Location Presentation
Sustainability and Green Technologies in Austria

Austrian Federal Ministry of Sustainability and Tourism
Directorate V/7 – Environmental Protection at Company Level and Technology
Austria: Location and Key Figures

- 8.8 m inhabitants
- Surface area 84,000 km²
- Republic with nine Federal States
Austria: The land of majestic mountains, clean air, clear water, music and environmental technology
Magnificent countryside protected by strict environmental legislation and an affinity with the environment

Intact environment
10 = Pollution does not affect the economy at all

IMD World Competitiveness Yearbook, 2018 modified

BMNT/Bernhard Kern
Research creates excellence in environmental technology and renewable energy

Comparison of R&D spending development (% GDP)

Eurostat, Statistik Austria, Austria with provisional data from 2016
New technologies quickly lead to competitive advantage

Green Technologies - Index: Competitiveness of various countries in Green Tech
Environmental legislation and targeted promotion of Innovative environmental technologies

Leading position in the development, deployment and export of innovative environmental technologies

Further secure and strengthen this position by:

• Targeted export promotion
• Research and training programs
• Grants and funding
• Strengthening of the domestic market
**Strong initiatives for economy and environment**

- **Strategic initiatives**
  - Environmental Technologies Master Plan
  - #Mission 2030 – The Austrian Government's Climate Change and Energy Strategy

- **Awareness raising initiatives**
  - klima:aktiv climate protection campaign
  - Austrian Ecolabel
  - State Prize for Environment and Energy Technology
  - EMAS

- **Investment Initiatives**
  - Sustainable public sector procurement
  - Environmental support
• Austria is committed to international climate targets and an active climate and energy policy.
  • Austria will reduce its greenhouse gas emissions by 36% compared to 2005 by 2030
  • Balance between ecological sustainability, competitiveness and supply security

• Orientation for all areas of activity by 2050 (particularly by 2030)
  • Consequent decarbonisation path reaching to 2050
Decarbonisation by 2050 – Abandoning fossil energy
Implementation of the Paris Agreement in Austria

- Austria is leading the ratification of the Paris Agreement
  - Austria is one of the first countries to deposit ratification with the UN

- In Katowice, 196 countries agreed on a common rulebook for implementation
  - Austria joined the „High Ambition Coalition“ during the negotiations
  - This group helped push the negotiations forward

- Austrian climate and energy strategy as a framework for implementation of the Paris climate targets

Source: Federal Environment Agency
GREEN JOBS SECURE EMPLOYMENT

Agriculture and Forestry

200,000 Green Jobs by 2020

Environmental Technology & Renewable Energy

Tourism & Leisure Industry
GREEN JOBS WIN-WIN FOR ENVIRONMENT AND ECONOMY

- Ensuring a high level of qualification
-Continuous improvement and innovation
- Promotion of networking and cooperation
- Support for internationalisation
- Stimulation of enterprise investment and private consumption
- Awareness development

200,000 Green Jobs by 2020
STATE PRIZE 2018 ENVIRONMENT AND ENERGY TECHNOLOGY

- Category Environment, Climate and Energy
  - ecop technologies for the project „Rotation Heat Pump“

- Category Research and Innovation
  - Fronius International for the project „SOLH2UB“

- Special Price Resource Efficiency
  - Compuritas for the project „Hardware as a Service“
ENVIETECH – ENERGY AND ENVIRONMENTAL TECHNOLOGY CONFERENCE

- International congress for environmental technology since 2008
- An industry event to showcase Austrian solutions

2018 topic: Lateral thinking for the future
CORPORATE ENVIRONMENTAL PROTECTION – A HIGH-RETURN ENVIRONMENTAL INVESTMENT

Case study Grossfurtner butchers

• Biogas plant turns slaughterhouse waste into energy
  • 1/3 of the energy demand, 3/4 of the heat demand
  • Awarded the Energy Globe Award as early as 2010

• Cascading heat usage at the Utzenaich site
  • State Prize 2015 Environment and Energy Technology

• Waste prevention and sustainable resource management
  • Waste management award „Phönix"
EMAS – SUSTAINABLE DEVELOPMENT IN BUSINESS AND ADMINISTRATION

- A voluntary assisting instrument to continually improve environmental performance
  - Ecological and economic deficiencies within an organisation are eliminated
  - Energy and cost savings
  - Private companies and the public administration participate in the program
Green Economy – High job potential

