%
RAG – Haidach 5	20 000	1%	20 000	1%	16	0.22%
RAG – Aigelsbrunn	50 000	2%	50 000	2%	100	1.35%
RAG total	**590 000**	**19%**	**590 000**	**18%**	**1 196**	**16.09%**
Wingas – Haidach	334 000	11%	334 000	10%	880	35.53%
Gazprom – Haidach	666 000	22%	666 000	21%	1 760	35.53%
E. ON gas storage – 7 fields	607 000	20%	405 000	12%	1 165	15.68%
Total	**3 087 000**	**100%**	**3 245 000**	**100%**	**7 431**	**100%**

Source: Energie-Control Austria (based on the information from companies).

Austria has one of the highest ratios between annual demand and working storage capacity, which is an indicator of good security of gas supply. Total storage capacity accounts for about 80% of 2012 natural gas consumption. During peaks of demand in the early winter, storage withdrawal can account for up to 60% of demand. If storages are properly filled, these provide Austria with a comfortable buffer in case of gas supply disruptions, as illustrated during past gas supply crises and shortfalls.

Total output capacity from gas storage sites is 3.2 mcm/hour. This is slightly higher than the 2.5 mcm/h of peak demand during the cold spell in February 2012.

SECURITY OF SUPPLY

Austria is vulnerable to a supply disruption as all of its physical gas imports come from Russia via the Brotherhood pipeline system. The key elements of Austria's overall gas security policy are large commercial stocks held by all major gas players as well as sufficient storage capacity, currently standing at around 80% of yearly consumption. Austria is well connected to its neighbours through a number of reversible pipelines.

EMERGENCY RESPONSE POLICY

Austria does not have government natural gas stocks, nor does it place an obligation on its suppliers to hold natural gas reserves. It does however have large gas storage capacity of commercial stocks, which provide a significant buffer in the event of a gas supply shortage. The key piece of legislation stating the government's power in dealing with gas supply emergencies is contained in Section 20j of the Energy Power Act, which states that the government is tasked with:

- giving directions to natural gas undertakings, control area managers, balancing group representatives, balancing group co-ordinators and producers regarding the production, transportation, transmission, distribution, storage, wholesaling and retailing of natural gas
- informing final consumers regarding the allocation, withdrawal and use of natural gas, and the exclusion of consumers from the withdrawal of natural gas
- issuing regulations regarding the supply of natural gas from and to EU member states and third countries.

In the event of an emergency, the government indicates that Austria would use primarily market mechanisms in order to ensure that consumers remain supplied.

SUPPLY AND RETAIL

RETAIL MARKET STRUCTURE

Six companies currently import gas into Austria on the basis of long-term supply contracts. The Austrian gas grid is operated by three transmission system operators (TSOs Gas Connect Austria GmbH, BOG GmbH and TAG GmbH) and 22 distribution system operators (DSOs). There are 35 gas suppliers operating in Austria.

The market was fully liberalised in October 2002, but real competition has not yet emerged. In 2012, the three largest suppliers account for 72% of sales, with one supplier alone (Energieallianz through its subsidiaries Wienenergie, EVN and Energie Burgenland)

accounting for around 60% of the market. Furthermore, most gas suppliers in the country are majority-owned by regional governments, and are partially interlinked.

The number of suppliers has increased sharply in just two years, as in 2011 residential gas users had the choice of between 7 or 8 suppliers, depending on the region. Today this number varies between 13 and 15. However, in Tirol and Vorarlberg, only 2 or 3 suppliers are active. Another indication of insufficient competition is the lack of correlation between retail and wholesale prices, with variations in the wholesale prices (e.g. during the recent financial crisis) not being fully passed on to end users. Rates of customers switching supplier are low, but are rising. In 2011, only 1.1% of all end users switched supplier. However, in 2012, the increase in gas prices and the entry of new suppliers helped push switching rates to 1.7% (or some 23 400 end users). In 2013, the switching rate further increased to a new record of 2.5% of all customers, according to E-Control. The regulator operates an increasingly popular web-based gas and electricity price comparison database that received 780 000 visits in 2013, 70% more than in 2012.

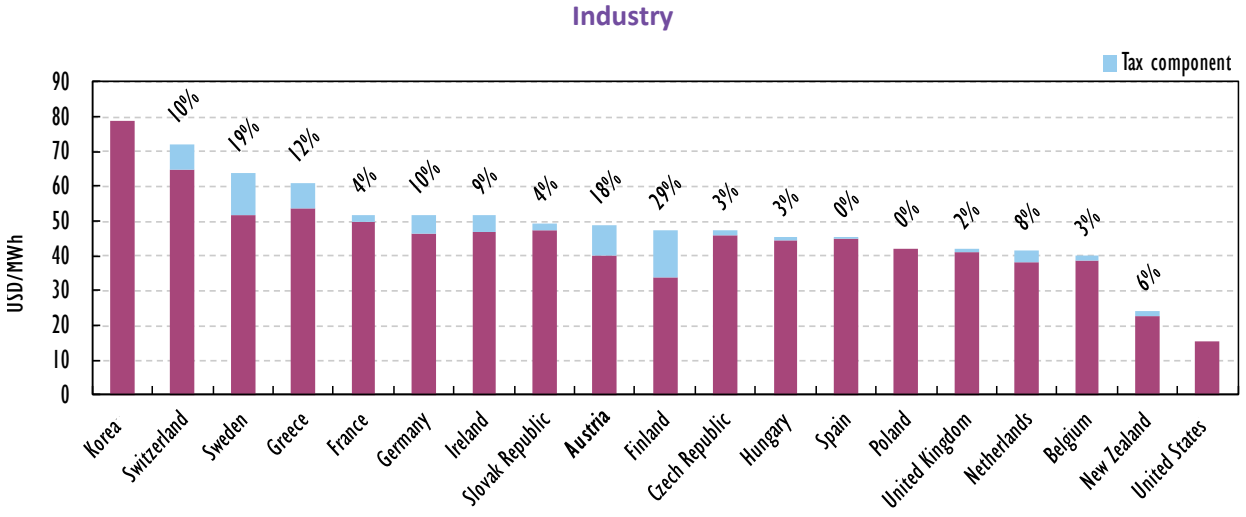
Households could save around EUR 200 per year on their gas bill by switching from the regional incumbent to the cheapest supplier. In total, less than 10% of all final customers have changed supplier since the market was liberalised.

E-Control and the Austrian Competition Authority jointly monitor and supervise on competition issues in the sector. Competition is expected to increase with the operational implementation (the legal implementation is already finished) of the Third Package for the Internal Market, which is under way.

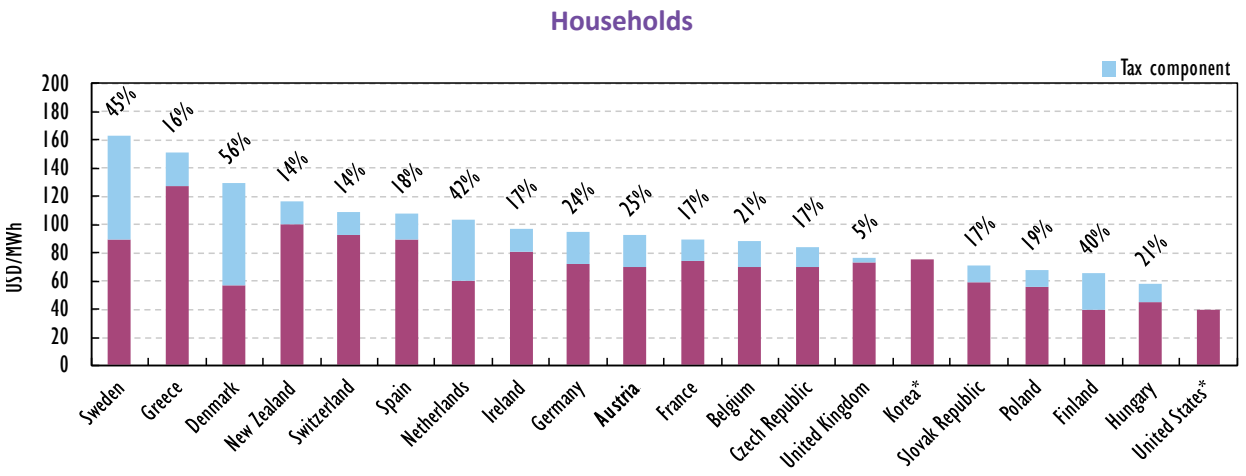
PRICES AND TAXES

The gas sector was liberalised in 2002, and regulated third-party access (TPA) rates of domestic use of the pipeline network ("network access tariffs") are set by the regulator, E-Control. Austrian gas prices are primarily based on oil-indexed Russian gas.

Figure 5.4 Natural gas prices in IEA member countries, 2013



Note: data not available for Australia, Canada, Denmark, Italy, Japan, Luxembourg, Norway, Portugal and Turkey.



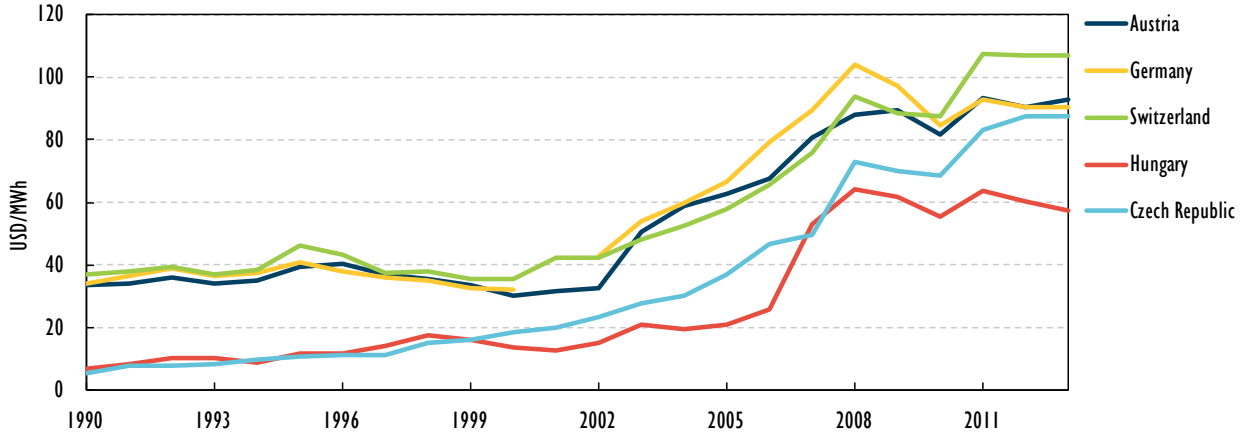
Note: data not available for Australia, Canada, Italy, Japan, Luxembourg, Norway, Portugal and Turkey.

* Tax information not available.

Sources: *Energy Prices and Taxes*, IEA/OECD Paris, 2013; and country submissions.

Prices at the Austrian hub have usually been higher than their northern counterparts (NetConnect Germany [NCG]). But since the last quarter of 2012, prices at the Central European Gas Hub have been lower than at NCG. The average price difference was EUR 1.34/MWh in first quarter 2013. Natural gas is also subject to several taxes in Austria: the so-called *Erdgasabgabe* of 6.6 EUR/Nm^3 (which means that consumers in different regions would pay different taxes to based on slightly different calorific values). In some cities, a local tax is also levied. The value-added tax amounts to 20%.

Figure 5.5 Household gas prices in Austria and in other selected IEA member countries, 1980-2012



Note: data not available for Germany for 2001.

Sources: *Energy Prices and Taxes*, IEA/OECD Paris, 2013; and country submission.

ASSESSMENT

Austria sources almost all of its physical (as opposed to contractual) gas imports from Russia. This dependence on one country is a concern for security of supply, particularly in light of recent gas curtailments or cuts affecting Central and Eastern Europe (2006 and

2009 Russia-Ukraine crises, cold spell in 2012). Yet Austria has several key geographical advantages, such as its location on a transit route and its storage capacities, which mitigate its exposure to a severe gas disruption; to date the country has not suffered from any major gas shortage. Also, Austria has taken effective steps to prepare for a gas emergency, notably by enabling the physical reversibility of a large number of its gas pipelines with neighbouring countries (Germany to Austria and Italy to Austria) in 2011. The government should continue to explore the benefits of increasing flexibility and diversity of supply options so as to increase its resilience. Possibilities to reverse flows on the HAG pipeline should also be explored, and the construction of a new interconnection between the Baumgarten hub and the Lanzhot entry point linking to the Czech gas pipeline system is under consideration.

In order to reduce exposure to gas supply risks, long-term options include possible Southern Corridor pipeline projects, South Stream and the development of an LNG terminal in Krk in Croatia. Nevertheless, none of these projects has yet started and they are unlikely to materialise anytime soon, if at all. Continued co-operation at the regional and European levels among all stakeholders to improve market integration is essential to facilitate these developments, alongside continued support by the government to the diversification of gas supply sources and/or routes.

Austria's gas market was fully liberalised in October 2002, and the European Union's Third Energy Package for Electricity and Gas Markets has been implemented through the Natural Gas Act 2011, and E-Control has been given increased regulatory powers. Yet, despite these reforms, real competition on the Austrian gas market has developed slowly, and suffers from strong concentration. A key indicator of a weak competitive environment is low supplier switching rates among consumers: Austria's rates stand below those of many of its European peers. Encouragingly, switching rates are increasing.

Given the reliance on imports to meet domestic demand, enforcement of effective TPA in cross-border points is critical to guarantee the opening and transparent operation of the gas market in Austria. The implementation of the entry-exit access scheme in January 2013 to the gas transmission system – with a virtual trading point operated by the Central European Gas Hub in Baumgarten – should improve liquidity somewhat, but there is still a lack of diversity in terms of suppliers. Indeed, Russia dominates the supply and sells its gas to Austria under long-term take-or-pay contracts, thereby limiting the scope for wholesale trading.

Strengthening the liquidity of the Central European Gas Hub (CEGH) is of paramount importance for a more efficient gas market that offers more transparent and competitive prices for the Austrian market and the region. The CEGH has the potential to become a regional gas hub and is working towards this goal, not least in planning a larger trading market involving the Czech Republic and the Slovak Republic as part of the EU-promoted gas target model. Its central geographic position and connection to key transmission pipelines and storage facilities are other major assets. However, Austria still relies on one source of supply. Increasing liquidity would require a number of developments, including the entry of new sellers with larger volumes, more storage capacity for third parties, continued development of cross-border trade and access to diversified gas supply sources.

Austria has sizeable recoverable shale gas resources, which could cover consumption during at least 20 years. The government has yet to develop a strategy or position at the

federal and regional levels on shale gas opportunities and risks, nor has there been a well-informed and prepared public debate that would focus on economic benefits, environmental concerns and technological aspects. The IEA recognises that this is a highly sensitive issue that has led to different outcomes in other IEA member countries. Yet the gains from developing Austria's shale gas resources should be assessed, based on a better understanding of the resources as well as the development of new technologies and the environmental impact. This would also help policy makers and the general public to form well-informed positions on the matter. Austria's high technological industrial base, strong environmental awareness and experience with upstream production make it well placed to explore this shale gas potential further.

RECOMMENDATIONS

The government of Austria should:

- *Continue analysis of a possible need for additional bidirectional interconnections with neighbouring countries and maintain efforts for diversifying gas supply sources to Austria and the region.*
- *Ensure continuous third-party access to storage in order to develop a more liquid, competitive market.*
- *Assess Austria's shale gas potential and possible options, in close co-ordination with key stakeholders in Austria; the IEA* Golden Rules *recommendations could be helpful in this regard.*

6. COAL

Key data (2012)

Production: none

Share of coal: 9.8% of TPES and 9.1% of electricity generation

Net imports: 3.6 Mt of hard coal (the Czech Republic 40.4%, the Unites States 33.4%, Poland 24.6%, Colombia 1%) and 1.2 Mt of coke-oven coke (Poland 78.7%, Hungary 19.1%)

Inland consumption: coke ovens and other transformation 45.9%, power generation 40%, industry 12.8%, residential 1.1%, commercial 0.2%)

OVERVIEW

Austria's coal supply was 4.6 million tonnes (Mt) or 3.3 million tonnes of oil-equivalent (Mtoe) in 2012. Coal represents nearly 10% of total primary energy supply (TPES) and 9.1% of electricity generation. Since 2002, coal supply has fallen by 14.4%, contracting as a share from 12.5% of TPES and from 12.9% of electricity generation.

SUPPLY AND DEMAND

SUPPLY

Austria has no indigenous production of coal, despite existing reserves of lignite (brown coal): 333 Mt at the end of 2011, according to the government. Production ceased in 2004.

In 2012, hard coal imports totalled 3.6 Mt, sourced from the Czech Republic 40.4%, the Unites States 33.4%, Poland 24.6%, Colombia 1% and other countries 0.6%. Over the past decade, imports from Poland have fallen significantly while imports from the United States, Colombia and Ukraine, among others, have increased.

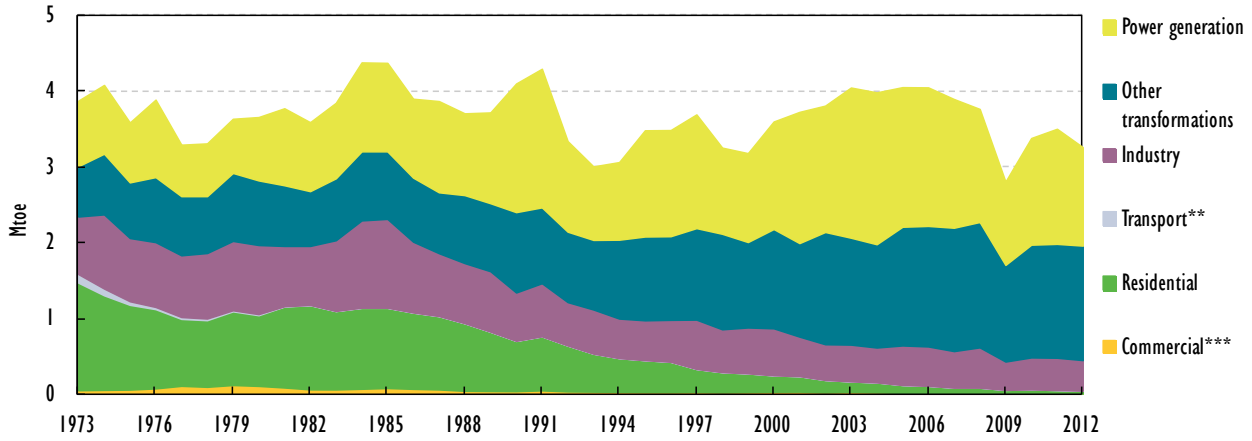
More specifically, steam coal imports came from the Czech Republic (44.8%), the United States (31.6%), Poland (16.8%), Germany (4.6%) and Colombia (1.9%), with additional smaller volumes from Canada and Ukraine. Coking coal, in turn, is imported from the Czech Republic (34% of the total), the United States (also 34%) and Poland (32%). Austria also imported 1.2 Mt of coke-oven coke, mainly from Poland and Hungary.

DEMAND

In Austria hard coal is primarily used to produce coke and generate power and heat. In 2012, 45.9% of coal supply was transformed into coke (coking coal) for iron and steel production while 40% was used directly in power and heat generation (steam coal). Final use of coal and coal products in industry accounts for 12.8% of primary coal consumption while residential and commercial sectors together amount to a marginal 1.3%.

Over the ten years since 2002, demand for coal has declined by 14.4%, falling significantly in industry, and in the residential and commercial sectors. Total industry demand has contracted by 13.6% since 2002, while residential and commercial demand has declined by 77% and 73.9%, respectively. Overall use of coal and coal products in electricity generation has declined by 22% over the same period. Consumption in the transformation sector increased by 1.9% in the ten years to 2012.

Figure 6.1 Coal supply by sector*, 1973-2012



Note: *Other transformations* includes coke ovens and energy sector consumption. *Industry* includes non-energy use. *Commercial* includes residential, commercial, public services, agriculture/forestry, fishing and other final consumption.

* TPES by consuming sector.

** Coal use in transport ceased in 2003.

*** Negligible.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2013; and country submission.

ASSESSMENT

Coal has limited importance in the Austrian energy mix, accounting for around 10% of Austria's TPES. There has been no domestic coal production in Austria since GKB-Bergbau GmbH stopped producing coal in 2004.

Total supply has been relatively stable since 1990, averaging around 4 Mt per year, but has been declining slightly in recent years. Coal's share of TPES has also declined, from around 12.5% in 2002 to 10% in 2012. Steam coal demand has averaged slightly over half of total coal demand, leaving coking coal demand (rather stable at 1.8 Mt) to cover slightly less than half of the total.

Coal in Austria is used primarily for power and heat generation (steam coal) and steel production (coking coal). There are two coal-fired power plants in Austria, and coal accounted for 9.1% of power generated in 2012. As coal-fired power can compensate for the diminished production of hydropower in the region, coal use for power generation varies year by year, depending on hydrological conditions.

The future of coal-fired generation in Austria is uncertain. The government does not have a specific policy on the matter, but both the power and heat sector and the iron and steel production are part of the EU-ETS the aim of which is to reduce EU-wide CO_2 emissions from energy-intensive sectors. No recent forecasts on Austria's coal outlook

have been conducted. The Austrian parliament, however, passed a law in December 2011 prohibiting the sequestration of CO_2 on the Austrian territory (setting aside a maximum amount of 100 thousand tonnes (kt) that could be sequestered for research purposes). This decision limits options for offsetting coal's carbon intensity and may work against the long-term viability of steel production in the country.

Despite the price competitiveness of coal compared to gas in the short term (because of increased US exports, low carbon ETS prices and high oil-indexed gas prices), the sustained use of coal in Austria's energy mix is questionable. Coal-fired generation will be threatened, as in other European countries, when the European Union's Large Combustion Plants Directive comes into effect in 2016.

RECOMMENDATION

The government of Austria should:

- ☐ *Outline a clear vision regarding the future of coal in Austria's energy mix, in light of its carbon footprint and security of supply benefits.*

7. OIL

Key data (2012)

Crude oil production: 0.8 Mt, -11.5% since 2002

Crude oil imports: 7.4 Mt, -7.9% since 2002

Share of oil: 34.4% of TPES and 1.1% of electricity generation

Consumption of oil products: 11.6 Mt (transport 60.5%, industry 18.3%, residential 10.5%, other transformation 5.6%, commercial and public services 2.8%, power generation 2.3%)

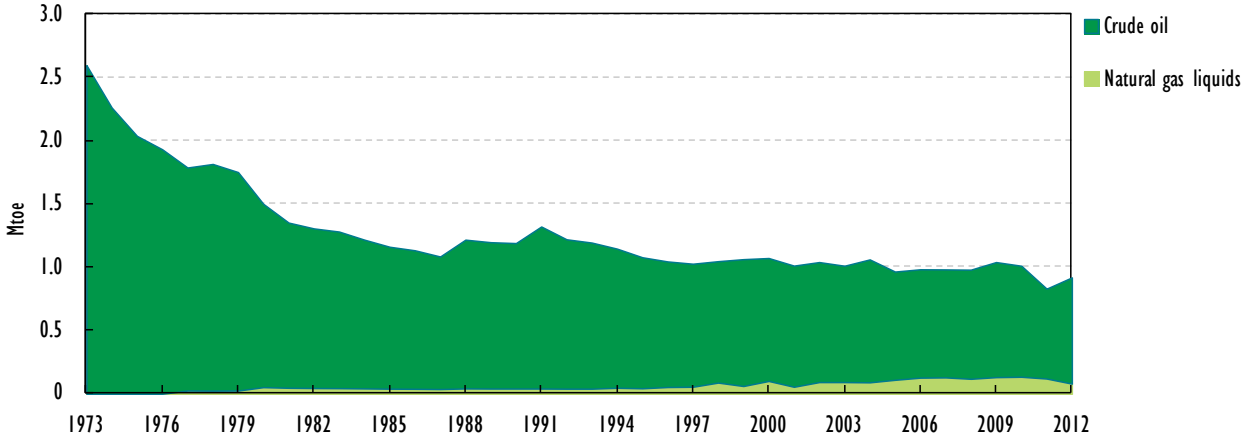
SUPPLY AND DEMAND

Oil remains the primary energy source in Austria, representing about 34% of the country's total primary energy supply (TPES), on par with many of its OECD peers.

DOMESTIC PRODUCTION

Domestic production of crude oil has been limited and relatively stable over the ten years to 2012, averaging 0.9 million tonnes (Mt). At the end of 2011, Austrian oil reserves amounted to 11.6 Mt, and production, at current levels, can continue for another 14 or 15 years. Two companies are producing crude oil: OMV accounts for about 85% of total crude and natural gas liquids (NGL) production in Austria, while RAG accounts for the remaining 15%.

Figure 7.1 Domestic oil production, 1973-2012



Sources: *Oil Information*, IEA/OECD Paris, 2013; and country submission.

