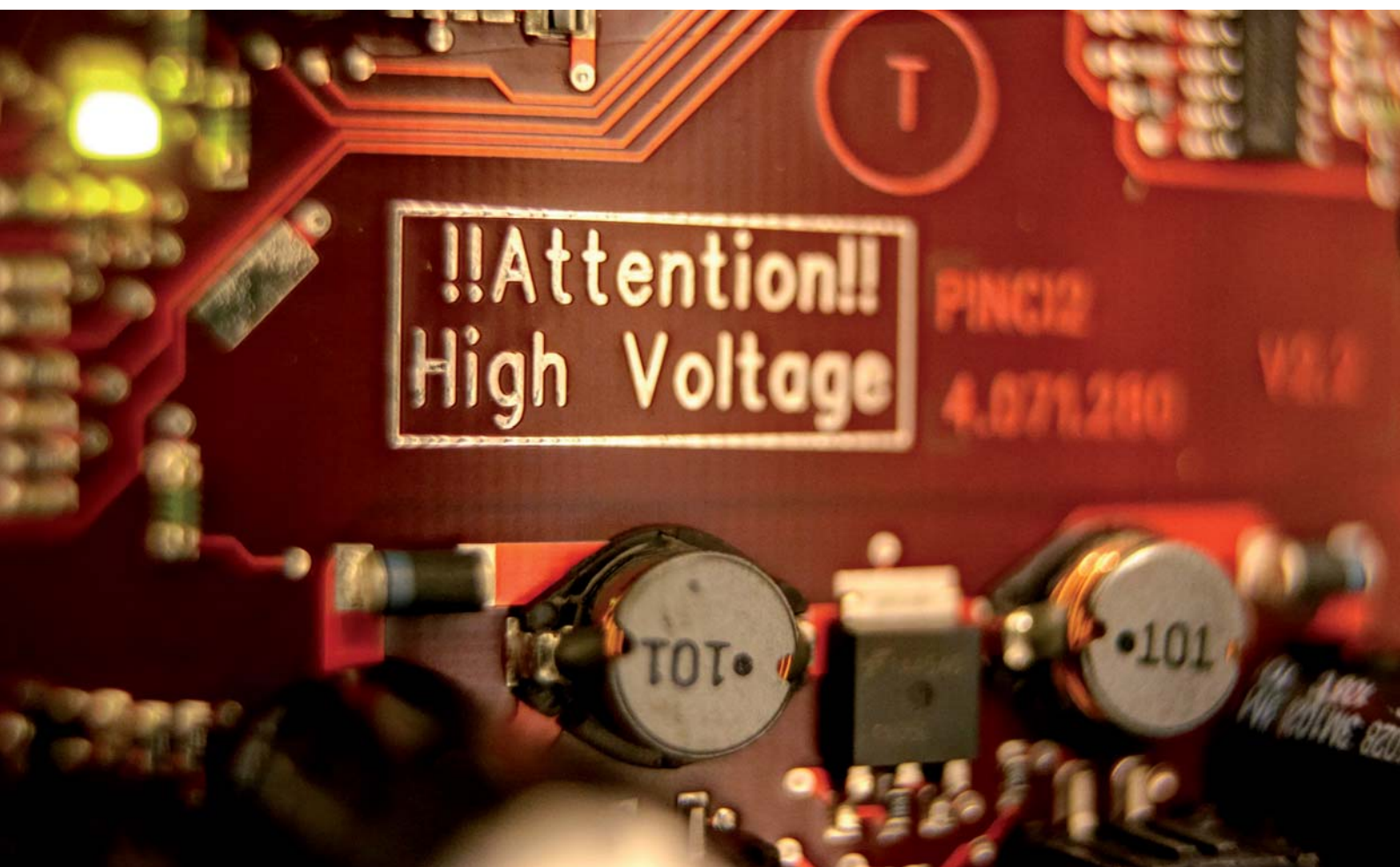


# Guide Energy Research Programme 2016

A funding programme of the Climate and Energy Fund  
of the Austrian Federal Government