Also in the future by promoting
• Energy efficiency
• Energy conservation
• Renewable energy
• Environmental technology
• Resource efficiency

183,378 people in green jobs
€ 33.9 billion turnover
Climate and Energy Fund
The major driver of research with the BMNT ministry

- Founded in 2007 on the basis of the Climate and Energy Fund Act
- Aim of restructuring the Austrian energy system
- EUR 1.1 billion for innovative research and demonstration projects
- 124,950 projects have been funded
Environmental Technologies Export Initiative
Presentation of innovative strength of Austria abroad

- Foundation 2005 to strengthen export orientation, in particular of SMEs
- 16 countries visited so far
- 200 companies have participated
- Aim: Increasing exports from 60% to 80% by 2020
Environmental Funding – A Success Story for 25 Years

- Based on the Environmental Aid Act of 1993
- Implemented so far:
  - 200,908 projects
  - EUR 7.9 billion in subsidies
  - EUR 31.9 billion in environmental investments
- In 2016 alone: 40 projects funded
- 18,000 green jobs secured
Measurable Success shows the Effect of the Austrian Environmental Policy
Renewable Energy Technologies
Renewable Energy: Measurable Results in Terms of Employment and Environmental Protection

33.5% renewable energy of total consumption
72.6% of electricity consumption in 2016

In 2016 alone:

• Avoidance of the equivalent of 30.2 million t CO2
• Sales in this area € 7.2 billion
• Around 41,600 jobs
Extremely High Share of Renewable Energy

- Austria: 72.6% with high quality
- Europe: 29.6%
- Globally: 23.9%

Quelle: Eurostat 2018
Employment and Economic Relevance of Individual Technologies

Renewable energy by employees

- Solid biomass: 41.6%
- Biofuels: 3.2%
- Biogas: 1.7%
- Geothermal energy: 0.2%
- Photovoltaics: 9.2%
- Solar thermal: 7.6%

41,591 FTE

Renewable energy by sales

- Solid biomass: 31.1%
- Biofuels: 4.7%
- Biogas: 2.6%
- Geothermal energy: 0.4%
- Photovoltaics: 6.7%
- Solar thermal: 5.7%

€ 7,219 m

Brochure: Renewable energy in numbers 2017, BMNT
STORAGE AS A KEY TECHNOLOGY

DEVELOPMENT OF RENEWABLE AND SECURE SUPPLY

Photo: Wien Energie GmbH, Ian Ehm (from the Storage Initiative Report)
AUSTRIAN STORAGE INITIATIVE

• Storage is key for an entirely renewable energy supply

• Research in Austrian areas of strength in innovative storage technologies

• Development of storage for new areas of application
  • High temperature, seasonal storage, modular pumped-storage, hydrogen/methane etc.

• Austria has leading technology expertise in storage
Voestalpine is building the largest industrial hydrogen pilot plant worldwide within the EU funded H2FUTURE framework.

- An important step towards decarbonisation in the steel industry
- 1200 m³ H₂ per hour will be produced
Photovoltaic electricity is stored as green hydrogen using electrolysis

Use as fuel for hydrogen cars

Seasonal storage and transformation into energy and heat using fuel cells

Awarded the State Prize 2018 for Environment and Energy Technology
SOLAR THERMAL AND SOLAR COOLING

HEAT FOR AUSTRIA -
COOLING FOR THE HOTTEST
AREAS IN THE WORLD
Bundesministerium
Nachhaltigkeit und Tourismus

A PIONEERING FORCE IN THE FORMATIVE PERIOD OF SOLAR THERMAL ENERGY

• Ambitious research programs lead by ministries from 1977
• Most modern and largest collector production facility in Europe founded in 1978
• Funding support from 1992 and a broad solar campaign from 1999
• Austria is a pioneer in funding support- an already developed industry was able to exploit market growth in other countries
• Today it is almost an integral part of new residential buildings in Austria
DEVELOPMENT OF AUSTRIAN SOLAR THERMAL MARKET TO A WORLD LEADER