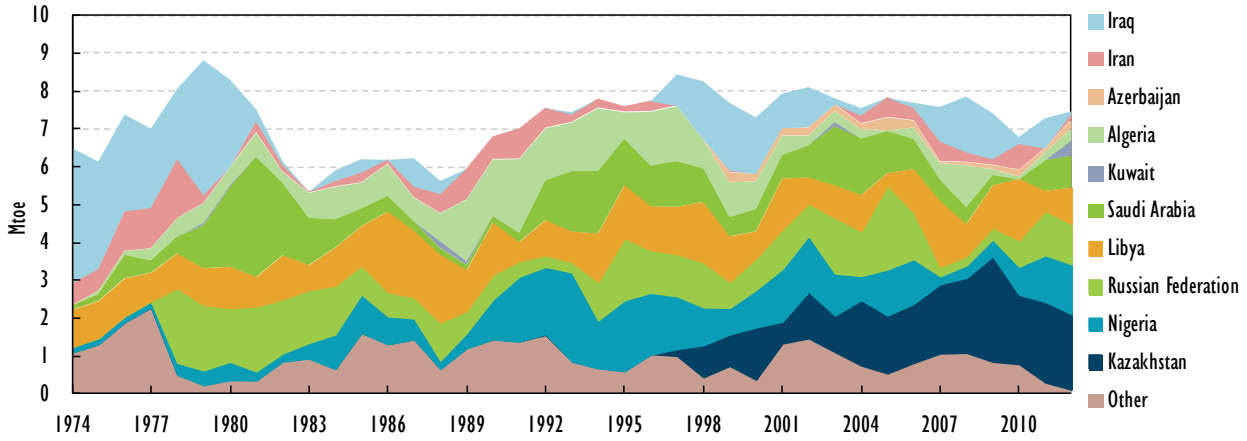
IMPORTS

Austria's oil imports in 2012 reached 13.3 Mt, consisting of 7.4 Mt of crude oil, 5.8 Mt of refined products and 0.1 Mt of natural gas liquids (NGLs) and refinery feedstocks.

Crude oil imports come from two main sources – member countries of the Organization of the Petroleum Exporting Countries (OPEC) and the former Soviet Union (FSU) republics. In 2012, these two blocs supplied 98.4% of the total, 54.5% from OPEC and 43.9% from FSU. By country, Kazakhstan was the largest crude oil supplier with 2.1 Mt, or 26.8% of the total, followed by Nigeria (17.6%), the Russian Federation (14%), Libya (12.8%) and Saudi Arabia (11.3%).

Oil products, in turn, are mainly imported from the neighbouring countries. In 2012, Germany supplied Austria with 46.7% of the total, while the Slovak Republic accounted for 19.5%, Hungary for 8.6%, Italy for 8.3% and the Czech Republic for 7.6%. In total, 95.4% of oil product imports were sourced from these neighbouring countries.

Figure 7.2 Crude oil imports by source, 1974-2012



Sources: *Oil Information*, IEA/OECD Paris, 2013; and country submission.

CONSUMPTION

Consumption by product

Oil product demand has been above 10 Mt since 1996, peaking at 13 Mt in 2006 and slowing retracting to 11.6 Mt in 2012. Consumption of oil products in 2012 was made up of gas/diesel oil (62.2%), motor gasoline (14.8%), naphtha (7%), kerosene jet fuel (5.9%), bitumen (3.8%) and others.

As in many European countries, diesel demand has grown markedly over time. It stood at 37% of total oil products in 1990 and increased to 62.2% by 2012, or 7.2 Mt. This represents an annualised growth rate of 3.6%, or 118.3% in total, over the 22 years. Over the 12 years since 2000, the growth rate was slower at 1.7% per year. It is worth noting that seven out of ten new cars bought in Austria run on diesel, and this "dieselisation" of the vehicle fleet is largely accountable for this growth in demand.

Gasoline represents 14.8% of Austrian oil product demand, but its consumption has decreased by 12.5% since 2000 and by 32% since 1990. In contrast, demand for kerosene and naphtha expanded in the period, growing at an annualised rate of 3.8% and 2.9% since 1990, respectively. Since 2000, the annual growth rate slowed to 1.6% for kerosene. In 2012, naphtha represented 7% (0.8 Mt) of oil product demand and kerosene was 5.9% (0.7 Mt). From 2000 to 2012, demand for fuel oil dropped by 71.8% and for bitumen by 23.8%. In 2012, demand for bitumen and fuel oil stood at 0.4 Mt (see Table 7.1).

Table 7.1 Oil demand by product, 2012

Type of oil product	Demand (kt)	Share
LPG and ethane	122	1%
Naphtha	824	7%
Gasoline	1 734	14.8%
Kerosene	688	5.9%
Diesel	7 268	62.2%
Heating/other gasoil	366	3.1%
Bitumen	447	3.8%
Other products	244	2.1%
Total products	**11 693**	

Sources: *Oil Information*, IEA/OECD Paris, 2013; and country submission.

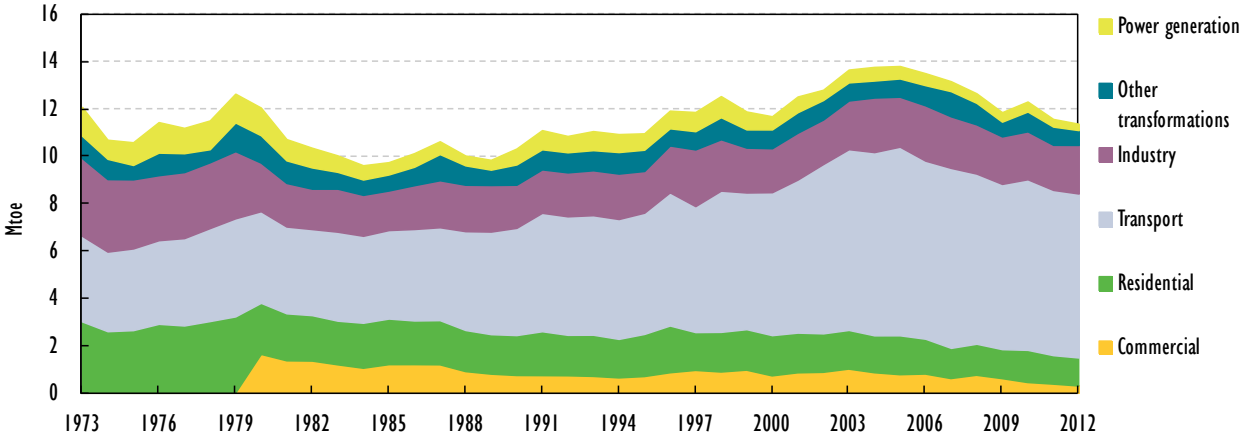
Consumption by sector

The transport sector is the largest oil-consuming sector, with 60.5% of total oil supply in 2012. Industry consumed 18.3%, followed by the residential sector at 10.5% and the transformation sector at 5.6%.

As seen in most IEA countries, the demand for oil in transport has increased over the years, while its use in other sectors has slowly declined. The share of transport in oil consumption has been increasing rapidly since 1973 when it accounted for 30% of all oil consumed in Austria. Conversely, the proportion of oil consumption in the residential and industry sectors has declined from 25% and 27.5% respectively in 1973.

Oil use has declined the most in power and heat generation: by 38.1% since 2002. The sector's share in total oil demand is down from 10% in 1973 and 3.4% in 2002, to 2.3% in 2012.

Figure 7.3 Oil supply by sector*, 1973-2012



Notes: *Other transformations* include energy sector consumption. *Industry* includes non-energy use. *Commercial* includes commercial, public services, agriculture, forestry, fishing and other final consumption.

* TPES by consuming sector.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2013; and country submission.

BIOFUELS

The government is keen on the promotion of biofuels, and implemented the 2003 European Biofuel Directive in 2004. In Austria, fuel suppliers have a biofuel substitution requirement, rather than a blending obligation, and they can meet the requirement on the basis of volume-weighted sales of pure biofuels. Austria met the European Union's (non-binding) 2010 objective of a 5.75% share of biofuels in motor fuel supply in October 2008. Biofuels accounted for 6.75% of motor fuels in 2011.

This achievement results partly from the fact that biofuel blends are subject to a reduced rate of mineral oil duty. In the case of *gasoline*, blends with a minimum content of 46 litres of biogenic substances and with sulphur content of no more than 10 mg/kg are subject to a duty of EUR 482 per 1 000 litres, compared to EUR 515 per 1 000 litres in case either of these two conditions is met. In the case of *diesel*, blends with a minimum content of 66 litres of biogenic substances and with a maximum sulphur content of 10 mg/kg are subject to a duty of EUR 397 per 1 000 litres, compared to EUR 425 per 1 000 litres in case either of these two conditions are met. Pure biofuels are exempt from mineral oil duty, reducing their retail prices and making them attractive to transport companies, among others.

The production and consumption of biofuels has scaled up significantly over the recent years. In 2012, production reached 310 kilotonnes (kt) of biodiesel (more than twice the 2006 volume) and 171 kt of bioethanol (14 times more than in 2007). Biodiesel consumption amounted to 507 kt and bioethanol consumption to 103 kt.

INFRASTRUCTURE

REFINING

Austria has only one refinery, the Schwechat facility outside Vienna. Schwechat is entirely owned and operated by OMV, and is one of the largest inland refineries in Europe. It processes indigenous and imported crude oil and produces a full range of oil products for domestic consumption and export.

The refinery has been primarily supplied via the TAL (Trans-Austria) pipeline system (with the Adria-Wien pipeline extension across Austria) from the Italian port of Trieste since the late 1960s. Crude imports come mainly from Kazakhstan, Nigeria, Russia, Saudi Arabia and Iraq. A smaller domestic pipeline, the GSU pipeline from Zistersdorf to Schwechat, ships locally produced crude, equivalent to 11% of domestic refinery intake.

The Schwechat refinery had a total distillation capacity of around 208.6 thousand barrels per day (kb/d) or 9.6 million tonnes, with a utilisation rate of around 80% in 2011. This refinery has been under fairly heavy market pressure by nearby refineries in neighbouring countries in recent years, because of their landlocked locations and stagnant/declining European demand. About 20% of its production is exported to neighbouring countries.

With total Austrian demand for oil products standing at 263 kb/d, the Schwechat refinery's capacity is quite well aligned with overall domestic demand. However, as is often the case for European markets, Schwechat is unable to meet Austria's distillate demand, with a gas/diesel oil deficit of about 63 kb/d in 2011, and a total distillate deficit of over 65 kb/d. Conversely, the industry had a small gasoline production surplus of 2 kb/d in 2011. Austria's net oil product imports stood at 78 kb/d in 2011.

Figure 7.4 Oil infrastructure in Austria

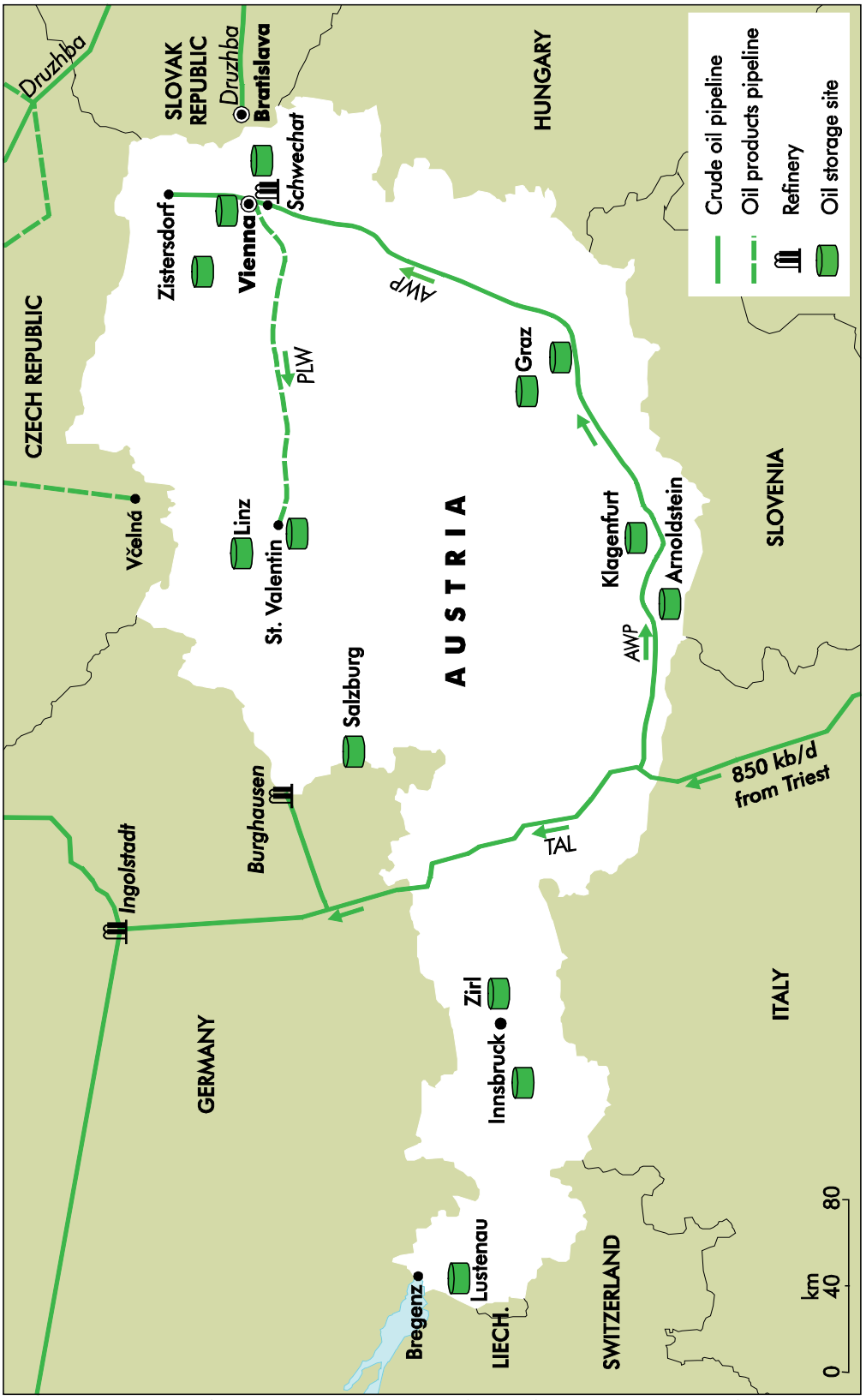
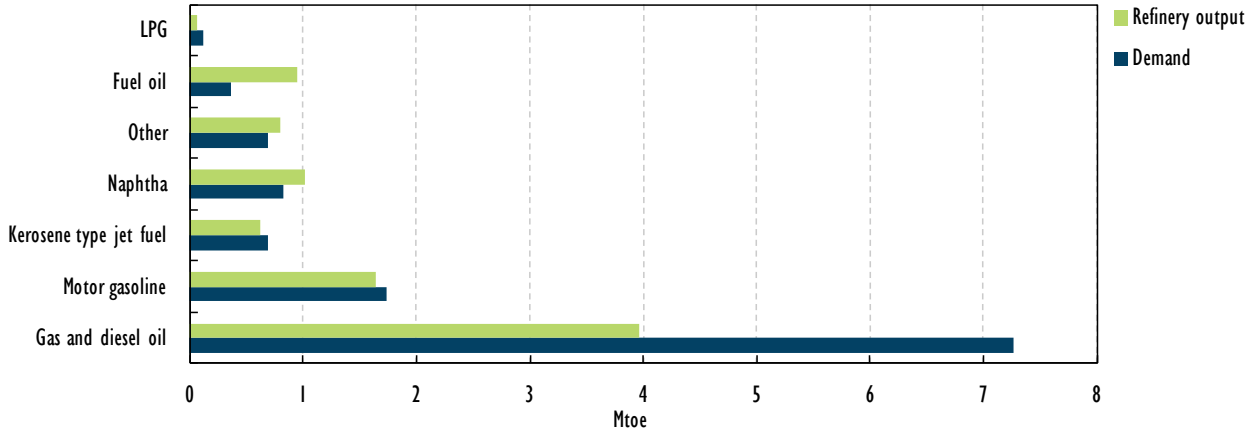


Figure 7.5 Refinery output and demand, 2012



Sources: *Oil information*, IEA/OECD Paris, 2013; and country submission.

Since 2006 this imbalance has worsened as diesel consumption as a share of oil demand has increased from 53.9% in 2006 to 62.6% in 2010. Between 2001 and 2010, demand for diesel and LPG/ethane increased by 17.2% and 31.2% respectively, while demand for gasoline and naphtha dropped by 39.9% and 31%, with residual fuels demand also dropping by 27%. These trends are expected to continue.

PIPELINES

Austria is supplied with crude by the Trans-Austria pipeline (TAL), which links Trieste (Italy) on the Adriatic coast with Ingolstadt (Germany). At Würmlach (Austria), it branches out onto the Adria-Wien pipeline (AWP), which feeds the OMV Schwechat refinery near Vienna. Crude takes around 14 days to reach the refinery from Trieste. In 2010, the total throughput of the TAL was 35 million tonnes (around 700 kb/d), of which 7.4 million tonnes (or 150 kb/d) was transported by the AWP to the Schwechat refinery. Imported crude oil is transported solely via the TAL and the AWP.

Austria has one product pipeline, the Produktenleitung West (PLW), which links the Schwechat refinery to the west of the country, and terminates at the St. Valentin storage site. In 2011, the throughput of the PLW was 1.1 million tonnes.

A crude oil pipeline leading from Bratislava (Slovak Republic) to Schwechat refinery has been under discussion for over a decade. The Schwechat refinery already receives and is able to process crude types from a variety of sources. The construction of this pipeline would allow the Austrian refiner to be fed through the southern arm of the Druzhba pipeline while at the same time allowing the Slovak Republic to be supplied through the TAL pipeline, via the AWP, in the event of an emergency.

Although a memorandum of understanding between Austria and the Slovak Republic expressing the intention to build this pipeline was signed in 2003, the construction has yet to commence. While the Austrian authorities have licensed the construction of the Bratislava-Schwechat pipeline in 2004 and secured the necessary financing for this European Project of Common Interest, progress on the Slovak side has been blocked by environmental concerns. Recent press reports suggest that Slovakia has given provisional approval to the project. The next phase is to analyse the ten possible routes to lay the pipeline.

STORAGE

In 2011, Austria's total storage capacity stood at 6.6 million cubic metres (mcm), or around 42 million barrels of crude and oil products. The storage capacity is quite evenly distributed between crude 53% (3.5 mcm), and 47% oil products.

Significant crude oil storage capacity is located in Trieste, on the Adriatic coast of Italy. The Austrian government, however, counts the stocks held in Trieste, at the start of the TAL pipeline to Schwechat, as domestic stocks. The Schwechat refinery itself enjoys storage capacity of about 2.4 million barrels. Most other crude oil storage sites are located along the AWP within easy reach from Schwechat refinery. Given that no alternative routes exist for crude, storage sites for crude have been installed along the supply chain, increasing Austria's ability to deal quickly and effectively with an interruption in crude supplies from Trieste.

Apart from the Trieste and the Schwechat/Lobau storage sites, Lannach near Graz (3.3 mb of oil products) and Valentin (2.9 mb) have the largest storage capacities.

Most of Austria's storage capacity for oil products is located near the refinery or at the Valentin site in the west of the country. Austria is currently suffering from a considerable deficit in distillate storage capacity. In 2011, middle distillates storage capacity stood at 9.2 mb, or 55% of all oil product storage capacity, despite accounting for 63% of oil product demand. In an effort to plug the gap in storage capacity for distillates, OMV is rededicating 210 mcm (1.3 mb) of fuel oil capacity to accommodate distillates.

Table 7.2 Austrian oil storage capacity, 2012 (thousand cubic metres)

Storage site	Crude oil	Intermediates	Gasoline	Distillates	Fuel oil	Total refined product	Total oil (crude and products)
Schwechat/Lobau (refinery)	380	490.8	688.5	961.4	333.7	1 983.6	2 854.4
Trieste	2 030						2 030
Lannach	525						525
Valentin			86.6	334.2	43.6	464.4	464.4
Kremsmunster	240						240
Wurmlach	237.5						237.5
Lobau				156		156	156
Zistersdorf	73						73
Auersthal	39						39
Graz			4	8.9		12.9	12.9
Lustenau			1.9	3.7		5.6	5.6
Total	**3 524.5**	**490.8**	**781**	**1 464.2**	**377.3**	**2 622.5**	**6 637.8**

Source: Ministry of Science, Research and Economy.

MARKET STRUCTURE

OMV AG is the national incumbent, and is owned by Österreichische Industrieholding AG (31.5%), International Petroleum Investment Company, Abu Dhabi (24.9%) and a number of smaller national and international investors (43.6%).

Because of its position as Austria's dominant producer, refiner and storage operator, OMV holds a high level of control over the wholesale market, particularly in the gasoline segment where refinery output closely matches domestic market needs. OMV's control of the middle distillate wholesale market is more limited, as refinery yields account for less than half of the growing demand for diesel.

Austria's regulator is active in monitoring the working of prices and competition in the fuel retail market, so as to ensure a fair and competitive playing field. Austria's retail market is indeed competitive, with four operators (BP, OMV, ENI, Shell) each controlling more than 14% of motor fuel sales, and no operator having a market share higher than 19%. At the end of 2012, Austria had 2 503 filling stations, 12% less than ten years earlier.

EMERGENCY RESPONSE POLICY AND RESERVES

One of the main aims of Austrian energy policy has been to reduce its dependence on energy imports and to strengthen its security of supply. Security of energy supply is one of the three pillars in the 2010 Energy Strategy Austria.

EMERGENCY RESPONSE POLICY

Austria has a strong legal framework to deal with energy supply crises, enshrined in the Energy Powers Act (*Energielenkungsgesetz*), established in 1982 and amended in December 2012, and the Oil Stockholding and Reporting Law (*Erdöl-Bevorratungs und Meldegesetz*), established in 1982 and revised in 2012 in order to comply with the EU Stockholding Directive 2009/119/EC.

These laws define all measures and responsibilities of the relevant national and regional emergency organisations. In times of oil supply disruptions, the Energy Steering Council, consisting of representatives of various ministries, energy industry and social partners would act as an advisory body to the Minister for Economic Affairs.

The government considers that demand restraint measures would be the main response measure in a domestic crisis. Measures to restrain oil demand are grouped in three stages, depending on the nature and severity of the crisis, and would mostly concern the transport sector, which consumes 61% of total oil demand. While the initial stage of light-handed measures would mostly focus on public campaigns for voluntary energy saving, medium-handed measures would include compulsory restrictions such as lower speed limits and driving bans, and the final heavy-handed stage would rely on coupon rationing for the private sector and allocations for fuel oil use in industry.

If demand restraint measures prove to be insufficient in the event of a crisis, the government can also make strategic stocks available.

EMERGENCY OIL RESERVES

The Oil Stockholding and Reporting Law guarantees the availability of emergency reserves covering 90 days of net imports, and obliges all importers to hold emergency stocks equivalent to 25% of their previous year's net imports, plus 10% to account for unavailable stocks. Importers may hold their stocks at the private, non-profit stockholding company Erdöl-Lagergesellschaft m.b.H. (ELG), an official licensed stockholding entity, which is owned by OMV (55.6% of the shares), BP (23.1%), Shell (16.7%) and ENI (4.6%). Emergency stocks are not held separately from commercial stocks. All oil products held by ELG are stocks commingled with operational stocks.

Box 7.1 Stockholding obligation of IEA member countries

Each IEA member country has an obligation to have oil stock levels that equate to no less than 90 days of net imports.

Currently, there are three net exporting IEA member countries (Canada, Denmark and Norway) which do not have a stockholding obligation.

The IEA minimum stockholding obligation is based on net imports of all oil, including both primary products (such as crude oil, natural gas liquids) and refined products. It does not cover naphtha and volumes of oil used for international marine bunkers.

The 90-day commitment of each IEA member country is based on average daily net imports of the previous calendar year. This commitment can be met both through stocks held exclusively for emergency purposes and through stocks held for commercial or operational use, including stocks held at refineries, at port facilities, and in tankers in ports.

The obligation specifies several types of stocks that cannot be counted towards the commitment, including military stocks, volumes in tankers at sea, in pipelines or at service stations or amounts held by end-consumers (tertiary stocks). It also does not include crude oil not yet produced.

Member countries can arrange to store oil outside their national boundaries and include such stocks in meeting their minimum requirement. This option is particularly important for countries in which storage capacity constraints or supply logistics make domestic storage insufficient.

To exercise this option and count the stocks held abroad towards the obligation, the governments involved must have bilateral agreements assuring unconditional access to the stocks in an emergency. When evaluating a country's compliance with the 90-day obligation, the IEA applies a 10% deduction to its total stocks, net any oil held under bilateral agreements. This accounts for any volumes that are technically unavailable, such as tank bottoms (see IEA Methodology on the IEA website for details).

Since November 2006, Austria has consistently met its minimum IEA stockholding obligation, with total stock coverage standing 114 days of net imports in November 2013, or 24.5 million barrels. The IEA estimates that the minimum stock levels necessary to cover the 90 days of net imports currently stand at 19.4 million barrels.

Source: IEA.

Currently companies delegate about 97% of their obligation to ELG. Thus only 3% of Austria's emergency stocks are held by the compulsory stockholders themselves. According to the regulations of the Energy Powers Act, the Austrian authorities have control over all stocks (compulsory and industry stocks) in crisis situations. The Department of Energy and Mining, within the Federal Ministry of Science, Research and Economy, can instruct ELG to release stocks if necessary.

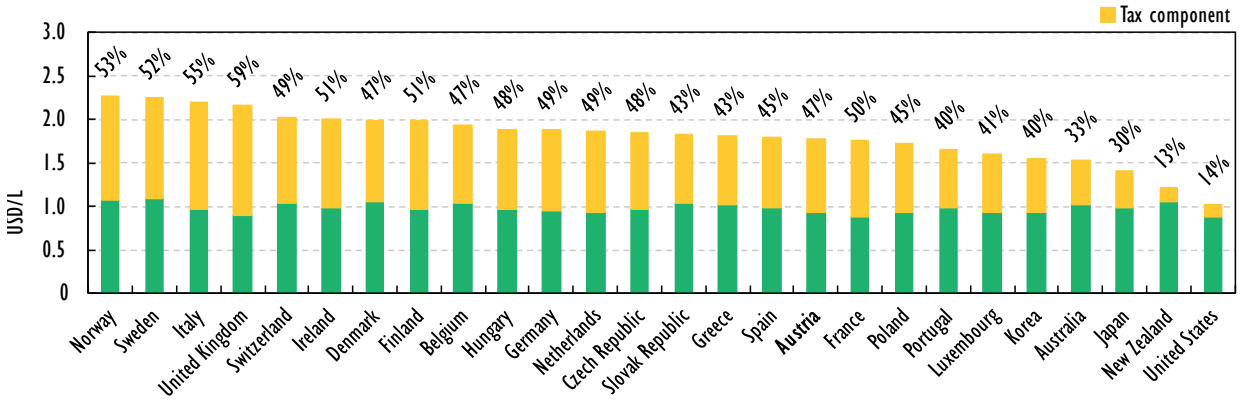
PRICES AND TAXES

Oil prices have been deregulated since 1981. Wholesale and retail prices are mainly influenced by the relevant quotation prices and exchange rates, which are driven by the global market fundamentals and expectations. Government interference is officially limited to determining the level of the excise tax and value-added tax (VAT).