# Contents

<b>Foreword</b>	<b>1</b>
<b>1.0 Key Facts at a Glance</b>	<b>2</b>
<b>2.0 Strategic Focus and Goals of the Programme</b>	<b>5</b>
<b>2.1 Programme strategy</b>	<b>5</b>
<b>2.2 Programme goals</b>	<b>5</b>
<b>3.0 TOPIC AREAS of the Call</b>	<b>6</b>
<b>TOPIC AREA 1 – Emerging Technologies</b>	<b>6</b>
<b>TOPIC AREA 2 – Energy Efficiency and Energy Saving</b>	<b>6</b>
TA 2/2.1 Energy Efficiency in Trade and Industry	7
TA 2/2.2 Energy Efficient Products	8
TA 2/2.3 Fuel Cells and Hydrogen	9
TA 2/2.4 Hybrid Systems for Heating, Cooling and Ventilation	10
<b>TOPIC AREA 3 – Renewable Energies</b>	<b>10</b>
TA 3/3.1 Bioenergy	10
TA 3/3.2 Photovoltaics	11
TA 3/3.3 Solar Thermal Energy	12
TA 3/3.4 Deep Geothermal Energy	13
TA 3/3.5 Heat Pumps	13
TA 3/3.6 Hydropower	14
TA 3/3.7 Wind Power	14
<b>TOPIC AREA 4 – Smart Grids</b>	<b>15</b>
TA 4/4.1 Power Grids	15
TA 4/4.2 Thermal Grids	16
<b>TOPIC AREA 5 – Mobility and Transport Technologies for Optimised Energy Efficiency and Climate Protection</b>	<b>16</b>
TA 5/5.1 Combustion Engine Drivetrain Components and Integration into the Drive System	17
TA 5/5.2 Conventional Drivetrain Vehicle Systems	17
TA 5/5.3 Lightweight Construction/Materials	17
<b>TOPIC AREA 6 – Energy Storage Technologies</b>	<b>18</b>
TA 6/6.1 Chemical Storage	18
TA 6/6.2 Electrical/Electromagnetic Energy Storage	19
TA 6/6.3 Mechanical Energy Storage	19
TA 6/6.4 Thermal Energy Storage	19
<b>TOPIC AREA 7 – R&amp;D Services</b>	<b>19</b>
TA 7/7.1 Technology Roadmap: Adjusting Energy-intensive Industrial Processes to Fluctuating Energy Supply	19
TA 7/7.2 Innovative Energy Technologies for Sports Facilities	21
<b>4.0 Administrative Instructions</b>	<b>22</b>
<b>4.1 Specific requirements</b>	<b>22</b>
4.1.1 Cooperative oriented basic research	22
4.1.2 Flagship projects	24
4.1.3 R&D services	24
<b>4.2 Bonus for multilateral networking of industrial research activities</b>	<b>25</b>
<b>4.3 Submission details</b>	<b>25</b>
4.3.1 Research funding from the FFG	25
4.3.2 Supplementary environmental funding from the KPC	26
4.3.3 Business funding from the aws	27
<b>4.4 Legal basis</b>	<b>27</b>
<b>4.5 Data protection and publication of funding decision</b>	<b>27</b>
<b>4.6 Open Access – notes on publication</b>	<b>27</b>
<b>5.0 Contact and Advice</b>	<b>28</b>
<b>5.1 Programme mandate and responsibility</b>	<b>28</b>
<b>5.2 Programme management</b>	<b>28</b>

# Foreword

Research enhances competitiveness. The Austrian Climate and Energy Fund has a track record of promoting innovation, from the first idea through to the implementation of marketable solutions. The figures speak for themselves: Some 300 million euros of funding have been awarded to a total of 750 energy and mobility research projects since 2007.

The Energy Research Programme of the Climate and Energy Fund aims to strengthen the links between science and industry in order to create growth and jobs and to enhance the attractiveness of Austria as a place of innovation.

We pave the way for more cost-effective energy and mobility technologies enabling faster market penetration. This requires the development of a wide range of technologies for different options. The great potential of technological innovation can only be realised effectively, however, if it also gains broad acceptance by the general public. Thus, the Climate and Energy Fund makes every effort to involve the people in this innovation process.