- 5.9 million m² of collector surfaces were installed by 2017
- In 2017 alone: 408,704t CO₂ saved / over 2,121 GWh in heat produced
• Sales of solar thermal industry in Austria in 2017: € 178 million
• 1,500 jobs solely through the solar thermal industry
SOLAR THERMAL ENERGY FOR TOMORROW'S MUNICIPAL HEAT SUPPLY
SOME OF THE LARGEST PROJECTS IN SOLAR THERMAL ENERGY AND COOLING FROM AUSTRIA

PepsiCo, Phoenix

Digicel Jamaica

High School Arizona
Solar thermal system for 2008 Olympic Games in Beijing

Hot water, heating systems support and solar cooling as an architectural feature
HEAT PUMP
HIGHLY EFFICIENT USE OF ELECTRICITY
FOR HEAT PRODUCTION
AUSTRIA'S ELECTRICITY MIX COUPLED WITH EXCELLENT HEAT PUMP TECHNOLOGY FOR MAXIMUM EMISSION SAVINGS

- Total sales in the heat pump sector 2017:
  - € 321.2 million
  - 1,388 jobs in this sector

- Heat pumps in operation in Austria in 2017:
  - Over 280,000 heat pumps installed in Austria
  - 608,995 t CO2 avoided
A HEAT PUMP COUNTRY AS A SPACE FOR INNOVATION

Driver:
Building control regulation through increasing building energy efficiency and market development of photovoltaics (often used in combination)
Austria's technology leader
Ochsner employs about 180 people with an R&D quota of 5% (status 2018, ecotechnology.at)

Heat pump systems for single housing units right up to large buildings and industrial applications

- High R&D intensity and award-winning company
- Current focus of research: High-temperature heat pumps for industry
• ecop Technology was awarded in the category environment, climate and energy
• Rotation heat pump – uses rotation as a physical process for heating and cooling
PASSIVE HOUSES
THE HIGHEST DENSITY OF PASSIVE HOUSES AROUND THE WORLD
REDUCING HEATING DEMAND TO CLOSE TO ZERO EVEN IN A HARSH CLIMATE IS A GREAT ACCOMPLISHMENT

- 17% of CO2 emissions come from heating demand in the building sector
- 12 million m² passive house surface in Austria
- Yearly avoidance of 140 million l of heating oil

- Targeted programs and lines of research
- Reference projects
- Reduction of the heating demand of buildings by residential building regulations and grants
EVERY FOURTH PASSIVE HOUSE BUILT IS IN AUSTRIA

- Concept was proactively taken up as early as 1994
- First passive house built in 1996
- By 2010: around 6,000 passive houses in Austria
  - Compared to 50 in the whole of North America
- By 2013: around 14,000 passive houses in Austria

*(Estimate IG Passivhaus Plus, counting stopped)*

AUSTRIA HAS THE WORLD'S HIGHEST DENSITY OF PASSIVE HOUSES

Austria House as a gift to Canada at the Olympic Games
AUSTRIA TAKES EXPERTISE IN ENERGY TO THE DESERTS OF SAUDI ARABIA

- Ground-breaking “Sheikh Zayed Desert Learning Center” flagship project
- BIPV, solar cooling, building control, LED lighting technology, planning and passive house technology from Austria

- Austrian building technology

Certifications
- LEED (USA)
- ESTIDAMA (Arab Green Building Seal)
SOLAR DECATHLON: BUILDING CONCEPTS WITH INTERNATIONAL AWARDS

• International, university competition for sustainable construction from the US Department of Energy
• Vienna University of Technology receives 1st place in 2013 in the building of the future category
AUSTRIA: THE HIGHEST QUALITY OF LIFE INTERNATIONALLY AND A SMART CITY PIONEER

- Vienna has been chosen for the 9th time as the city with the highest quality of life (Mercer study 2018)
- 10% of EU Smart City projects are in Austria
BIOMASS – (PELLETS)

ABUNDANCE OF FORESTS IN AUSTRIA, ADVANCED BIOMASS TECHNOLOGY FOR WORLD MARKETS
AUSTRIA, THE LAND OF FORESTS AND ADVANCED BIOMASS TECHNOLOGIES

- 50% of the national territory is covered by forests
- 30.4 m reserve solid cubic meters regrow annually
- 17.4% of all heating systems are based on biomass (wood)
The use of biofuels in 2017 yielded:

- 10 million tonnes of CO2 savings
- €1,606 million turnover in the sector
- 19,000 jobs
- Trend: continually increasing
DEVELOPMENT OF BIOMASS BOILERS IN AUSTRIA