Nevertheless, motor fuel pricing is a notable political issue, and the regulator has undertaken in-depth investigations into the working of prices and competition in the fuel retail market. As a means to increase market transparency and enhance competition, the government publishes a weekly comparison of fuel prices across the European Union. The Austrian downstream sector is one of the most highly regulated in the European Union, with the government setting maximum fuel prices and retailers being limited in their ability to adjust prices.

The authorities keep daily record of consumer prices of motor fuels by requiring filling station operators to report every price change of every filling station to a central database. Austria has a law that only allows price increases at mid-day (12:00) and bans price increases altogether over three particular weekends of the year (Easter, mid-August, Christmas). The authorities have the power to set maximum retail prices for motor fuels, which can be exercised for a period of up to six months at a time.

Figure 7.6 Automotive diesel prices and taxes in IEA member countries, fourth quarter 2013

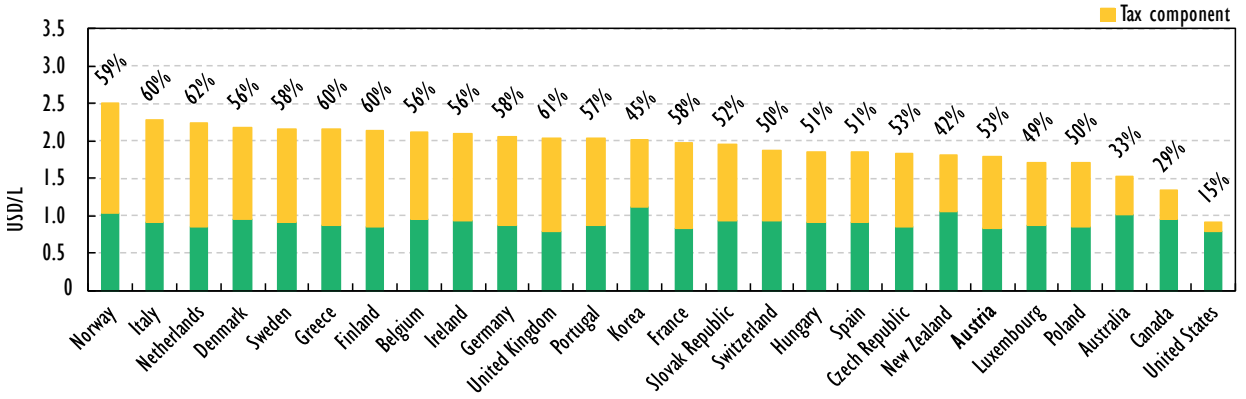


Note: data not available for Canada and Turkey.

Gasoline is more heavily taxed than diesel, thereby encouraging the dieselisation of the car fleet. In the fourth quarter of 2013 (fourth quarter 2013), premium unleaded gasoline (98 RON) was 10% more expensive than diesel (USD 1.78 per litre (USD/L) for diesel vs. USD 1.97/L for gasoline). The price of premium unleaded gasoline (95 RON) and regular unleaded gasoline was similar to diesel.

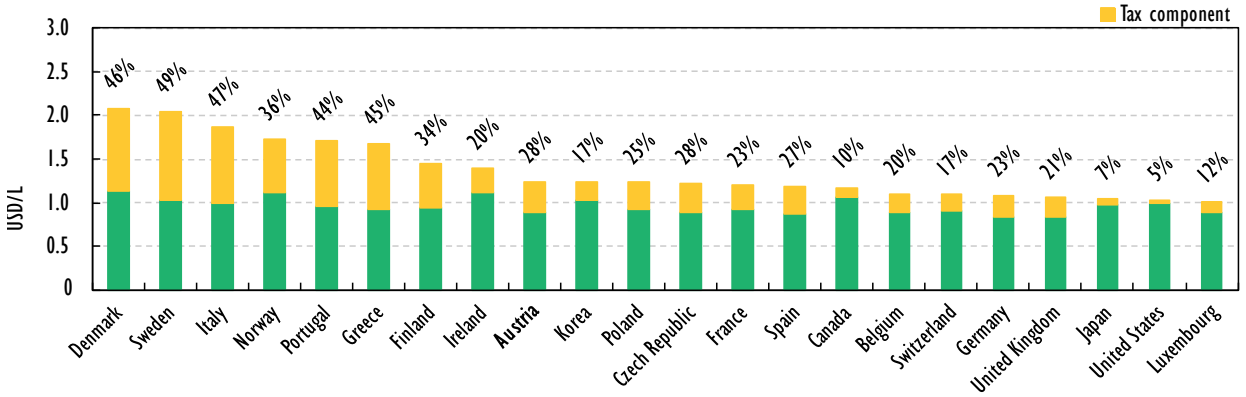
This growth in diesel demand is exacerbated by the fact that the price of automotive diesel is lower than in most of Austria's neighbours. For instance, in Italy, prices of diesel at the pump are on average 22.8% higher, while in Germany and Hungary they are about 5% higher and in the Slovak Republic they are 3% higher (fourth quarter 2013).

Figure 7.7 Premium unleaded petrol prices and taxes in IEA member countries, fourth quarter 2013



Note: data not available for Japan and Turkey.

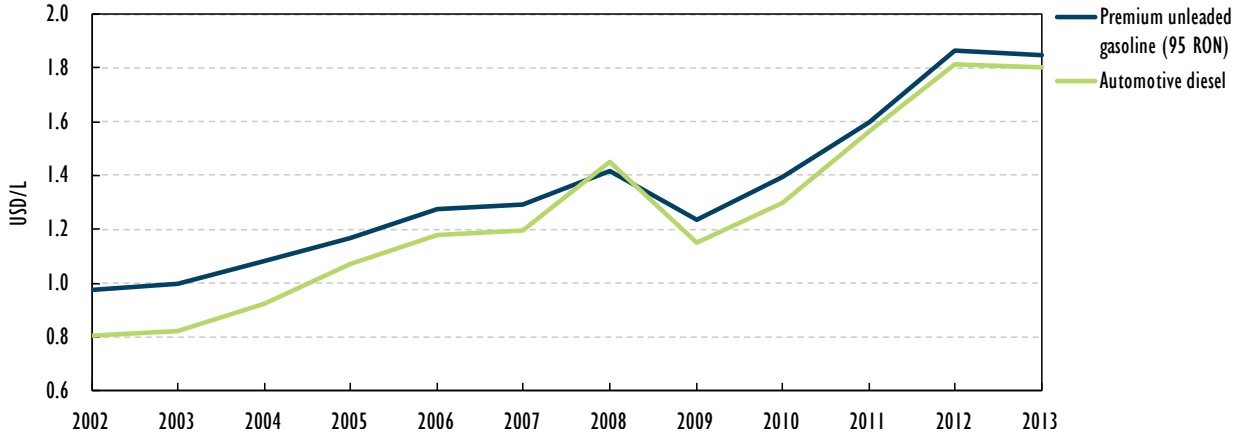
Figure 7.8 Light fuel oil prices and taxes in IEA member countries, fourth quarter 2013



Note: data not available for Australia, Hungary, the Netherlands, New Zealand, the Slovak Republic and Turkey.

Sources: *Energy Prices and Taxes*, IEA/OECD Paris, 2013; and country submission.

Figure 7.9 Average gasoline and diesel prices (including taxes) in Austria, 2002-13



Sources: *Energy Prices and Taxes*, IEA/OECD Paris, 2013; and country submission.

ASSESSMENT

Austria's sole refinery – the 200 kb/d OMV-owned Schwechat plant next to Vienna airport – has been primarily supplied via the TAL (Trans-Austria) pipeline system (with the Adria-Wien pipeline extension across Austria) from the Italian port of Trieste since the late 1960s.

Since 2003, plans have been afoot to link the Schwechat refinery to MOL's Bratislava refinery in the Slovak Republic (BSP pipeline), thereby allowing Austria to diversify its crude supplies by accessing Russian crude supplies along the Druzhba pipeline. The Schwechat refinery already uses Russian crude; therefore, a connecting pipeline from Bratislava to Schwechat would bring crude types similar to those already processed by the refinery. Yet, despite the Austrian government's support and the overcoming of all environmental and other hurdles on the Austrian side, construction has been delayed since 2008, apparently because of environmental concerns over the route in the Slovak Republic. Austria should continue to prioritise this project and accordingly take steps to promote and advance its development.

Although Schwechat, owned by OMV and located close to Vienna, supplies about 75% of its production to the domestic market, Austria is a net importer of petroleum products with net imports reaching 3.5 Mt, or 30% of the consumption of petroleum products in 2012. Net imports of diesel reached 47% of consumption, mostly coming from Germany, Italy and Slovakia. There is no pipeline for import of fuels and 80% of imports are shipped by rail.

The government is keen on the promotion of biofuels, and implemented the 2003 European Biofuel Directive in 2004, according to an accelerated timetable of blending obligations, assisted through tax breaks for cleaner, greener fuels. Austria met the European Union's (non-binding) 2010 objectives of having 5.75% biofuels in its motor fuel supply in October 2008. Biofuels accounted for 6.75% of motor fuels in 2011.

Reducing oil demand is a notable part of the 2010 Energy Strategy Austria. The strategy calls for stabilising final energy consumption at 1 100 PJ in 2020, and has a sectoral target of a 5% reduction in the sector of mobility in 2020 as compared to 2005 and calculated on baseline projections. The government addressed this objective by raising motor fuel taxes in 2011, thereby bringing Austria's taxes more in line with those of its neighbours.

Austria has relatively high taxes on acquisition and ownership of cars, while at the same time the retail excise duty (mineral oil tax) is lower than in neighbouring Germany and Italy. New cars are subject to a fuel consumption/pollution tax (*Normverbrauchsabgabe*, NoVA), levied on the purchase price of new passenger cars and motorcycles which is supplemented by an ecologically related tax bonus/malus system, providing incentives/disincentives for low/high-consuming and low/high-polluting light vehicles. Both registration and excise duties favour diesel vehicles and have contributed to Austria's exceptionally high dieselisation rate in the past: in 2010 the share of diesel cars in the passenger car fleet stood at above 55%.

Price-induced fuel exports in vehicle tanks – commonly referred to as "fuel tourism" – are a significant amount of total fuel use attributed to Austria, accounting for roughly 28%, notably because of transiting commercial heavy-duty traffic and exporting Austrian haulers. A reduction of price-induced fuel exports in vehicle tanks would also help Austria to meet its climate objectives.

RECOMMENDATIONS

The government of Austria should:

- *Continue to promote the construction of the Bratislava-Schwechat pipeline.*
- *Ensure a stable policy outlook for biofuels, including increasing second-generation biofuels.*
- *Evaluate measures to reduce motor fuel consumption and in particular the share of diesel by ensuring that taxation levels and vehicle registration duties give adequate signals to consumers.*

8. ELECTRICITY

Key data (2012)

Installed capacity: 22.9 GW, +28.3% since 2002

Peak demand: 10.1 GW

Total electricity generation: 68.7 TWh, +13.2% since 2002

Electricity generation mix: hydro 63.7%, natural gas 14.1%, coal 9.1%, biofuels and waste 7.9%, wind 3.6%, oil 1.1%, solar 0.5%

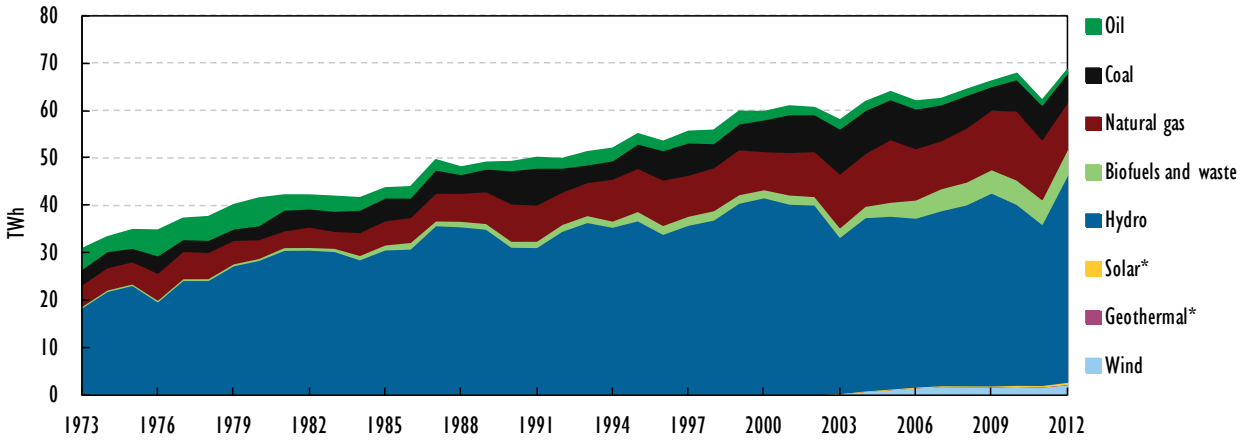
Electricity consumption: 64.4 TWh (industry 44.7%, residential 27.9%, commercial and other services 22.5%, transport 4.9%)

SUPPLY AND DEMAND

GENERATION

Electricity generation in Austria was 68.7 TWh in 2012. This is a record high level of generation, increasing by 10.4% compared to 2011. Over the ten years since 2002 generation has increased by 13.2%.

Figure 8.1 Electricity generation by source, 1973-2012



* Negligible.

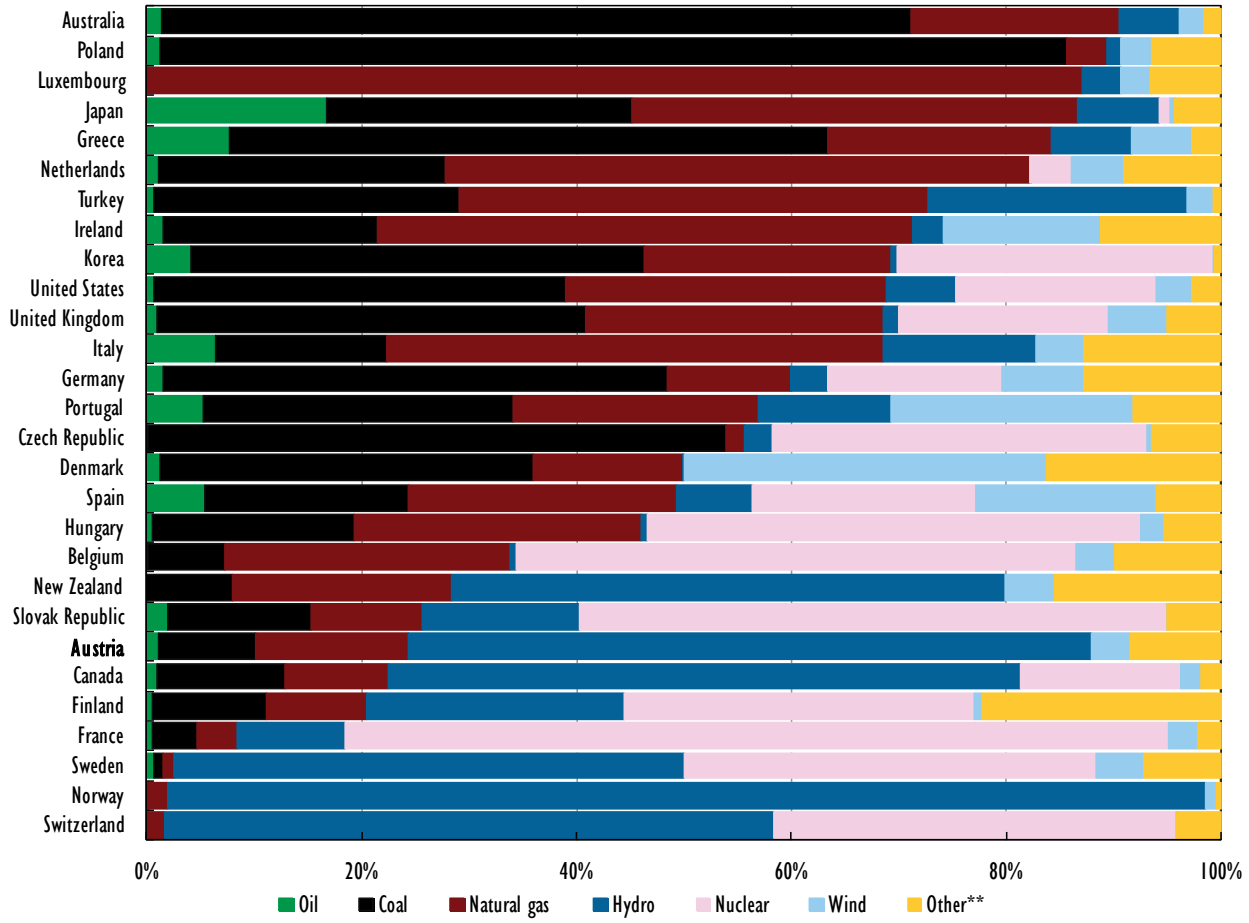
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2013; and country submission.

Hydro is the main source of electricity in Austria and accounts for 63.7% of total generation. Output from small and large hydro has increased by 8.9% since 2002 which is a slower rate of growth compared to total generation. The share of hydro in total generation has contracted from 66.3% in 2002.

Around 24% of electricity is generated from fossil fuels. Natural gas accounts for 14.1% of electricity generation, a share which has fallen slightly from 15.3% in 2002. Gas-fired generating capacity in Austria has grown by 70% since 2002 while total generation from gas has increased by 4.3%, reflecting the generally challenging operational environment for combined-cycle gas turbines (CCGTs) in Europe. Coal accounts for 9.1% of total generation, albeit its use has experienced a 20.1% drop since 2002, losing its share of 12.9% of generation in 2002. Oil plays a small part in power generation, accounting for 1.1% of the total, and less than half the share it represented in 2002.

Renewable energy sources (other than hydro) have experienced a boom in Austria over the past decade, with total generation from biofuels and waste, wind and solar increasing by over 300%, from 1.9 terawatt hours (TWh) in 2002 to 8.2 TWh in 2012. The share of biofuels and waste in generation has increased from 2.9% in 2002 to 7.9% in 2012, the share of wind has increased from 0.2% in 2002 to 3.6% in 2012, while solar energy has increased from negligible levels to 0.5% of the total in 2012.

Figure 8.2 Breakdown of electricity generation by source in IEA member countries, 2012*



* Actual data for Austria and estimated for other countries.

** *Other* includes solar, biofuels and waste, and geothermal.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2013; and country submissions.

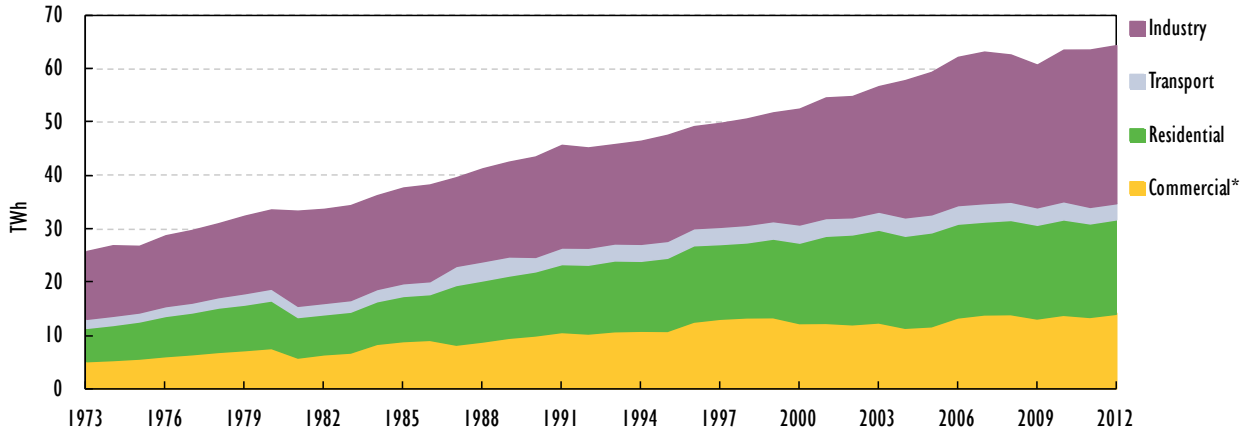
CONSUMPTION

In 2012, electricity demand in Austria totalled 64.4 TWh. It has grown steadily over the past decades, with the sole exception of the decline in the wake of the 2008/09 financial crisis. The government forecasts that demand for electricity will continue to grow, despite the fact that energy-saving measures will reduce overall energy consumption. This is because a shift to electricity consumption is part of the solution for improving energy efficiency and thus reducing overall energy consumption in the country.

The industry sector is the largest consumer of electricity, accounting for 44.7% in 2012. Industry consumption has grown by 30.1% since 2002 while total electricity consumption has increased at a slower rate of 17%. As such, the industry sector has increased its share in electricity usage from 40.2% of the total in 2002. The largest increase has been in wood and wood product manufacturing and construction.

The residential sector consumed 27.9% and the commercial/public services sector 22.5% of total electricity in 2012. Residential consumption has decreased as a percentage of the total from 31.1% in 2002 while commercial usage has remained relatively unchanged. The transport sector was the only sector to reduce overall electricity consumption from 2002 to 2012, decreasing by 5.7%. Transport accounts for 4.9% of total electricity usage, down from 6.1% in 2002.

Figure 8.3 Electricity consumption by sector, 1973-2012



* *Commercial* includes commercial and other services, agriculture/forestry and fishing.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2013; and country submission.

IMPORTS AND EXPORTS

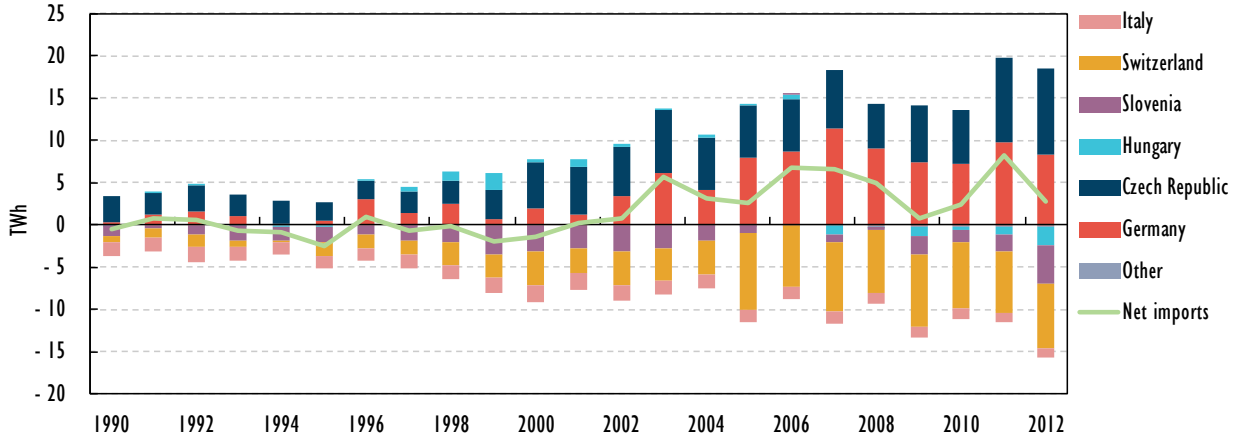
Austria is a net importer of electricity with total net imports of 2.8 TWh in 2012. This represents 3.9% of total electricity consumption in the country. As is the nature of electricity trade, net imports have been volatile over the past decade, averaging 4 TWh since 2002, or around 6% of electricity consumption.

Electricity exports were 20.5 TWh in 2012, which is 22.1% higher than in 2011 and 39.3% higher than ten years earlier. Exports reached their record high in 2012, at 30% of generation. According to the latest available data per country, 43.9% of electricity exports went to Switzerland in 2011, followed by Germany (23.7%), Slovenia (14.2%) and Hungary (9.7%). The remainder was to Italy and the Czech Republic. Over the past

decade, exports to Switzerland, Hungary and the Czech Republic have grown, while exports to Germany, Italy and Slovenia have contracted.

Electricity imports totalled 23.3 TWh in 2012, which is 6.9% lower than a record high of 25 TWh in 2011, and 51.3% higher than in 2002. Germany is the main source of electricity imports for Austria, representing 54.9% of imports in 2011. The Czech Republic accounted for 40.3% in 2011, with the remainder from Hungary, Slovenia and Switzerland. Since 2002, imports from Hungary and Switzerland have subsided while imports from Germany, the Czech Republic and Slovenia have increased their penetration in the Austrian market.

Figure 8.4 Net electricity imports to and exports from Austria by country, 1990-2012



Sources: *Electricity Information*, IEA/OECD Paris, 2013, and country submission.

Austria has significant hydro pumped storage capacity, which has been increasingly in use over the past decade. Total electricity in pumped storage was 5.6 TWh in 2012, more than twice the volume of 2.6 TWh stored in 2002. This increase coincides with higher imports, as water is often pumped back up to the storage by using cheap excess electricity from neighbouring countries, particularly from Germany.