- Turnover € 863 million
- Job effect 3,600 FTE
AUSTRIA HAS LEADING ROLE IN THE GLOBAL MARKET FOR PELLET PRODUCTION

- 2/3 of the pellet boilers installed in Western Europe come from Austria
- Leading manufacturers of equipment for the production of pellets come from Austria
HYDROELECTRIC POWER

A MAIN PILLAR OF POWER GENERATION IN AUSTRIA AND TECHNOLOGY LEADER IN THE WORLD MARKET
Broad acceptance among the population through environmentally compatible power plants

Environmentally compatible use of hydropower through the EU Water Framework Directive

Firmly rooted in the regional economy
HYDROPOWER IN AUSTRIA - THE MAIN PILLAR OF RENEWABLE ENERGY PRODUCTION

- € 2,000 million in sales
- 6,784 jobs
- Potential expansion of hydropower by 2030: around 8 TWh
HYDROPOWER IN AUSTRIA – DEVELOPMENT SINCE 1950

- Hydropower (undifferentiated)
- River
- Storage

Cumulative gross bottleneck capacity in MW

Installed annually in MW


-0.1 0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10 10.5 11 11.5 12 12.5 13 13.5 14 14.5 15
AUSTRIA IS LEADING IN HYDROPOWER ENERGY PRODUCTION

- Total capacity of 14.1 GW
- 160 large and 3,000 small hydropower plants
- 6 million t of CO2 savings
- Highest level of expertise in planning, provision and operation of power generation plants

Source: Statistik Austria
AUSTRIA GUARANTEES SUPPLY SECURITY

• Pumped storage power plants for efficient energy storage
• Compensation of seasonal and daily fluctuations of other renewable energy sources
• Pumping capacity of around 8,500 MW installed
COMPONENTS FOR HYDROELECTRIC POWER PLANTS SUCCESSFULLY POSITIONED IN THE GLOBAL MARKET THROUGH YEARS OF EXPERIENCE

• Turbines from Austria are used in the world’s largest power plants
  • Large projects in Turkey, India, Norway, South Korea, Sri Lanka, Iran, Guatemala

• Turnkey power plants from Austria are exported worldwide

• Area of greatest current relevance: revitalizing existing plants worldwide

(Potentials for growth and expansion of renewable energy systems, 2012)
WASTE MANAGEMENT AND RECYCLING ECONOMY

CONVERTING WASTE TO VALUABLE RESOURCES WITH AUSTRIAN PRODUCT AND SERVICE INNOVATION
THE SUCCESSFUL STRATEGY OF PREVENTION AND RECOVERY

- Closing of material cycles
- Push eco-innovation
- Responsibility of producers
- Keeping the population well informed
- Substitution of materials
  - NAWARO action plan of the BMNT
- Monitoring of material flows
- Development and promotion of clean production processes
- Return and recycling systems
INNOVATIVE LEGISLATION AND RAISING AWARENESS LEAD TO UNIQUE COLLECTION SYSTEMS AND TECHNOLOGIES

- Waste Management Act whereby disposal is not subsidised
  - Precautionary principle
- Public relations raises awareness for waste reduction and separation in the population
WASTE MANAGEMENT – AUSTRIA IS AMONGST LEADERS IN RECYCLING IN EUROPE

Recycling quota for domestic waste in the EU

Germany, Austria, Belgium, Netherlands, Sweden, France, Spain, Greece, Romania, Malta
• Separate collection of recyclable waste streams such as biodegradable waste, packaging waste, construction waste, etc.
More than 1 million tonnes of packaging waste and waste paper are collected per year

- 96% of the total packaging brought into circulation
- 90% is converted to new products or packaging
- The remainder is used for energy recovery (e.g. district heating)
- Almost no landfilling

More than 500,000 t CO2 saved annually
THERMAL TREATMENT AND ENERGY PRODUCTION INSTEAD OF DISPOSAL

- Incineration plants for municipal waste:
  - 2.6 million t/a
- Other equipment for heat treatment:
  - 1.7 million t/a
- Prerequisites: Appropriate legal basis and standards such as
  - Waste Incineration Regulation
  - Rules for sampling, sample preparation and analysis
FROM INNOVATIVE HOME MARKET TO THE WORLD MARKET LEADER IN RECYCLING PLANTS