INSTITUTIONS

The **Federal Ministry of Science, Research and Economy** (BMWFW, until 1 March 2014, the Federal Ministry of Economy, Family and Youth) is responsible for policies relevant to the electricity sector in general, but co-ordinates with other ministries where appropriate. The ministry takes decisions on the provision of investment subsidies, including feed-in tariffs for renewable electricity and biofuels. The ministry is also responsible for the financial oversight and corporate governance of the majority state-owned electricity company Verbund AG.

E-Control is the independent body responsible for overseeing the liberalisation of Austria's natural gas and electricity markets and the day-to-day operation of those markets. Established in 2001, it works to promote competition in the electricity and natural gas sectors and to ensure that the benefits of competitive pressures on prices and services flow to consumers. E-Control has been given increased regulatory powers with the 2010 E-Control Act (*Energie-Control Gesetz*), enshrining its independence and expanding its authority and sanctioning power.

The **Austrian Competition Authority**, in co-ordination with E-Control, is the government body responsible for enforcing Austrian and European competition laws.

INDUSTRY STRUCTURE

By EU standards, Austria's electricity generation industry is relatively diverse, with several companies generating more than one TWh per year. By far the largest generator is Verbund (see Box 8.1) which has more than 100 power plants in Austria and generates around 40% of the country's electricity. By law, at least 51% of the shares of an electricity utility must be owned by the state.

Box 8.1 Verbund

The largest supplier and generator in Austria is Verbund, which was formed after the Second World War during the nationalisation of the electricity industry. Verbund is owned 51% by the Austrian government, in accordance with the constitutional provisions regarding state ownership, and the remainder is held by other Austrian utilities (30% together), or in free flotation (20%).

Verbund accounts for around 55% of electricity production, operates the largest part of the Austrian transmission network, and has become a driving force for real competition in the Austrian market through its subsidiaries Austrian Power Trading (APT) and Austrian Power Sales (APS), operating in the wholesale and final customer markets, respectively. Verbund also owns subsidiaries or has shares in companies operating in other European countries, such as Italy or France. Like all Austrian electricity generators, Verbund's portfolio is primarily based on large and small hydropower stations, with a share of thermal generation in the form of coal and gas plants.

In 2006, Verbund was the object of an attempt by the Austrian government to create a national energy champion, by merging it with the partially state-owned Austrian oil and gas company, OMV. This project failed because of the resistance to the constitutional change which would have been required to allow the share of the government in the combined entity to fall below 51%.

The transmission network is split into three regions, each owned by a different company and all the networks have been legally unbundled.

Despite the complete market liberalisation since 2001, market concentration at retail level remains quite high, with the three largest household suppliers controlling 58% of the market (2010), and the five largest suppliers having 71%. Of the roughly 140 retailers, many operate only at local or regional level.

Ownership of integrated electricity companies is often in the hands of the regional or municipal government of the area the company serves. Supply companies normally own the local distribution network.

SUPPLIER SWITCHING

The Austrian electricity market was fully liberalised in 2001, allowing electricity suppliers to set their prices and consumers to freely choose their supplier. Each consumer can shop around for the cheapest offer and freely choose an electricity supplier.

Despite this legal opening, relatively little switching has taken place, with switching rates remaining at 1.3% in 2011, 1.1% in 2012 and 1.9% in 2013. As a result, incumbent suppliers remain dominant, and continue to uphold their sizeable market shares.

To help customers compare electricity prices between suppliers, Austria's energy regulator, E-Control, has developed a specific tariff calculator (*Tarifkalkulator*, www.e-control.at/de/konsumenten/service-und-beratung/toolbox/tarifkalkulator).

RECENT LEGISLATION

In order to transpose the new Electricity Directive, which is part of the European Union's Third Energy Package of legislation, the Austrian parliament passed the *Elektrizitätswirtschafts- und -Organisationsgesetz* (ElWOG – Electricity Act 2010) and the *Energie-Control Gesetz* (E-Control Act), replacing the *Energie-Regulierungsbehördengesetz* (Energy Regulatory Authorities Act).

ELECTRICITY ACT 2010

The unbundling rules for electricity transmission system operators (TSOs) have been completely transformed in the 2010 Electricity Act, which came into effect in March 2011. The relevant provisions in this Act are based on the new EU Electricity Directive, and large parts of them are taken over from it word for word. The new requirements give Austrian TSOs a choice between four options (ownership unbundling; independent system operator [ISO]; independent transmission operator [ITO]; and more effective independence of the transmission system operator [ITO+]). This passes on the right of member states to opt for one of the prescribed unbundling models to the TSOs themselves.

The procedure for the determination of the system charges has also been revised. In particular, the relevant legal provisions are now far more detailed for the regulatory authority, as regards both the principles of cost and quantity determination, and the individual components of the charges. The procedure itself has been modified, in that system operators' cost bases must first be determined by notice of the regulatory authority, and the system charges then set by order of the latter on the basis of the notices.

The rules governing the duties of system operators and electricity suppliers to their customers have also been revised. The switching period has been reduced to three weeks, in line with the directive's requirements, and the provision regarding the supplier of last resort has been modified. There are now special rules on disconnection, consumer information and smart meters.

E-CONTROL ACT

The Austrian national regulatory authority, E-Control, was created in 2001 when the market was liberalised. In line with a key objective of the Third Package – namely to give regulators greater powers and more independence from government – E-Control's powers have been augmented with the 2010 E-Control Act (*Energie-Control Gesetz*), which consolidates all regulatory power under one entity (through the integration of E-Control Kommission into E-Control GmbH), ensures its independence from public and private interests (by transforming the regulatory body into a public authority) and expands its sanctioning power.

E-Control's governing bodies are an executive board, a regulation commission and a supervisory board; they are not obliged to observe ministerial directions when performing regulatory functions. A regulatory advisory council, consisting of representatives of federal government ministries, interest groups and provincial governments, is to be set up to advise the regulatory authority on tariff-related and other matters. The executive board will be responsible for managing day-to-day operations and representing the authority. The members are to be appointed for five years, and reappointment for one further term is possible.

CRITERIA CATALOGUE FOR HYDROPOWER

In order to support the increase of hydropower generation in Austria while protecting sensitive water bodies, as required by environmental law, a catalogue of criteria for new hydropower plants was elaborated and published in January 2012. With special reference to the environmental objectives of the EU Water Framework Directive (WFD) and the no-deterioration principle in particular, this catalogue was made to help to decide on the appropriateness of a water stretch to be used for hydropower generation taking into account economic as well as environmental and other water management aspects.

The catalogue therefore consists of a list of economic, environmental and water management criteria which help in balancing contradictory interests during a licensing procedure in case a new hydropower plant would mean a deterioration to the existing ecological status of the water body or would prohibit the achievement of the environmental objective (good ecological status/good ecological potential) of the WFD.

In a water management planning procedure, the catalogue will be one of the main tools to find those locations where new hydropower plants can be built with minimised negative effects on the aquatic ecology (hydropower use in an aquatic environmentally acceptable way).

The catalogue can also be used to inform hydropower users at a very early stage about the probability and possible problems to obtain a licence for a specific site. In this regard it also supports the streamlining of licensing procedures.

INFRASTRUCTURE

Austria has a relatively well-developed electricity infrastructure, although some required investments in transmission have been held back by permitting procedures. Investment in generating capacity has lagged the growth of demand, turning Austria into a net importer of electricity. Austria is well interconnected, and the western part of the country's electricity system is completely integrated into the German system. The government has made energy infrastructure improvements a priority, particularly in the electricity sector.

POWER GENERATION

The Austrian power generation system is based primarily on large hydroelectric installations, taking advantage of the geographical conditions of the country. The balance is provided by thermal generation, which often operates in CHP mode, and other renewables. Table 8.3 gives an overview of power generating capacity and production in 2011.The maximum demand load in 2011 was 9 716 MW, well within the capacity of the Austrian power generation park.

Box 8.2 Nuclear energy ban

There is no utilisation of nuclear energy in Austria. The utilisation of nuclear fission for energy supply is prohibited in Austria since 1978 by federal law following a referendum. In 1999, this ban became part of constitutional legislation (Federal Constitutional Act *Atomfreies Österreich*, Federal Law Gazette 149/1999). Austria does not regard nuclear energy as a viable strategy option to combat climate change, as it views nuclear energy as a hazardous technology, potentially extremely expensive and incompatible with the principles of sustainable development.

Table 8.1 Electricity generation capacity by energy source, 2011

Generation component/type			Allocated power plant and other power plants			
			Number	Capacity (MW)	Generation (GWh)	Number of hours used
Hydropower plants	Run-of-river	> 10 MW	90	4 433	21 024	4 743
		< 10 MW	601	782	4 252	5 440
	Reservoir hydro, including pumped storage	> 10 MW	67	7 615	11 996	1 575
		< 10 MW	44	150	429	2 857
	Other small hydro		1 869	220	0	N.A.
	Total hydro		**2 671**	**13 200**	**37 701**	**2 856**
Thermal pop-up plants	Hard coal		4	1 171	5 315	4 539
	Derivatives		7	444	1 931	4 349
	Petroleum derivatives		11	362	1 179	3 260
	Natural gas		64	5 102	11 556	2 265
	Biomass		103	401	2 345	5 841
	Other		394	769	3 506	6 635
	Total thermal		**583**	**8 249**	**25 832**	**3 132**
Renewables	Wind, PV, geothermal		198	1 107	1 985	1 793
	Other renewables		10 375	72	0	N.A.
	Total renewables		**10 573**	**1 179**	**1 985**	**1 683**
Total			**13 827**	**22 628**	**65 518**	**2 903**

Source: Energie-Control Austria.

Table 8.2 Monthly data on electricity system adequacy, 2011

Report period	Maximum load (MW)	Minimal load (MW)	Maximum daily consumption (GWh)	Minimum daily consumption (GWh)	Monthly consumption (GWh)	Use of maximum load factor (hours)	Load factor
January	9 587	4 920	196.2	145.2	5 524	576	0.77
February	9 652	5 098	199.8	148.9	5 078	526	0.78
March	9 220	4 585	191.1	129.9	5 275	572	0.77
April	8 398	3 833	170.2	115.5	4 560	543	0.75
May	8 214	3 925	164.2	118.6	4 617	562	0.76
June	8 381	3 754	163.5	115.2	4 379	523	0.73
July	8 426	3 814	166.2	116.1	4 557	541	0.73
August	8 555	3 826	167.7	114.8	4 536	530	0.71
September	8 696	4 021	167.2	122.6	4 643	534	0.74
October	8 752	4 022	178.1	122.8	4 933	564	0.76
November	9 588	4 441	193.4	132.8	5 170	539	0.75
December	9 716	4 695	199.9	139.4	5 408	557	0.75
Annual	**9 716**	**3 754**	**199.9**	**114.8**	**58 679**	**6 567**	**0.755**

Source: E-Control (July 2012 data).

TRANSMISSION AND DISTRIBUTION

The Austrian transmission system is broken into three separate control areas, the western-most of which is fully integrated into the southern German system of the energy company EnBW. Transmission networks are owned by integrated electricity companies such as Verbund. Austria has chosen legal unbundling for the transmission and distribution networks and this has been implemented.

With around 94% of the Austrian high-voltage electricity grid, the Austrian Power Grid AG (APG) is the main Austrian electricity TSO, and it has been certified as an independent transmission operator (ITO). There has been a reduction to only one control area by the co-ordination of the three TSOs, and the control area is now managed only by APG. APG is responsible for ensuring the reliability of the electricity system, and in this regard is statutorily obliged (according to paragraph 37 of the Electricity Act 2010) to produce a ten-year grid development plan – the APG Master Plan 2020 – which is coherent with the vision held by the European Network of Transmission System Operators for Electricity (ENTSO-E) and outlines a long-term strategic network expansion plan based on the energy-economic developments in Europe. A substantial portion of the APG-defined master plan projects is classified by the European Commission as Trans-European Networks projects and hence as particularly urgent.

An almost complete ring of 380 kV lines has existed for around 35 years, but it has not been possible to complete this because of permitting issues. Yet, despite this lack of a complete ring main, the reliability of the Austrian network is comparatively high.

Use of the network is paid for through the system charges. These are the prices that system operators are permitted to charge for their services. Electricity DSOs have been subject to an incentive-based regulation system since 1 January 2006. The first regulatory period lasted four years, and the second four-year period began on 1 January 2010.

Table 8.3 Length of high-voltage networks, 2012

Voltage	Above ground (km)	Below ground (km, estimated)	Total (km)	Share of total (%)
110 kV	10 501	660	11 161	63
220 kV	3 662	5	3 667	21
380 kV	2 783	55	2 838	15
Total	**16 946**	**720**	**17 666**	**100**

Source: E-Control.

REGIONAL INTERCONNECTIONS

Austria is well interconnected, and the western part of the Austrian electricity system is completely integrated into the German system. However, more investments in interconnections with Italy, Slovenia and Switzerland are required.

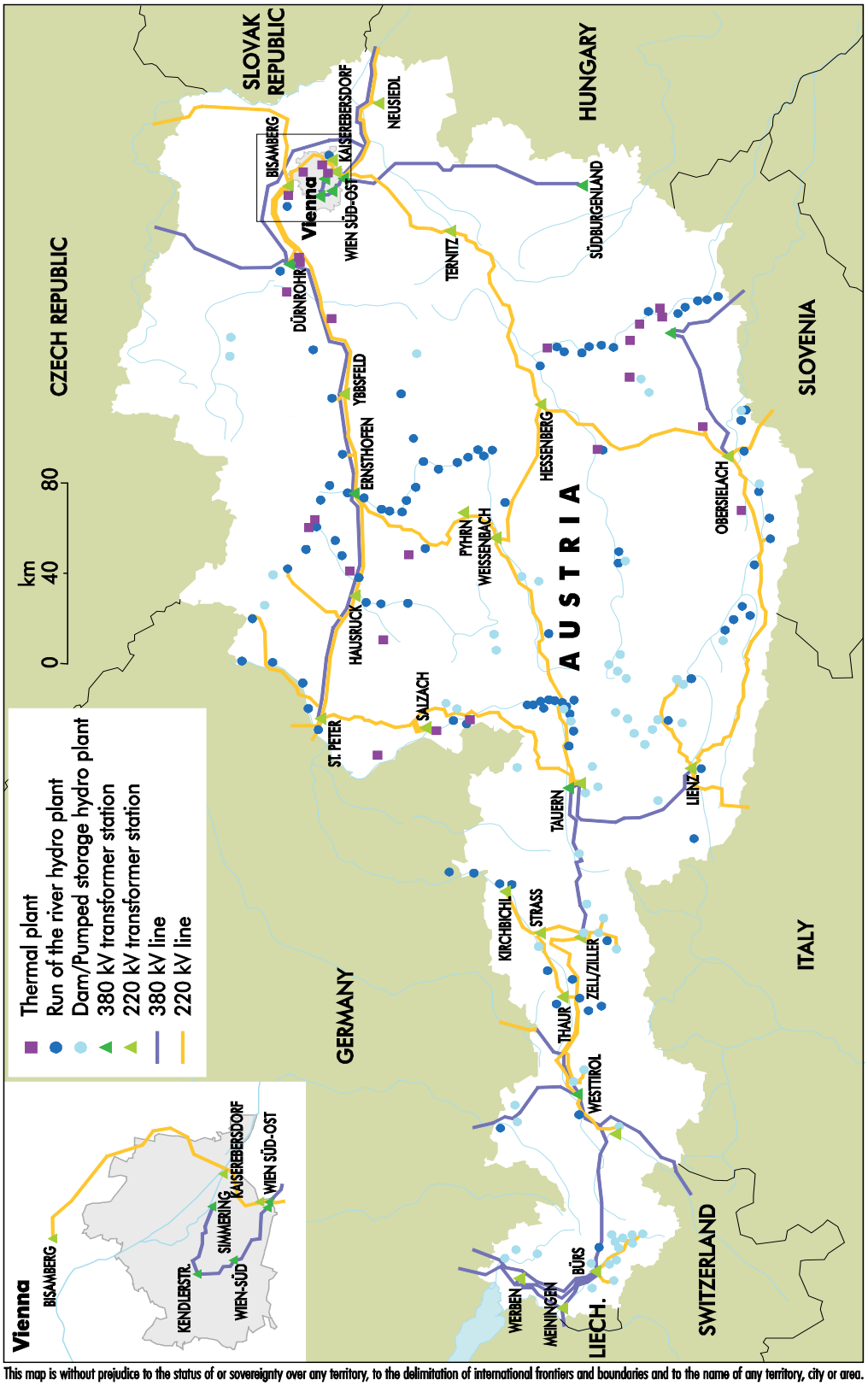
Austria is also linked to the Central Eastern European (CEE) market area, but integration remains limited by congested interconnections and insufficient market coupling arrangements. Interconnections on Austria's eastern borders are increasingly strained because of unscheduled loop flows from renewable energy generation in Northern Germany coming through the Eastern European network, particularly at the highly congested Austrian/Czech border. Plans have been elaborated for further integration of the region's electricity markets.

Table 8.4 International interconnections and electricity trade, 2011

	Into Austria (MW)	From Austria (MW)	Imports from (GWh)	Exports to (GWh)
Germany	1 400	1 600	13 707	3 979
Switzerland	1 200	1 200	102	7 362
Italy	220	n/a	11	1 074
Slovenia	450	450	400	2 386
Hungary	500	400	698	1 629
Czech Republic	600	200	10 054	86

Source: E-Control.

Figure 8.5 Map of Austria's high-voltage electricity grid

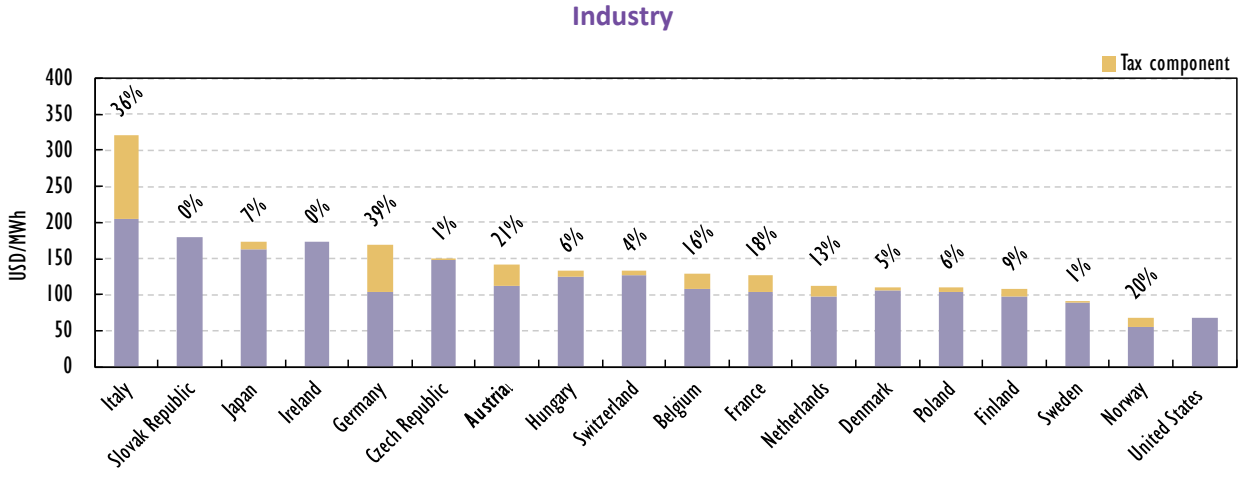


Source: APG.

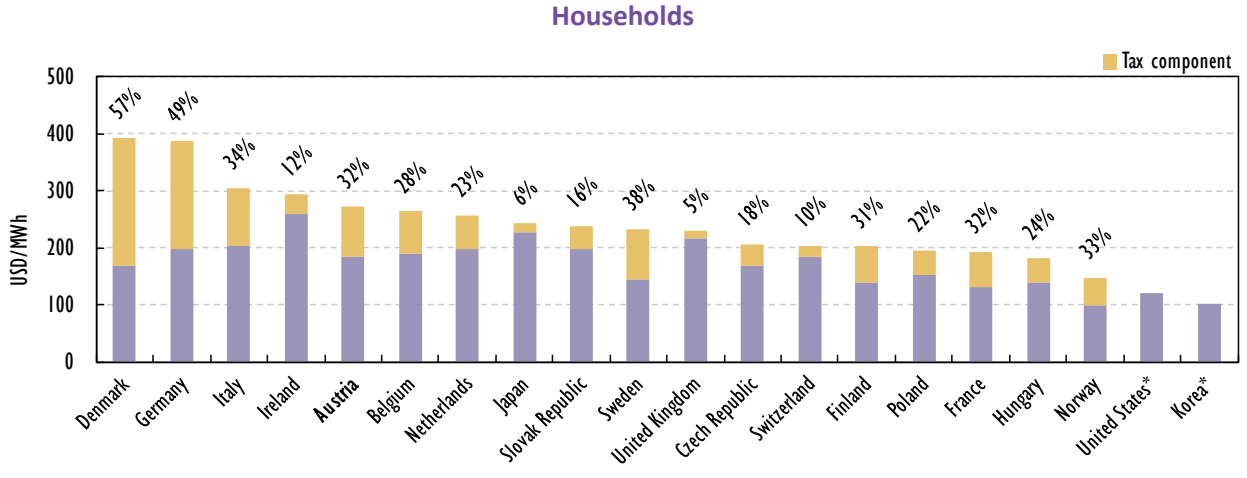
PRICES AND TARIFFS

There is no retail price regulation in Austria. However, there is a provision for a "last-resort tariff" in order to ensure the supply for all customers at any time. The German and Austrian wholesale markets form a common German/Austrian price zone, and Austria participates in the Central West European (CWE) market coupling arrangements.

Figure 8.6 Electricity prices in IEA member countries, 2013



Note: data not available for Australia, Canada, Greece, Korea, Luxembourg, New Zealand, Portugal, Spain, Turkey and the United Kingdom.

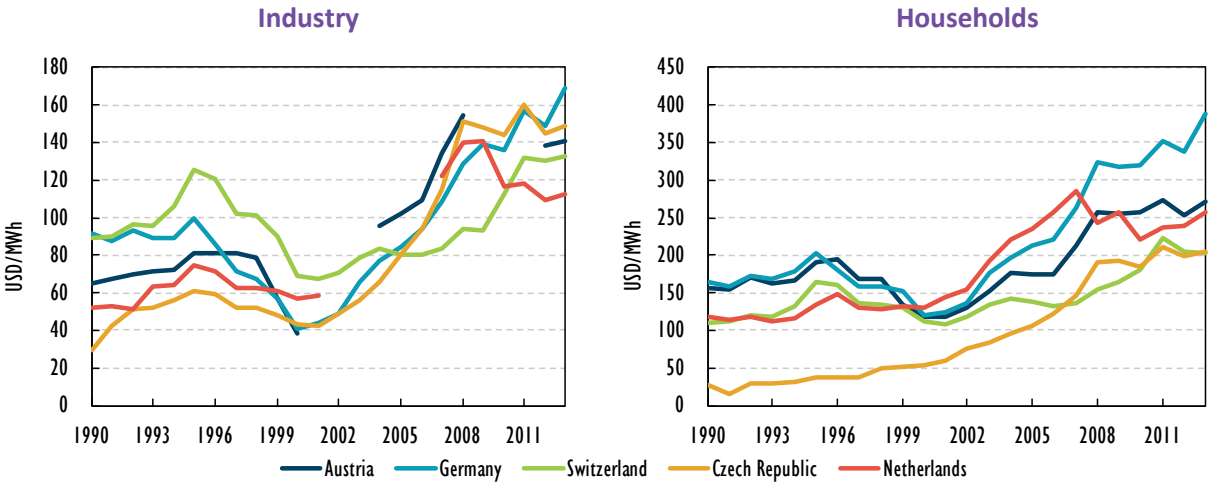


Note: data not available for Australia, Canada, Greece, Luxembourg, New Zealand, Portugal, Spain and Turkey.

* Tax information not available.

Sources: *Energy Prices and Taxes*, IEA/OECD Paris, 2013; and country submission.

Figure 8.7 Electricity prices in Austria and in other selected IEA member countries, 1980-2013



Note: data not available for Austria (Industry) from 2000 to 2003 and from 2008 to 2010.

Sources: *Energy Prices and Taxes*, IEA/OECD Paris, 2013; and country submission.

ASSESSMENT

Austria's Alpine location allows for abundant hydroelectric resources, which account for around 64% of the country's power input. Additional electricity sources are well diversified, with natural gas, coal and biomass accounting for 14.1%, 9.1% and 7.6% of total electricity supply in 2011, respectively, with wind (3.6%) and oil (1.1%) also contributing marginal amounts to the energy mix. Austria's energy-intensive industrial sector accounts for more than 44% of the total electricity demand. Residential demand accounts for a further 27.9% of electricity demand, and the commercial and services sector for 22.5%.

Austria is relatively well integrated into the wider regional electricity markets. This high level of integration is exemplified by the high level of yearly imports and exports, which together account for over half of the country's production. Austria shares a common (and generally uncongested) wholesale market with Germany, through which Austria participates in the CWE market coupling arrangements. At a national level, however, the Austrian electricity system is split into three transmission system areas, one of which is not interconnected with the rest of the Austrian system, but is a part of the German system.

Substantial investments are foreseen in the Austrian power sector in order to guarantee a safe and sustainable power system also in the future. The generating capacity of both conventional thermal and renewable power plants is forecast to grow, with the latter being encouraged by the support of feed-in tariffs. No capacity mechanism system is currently foreseen by the government. There are investments planned for the renewal and expansion of the transmission and distribution grids. However, there are some obstacles here by the complex licensing procedures with the risk of project delays. Persistent infrastructure issues relating to the 380 kV domestic ring line is testimony to the difficult task of planning and consenting in Austria.

Electricity markets in CWE and CEE have changed owing to the strong increase of non-dispatchable generation from renewable sources, particularly from photovoltaics (PV) and wind. This is especially the case for Germany, which affects Austria because of the close connection of the markets, with hours when Austria has imported at a capacity of up to 7 000 MW from Germany. Owing to several factors, such as market design and transmission capacity within Germany, this creates an increase of loop flows in CWE and CEE and more re-dispatch measures that are needed to stabilise the grid.

The operation of the grid is brought under growing pressure with the increase of intermittent electricity produced by wind generation, suggesting a need for more backup capacity and pumped storage, and for smarter management of the current renewable capacity. Given the capital-intensive, long-term and interdependent nature of investments in the electricity sector, it is important to accurately forecast and monitor the interactions of the renewable energy and demand-side management on the need for power storage, and extension and renewal of the grid.

Austria's flexible hydropower plants are crucial for balancing the system and must play an important role for the integration of renewable energies in Europe. Yet, in order to realise this potential, it is important to remove barriers, such as speeding up the development of the high-voltage transmission grid, improving access to the European balancing and intraday markets and harmonising framework rules for pumped storage plants. Commendably, on the latter point, a common initiative between Austria, Germany and Switzerland was signed in 2012 to further develop this technology and to realise a co-ordinated extension of the transmission lines.

Although Austria is linked to the Central Eastern European market, significant measures will need to be implemented in order to reach an internal EU electricity market by 2014. ACER and regulators in the CEE region are aiming to implement implicit flow-based intraday capacity allocation procedures in the region in 2014. There is significant concern around how to deal with unscheduled loop flows, particularly at the highly congested Austrian/Czech border. Austria needs to further strengthen interconnections (particularly with Italy, Slovenia and Switzerland) and additional system management capacity in order to stabilise domestic and regional supply.

Although Austria and Germany share a wholesale trading market, foreign wholesale traders are not very active in Austria, with sales often limited to larger customers consuming over 10 GWh. The European Commission reports that 11 domestic wholesale traders are active in the country. Market information on congestion, balancing prices, and availability is not readily available to new entrants, meaning that the vertically integrated incumbents have an advantage because of lack of transparency. Indeed, although there is a (non-mandatory) national power exchange, over-the-counter trading accounts for the vast majority of total trading.

The powers of the Austrian regulator, E-Control, were strengthened with the 2010 E-Control Act, consolidating all regulatory power under one entity and enshrining its independence. In theory, the regulator is now also empowered to monitor price developments and launch sector inquiries, including requesting specific information from companies. However, in 2011 retail companies have legally challenged E-Control's very first sector inquiry regarding retail margins of electricity distributors. Subsequently, the high courts have effectively ruled in favour of E Control. The reversal of the burden of proof with respect to price abuse has not been introduced in the new law.

Despite the complete market liberalisation since 2001, market concentration at retail level remains quite high. Several measures were taken by the regulator to improve competition in the retail sector, such as the *Tarifkalkulator* and a decrease of the switching period to three weeks. Yet the retail market continues to suffer from low, albeit increasing, levels of supplier switching, which stood at just 1.9% in 2013; and retail prices do not closely follow the price patterns of wholesale prices. Competition in the retail market could be strengthened through greater transparency and enhanced possibilities for customers to switch suppliers. For example, customer online switching between retailers is currently not possible in Austria.

Energy-efficient smart meters are also being promoted as a means of increasing security of supply. Once these meters have been installed, residential and commercial customers will be better equipped and informed to take advantage of advanced time-varying pricing of electricity. In early 2010, E-Control published a cost-benefit analysis for the roll-out of smart meters. A government decree entered into force in April 2012 calling for the roll-out of smart meters to 70% of all end-consumers by 2017 and 95% by 2019. It is important that the effectiveness of demand-side measures is investigated and that the legal framework is adapted in order to encourage deployment as far as possible.

RECOMMENDATIONS

The government of Austria should:

- ☐ *Increase the international integration of the electricity market with its neighbouring countries through:*
  - *the increase of interconnector capacity, where necessary*
  - *the co-ordination of re-dispatch measures and the improvement of congestion management and pricing of transmission use*
  - *extending market coupling*
  - *establishing competitive cross-border balancing and intraday markets*
  - *continuing the work on the flow-based transmission capacity allocation for CEE.*
- ☐ *Study the cost-effectiveness of the planned investments in an integrated approach by analysing the interdependencies of the higher share of renewable energies, the possibilities of demand-side management and its effects on the need for electricity storage, and for extensions and renewal of the grid.*
- ☐ *Simplify the licensing process for infrastructure projects by streamlining the procedures on a federal and provincial level; ensure transparency and early involvement of civil society in the process.*
- ☐ *Further promote competition in the retail market (in particular regarding pricing levels) by strengthening the power of the regulator e.g. by introducing the concept of "reversal of the burden of proof", notably with respect to price abuse, and by allowing further measures such as online switching.*

9. RENEWABLE ENERGY

Key data (2012)

Share of renewable energy: 32.6% of TPES and 75.7% of electricity generation

(IEA median: 9% of TPES and 18.8% of electricity generation)

Biofuels and waste: 19.9% of TPES and 7.9% of electricity generation

Hydro: 11.4% of TPES and 63.7% of electricity generation

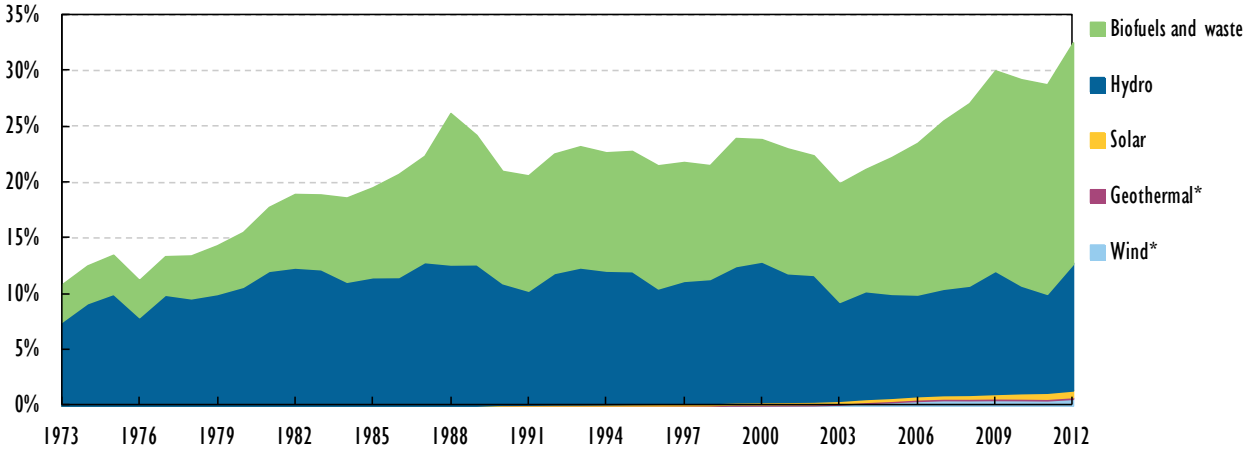
Wind: 0.6% of TPES and 3.6% of electricity generation

Solar: 0.6% of TPES and 0.5% of electricity generation

SUPPLY

Renewable energy contributed 10.8 million tonnes of oil-equivalent (Mtoe) to total primary energy supply (TPES) in 2012, or 32.6% of the total. Biofuels and waste are the main form of renewable energy, accounting for 19.9% of TPES. Hydropower accounted for around 11% and wind power and solar for 0.6% each. Geothermal energy is produced in Austria, however still at negligible levels.

Figure 9.1 Renewable energy as a percentage of TPES, 1973-2012



* Negligible.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2013; and country submission.

Renewable energy supply has increased by 57.9% over the past decade, up from 6.8 Mtoe in 2002. The strongest rate of growth was in wind power, the deployment of which started in 2000 and grew to 0.2 Mtoe by 2012. Solar power tripled from 0.07 Mtoe in 2002 to 0.2 Mtoe in 2012, while the use of biofuels and waste doubled over

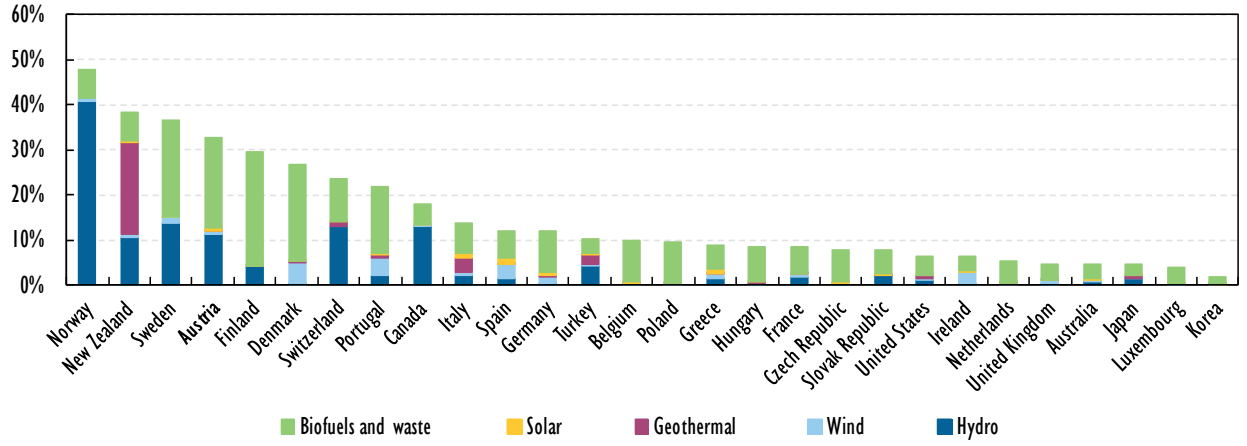
the same period, from 3.3 Mtoe to 6.6 Mtoe. Hydropower generation, which varies year-on-year according to hydrological conditions, was 8.8% higher in 2012 than in 2002.

Renewable energy is used mainly for electricity and heat production. Thanks to its Alpine topography, Austrian electricity generation is dominated by domestic hydropower – around 63.7% of total domestic electricity generation in 2012 – providing Austria with a high degree of energy security and independence in terms of electricity supply. With biofuels and waste contributing a further 7.9% of electricity supply, other forms of renewable energy contributing incrementally, electricity generated from renewable energy sources stood at 75.7% of the total, or 52 TWh, in 2012.

Biofuels and waste also fuel 50.5% of total heat production in Austria, with less than 0.1% coming from solar and geothermal energy. Over the ten years to 2012, biofuels and waste have experienced the strongest surge in growth, increasing from 2.9% of electricity generation and 25.2% of heat generation in 2002. Energy from wind and solar have grown strongly as well. However, their penetration is still relatively low.

Biofuels and waste are also important for the transport sector, accounting for 6.1% (0.5 Mtoe) of energy consumed in transport in 2012. This share has grown remarkably from 0.2% in 2002, with a surge in 2006 when the supply of biofuels in transport grew from 0.5% to 3%. Austria has the highest penetration of biofuels in transport among IEA member countries, followed by Sweden (5.9%) and France (5.6%).

Figure 9.2 Renewable energy as a percentage of TPES in IEA member countries, 2012

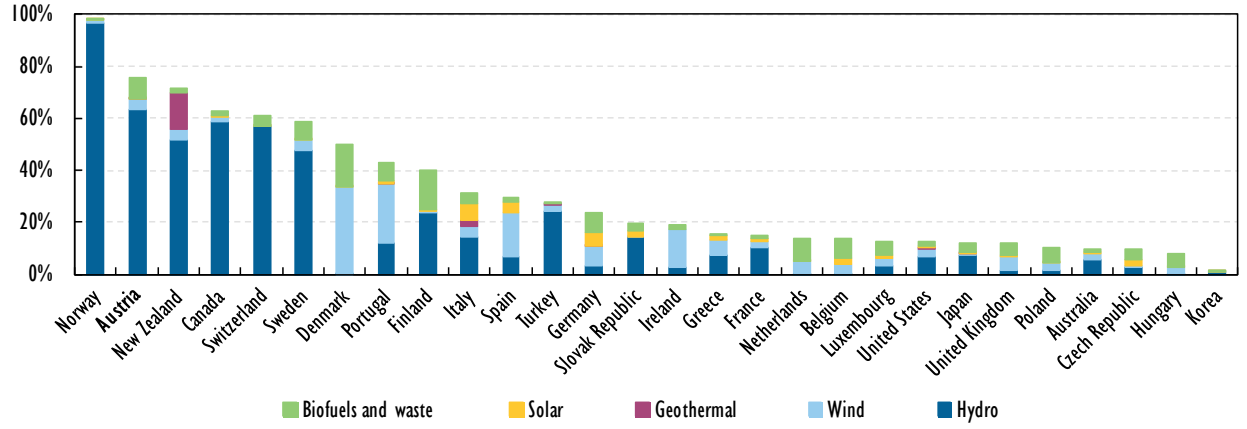


Note: actual data for Austria and estimated for other countries.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2013; and country submissions.

Austria has the fourth-highest share of renewable energy in TPES among IEA member countries, behind Norway, New Zealand and Sweden (Figure 9.2). It also ranks fourth-highest with regards to biofuels and waste in its overall energy mix, while it is sixth-highest when considering hydro as part of TPES. With regard to renewables in electricity generation, Austria ranks second-highest after Norway and just above New Zealand (Figure 9.3). Austria has the largest share of hydro in electricity generation after Norway, and the fourth-largest share of biofuels and waste in electricity, after Denmark, Finland and the Netherlands.

Figure 9.3 Electricity generation from renewable sources as a percentage of all generation in IEA member countries, 2012



Note: actual data for Austria and estimated for other countries.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2013; and country submissions.

INSTITUTIONS

The **Federal Ministry of Science, Research and Economy** (BMWFW, until 1 March 2014, the Federal Ministry of Economy, Family and Youth) is responsible for policies relevant to the support of renewable energy in general, but co-ordinates with other ministries where appropriate. The ministry takes decisions on the provision of investment subsidies, including feed-in tariffs for renewable electricity and biofuels. It also oversees investment aids for biomass district heating and industrial plants using biomass or other renewables.

The **Federal Ministry of Agriculture, Forestry, Environment and Water Management** (*Lebensministerium*) is responsible for policies on the production of forest and agricultural biomass, and for assessing the environmental impacts of energy projects.

However, because of the federal nature of Austria's system of governance, provincial governments are responsible for the building sector and its regulations. As such, provincial governments are thus responsible for policies on renewable heating in buildings and diverse other schemes. In the case of solar power, some local governments also run additional photovoltaic aid schemes, including education and demonstration.

The Federal Environment Fund supports projects with a total annual budget of more than EUR 90 million, of which more than EUR 49.5 million (2011) was spent for heating and cooling from renewable energy sources. The Fund focuses on biomass and biogas district heating, entrepreneurial biogas developments, for example in agriculture, biomass central heating systems, solar panels and energy efficiency measures. The government estimates that implementing these projects could avoid emitting around 6.2 Mt of CO_2.

POLICIES AND MEASURES

OVERVIEW AND TARGETS

The specific focus areas of Austria's renewable policies are hydropower (including pump storage), wind power, biomass and photovoltaics (PV). The related technologies are to be promoted and developed at the highest possible degree of cost-effectiveness, and

applied to sectors as diversified as district heating and cooling, new transmission networks, diversification of supply sources and routes, gas storage, smart grids and smart metering.

Austria's renewable energy policy is driven by EU policies. Under the EU Renewable Energy Directive,[3] Austria is required to increase its share of renewable energy from 23.3% of gross final consumption in the base year 2005 to 34% in 2020. This is the fourth-highest share among EU member states, after Sweden (49%), Latvia (40%) and Finland (38%).

While the 34% renewable energy target is binding, the manner in which an individual member state achieves it is left to its own discretion. The directive obliges member states to develop a National Renewable Energy Action Plan (NREAP). Austria's NREAP indicates that meeting the 34% share of renewables by 2020 is based on two conditions:

- A 13% reduction of final energy consumption (compared to the reference scenario in the 2010 Energy Strategy Austria) is needed for the efficiency scenario to be achieved, thereby bringing final energy consumption down to 1 100 PJ, or 27 109 ktoe.
- The volume of renewable energy must be increased by 18% by 2020, relative to 2008.

Nominally, Austria hopes to produce 9 217 ktoe of energy from renewables sources in order to meet the 2020 target. More specifically, 32.6% of gross final energy consumption in heating and cooling, 11.4% in transport and 70.6% of electricity consumption should be met with renewable sources in 2020. The share of renewable energy in the country's energy mix is already quite high, and has been increasing incrementally in recent years. As of 2010, the share of renewable energy in Austria's overall energy consumption already exceeds 31%. According to the government's internal scenario, Austria is currently on track to meet its 2020 targets for renewable energy supply.

ELECTRICITY

A new renewable energy law – *Ökostromgesetz*, or Green Electricity Act – became effective in July 2012, further increasing support levels for electricity generated from renewable sources.

The Green Electricity Act has set strong targets for 2020, with a view to encouraging the development of these additional capacities (as compared to 2010 levels):

- hydropower: 1 000 MW
- wind power: 2 000 MW
- biomass and biogas: 200 MW
- photovoltaics: 1 200 MW.

Before the passing of the Green Electricity Act in 2012, targets for additional electricity production from supported renewables for the year 2015 (as compared to 2010) were as follows:

1. Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources, amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

- hydropower: 700 MW
- wind power: 700 MW
- biomass and biogas: 100 MW
- photovoltaics: 500 MW.

Overall, the government had laid out the overarching target of 15% of its electricity coming from supported renewable energy sources by 2015. As of 2011, electricity from supported renewables is already estimated to account for around 17% to 18% of final electricity consumption. The feed-in tariff levels for installations that entered the feed-in tariff scheme from mid-2012 to end-2013 ranged from EUR 0.0323 per kWh for refurbished small hydro plants to EUR 0.199 per kWh for small biomass plants. For wind power, the tariff is set at EUR 0.0945 per kWh for 2013 and for solar PV plants at EUR 0.1659 per kWh in 2013. The tariff levels are fixed for 13 to 15 years, depending on the technology.

Box 9.1 The Green Electricity Act's funding allocation

Under the previous renewable energy law, EUR 21 million was allocated each year in the form of feed-in tariffs to encourage renewable energy investments. The new energy law has increased the overall budget for yearly support payments for feed-in tariffs by an additional EUR 50 million in 2012. This additional funding is allocated in the following manner:

- EUR 8 million for photovoltaics
- EUR 10 million for biomass (solid, liquid) and biogas
- at least EUR 11.5 million for wind
- at least EUR 1.5 million for small hydropower
- EUR 19 million will be put in the *Resttopf*, a leftover reserve fund whose money will be distributed across the wind, hydro and photovoltaic industries, and will decline progressively over the following ten years, by EUR 1 million per year.

Besides feed-in tariffs, investment grants for small and medium hydropower plants are provided by the renewable energy law. Photovoltaics investment grants are provided via the KLI.EN Fund and/or local authorities.

The total spending on feed-in tariffs amounted to EUR 350 million in 2010 and EUR 308 million in 2011.

Source: BMWFW.

HEAT

Biofuels and organic waste are the largest primary energy sources for large-scale heat production at co-generation (CHP) and heat-only plants. In 2011, they accounted for around 45% of the total primary energy input. Wood waste is also used for process heat in manufacturing industry. For small-scale heat production at individual buildings, pellets, fuel wood, solar and geothermal are used. In the 2009 National Renewable Energy Action Plan, the government sees little further growth for renewable energy use for heat production. In total, final use of renewable energy for heating and cooling would increase from 3.7 Mtoe in 2010 to 4.2 Mtoe in 2020, or by around 14%.

The federal government grants subsidies for commercial RES-H capacity. The subsidies are typically flat-rate and technology-specific. They are granted in the following categories:

- large solar installations
- individual biomass units (separate for units of up to 400 kW_{th} and above that)
- biomass CHP
- biomass microgrids
- local biomass heating
- thermal solar installations (separate for installations of up to 100 m^2, and above that)
- connection to district heating (separate for connections of up to 400 kW_{th}, and above that)
- geothermal
- heat pumps (separate for units up to 400 kW_{th}, and above that).

Alternatively, the provinces offer investment subsidies of up to between 25% and 30% of the environment-related investment costs, i.e. the difference between total costs and the cost of a mainstream non-renewable energy technology solution of the same capacity, such as oil heating systems. This subsidy also applies to investments in heat distribution from CHP and heat plants and to connecting to a district heating system, for example.

For small-scale heating systems using renewable resources, the largest form of aid is available at provincial level in the building sector and is specifically used for supporting investments in solar thermal, heat pumps and biomass heating systems.

Specifically for solar thermal demonstration projects with a collector area between 50 metres (m) and 2 000 m, investment subsidies are available for the following purposes:

- support heat production from solar collectors
- microgrids, local and district heating networks with solar heaters present
- meeting 20% of commercial buildings heat demand with solar thermal energy
- solar-assisted air-conditioning
- development of new technologies and innovative approaches in the solar thermal sector.

TRANSPORT FUELS

The Federal Ministry of Agriculture, Forestry, Environment and Water Management has successfully implemented the Biofuels Directive 2003/30/EC, and with an accelerated timetable. Initially, an obligation to substitute 2.5% of all petrol and diesel fuels placed on the market or used in the federal territory by biofuel or other renewable fuels became effective on 1 October 2005. This percentage was subsequently raised to 4.3 % on 1 October 2007 and to 5.75% on 1 October 2008.

As a result, the target level of 5.75% biofuels in transport fuels by 2010, as laid out by the directive, was reached two years ahead of time in Austria. The country has continued to exceed the EU target since 2008, and its share of biofuels in transport fuels stood at 6.0% in 2011.

A new fuel law – *Kraftstoffverordnung*, or Fuel Act – came into effect in December 2012, requiring that 7.3% of the 10% renewables-in-transport target (by 2020) of Directive 2009/28/EC[4] be fulfilled by using biofuels.

The promotion of biofuel blending into motor fuels is notably encouraged by means of tax exemptions, with a lowered excise tax for diesel containing above 6.6% biodiesel and for unleaded gasoline containing above 4.6% bioethanol.

Table 9.1 Details regarding excise tax rebates for sulphur-free and biofuel-blended motor fuels

	2007	2008	2009	2010	2011	2012
Excise tax for diesel (EUR/1 000 litres)						
Preferential rate (sulphur free; with a minimum amount of 4.4% v/v biofuels from 1 October 2005 until 31 December 2009 and 6.6% since then)	347	347	347	397	397	397
Normal rate	375	375	375	425	425	425
Difference	28	28	28	28	28	28
Excise tax for unleaded petrol (EUR/1 000 litres)						
Preferential rate (sulphur free; with a minimum amount of 4.4% v/v biofuels from 1 October 2005 until 31 December 2009 and 6.6% since then)	442	442	442	482	482	482
Normal rate	475	475	475	515	515	515
Difference	33	33	33	33	33	33
Pure biofuel (EUR/1 000 litres)						
	0	0	0	0	0	0

Source: Government of Austria.

Of note, in terms of greener transport, the government is also actively promoting the expansion of the electric vehicles (EVs) market, with the target of 250 000 being in use in Austria by 2020.

Since 2007, the klima:aktiv mobil programme has supported around 9 000 EVs (especially E-bikes and E-scooters) with EUR 8.6 million, and around 1 000 E-charging stations with an additional EUR 0.4 million of funding.

ASSESSMENT

Austria has long had a strong renewable energy portfolio. It is among the leading European countries for hydro and biomass use, and has increased wind and solar energy capacity in recent years. This advantage is in part natural (48% of the country is forest and there are still notable hydro reserves) and in part from a sustained period of government support in a vacuum of competing low carbon technologies.

2. Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources, amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

Under the EU Renewable Energy Directive, Austria has a target of 34% renewable energy in gross final consumption in 2020, the fourth-highest share among EU member states. This target is detailed in its National Renewable Energy Action Plan (NREAP), and the approach to delivering this ambition is also set out in the Energy Strategy Austria. Renewable energy is one of the three key pillars of the strategy.

Compared to its European peers, Austrian renewable energy targets are arguably modest, and there is a general expectation that they will be met with little adaptation to existing policies. Boundary conditions to the debate include political decisions such as the moratorium on carbon capture and storage (CCS) development, opposition to nuclear power and full development of large-scale (>20 MW) hydro sites. To reach the target, the increase in renewable energy will therefore be supplied by small hydro, wind, biomass-fired generation and photovoltaics, with increases in scale ranging from 6% for biomass to 258% for photovoltaic generation. Austria also has a separate EU-mandated target for a 10% share of renewable energy in energy consumption in the transport sector by 2020, and a parallel aim to have 250 000 electric vehicles on the road, by 2020. Biomass is the main source of large-scale heat production in the country, ahead of natural gas, but the NREAP sees little room for increasing its use by 2020. Solar thermal has benefitted from ambitious subsidies and seen rapid growth, but the focus of the NREAP is clearly on electricity.

A new renewable electricity law (the Green Electricity Act) was passed in 2012 and the government provides considerable support to the development of renewables-based electricity generation, with a feed-in tariff budget allowance of EUR 50 million for 2012. Besides feed-in tariffs, the Green Electricity Act allows for investment grants for larger hydropower plants, recognising that such schemes do not need feed-in rights. The government believes that it is on track to meet the country's overall targets.

Hydropower is the most important source of renewable electricity in Austria, accounting for almost three-quarters of installed renewables capacity with some 12.7 GW in place. Some 2.1 GW of Austria's hydropower is pumped storage. Yet little research has been conducted into the potential impacts of climate change on hydrological reserves. Given the significant dependence on hydropower, it would be prudent to consider the reliability of future water resources, and monitor this closely.