- World market leader in plastic recycling systems
- World market leader in glass recycling systems
- Global Player in biomass comminution, separation and sorting
- World market leader in mobile processing plants for construction waste and debris
WATER POLLUTION CONTROL
THE BEST DRINKING WATER, CLEAN RIVERS AND LAKES THANKS TO THE LATEST TECHNOLOGY
LEGISLATION ENSURES OUTSTANDING QUALITY AND PROVIDES ECONOMIC STIMULATION

- Comprehensive measures for water pollution control since 1960's
- €45 billion funding since 1960 for public wastewater, mixed and storm water drains and more than 1,600 public sewage treatment plants

- Expertise established in Austrian companies and new technologies developed in accordance with strict legislation
RESPONSIBILITY FOR WATER RESOURCES IN TERMS OF QUALITY AND SUPPLY

- Average rainfall of 1,100 mm per year

- 95% of the population are connected to public sewage system
- More than 1,600 treatment plants clean wastewater
- BOD > 98%
- COD > 92%
- Nitrogen > 80%
- Phosphorus > 90%
Every year, domestic water management companies generate around €300 million in sales.

More patent applications in the area of water and wastewater as part of environmental technology patents than Germany or the whole of the EU, in 2014. (Source: ETH-Zürich)

Supply with drinking water:
- 50% from springs / 50% from ground water
AUSTRIA SUPPLIES THE WORLD WITH THE MOST ADVANCED TECHNOLOGY FOR CLEAN WATER

The then largest treatment plant for the C-tech method was built in Jelutong in Malaysia.

- Cyclic Activated Sludge Process
- 600,000 m³ of wastewater per day
- Capacity for 1.2 million inhabitants

Algeria’s largest and Africa’s second largest municipal wastewater treatment plant

- 270,100 m³ wastewater per day
INNOVATION²: A WATER TREATMENT PLANT WITH COGENERATION REDUCES THE CO₂ BALANCE

- Wastewater treatment for 1 million people in Saudi Arabia
- 200,000 m³ per day
- Biogas is generated from sewage sludge
- Biogas provides power for operation
AN ABUNDANCE OF WATER CAN BE A HAZARD - RISK MANAGEMENT TO PROTECT THE POPULATION AND THE ECONOMY

- Two floods at hundred-year level in 2002 and 2013 with highest level of the Danube 2013
  - Austria’s exposure increased due to climate change
- Damage in 2013 significantly lower by forward-looking risk management
  - Protective structures are closely coordinated with neighbouring states
AIR POLLUTION CONTROL - AN IMPORTANT ECONOMIC FACTOR IN AUSTRIA

• Air pollution control technology: Production of equipment, technologies and specific materials
  • Catalyst preparation is the most important production area
  • Dust collectors & dust collection systems
  • Aerators

• Austrian companies offer a variety of solutions
  • Filter systems, catalytic post-treatment systems, thermal recuperator, methods for emission reduction and particulate filters for cleaning the exhaust air arising from different industrial processes.
Bauxite digestion - particle and alkali containing gases in metallurgy

Europe's cleanest sinter plant in Linz

THE BEST AIR QUALITY SHOWS THE SUCCESS OF THE AUSTRIAN ENVIRONMENTAL POLICY

- Annual air pollutant inventory by the Federal Environment Agency
- Current initiative example: "Energy revolution campaign" of the BMNT
BEST AIR QUALITY - SIGNIFICANT DECREASE IN EMISSIONS IN RECENT YEARS

- Sulphur dioxide (SO₂), nitrogen oxides (NOₓ), ammonia (NH₃) and organic compounds without methane (NMVOC)
  - Binding limit within the EU member states
  - Very successful actions: up to 81% reduction in Austria since 1990
    - SO₂: -81% since 1990
BEST AIR QUALITY - SIGNIFICANT DECREASE IN EMISSIONS IN RECENT YEARS

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  - Binding limit within the EU member states
- Very successful actions: up to 81% reduction in Austria since 1990
  - NMVOC: -55% since 1990
AMBITIOUS ENVIRONMENTAL POLICY
SUCCESSFUL COMPANIES
A CLEAN ENVIRONMENT FOR OURSELVES AND OUR CHILDREN
THANK YOU FOR YOUR ATTENTION