The 2012 Green Electricity Act also seeks to develop an additional gigawatt of hydro capacity (compared to 2010) by 2020. Yet a significant proportion of the economic potential of large hydro has already been developed, and the remaining potential cannot be used because of nature protection regulations. The upgrading of existing plants – more than half of which are more than 40 years old – could increase overall capacity. Small hydro plants are already producing around 4 TWh/year. New locations and technologies could increase the potential for additional small hydro, and the government should ensure that support is available both for further development of these technologies and for their deployment.

A catalogue of criteria for new hydropower plants was published in January 2012, making specific references to the environmental objectives of the EU Water Framework Directive. This catalogue will help the consideration of economic and environmental and other water management aspects to development. It should help to balance contradictory interests during a licensing procedure and permit locations where new hydropower plants can be built with minimal negative effects on the environment. While

this catalogue is commendable, the government should ensure that it does not impede the deployment of hydro capacity.

Biomass will be essential for meeting renewable energy targets for 2020, and unlike hydropower whose sole output is electricity, biomass is growing across various energy sectors, including heating (CHP), electricity generation, and transport fuel. A total of 65 TWh (232 PJ) of final energy consumption in 2020 is projected to be based on biomass, mainly wood. This will require a total increase of 28% from 2009.

In the electricity sector, the government has a 2020 target of developing 200 MW of additional biomass- and biogas-fired electricity generating capacity by 2020. This is a relatively modest target, and most of the biomass for electricity generation will come from forestry-based biomass, and notably domestically produced wood chips. There are discussions at the EU level regarding the introduction of mandatory sustainability requirements for solid and gaseous biomass sources used for electricity production, heating and cooling. This could be a source of concern, both for forest owners, energy utilities and government officials. Small, privately owned forests account for a sizeable share of Austria's total forests, and sustainability certification could create a bureaucratic and financial burden that would prevent optimum use of those forests for bioenergy production. Austria is in favour of applying solid sustainability criteria for forest biomass, but sees existing forestry certification schemes (PEFC, FSC) as sufficient to guarantee the sustainability of wood used for energy generation. Austria should ensure that small-scale domestic biomass production is considered within these new standards and requirements.

Biogas is produced at farms and it is used for relatively small-scale power generation, supported by feed-in tariffs, but there is also potential to upgrade biogas in order to feed it into the gas grid. If developed and economically viable (high gas import prices should in principle offer a strong incentive), this could contribute, in the medium to long term, to a more competitive and diversified gas market. Yet the rising costs of the feedstock, non-responsive feed-in tariffs and their limitation to between 13 and 15 years, and more attractive tariffs for PV, are challenging the viability of the biogas industry. Further challenges to realising this potential include the regulation and costs of grid connection, quality standard requirements, co-operation between TSOs and DSOs, and a strong political commitment to develop this potential. Biogas should be seen as one option for utilising biomass and waste for energy. Its viability should be considered in comparison with other technology options, such as utilising the feedstock at CHP plants.

The government is keen on the promotion of biofuels by means of favourable tax breaks, and has set an accelerated timetable for meeting the European Union's biofuel and renewable energy targets (5.75% in 2010, 10% by 2020). Biofuels accounted for 6.6% of motor fuels in 2011, and the government appears to be well on track to continue to meet its EU obligation.

Solar photovoltaic power has also seen some development, with installed capacity growing from just 5 MW in 2000 to 53 MW in 2009 and 172 MW in 2012, and an additional 170 MW is forecast for 2013. The scale of deployment of the technology however remains significantly smaller than for wind power. Nevertheless, whereas wind power is believed to have reached a plateau in terms of capacity additions, solar power continues to grow, aided by a favourable government support scheme. The government aims to develop 1.2 GW of additional photovoltaic power (compared to 2010) by 2020. Besides grid-integrated PV generation, there is an ongoing programme for the use of

solar energy for heating purposes in passive houses, particularly in the more inaccessible parts of Alpine Western Austria.

For a decade, wind power capacity grew very quickly, from 54 MW in 2000 to 1 300 MW in 2012. This places Austria among the European leaders in terms of the share of onshore wind power in energy supply. The 2012 Green Electricity Act seeks to develop two additional gigawatts of wind power (compared to 2010 levels) by 2020.

Public support for renewable energy is very high – and explains the acceptance of subsidies for renewable energy (currently estimated at EUR 60 per household per year). In recent years, Austria's economy has performed better than most of its euro area peers; however, the economic outlook can be expected to remain uncertain and, in this environment, public support may begin to shift against subsidies as is the case in several other EU member states.

RECOMMENDATIONS

The government of Austria should:

- *Raise its ambitions regarding the deployment of cost-effective renewable energy from the relatively modest levels in the existing Energy Strategy Austria.*
- *Ensure long-term financial stability of the support system by including degression for all technology feed-in tariffs.*
- *Produce a foresight report which will evaluate potential changes in hydrology regarding precipitations and alpine glaciers out to 2050.*
- *Help both define EU sustainability criteria for biomass and develop a robust EU certification scheme that does not create an unacceptable burden for small forest owners.*

10. DISTRICT HEATING AND COMBINED HEAT AND POWER PRODUCTION

Key data (2012)

District heat

Total production: 23 TWh (CHP plants 62.6%, heating plants 37.4%), +69.6% since 2002

Fuel share: biofuels and renewable waste 44.2%, natural gas 39.1%, non-renewable waste 6.2%, oil 6%, coal 3.8%, other renewables 0.7%

Total consumption: 21.1 TWh (commercial and public services 45.1%, residential 39.1%, industry 15.3%, agriculture 0.5%), +68.3% since 2002

Combined heat and power

Total production: 25.1 TWh (natural gas 51.7%, biofuels and renewable waste 30.6%, oil 7%, coal 5.4%, non-renewable waste 5.4%), +45.8% since 2002

Source: Statistik Austria.

SUPPLY AND DEMAND

DISTRICT HEAT

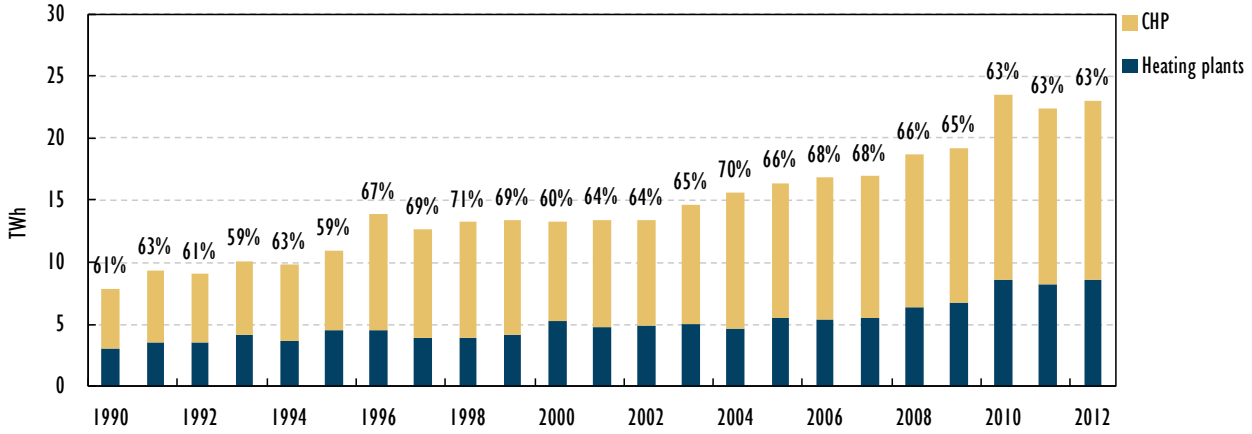
Supply

District heating in Austria has grown remarkably over the past two decades, almost tripling from 7.9 terawatt hours (TWh) in 1990 to 23 TWh in 2012. Production peaked in 2010 at 24 TWh, increasing by 27.4% during the year. Supply fell in 2011 owing to milder weather but increased again in 2012 by 2.9%. In the ten years since 2002, production of heat for district heating has increased by 69.6%.

Combined heat and power (CHP) plants supply the majority of the network, namely 62.6% in 2012. District heating is fuelled mainly by biofuels and renewable waste which represent 44.2% of total supply. The second-largest source of district heating is natural gas, accounting for 39.1% of the total. Non-renewable waste represents 6.2% of supply, oil 6% and coal 3.8%.

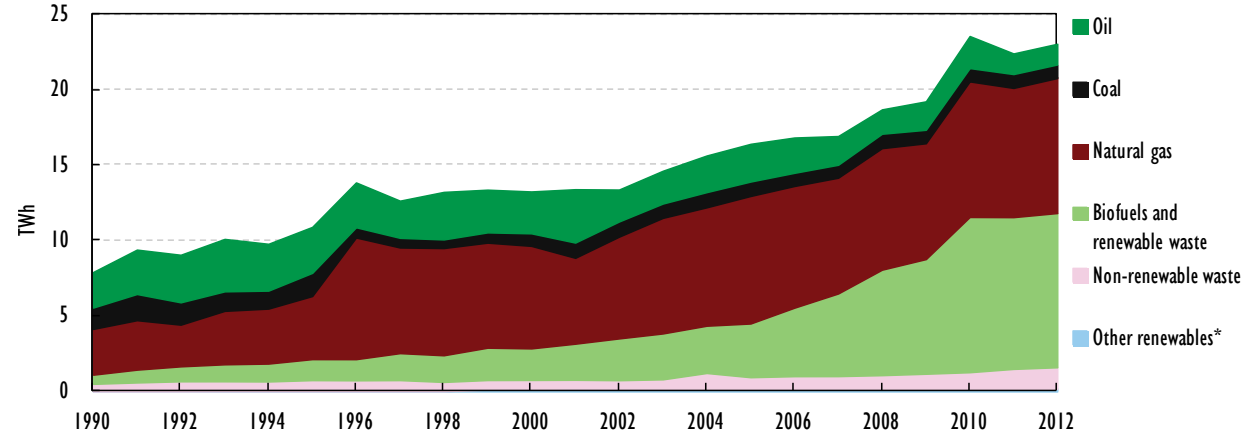
District heat has become decarbonised in the past decade, as oil and natural gas have given way to more biofuels and waste. In 2002, natural gas, coal and oil accounted for nearly 75% of supply. Biofuels and renewable waste amounted to 20.5% with non-renewable waste at 4.8%. In absolute terms, the use of oil and coal has declined, while the use of other fuels, including natural gas, has increased in line with growing production.

Figure 10.1 District heat production and share of CHP, 1990-2012



Source: Statistik Austria.

Figure 10.2 Supply of district heat by source, 1990-2012



* Negligible.

Source: Statistik Austria.

Demand

Total consumption of district heat amounted to 21.1 TWh in 2012. This is an increase of 68.3% compared to 2002. Demand for district heating has grown considerably over the past decade thanks to competitive prices and overall population growth while government subsidies in CHP have fostered growth in the network.

The total number of dwellings with district heating has increased by around two-thirds since the start of the century, from 477 000 in 2000 to 806 000 in 2012.

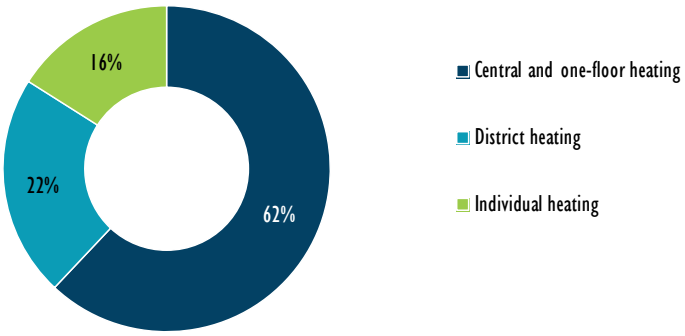
Commercial and public services buildings account for 45.1% of total demand for district heating, households for 39.1%, industry for 15.3% and agriculture for 0.5%.

However, residential space heating in Austria is dominated by central heating (mainly fuelled by natural gas) which at present reaches nearly half of the households. Around 22% of households are connected to a district heating network and the rest use individual or single floor-based heating. District heating is typically deployed at large

residential buildings: nationwide, it is used in 45% of buildings with 20 or more dwellings and in 37% of buildings with 10 to 19 dwellings.[1]

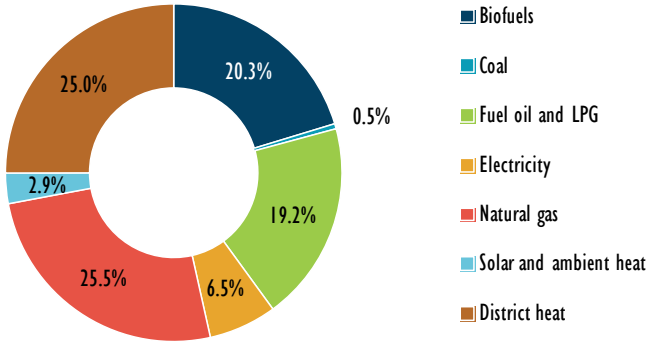
In Vienna, 40% of households are on district heating. The government aims to increase this share to 50% by 2020 as part of a plan to maximise CHP developments and increase energy efficiency.

Figure 10.3 Breakdown of residential space heating by type, 2012



Source: Association of Gas and District Heating Supply Companies (FGW).

Figure 10.4 Breakdown of residential space heating by source, 2011



Source: Statistik Austria.

COMBINED HEAT AND POWER

In 2012, electricity and heat generation at CHP plants totalled 25.1 TWh, up 45.8% from 2002. Of this total, 14.4 TWh was district heat and 10.6 TWh was electricity. Industrial CHP (autoproducers) accounts for 43.9% of total electricity generation from CHP, and around 19% of district heat generation. Electricity generation from autoproducers has remained relatively constant over the past decade while district heat generation from autoproducers has been on the rise, increasing by a total of 246.9% since 2002.

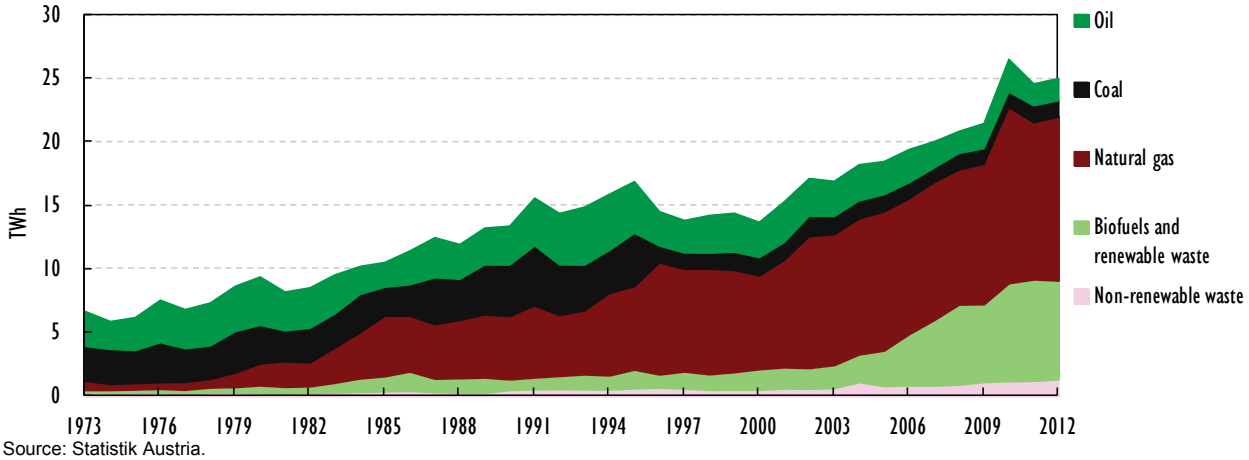
Generous government subsidies have fostered strong growth in efficient CHP in Austria over the past decade. CHP output is closely aligned with the production of district heat, as more than 60% of district heat is generated in CHP plants; on average, these produce an equal share of heat and electricity, with strong seasonal variations; in summer periods electricity is the primary output while heat is the primary output in winter.

1. The Association of Gas and District Heating Supply Companies (FGW).

Natural gas is the dominant fuel in CHP plants, sourcing 51.7% of all output in 2012. Biofuels and renewable waste represented 30.6% while oil accounted for 7% and coal and non-renewable waste with 5.4% each. From 2002 to 2012, the share of biofuels in CHP plants has tripled. The use of biofuels has mainly replaced oil which has lost its share of around 17% in 2002. Coal has also declined from 9.4% while natural gas has decreased from 60.8%.

CHP output accounts for 62.6% of district heat production and 15.5% of electricity production, relatively unchanged from 2002. The highest share of CHP in district heating was at 70% in 2004. Since then, growth in heat output has been marginally slower in CHP plants than in heat-only plants, mainly because of a boom in biomass- and natural gas-fuelled heat plants. Another explanation may be that CHP plants were running at higher power-to-heat ratios encouraged by the CHP electricity feed-in tariffs which were taken into use in 2003 (see Box 10.1).

Figure 10.5 CHP production by fuel, 1973-2012



Source: Statistik Austria.

DISTRICT COOLING

Compared to district heating, district cooling systems in Austria are new and small-scale. The technology was taken into use at the turn of the 21st century and the network in Vienna, the largest one in the country, had a capacity of 17 MW in 2011. There is still considerable potential for the further development of cooling markets, and the Energy Strategy Austria targets the capacity of district cooling networks to increase by more than ten times to 200 MW by 2020.

INDUSTRY STRUCTURE

OWNERSHIP AND OPERATING OF THE INFRASTRUCTURE

The district heating, district cooling and CHP industry is relatively fragmented in Austria, with over 750 utilities across the country. However, most businesses are not unbundled. Owners of larger municipal or communal district heating supply companies are in many cases the local authorities, having at least a minor shareholding. As a rule, a district heating supply company owns at least one facility of heat production (CHP or boiler) and the corresponding network. In some cases, district heating suppliers (mainly larger ones) buy waste heat from other companies, such as owners of CHP plants or owners of other

plants producing heat from waste. These companies could be electricity producers or owners of other industrial plants.

LEGAL FRAMEWORK AND SUPPORT SCHEMES

Federal legislation pertaining to competition, consumer protection, trade regulations and safety across types of businesses is applicable to district heating, cooling and CHP businesses. In addition, separate regulations are specifically applicable to each province.

Even though district heating and cooling prices are not directly regulated, the Federal Minister of Science, Research and Economy may, under the 1992 Price Law (*Preisgesetz*), define by ordinance principles and structures of tariffs for district heat suppliers. The minister may further delegate this function to federal authorities. This is done on a case-by-case basis. One example is the official order on pricing for Fernwärme Wien GmbH enacted by the provincial governor of Vienna in 2009.

Box 10.1 CHP support

Austria has supported commercial CHP for more than a decade. In 2000, the Austrian Energy Liberalisation Act came into force. It enabled the nine provinces (*Länder*) to oblige grid companies to purchase electricity from CHP plants, provided that they served public district heating supply. It also enables the provinces to subsidise electricity generation from CHP plants serving public district heating.

The 2003 Green Electricity Act established a single CHP tariff for the entire country. To finance the subsidy on CHP electricity, it introduced a surcharge on electricity sold to end users and capped it at 0.015 EUR per kWh (EUR/kWh) in 2003, gradually reducing to 0.005 EUR/kWh by 2010.

Austria's CHP Law (*KWK Gesetz*) took effect in early 2009, to promote CHP through the partial reimbursement of operating expenses for new and modernised CHP plants for public district heating, and to promote investment grants for new CHP plants (except those covered by the Green Electricity Act). New or modernised CHP plants for public district heating may receive investment subsidies if these result in savings in energy and CO_2 emissions compared with separate production of heat and electricity. An efficiency formula is used to determine whether savings occur. An additional eligibility criterion for new plants is that they must serve primarily heat production, either district or process heat.

From 2006 to 2012, EUR 55 million was available for the subsidies, with 30% allocated to industrial CHP. New plants for which permits were received by 30 September 2012 and are in operation by 31 December 2014 may receive investment subsidies up to 10% of the total investment needed. Plants up to 100 MW may receive a subsidy of 100 EUR/kW; those between 100 MW and 400 MW, 60 EUR/kW; and those above 400 MW, up to 40 EUR/kW. Existing or modernised plants may receive subsidies in EUR/kWh based on several cost parameters, such as fuel costs, operation and maintenance costs, adequate return on employed capital, pension payments, administrative costs and taxes.

Source: IEA Policies and Measures Database (PAMS).

The federal government supports CHP and district heating sectors through various state aid schemes, contributing to an expansion in the market share and an increase in use of biofuels in small-scale heat production. Of particular note is the 2009 Law for Expansion of District

Heating and District Cooling Networks (*Wärme- und Kälteleitungsausbaugesetz*), which provides explicit state aid of up to EUR 60 million per year (EUR 300 million in total) for the construction of new infrastructures. Since 2009, more than EUR 90 million in total has been allocated under the scheme, however. The upper limit of EUR 60 million per year has not been reached owing to budget restrictions.

The Federal Environment Fund, endowed with an annual budget of over EUR 90 million, also supports projects for using renewable energy in heating and cooling. The Fund particularly focusses on biofuels heating and district heating systems, which alone accounted for EUR 43 million of expenditure in 2011. Between 2003 and 2010, a total of EUR 340 million was provided to CHP plants for adjusting their operations to new market rules. See Box 10.1 for further details of CHP support schemes and measures.

PRICES

District heating companies in Austria set competitive prices while competition authorities monitor excessive profits on the basis of competition law. Retail prices that these companies can charge are generally capped by the provincial authorities, and price revisions are done at the initiation of the district heating provider. Therefore, unless price increases are approved by the authorities at the right time, companies may be operating below cost.

Price ceilings may also be imposed on companies which are believed to be overcharging customers and/or operating at a high margin. The decision is taken by the Minister of Science, Research and Economy and delegated to the federal authorities.

Table 10.1 Average unit cost of residential district heating by province, 2011/12

Province	Cost of district heat (EUR/m^2)
Burgenland	17
Carinthia	15.6
Lower Austria	16.8
Upper Austria	16.2
Salzburg	18
Styria	16.7
Tyrol	16.5
Vorarlberg	19.1
Vienna	15.9
Austria	**16.4**

Source: Statistik Austria.

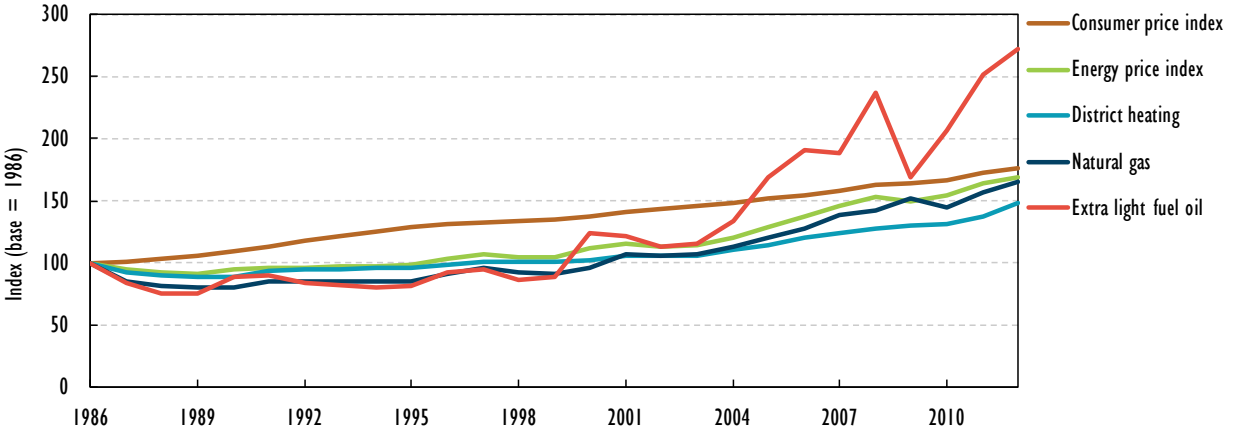
Table 10.1 outlines the average unit cost of district heating for households by province and at the national level in 2011/12. Prices in Burgenland, Lower Austria, Salzburg, Styria, Tyrol and Vorarlberg are higher than the national average, while lowest prices are in Carinthia and Vienna.

This retail pricing system differs considerably from the main competition in the heating of dwellings, i.e. market-priced gas systems and decreasingly also market-priced oil

heating systems. Such pricing differences can lead to uncertainty in consumer choice and lack of understanding of the long-term benefits of either system, particularly when gas prices are low and attractive to consumers.

Figure 10.6 shows the development of prices of various fuels since the mid-1980s, indicating that the price of district heating has experienced the slowest growth and the least volatility over the two decades. Prices for district heating are normally long running and change very little, while the price of fuels can be more unpredictable.

Figure 10.6 Comparison of price indices, 1986-2012



Sources: Statistics Austria and Association of Gas and District Heating Supply Companies.

ASSESSMENT

Given its cold winters, Austria's demand for heat is higher than in many IEA member countries and the country has successfully deployed a comprehensive district heating system. District heating and CHP production have both experienced a boom over the past decade, supported by generous government subsidies and incentive schemes. Production by CHP plants has increased by 45.8% since 2002, partially thanks to the payments from the Federal Environment Fund which provided EUR 340 million to operational CHP plants between 2003 and 2010. The efficiency of CHP plants has also contributed to growth in this sector – CHPs operate on thermal efficiencies of over 70% compared to power stations which average below 50%. Since CHP accounts for most of district heat production, the Austrian government considers district heat supply to be relatively efficient; the new Energy Efficiency Law is not expected to impose changes to efficiency levels of new or existing district heating systems.

The support policy has focused on the electricity generation aspects of CHP. The incentives therefore have driven a higher power-to-heat ratio on CHPs, regardless of the needs of the energy system. Instead, policies should consider CHP more from a systems integration angle, as flexible units to operate at a lower power-to-heat ratio during an excess electricity period and vice versa. Subsidies could also be directly linked to efficiency: the higher the efficiency, the higher the subsidy. In any case, it is welcome that subsidies for new CHP plants require that the plants are primarily for heat production.

Policies should also focus on the energy efficiency performance or carbon intensity of the networks by pursuing good design and operation practices on the distribution networks, and promoting energy efficiency measures on the end-use side (buildings applications). They should also explore the potential for including other energy sources to the network as industrial recovered waste heat or other renewable energy sources, apart from biomass. This will require strategic heat planning to avoid missing the opportunity to use local energy sources available.

Natural gas accounts for half the production of electricity and heat in CHPs, while biofuels account for about a third. Since the beginning of the century, the use of biofuels and waste in CHPs and heat plants has boomed, replacing older oil and coal boilers. The use of renewable energy has both increased thermal efficiency in the sector and helped reduce GHGs. For this reason, the government plans to continue to support the CHP and district heating sector, aiming to increase the supply of district heating by 1.4% per year from 2012 to 2021. In 2009, the Law for Expansion of District Heating and District Cooling Networks (*Wärme- und Kälteleitungsausbaugesetz*) was introduced, with explicit aid of up to EUR 60 million per year (EUR 300 million in total) for the construction of new infrastructures.

However, the allocation of funds under the above-mentioned law has lagged since 2009, with just under EUR 40 million paid out in total. This has resulted in project delays, shaken investor confidence and lack of clarity in the long-term projections for the sector. In order to achieve the planned growth by 2020, the government needs to set out a clear vision for the district heating and cooling industry, taking into account the essential efficiency gains from planned developments, and assure binding incentive payments which attract investment and encourage new projects.

District heating and cooling prices are not regulated. However, retail prices are generally capped by the provincial authorities, with price revisions done at the initiation of the district heating provider or the ministry if use of monopolistic power is suspected. Unless price increases are approved by the authorities at the right time, companies may be operating below cost and unable to fulfil their network investment plans, or above a reasonable profit margin, thus charging captive customers excessively. This retail pricing system also differs considerably from the main competition in space heating, i.e. market-priced gas systems and decreasingly also market-priced oil heating systems. Such pricing differences can also lead to uncertainty in consumer choice and lack of understanding of the long-term benefits of either system, particularly when gas prices are low and attractive to consumers.

Both consumers and suppliers could benefit from price regulation of district heating and district cooling in each province. Price regulation could include mandatory periodic revisions of retail prices, setting prices for each system on the basis of different levels of costs of the plants, fuel framework, provincial legislation, and other factors to which the individual plants are subject. Companies would have the opportunity to account for projected costs in the regulated price, avoiding operating below cost. Prices would be made available to consumers in order to increase transparency. Strategic planning could also be considered to tap the district cooling potential. District heating networks could be integrated with district cooling networks and the surplus district heat could be converted into district cooling through absorption chillers and the use of free cooling sources.

RECOMMENDATIONS

The government of Austria should:

- *Outline a clear vision regarding the future of district heating, considering its benefits in terms of energy efficiency.*
- *Consider introducing tariff regulation of district heating and district cooling in each province.*

11. ENERGY TECHNOLOGY RESEARCH, DEVELOPMENT AND DEMONSTRATION

Key data (2012)

Government energy RD&D spending: EUR 120.1 million, +311.5% since 2002

Share in GDP: 0.52 per USD 1 000 PPP (IEA median in 2011: 0.39)

Government energy RD&D spending per capita: EUR 14.3

OVERVIEW

Energy research, development and demonstration (RD&D) supports several policy objectives stated by the government. It is expected to help Austria meet its goal of becoming one of the leaders in innovation in Europe by 2020. It is also seen as a major tool for reaching the long-term goal of cutting GHG emissions by 80% to 95% from 1990 to 2050.

Energy RD&D is explicitly formulated with regard to its relevance for energy, environmental, economic and research policies. It is export-focussed and guided by the principle of sustainable development.

INSTITUTIONAL FRAMEWORK

Government efforts in energy RD&D involve several ministries. The **Federal Ministry of Science, Research and Economy (BMWFW)** is responsible for policy on basic research on all sectors, including all issues regarding Austrian universities. It is also in charge of the **Austrian Science Fund**, a major source of funding for basic research.

The **Federal Ministry of Transport, Innovation and Technology (bmvit)** is responsible for policy on applied energy and technology research. Together with the BMWFW, the bmvit owns the Austrian **Research Promotion Agency (FFG)** and the **Austria Wirtschaftsservice (AWS)** funding agency. Together with the **Federation of Austrian Industries**, the bmvit also co-owns the **Austrian Institute of Technology (AIT)**, an important research and technology institution.

The FFG is the national funding institution for applied research and development. The two federal ministries channel all their funding through the FFG in a top-down process. The FFG also has a bottom-up funding programme for applied R&D. The AWS in turn enables market implementation through funding instruments, such as credits, loans and venture capital.

The **Climate and Energy Fund (KLI.EN)** was set up in 2007 as a strategic horizontal implementation body for climate and energy solutions to support Austria in meeting its obligations under the European Union's 20-20-20 by 2020 targets. The Fund is a strategic instrument of the federal government for research, development and innovation to address the "Grand Societal Challenges" of secure, clean and efficient energy; smart,

green and integrated transport; and climate action. The Fund is owned by the Federal Ministry of Transport, Innovation and Technology and the Federal Ministry of Agriculture, Forestry, Environment and Water Management. The KLI.EN Fund administers its programmes either through the FFG, the AWS, or through the Kommunalkredit Public Consulting (KPC) funding agency, depending on the type of financial instruments needed.

The Federal Ministry of Agriculture, Forestry, Environment and Water Management is involved in energy-related RD&D through the klima:aktiv programme. The latter is administered through the KPC funding agency.

The **Austrian Council for Research and Technology Development** advises the federal government on research, technology and innovation matters. It publishes suggestions for strategic directions, focal areas of technology research, development and innovation (RDI) programmes and monitoring systems of technology RDI.

POLICIES AND PROGRAMMES

Austria's energy RD&D strategy is formulated on the basis of the broad-ranging e2050 strategy process which was launched in late 2005 and is managed by the bmvit. The e2050 process aims at defining a long-term vision for a sustainable energy future and developing technology policy strategies and recommendations. The main areas of action are to:

- initiate and analyse foresight studies
- discuss and evaluate long-term energy options
- derive technological innovation strategies
- promote and perform online-based surveys and technology assessments
- identify the main research priorities
- monitor and analyse energy-relevant technology developments.

One major result of the e2050 strategy process is the publication of Austria's Energy Research Strategy in August 2010. The strategy process included consultation with more than 5 000 representatives from industry, academia and administration, an open access online survey and several issues workshops with the general public which resulted in more than 850 statements and comments. The strategy was published by the Austrian Council for Research and Technology Development as a recommendation to the federal government.

The 2010 Energy Research Strategy targets the following research areas:

- energy-efficient buildings
- smart cities
- energy-efficient end-use technologies
- smart grids, energy management and storage
- process heat from renewable energy
- transport, logistics and mobility systems
- biofuels.

The 2010 Energy Research Strategy supports the goals of the 2010 national energy strategy (Energy Strategy Austria). It also feeds into the development of the federal strategy on research, technology and innovation (*FTI Strategie*). This strategy aims on the one hand to make Austria one of the most innovative member states of the European Union by 2020, and on the other hand to help the country cope with the expected societal and economic challenges in the longer term. In the long-term perspective to 2050, energy is considered in the context of climate change and scarce resources, where the main areas for future action are urban development, sustainable security of resources and societal transformation processes.

Technology-specific energy RD&D is guided by roadmaps and strategies. Current roadmaps include photovoltaics (updated in 2007), solar thermal 2020 (being updated), energy-relevant materials (2013). Austria also has a biofuels R&D strategy (2010). Under preparation are the roadmaps on renewable energy heating and cooling systems, and energy storage, as well as the implementation strategy on smart grids and the research agenda on bio-based industry.

Examples of major energy RD&D programmes are listed below.

Climate and Energy Fund: the annual budget of up to EUR 150 million is allocated to the following three programme lines:

- *Research*: research and development of sustainable energy technologies as well as climate change and adaptation research.
- *Mobility*: promotion of projects in the fields of intelligent transport systems, e-mobility and environment-friendly freight transport.
- *Market*: launch and testing of sustainable energy and mobility technologies and awareness-raising in model regions.

The funds are allocated through concrete programmes (around 20 per year). The current R&D programme is called E!Missi0n+.

E!Missi0n+: R&D programme with an annual budget of up to EUR 30 million. Its focus areas are emerging technologies; energy efficiency and energy saving; renewable energy (solar thermal, bioenergy, wind, geothermal, solar PV); smart grids; energy storage and energy transition.

Smart Cities – FIT for SET: a programme of the Climate and Energy Fund to support demonstration and implementation projects of new energy technologies in the urban environment.

City of Tomorrow: a mission-oriented R&D programme of bmvit, which is based on the results of the former programme "Building of Tomorrow Plus" and focuses on technologies, technological systems and urban services for the city of tomorrow. Within the first call for proposals, the following themes were addressed: system design and urban services, built infrastructure, technologies for urban energy systems. The budget of the programme is around EUR 8 million per year.

Mobility of the Future: a mission-oriented programme of bmvit supports system-oriented innovation in the fields of personal mobility and the mobility of goods based on user needs. Complementing these user-oriented themes, the programme also supports technical innovation in the fields of transport infrastructure and vehicle technology. The annual budget is up to EUR 19 million.

The Austrian government supports several measures to deploy new technologies. Individual RD&D programmes are carried out through workshops and other networking opportunities, including co-operation with investment promoters AWS and KPC. Pre-commercial public procurement is also supported. The results of publicly funded energy RD&D programmes are openly accessible at www.nachhaltigwirtschaften.at.

Box 11.1 Austrian technology for the world's largest solar district heating facility

The world's largest solar district heating facility relies on Austrian technology and know-how. The solar plant in Riyadh, Saudi Arabia comprises 36 300 m^2 of collector surface and has a maximum capacity of 25 MW in summer (17 MW in winter). The plant, located on the grounds of the recently built Princess Nora University for Women, delivers water and space heating to some 36 000 residents. Over its life-time, the facility is estimated to provide the equivalent of 52 million litres of diesel fuel and to avoid 125 kilotonnes of CO_2.

Inaugurated in 2011, the solar district heating facility was designed and constructed by Millennium Energy Industries, the leading solar heating and cooling solution provider in the Middle East and North Africa regions. Two Austrian companies featured prominently in the project: GREENoneTEC supplied the solar collectors and AEE Intec designed the primary solar loop, including field hydraulics, stagnation behaviour and safety features. Both companies have benefitted from the Austrian government's sustained efforts to promote R&D on, and invest in, solar energy technology.

The collector surface is centrally installed on the flat roof of a 60 000 m² storage building. The facility also includes a 900 m³ energy storage. GREENoneTEC tailored its GK 3000 series collectors to the local circumstances. For example, the panels are large (10 m^2, 170 kg) and have a transparent coating to increase their performance. They also have a special mounting system to avoid damage from sandstorms and high winds.

Sources: GREENoneTEC; AEE Intec; Millennium Energy Industries.

MONITORING AND EVALUATION

The bmvit is responsible for monitoring and evaluating the effectiveness of government efforts and activities in energy RD&D. Several approaches are used.

INPUT-ORIENTED EVALUATION

The bmvit evaluates public research expenditures through an annual survey that is made available to the general public.

OUTPUT-ORIENTED EVALUATION

Market developments in the fields of bioenergy (fuels, boilers, cook stoves), photovoltaics, solar thermal and heat pumps are evaluated every year.

PROGRAMME EVALUATION

The effectiveness of each energy research programme is evaluated every five years. The most recent evaluation was done in 2011 on the programme *IEA Research Cooperation,*

which covers Austrian participation in the IEA Implementing Agreements. In 2011, the programme *Buildings of Tomorrow Plus* was evaluated.

TECHNOLOGY-ORIENTED EVALUATION

Technology roadmaps define a vision, identify the most promising technology pathways, and evaluate the prospects for individual technology areas. Their recommendations on RD&D are fed into the national research programmes. In Austria, roadmaps have been prepared for solar thermal, photovoltaics, bio-heating and cooling and smart grids.

EVALUATION OF RESEARCH FUNDING AND FINANCING SYSTEMS

The bmvit and the BMWFW jointly commission regular evaluations of the Austrian funding and financing system for energy RD&D. The most recent evaluation of this nature was carried out in 2009 (Evaluation of Government Funding in RTDI from a Systems Perspective in Austria).[1] This evaluation recommended a radical strategic shift in innovation policy in the following six respects:

- from an innovation policy in the narrow sense to a comprehensive innovation policy
- from an imitation strategy to a frontrunner strategy
- from fragmented public interventions to co-ordinated and consistent interventions derived from a vision
- from a multitude of narrowly defined financial programmes to a flexible, dynamic policy defining broader tasks and priorities
- from a blurred division of responsibilities between and within ministries (and other stakeholders) to well-defined responsibilities
- from managing public intervention by bureaucratic procedures to modern public management techniques.

FUNDING

In 2012, public funding for energy RD&D amounted to EUR 120 million (see Figure 11.1). Energy efficiency projects accounted for 46.1% of the total, renewable energy for 23.5% and power and storage technologies including smart grids for 19.1%. The remaining 10% funded research on fossil fuels, nuclear, hydrogen and fuel cells, and other areas.

Spending on energy efficiency RD&D focuses on two sectors: transport and buildings, appliances and equipment. Regarding funding for renewable energy RD&D, solar energy and bioenergy receive the greatest share. Overall, three-quarters of public funding was allocated to applied research.

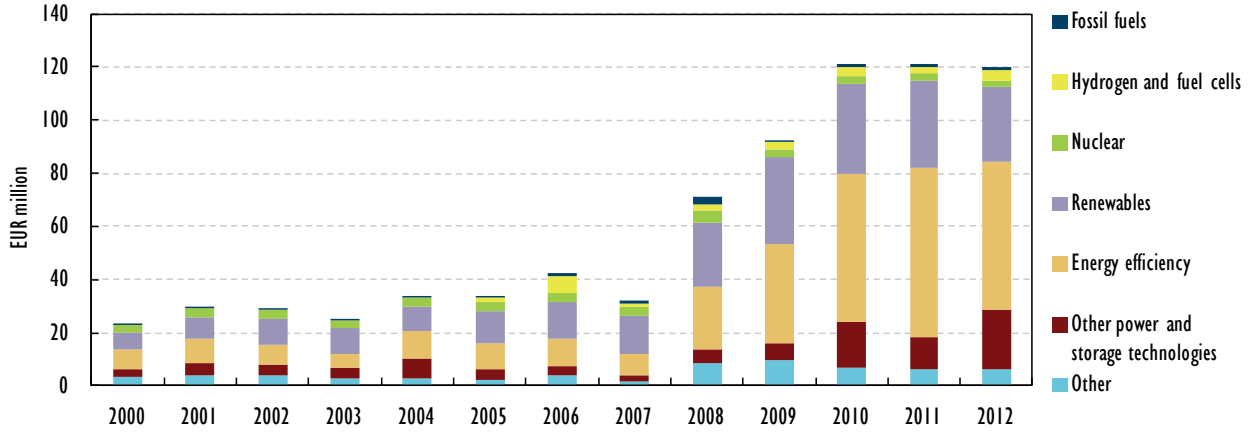
Since 2007, public funding for energy RD&D has increased almost fourfold. Austria's Energy Research Strategy includes a target for raising annual public spending on energy RD&D to EUR 120 million. This target was met in 2010.

1. *Reaching Out to the Future Needs -Radical Change towards a New Policy for Innovation, Science and Technology in Austria*, Karl Aiginger, Rahel Falk, Andreas Reinstaller, Synthesis Report, May 2009.

The main reason for the significant increase in public funding is the 2007 Climate and Energy Fund. In 2011, the Fund provided 41% of total public energy RD&D funding. The federal ministries accounted for 24%, most of which was allocated by the bmvit. Other major funding sources included the Austrian Industrial Research Promotion Fund (FFG, 13% of the total) and non-university research facilities (11%). Universities funded 7% of the total. Data on private sector funding are not readily available, but the energy RD&D funding system is based on a close partnership with the private sector. The closer the project is to market deployment, the higher the share of private sector funding.

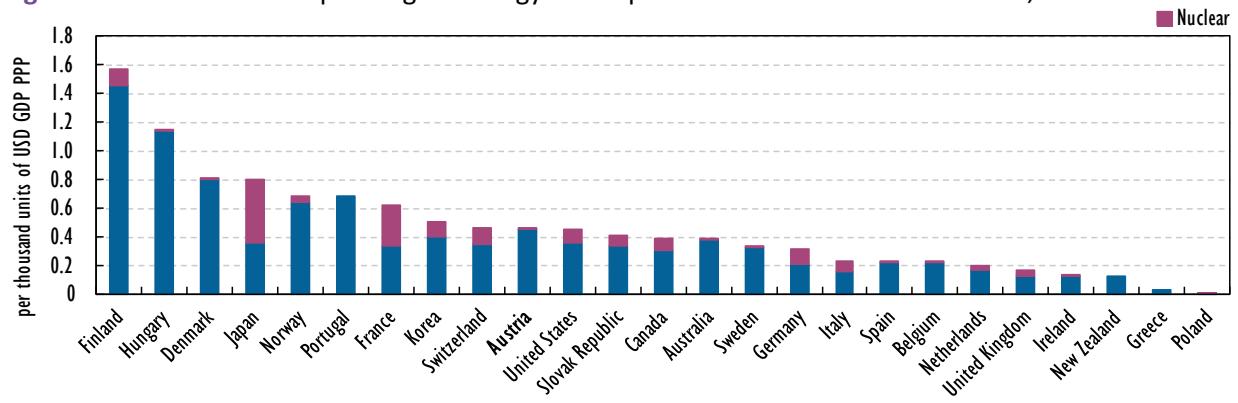
By international comparison, government spending on energy RD&D as a share of gross domestic product was slightly above the IEA median in 2011, and appears higher if spending on nuclear is excluded (see Figure 11.2). Austrian participants also receive energy RD&D funding from the EU 7th Framework Programme for Research and Development 2007-2013 (EUR 3 million for new projects in 2011) and the Intelligent Energy – Europe programme (EUR 5 million in 2011). Figures 11.1 and 11.2 do not include these amounts.

Figure 11.1 Government spending on energy RD&D, 2000-12



Source: country submission.

Figure 11.2 Government spending on energy RD&D per GDP in IEA member countries, 2011



Note: data not available for the Czech Republic, Luxembourg and Turkey.

Sources: *OECD Economic Outlook*, OECD Paris 2012; and country submissions.

INTERNATIONAL COLLABORATION

INTERNATIONAL ENERGY AGENCY

Austria manages its participation in the IEA Implementing Agreements (IAs) under the national programme IEA-Research Co-operation. The programme aims to strengthen international energy technology research collaboration by allowing Austrian industry representatives, researchers and policy makers to participate in the IAs. Austrian experts are currently engaged in 18 of the 42 IAs. The Austrian IA portfolio is largely consistent with national priorities (energy efficiency, renewables, smart grids, electric vehicles, and clean fossil fuels). However, there is no Austrian participation in IAs covering issues related to energy efficiency in the industrial sector. Given that nearly 30% of CO_2 emitted is from fuel combustion in this sector, the AIT, jointly administered between the Federation of Austrian Industries and the bmvit, could explore participating in the industrial IAs to accelerate knowledge-sharing in this area.

In areas related to bioenergy and solar power, Austria has been able to lead the way internationally. The 2012 programme evaluation indicates that international collaboration has helped industry to attract foreign investment in their technologies, while researchers have been able to further collaborate within several EU projects.

Since 2005, resource allocation to Austrian participation in the IEA IAs has amounted to around EUR 2 million per year. The programme target is to continue international collaboration and to disseminate information more broadly among national experts.

EUROPEAN UNION

Austria is involved in the ERA-Net projects on smart grids, solar and bioenergy. Austria is very active in the Strategic Energy Technology Plan (SET-Plan) and European Industry Initiatives focusing on wind, PV, bioenergy, smart grids, and smart cities and communities. The large research facility AIT actively contributes to the European Energy Research Alliance (EERA), while several Austrian ministries and companies participate in the follow-up activities related to the European 2011 Materials Roadmap for Energy Technology.

Austria is the co-ordinator for the Joint Programming Initiative (JPI) Urban Europe, which involves 14 member countries. The JPI intends to:

- transform urban areas to centres of innovation and technology
- realise eco-friendly and intelligent intra- and interurban transport and logistics systems
- ensure social cohesion and integration
- reduce the ecological footprint and enhance climate neutrality.

BILATERAL PARTNERSHIPS

A partnership on smart cities among Germany, Austria and Switzerland was initiated in October 2012. It aims at creating an exchange of best practices and piloting technology transfer via demonstration projects. Two pilot projects were started: between Karlsruhe – Salzburg – Winterthur and the INFRA-Plan (between Berlin-Adlershof – Graz Mitte – Hamburg-Wilhelmsburg).

The Smart Cities Member States Initiative (SCMSI) is currently chaired by Austria. It aims at supporting the European SET-Plan and the European Innovation Partnership on Smart Cities and Communities via multilateral joint activities, which include transnational joint calls for proposals.

ASSESSMENT

Since the 2007 IEA in-depth review, Austria has taken major steps to improve the general framework conditions for RD&D. The government has more than tripled public funding, adopted a new Energy Research Strategy and launched several priority programmes. Responsibilities between institutions are clear, with good co-operation among actors. Energy R&D priority setting is based on an open and transparent process, and RD&D activities are regularly monitored and evaluated using different approaches. These are impressive developments.

Over the past years, energy RD&D in Austria has been very successful in developing and creating sustainable energy technologies that have resulted in exporting industries. For example, companies located in Austria now export solar water heating and biomass heating technologies. The passive house concept, largely and successfully deployed in Austria, is now taking hold in other countries.

A common challenge for an overall government strategy in energy RD&D is to link these efforts coherently both to the general energy policy and to the many relevant sectoral strategies and policies. Austria has done well in this respect. On the one hand, the government's 2010 Energy Research Strategy supports the goals of the 2010 National Energy Strategy. On the other hand, the 2010 Energy Research Strategy is also feeding into the development of the federal strategy on research, technology and innovation, a process that began in 2011.

Energy RD&D funding has increased fourfold since 2007 and, since 2010, has already reached the target of EUR 120 million per year, as laid out in the 2010 Energy Research Strategy. This has also helped Austria climb to the sixth place among IEA member countries as measured by government spending on energy RD&D per GDP (excluding nuclear). These efforts are to be applauded.

The major increase in public funding is a result of the KLI.EN Fund to support energy R&D in renewables and energy efficiency, as well as market demonstration and deployment. The KLI.EN four-year funding package is allocated fairly equally between energy research, transport research and implementing measures. The IEA encourages the government to maintain energy RD&D funding at the current levels, or ideally increase them, particularly with regard to incentives and measures to support private sector R&D.

As government budgets are under pressure from various directions, stronger incentives for more private funding, including venture capital, for energy technology development would be welcome. Another source for future funding will be the EU Framework Programme for Research and Innovation 2014-2020 (Horizon 2020). As far as possible, Austria should work to ensure that energy-related activities will receive a fair share of the programme's budget of around EUR 80 billion.

An important aspect of bringing new technologies to the market are the open access programmes whereby the programme results are open to all. The IEA urges the government to continue this transparent approach. The government has also adopted

several other useful measures, including pre-commercial public procurement and programme co-operation with investment promoters.

Austria's focus on international research co-operation is to be commended. Developing technologies is becoming increasingly complex, so pooling resources and maximising expertise through international collaboration is worthwhile. In this respect, the government should consider aligning research activities with other countries, where feasible. The IEA also commends Austria's active participation in the IEA Implementing Agreements (IAs). The Austrian IA portfolio is largely consistent with national priorities (energy efficiency; smart grids; electric vehicles; renewables; clean fossil fuels). An area potentially worth exploring is IAs relating to the industry sector.

In order to succeed in the long term, energy research relies on the contributions of dedicated and talented individuals. A common challenge in many countries is the limited interest of students for natural sciences and engineering. Also in Austria, the energy community should more clearly raise this concern to the attention of national education policy makers. Efforts should also be made to ensure sufficient R&D capacity by further international integration, taking advantage of foreign expertise in research areas of interest to Austria. The international aim of the new RD&D programme in this area is, therefore, commended.

RECOMMENDATIONS

The government of Austria should:

- *Fund energy RD&D at current or higher levels in the long term, notably through the Climate and Energy Fund.*
- *Introduce stronger incentives, such as tax breaks, to attract private funding for energy technology development.*
- *Maintain the policy of open access to research results.*
- *Encourage students to opt for subjects critical to energy RD&D, such as science and engineering.*

PART III
ANNEXES

ANNEX A: ORGANISATION OF THE REVIEW

REVIEW CRITERIA

The Shared Goals, which were adopted by the IEA Ministers at their 4 June 1993 meeting in Paris, provide the evaluation criteria for the in-depth reviews conducted by the IEA. The Shared Goals are presented in Annex C.

REVIEW TEAM AND PREPERATION OF THE REPORT

The in-depth review team visited Austria from 25 February to 1 March 2013. The team met with government officials, energy suppliers and consumers and many other interest groups. This report was drafted on the basis of these meetings, the team's preliminary assessment of Austria's energy policy, and the government response to the IEA energy policy questionnaire. The members of the team were:

IEA member countries

Ms. Florence TORDJMAN, France (team leader)

Mr. Kåre GROES, Denmark

Dr. Aurelio P. FETZ, Switzerland

Mr. Alasdair GRAINGER, the United Kingdom

European Commission

Dr. Silvia REZESSY

External consultant

Mr. Miika TOMMILA

IEA secretariat

Dr. Marc-Antoine EYL-MAZZEGA

Ms. Sonja LEKOVIC

Mr. Kijune KIM

Mr. James SIMPSON

The team is grateful for the co-operation and assistance of the many people it met throughout the visit. Thanks to their open hospitality and willingness to share information, the visit was highly informative, productive and enjoyable. The team wishes to express its gratitude to Mr. Christian Schönbauer, Director-General of the Energy and Mining Department, Federal Ministry of Science, Research and Economy, for his personal engagement in briefing the team on Austrian energy policy issues. The team also wishes to thank Mr. Reinhard Knorreck and Ms. Verena Gartner for their tireless efforts in

planning and organising the visit and supporting the team throughout. The team also wishes to thank other staff in the Federal Ministry of Science, Research and Economy as well as in the Federal Ministry of Transport, Innovation and Technology and the Federal Ministry of Agriculture, Forestry, Environment and Water Management for their professionalism and helpfulness in preparing, guiding and assisting the team for the duration of the visit.

James Simpson prepared the review and drafted Chapters 2 to 9 of the report. Other chapters were drafted by Miika Tommila (Chapters 1 and 11) and Sonja Lekovic (Chapter 10). Sonja Lekovic also provided statistics-related sections for most chapters. Helpful comments were provided by Manuel Baritaud, Anne-Sophie Corbeau, Anselm Eisentraut, Marc-Antoine Eyl-Mazzega, Kenneth Fairfax, Carlos Fernandez Alvarez, Araceli Fernandez Pales, Kijune Kim, Cuauhtemoc Lopez-Bassols, Kieran McNamara, Carrie Pottinger, Julian Smith, Miika Tommila and Dennis Volk.

Sonja Lekovic and Bertrand Sadin prepared the figures and maps. Roberta Quadrelli provided support on statistics. Muriel Custodio, Astrid Dumond, Angela Gosmann and Therese Walsh managed the production process. Viviane Consoli and Rebecca Gaghen provided editorial assistance.

ORGANISATIONS VISITED

During its visit in Austria, the review team met with the following organisations:

- AEE Intec
- Association of Gas and District Heating Companies
- Austrian Chamber of Commerce
- Austrian Climate and Energy Fund
- Austrian Energy Agency
- Austrian Gas Grid Management
- Austrian Petroleum Industry Association
- Austrian Power Grid
- Bioenergy2020+ GmbH
- Central European Gas Hub AG (CEGH)
- Chamber of Labour
- E-Control
- Federal Environment Agency
- Federal Ministry of Economy, Family and Youth (since 1 March 2014, Federal Ministry of Science, Research and Economy)
- Federal Ministry of Agriculture, Forestry, Environment and Water Management
- Federal Ministry of Finance
- Federal Ministry of Transport, Innovation and Technology
- Federation of Austrian Industries
- Federation of Trade Unions
- Gas Connect Austria
- Graz University of Technology

ORGANISATIONS VISITED (*continued*)

- Liaison Office of the Provinces
- OMV
- Österreichs Energie
- Rohöl-Aufsuchungs AG (RAG)
- Renewable Energy Austria
- Tiroler Wasserkraft AG
- Umweltdachverband
- Verbund
- Vienna Energy Club
- Vorarlberger Kraftwerke AG

ANNEX B:
ENERGY BALANCES AND KEY STATISTICAL DATA

Unit: Mtoe

SUPPLY		1973	1990	2000	2009	2010	2011	2012
TOTAL PRODUCTION		**7.9**	**8.1**	**9.8**	**11.6**	**12.1**	**11.6**	**12.8**
Coal		1.0	0.6	0.3	-	-	-	-
Peat		-	-	-	-	-	-	-
Oil		2.6	1.2	1.1	1.1	1.0	1.0	0.9
Natural gas		2.0	1.1	1.5	1.4	1.5	1.5	1.6
Biofuels & waste[1]		0.7	2.5	3.2	5.3	5.9	5.8	6.1
Nuclear		-	-	-	-	-	-	-
Hydro		1.6	2.7	3.6	3.5	3.3	2.9	3.8
Wind		-	-	0.0	0.2	0.2	0.2	0.2
Geothermal		-	0.0	0.0	0.0	0.0	0.0	0.0
Solar/other[2]		-	0.0	0.1	0.1	0.2	0.2	0.2
TOTAL NET IMPORTS[3]		**13.8**	**17.0**	**18.5**	**20.6**	**21.1**	**23.1**	**20.9**
Coal	Exports	0.1	0.0	0.1	0.0	0.0	0.0	0.0
	Imports	3.1	3.2	3.1	2.8	3.4	3.3	3.3
	Net imports	3.0	3.2	3.0	2.8	3.4	3.3	3.3
Oil	Exports	0.1	0.6	1.5	2.2	2.2	2.2	2.4
	Imports	9.8	10.2	12.4	13.7	13.9	13.5	13.6
	Int'l marine and aviation bunkers	-0.1	-0.3	-0.6	-0.6	-0.7	-0.7	-0.7
	Net imports	9.6	9.4	10.4	10.9	11.0	10.6	10.4
Natural Gas	Exports	-	-	0.0	3.1	4.2	3.1	5.2
	Imports	1.3	4.4	5.3	9.5	10.3	11.1	11.6
	Net imports	1.3	4.4	5.3	6.4	6.1	8.0	6.4
Electricity	Exports	0.4	0.6	1.3	1.6	1.5	1.4	1.8
	Imports	0.3	0.6	1.2	1.7	1.7	2.1	2.0
	Net imports	-0.1	-0.0	-0.1	0.1	0.2	0.7	0.2
TOTAL STOCK CHANGES		**-0.2**	**-0.3**	**0.3**	**-0.4**	**0.9**	**-1.6**	**-0.6**
TOTAL SUPPLY (TPES)[4]		**21.5**	**24.8**	**28.5**	**31.8**	**34.1**	**33.2**	**33.1**
Coal		3.9	4.1	3.6	2.8	3.4	3.5	3.3
Peat		-	-	-	-	-	-	-
Oil		12.1	10.4	11.7	11.9	12.3	11.6	11.4
Natural gas		3.3	5.2	6.5	7.5	8.2	7.8	7.4
Biofuels & waste[1]		0.7	2.5	3.1	5.7	6.3	6.2	6.6
Nuclear		-	-	-	-	-	-	-
Hydro		1.6	2.7	3.6	3.5	3.3	2.9	3.8
Wind		-	-	0.0	0.2	0.2	0.2	0.2
Geothermal		-	0.0	0.0	0.0	0.0	0.0	0.0
Solar/other[2]		-	0.0	0.1	0.1	0.2	0.2	0.2
Electricity trade[5]		-0.1	-0.0	-0.1	0.1	0.2	0.7	0.2
Shares in TPES (%)								
Coal		*18.0*	*16.5*	*12.6*	*8.8*	*9.9*	*10.6*	*9.8*
Peat		*-*	*-*	*-*	*-*	*-*	*-*	*-*
Oil		*56.4*	*41.7*	*41.1*	*37.4*	*36.1*	*35.0*	*34.4*
Natural gas		*15.4*	*20.9*	*22.8*	*23.5*	*24.1*	*23.5*	*22.4*
Biofuels & waste[1]		*3.3*	*10.1*	*11.0*	*18.0*	*18.5*	*18.8*	*19.9*
Nuclear		*-*	*-*	*-*	*-*	*-*	*-*	*-*
Hydro		*7.5*	*10.9*	*12.6*	*11.1*	*9.7*	*8.9*	*11.4*
Wind		*-*	*-*	*-*	*0.5*	*0.5*	*0.5*	*0.6*
Geothermal		*-*	*0.0*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*
Solar/other[2]		*-*	*0.1*	*0.2*	*0.4*	*0.5*	*0.6*	*0.6*
Electricity trade[5]		*-0.6*	*-0.2*	*-0.4*	*0.2*	*0.6*	*2.1*	*0.7*

0 is negligible, - is nil, .. is not available, x is not applicable. Please note: rounding may cause totals to differ from the sum of the elemen

Unit: Mtoe

DEMAND							
FINAL CONSUMPTION	**1973**	**1990**	**2000**	**2009**	**2010**	**2011**	**2012**
TFC	**16.6**	**19.7**	**23.5**	**26.6**	**28.2**	**27.2**	**27.2**
Coal	2.3	1.3	0.9	0.4	0.5	0.5	0.5
Peat	-	-	-	-	-	-	-
Oil	10.0	8.8	10.4	10.9	11.1	10.5	10.5
Natural gas	1.4	3.0	4.3	4.8	5.1	5.0	4.8
Biofuels & waste[1]	0.7	2.2	2.5	3.8	4.1	3.9	4.0
Geothermal	-	0.0	0.0	0.0	0.0	0.0	0.0
Solar/other[2]	-	0.0	0.1	0.1	0.2	0.2	0.2
Electricity	2.2	3.7	4.4	5.1	5.4	5.4	5.4
Heat	-	0.6	1.0	1.5	1.9	1.8	1.8
Shares in TFC (%)							
Coal	*14.1*	*6.8*	*3.7*	*1.7*	*1.8*	*1.8*	*1.7*
Peat	-	-	-	-	-	-	-
Oil	*59.9*	*44.8*	*44.1*	*40.8*	*39.3*	*38.6*	*38.5*
Natural gas	*8.7*	*15.4*	*18.2*	*18.0*	*18.2*	*18.4*	*17.8*
Biofuels & waste[1]	*4.2*	*11.1*	*10.6*	*14.1*	*14.5*	*14.3*	*14.8*
Geothermal	-	-	-	*0.0*	*0.0*	*0.0*	-
Solar/other[2]	-	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.6*
Electricity	*13.1*	*18.7*	*18.8*	*19.2*	*19.0*	*19.7*	*19.9*
Heat	-	*3.1*	*4.3*	*5.7*	*6.6*	*6.5*	*6.7*
TOTAL INDUSTRY[6]	**6.4**	**6.7**	**7.7**	**9.0**	**9.6**	**9.6**	**9.6**
Coal	0.8	0.6	0.6	0.4	0.4	0.4	0.4
Peat	-	-	-	-	-	-	-
Oil	3.3	1.9	1.9	2.0	2.0	1.9	2.1
Natural gas	1.3	2.0	2.4	2.7	2.9	3.0	2.9
Biofuels & waste[1]	0.0	0.6	0.8	1.5	1.6	1.6	1.5
Geothermal	-	-	-	-	-	-	-
Solar/other[2]	-	-	-	-	-	-	-
Electricity	1.0	1.5	1.8	2.2	2.3	2.4	2.4
Heat	-	0.1	0.1	0.2	0.2	0.3	0.3
Shares in total industry (%)							
Coal	*11.8*	*9.6*	*8.3*	*4.3*	*4.6*	*4.6*	*4.3*
Peat	-	-	-	-	-	-	-
Oil	*51.5*	*27.7*	*24.6*	*22.6*	*21.4*	*20.1*	*21.6*
Natural gas	*19.9*	*29.5*	*31.4*	*29.8*	*30.3*	*30.7*	*30.1*
Biofuels & waste[1]	*0.5*	*9.1*	*11.0*	*16.4*	*16.8*	*16.8*	*15.9*
Geothermal	-	-	-	-	-	-	-
Solar/other[2]	-	-	-	-	-	-	-
Electricity	*16.2*	*23.0*	*23.2*	*24.3*	*24.3*	*25.1*	*25.1*
Heat	-	*1.2*	*1.6*	*2.5*	*2.6*	*2.8*	*2.9*
TRANSPORT[4]	**3.9**	**4.8**	**6.5**	**7.9**	**8.1**	**7.9**	**7.8**
OTHER[7]	**6.3**	**8.1**	**9.4**	**9.7**	**10.5**	**9.7**	**9.8**
Coal	1.5	0.7	0.2	0.1	0.1	0.1	0.0
Peat	-	-	-	-	-	-	-
Oil	3.0	2.5	2.5	1.9	1.8	1.6	1.5
Natural gas	0.1	1.0	1.7	1.9	2.1	1.9	1.8
Biofuels & waste[1]	0.7	1.6	1.6	1.8	2.0	1.8	2.0
Geothermal	-	0.0	0.0	0.0	0.0	0.0	0.0
Solar/other[2]	-	0.0	0.1	0.1	0.2	0.2	0.2
Electricity	1.0	1.9	2.4	2.6	2.7	2.7	2.7
Heat	-	0.5	0.9	1.3	1.6	1.5	1.5
Shares in other (%)							
Coal	*23.4*	*8.6*	*2.6*	*0.6*	*0.6*	*0.5*	*0.4*
Peat	-	-	-	-	-	-	-
Oil	*48.4*	*30.3*	*26.2*	*19.3*	*17.5*	*16.7*	*15.5*
Natural gas	*2.3*	*11.7*	*18.4*	*19.9*	*20.0*	*19.4*	*18.0*
Biofuels & waste[1]	*10.4*	*19.3*	*17.4*	*18.4*	*19.0*	*18.5*	*20.5*
Geothermal	-	-	*0.1*	*0.0*	*0.0*	*0.0*	*0.1*
Solar/other[2]	-	*0.2*	*0.7*	*1.3*	*1.5*	*1.7*	*1.8*
Electricity	*15.6*	*23.3*	*25.1*	*27.2*	*26.0*	*27.5*	*27.9*
Heat	-	*6.6*	*9.6*	*13.3*	*15.3*	*15.5*	*15.7*

Unit: Mtoe

DEMAND							
ENERGY TRANSFORMATION AND LOSSES	**1973**	**1990**	**2000**	**2009**	**2010**	**2011**	**2012**
ELECTRICITY GENERATION[8]							
Input (Mtoe)	**4.9**	**7.2**	**8.2**	**9.6**	**10.3**	**9.8**	**10.4**
Output (Mtoe)	**2.7**	**4.2**	**5.1**	**5.7**	**5.8**	**5.4**	**5.9**
(TWh gross)	30.9	49.3	59.9	66.3	67.9	62.3	68.7
Output Shares (%)							
Coal	*10.3*	*14.2*	*11.3*	*7.6*	*9.9*	*11.8*	*9.1*
Peat	-	-	-	-	-	-	-
Oil	*14.1*	*3.8*	*2.8*	*1.7*	*1.9*	*1.6*	*1.1*
Natural gas	*14.3*	*15.7*	*13.1*	*18.6*	*21.1*	*20.0*	*14.1*
Biofuels & waste [1]	*0.7*	*2.4*	*2.8*	*7.4*	*7.5*	*8.3*	*7.9*
Nuclear	-	-	-	-	-	-	-
Hydro	*60.6*	*63.9*	*69.9*	*61.6*	*56.5*	*55.0*	*63.7*
Wind	-	-	*0.1*	*3.0*	*3.0*	*3.1*	*3.6*
Geothermal	-	-	-	-	-	-	-
Solar/other [2]	-	-	-	*0.1*	*0.1*	*0.3*	*0.5*
TOTAL LOSSES	**4.7**	**5.1**	**5.0**	**5.2**	**5.9**	**6.0**	**5.9**
of which:							
Electricity and heat generation[9]	2.2	2.2	1.9	2.3	2.5	2.5	2.5
Other transformation	1.4	0.8	1.1	0.7	1.1	1.0	0.9
Own use and transmission/distribution losses[10]	1.2	2.1	2.0	2.2	2.4	2.5	2.5
Statistical Differences	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**-**	**0.0**
INDICATORS	**1973**	**1990**	**2000**	**2009**	**2010**	**2011**	**2012**
GDP (billion 2005 USD)	141.61	215.29	280.62	320.02	326.59	335.39	338.05
Population (millions)	7.59	7.68	8.01	8.36	8.39	8.42	8.41
TPES/GDP (toe/1000 USD)[11]	0.15	0.12	0.10	0.10	0.10	0.10	0.10
Energy production/TPES	0.37	0.33	0.34	0.37	0.36	0.35	0.39
Per capita TPES (toe/capita)	2.83	3.23	3.56	3.80	4.07	3.94	3.94
Oil supply/GDP (toe/1000 USD)[11]	0.09	0.05	0.04	0.04	0.04	0.03	0.03
TFC/GDP (toe/1000 USD)[11]	0.12	0.09	0.08	0.08	0.09	0.08	0.08
Per capita TFC (toe/capita)	2.19	2.57	2.94	3.18	3.36	3.23	3.24
Energy-related CO_2 emissions ($MtCO_2$)[12]	54.0	56.4	61.7	64.0	69.4	67.7	64.7
CO_2 emissions from bunkers ($MtCO_2$)[12]	0.3	0.9	1.7	1.9	2.0	2.1	2.1
GROWTH RATES (% per year)	**73-90**	**90-00**	**00-10**	**09-10**	**10-11**	**11-12**	**90-12**
TPES	0.9	1.4	1.8	7.3	-2.8	-0.1	1.3
Coal	0.3	-1.3	-0.6	20.6	3.6	-6.9	-1.0
Peat	-	-	-	-	-	-	-
Oil	-0.9	1.2	0.5	3.8	-5.9	-1.7	0.4
Natural gas	2.7	2.3	2.3	10.0	-5.2	-4.8	1.6
Biofuels & waste[1]	7.6	2.3	7.3	10.5	-1.3	5.6	4.5
Nuclear	-	-	-	-	-	-	-
Hydro	3.1	2.9	-0.9	-6.2	-10.8	27.9	1.5
Wind	-	-	40.4	5.3	-6.7	27.7	-
Geothermal	-	20.1	3.4	2.9	-5.7	3.0	10.2
Solar/other[2]	-	16.3	9.7	29.5	8.2	10.8	12.6
TFC	1.0	1.8	1.8	5.8	-3.5	0.2	1.5
Electricity consumption	3.1	1.9	1.9	4.6	-0.1	1.3	1.8
Energy production	0.2	1.9	2.2	4.4	-4.4	10.6	2.1
Net oil imports	-0.1	1.0	0.6	1.0	-3.8	-1.6	0.5
GDP	2.5	2.7	1.5	2.1	2.7	0.8	2.1
TPES/GDP ratio	-1.6	-1.2	0.3	5.2	-5.5	-0.9	-0.7
TFC/GDP ratio	-1.5	-0.9	0.3	3.7	-6.0	-0.6	-0.6

Footnotes to energy balances and key statistical data

1. Biofuels and waste comprises solid biofuels, liquid biofuels, biogases, industrial waste and municipal waste. Data are often based on partial surveys and may not be comparable between countries.
2. "Other" includes ambient heat used in heat pumps.
3. In addition to coal, oil, natural gas and electricity, "total net imports" also includes biofuels.
4. Excludes international marine bunkers and international aviation bunkers.
5. Total supply of electricity represents net trade. A negative number in the share of TPES indicates that exports are greater than imports.
6. "Industry" includes non-energy use.
7. "Other" includes residential, commercial and public services, agriculture/forestry, fishing and other non-specified.
8. Inputs to electricity generation include inputs to electricity, CHP and heat plants. Output refers only to electricity generation.
9. Losses arising in the production of electricity and heat at main activity producer utilities and auto-producers. For non-fossil-fuel electricity generation, theoretical losses are shown based on plant efficiencies of 10% for geothermal and 100% for hydro, wind and photovoltaic.
10. Toe/thousand US dollars at 2005 prices and exchange rates.
11. Energy-related CO_2 emissions have been estimated using the IPCC Tier I Sectoral Approach from the *Revised 1996 IPCC Guidelines*. In accordance with the IPCC methodology, emissions from international marine and aviation bunkers are not included in national totals.

ANNEX C: INTERNATIONAL ENERGY AGENCY "SHARED GOALS"

The member countries* of the International Energy Agency (IEA) seek to create conditions in which the energy sectors of their economies can make the fullest possible contribution to sustainable economic development and to the well-being of their people and of the environment. In formulating energy policies, the establishment of free and open markets is a fundamental point of departure, though energy security and environmental protection need to be given particular emphasis by governments. IEA countries recognise the significance of increasing global interdependence in energy. They therefore seek to promote the effective operation of international energy markets and encourage dialogue with all participants. In order to secure their objectives, member countries therefore aim to create a policy framework consistent with the following goals:

1. Diversity, efficiency and flexibility within the energy sector are basic conditions for longer-term energy security: the fuels used within and across sectors and the sources of those fuels should be as diverse as practicable. Non-fossil fuels, particularly nuclear and hydro power, make a substantial contribution to the energy supply diversity of IEA countries as a group.

2. Energy systems should have **the ability to respond promptly and flexibly to energy emergencies.** In some cases this requires collective mechanisms and action: IEA countries co-operate through the Agency in responding jointly to oil supply emergencies.

3. The environmentally sustainable provision and use of energy are central to the achievement of these shared goals. Decision-makers should seek to minimise the adverse environmental impacts of energy activities, just as environmental decisions should take account of the energy consequences. Government interventions should respect the Polluter Pays Principle where practicable.

4. More environmentally acceptable energy sources need to be encouraged and developed. Clean and efficient use of fossil fuels is essential. The development of economic non-fossil sources is also a priority. A number of IEA member countries wish to retain and improve the nuclear option for the future, at the highest available safety standards, because nuclear energy does not emit carbon dioxide. Renewable sources will also have an increasingly important contribution to make.

5. Improved energy efficiency can promote both environmental protection and energy security in a cost-effective manner. There are significant opportunities for greater energy efficiency at all stages of the energy cycle from production to consumption. Strong efforts by governments and all energy users are needed to realise these opportunities.

6. Continued **research, development and market deployment of new and improved energy technologies** make a critical contribution to achieving the objectives outlined above. Energy technology policies should complement broader energy policies. International co-operation in the development and dissemination of energy technologies, including industry participation and co-operation with non-member countries, should be encouraged.

7. Undistorted energy prices enable markets to work efficiently. Energy prices should not be held artificially below the costs of supply to promote social or industrial goals. To the extent necessary and practicable, the environmental costs of energy production and use should be reflected in prices.

8. Free and open trade and a secure framework for investment contribute to efficient energy markets and energy security. Distortions to energy trade and investment should be avoided.

9. Co-operation among all energy market participants helps to improve information and understanding, and encourages the development of efficient, environmentally acceptable and flexible energy systems and markets worldwide. These are needed to help promote the investment, trade and confidence necessary to achieve global energy security and environmental objectives.

(The Shared Goals were adopted by IEA Ministers at the meeting of 4 June 1993 in Paris, France.)

* Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Luxembourg, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States.

ANNEX D: GLOSSARY AND LIST OF ABBREVIATIONS

In this report, abbreviations and acronyms are substituted for a number of terms used within the International Energy Agency. While these terms generally have been written out on first mention, this glossary provides a quick and central reference for the abbreviations used.

ACER	Agency for the Co-operation of Energy Regulators
bcm	billion cubic metres
b/d	barrels per day
BMFWJ	Federal Ministry of Economy, Family and Youth
bmvit	Federal Ministry of Transport, Innovation and Technology
BMWFW	Federal Ministry of Science, Research and Economy
CCGT	combined-cycle gas turbine
CCS	carbon capture and storage
CDM	clean development mechanism (under the Kyoto Protocol)
CHP	combined heat and power production
CO_2	carbon dioxide
DSO	distribution system operator
EIA	environmental impact assessment
ENTSO-E	European Network of Transmission System Operators for Electricity
ETS	Emissions Trading Scheme (European Union)
EU	European Union
FSU	former Soviet Union
GDP	gross domestic product
GHG	greenhouse gas
GW	gigawatt
GWh	gigawatt hour
IA	Implementing Agreement
IPCC	International Panel on Climate Change
ITO	independent transmission operator
J	joule
JI	Joint Implementation (under the Kyoto Protocol)
kt	kilotonne
kV	kilovolt

kWh	kilowatt hour
LNG	liquefied natural gas
LPG	liquefied petroleum gas
LULUCF	land use, land-use change and forestry
Mb	million barrels
mcm	million cubic metres
Mt	million tonnes
Mtoe	million tonnes of oil-equivalent, see toe
Mt CO_2	million tonnes of carbon dioxide-equivalent
MW	megawatt of electricity
NCG	NetConnect Germany
NEEAP	National Energy Efficiency Action Plan
NGL	natural gas liquids
NREAP	National Renewable Energy Action Plan
OMV	Austrian Oil and Gas Company (partly state-owned)
PJ	petajoule
PPP	purchasing power parity
PV	photovoltaics
R&D	research and development
RES	renewable energy sources
t	tonne
TAG	Trans-Austria gas pipeline
TAL	Trans-Austria oil pipeline
TFC	total final consumption of energy
toe	tonne of oil-equivalent; defined as 10^7 kcal
TPA	third-party access
TPES	total primary energy supply
TSO	transmission system operator
TW	terawatt
TWh	terawatt hour
UNFCCC	United Nations Framework Convention on Climate Change
VAT	value-added tax

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Energy Policies of IEA Countries

Austria

Austria's energy policy rests on three pillars – security of supply, energy efficiency and renewable energy sources. The country's decarbonisation drive has strengthened as the economy and renewable energy use have continued to grow, while fossil fuel use has decreased. Notably, Austria has more than tripled the public funding for energy research, development and demonstration since 2007.

Greenhouse gas emissions from energy use, which peaked in 2005, still need to be reduced further, and the transport sector offers prime opportunities for this. In the context of EU negotiations on an energy and climate policy framework to 2030, Austria should develop a strategy that also integrates security of supply and internal market dimensions.

Closer cross-border integration of both electricity and natural gas markets and systems is required to build a single European market. This calls for increased co-ordination and co-operation with neighbouring countries. Austria should also encourage investment in networks, optimise demand response and integrate variable renewable energy supply in a cost-effective and market-based manner.

A well-functioning internal market can help reduce the growing concerns over energy prices and costs, both for industry and for citizens. Austria could address these concerns also by implementing more energy efficiency measures and facilitating greater retail market competition.

This review analyses the energy policy challenges facing Austria and provides sectoral studies and recommendations for further policy improvements. It is intended to help guide the country towards a more secure and sustainable energy future.

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