We invite you to submit your innovative projects and play your part in shaping Austria's future.



Theresia Vogel  
Managing Director of the Climate and Energy Fund



Ingmar Höbarth  
Managing Director of the Climate and Energy Fund

# 1.0 Key Facts at a Glance

The Energy Research Programme 2016 was launched by the Austrian Climate and Energy Fund to support energy and mobility technology innovations in those areas in which Austria demonstrates clear strengths, offers internationally recognised high levels of expertise and can make an effective contribution to climate protection and security of supply.

The Call makes a budget of up to **16 million euros** of funding available from the Austrian Climate and Energy Fund.

## Scope of the Call

The main focus of this Call is on research, development and market introduction of new materials as well as innovative technologies, systems and concepts. Accompanying acceptance research studies are in principle eligible for funding as part of research and technology development projects.

Aspects of academic and professional education and further training can be integrated into the research and development projects to ensure an adequate supply of human resources to meet the need for highly qualified staff in the future.

The topic areas described in the table below identify issues that are of particular relevance to the Climate and Energy Fund's research and technology programme and thus to this Call.

## Call instruments

This Call provides funding instruments for research, environment and business and is carried out in cooperation with the Austrian Research Promotion Agency (FFG), austria wirtschaftsservice GmbH (aws) and Kommunalkredit Public Consulting GmbH (KPC).

Research funding and financing instruments are available for "Cooperative Projects of Oriented Basic Research", "Exploratory Projects" <sup>1)</sup>, "Individual Projects of Industrial Research", "Cooperative R&D Projects", "Flagship Projects" and "Research & Development Services". Applications are submitted to and processed by the FFG.

**NEW:** New submission modalities for the funding of investments in pilot and demonstration facilities in "Cooperative R&D Projects of Experimental Development" and "Flagship Projects" under the 2015 funding guidelines of the National Environmental Fund (UFI) in cooperation with KPC.  
(Details can be found in Chapter 4.3.2.)

The market introduction of research results is eligible for funding under the "study2market" and "mission2market" instruments. Applications are submitted to and processed by aws.

(More detailed information can be found in Chapter 4.3.3.)

## Bonus for multinational networking

The Climate and Energy Fund supports the transfer and dissemination of research results from transnational collaborations in the D-A-CH region (Germany, Austria, Switzerland) and promotes cooperation as part of the IEA Research Cooperation programme of the Federal Ministry for Transport, Innovation and Technology (bmvit). For details, see Chapter 4.2

More detailed information about the instruments and requirements can be found in Chapter 4.0.

**The following areas are not eligible for the FFG research funding:** projects with a focus on aspects of standardisation, systems analysis<sup>2)</sup> (e.g. energy scenarios, lifestyles), legal or political framework conditions (e.g. approval procedures) or regulations

and the development of monitoring, quality management systems and planning tools (e.g. manuals, software tools, databases) unless expressly specified as a call topic in the relevant thematic field.

<sup>1)</sup> Exploratory Projects are designed to provide preparatory work for R&D projects, especially European and international R&D projects.

<sup>2)</sup> Research projects on aspects of climate change, its impact on Austria and potential adaptation measures are covered by the Austrian Climate Research Programme (ACRP) of the Climate and Energy Fund.

<b>1. Emerging Technologies</b>	
<b>2. Energy Efficiency and Energy Saving</b>	2.1 Energy Efficiency in Trade and Industry 2.2 Energy-Efficient Products 2.3 Fuel Cells and Hydrogen 2.4 Hybrid Systems for Heating, Cooling and Ventilation
<b>3. Renewable Energies</b>	3.1 Bioenergy 3.2 Photovoltaics 3.3 Solar Thermal Energy 3.4 Deep Geothermal Energy 3.5 Heat Pump 3.6 Hydropower 3.7 Wind Power
<b>4. Smart Grids</b>	4.1 Power Grids 4.2 Thermal Grids
<b>5. Mobility and Transport Technologies for Optimised Energy Efficiency and Climate Protection</b>	5.1 Combustion Engine Drivetrain Components and Integration into the Drive System 5.2 Conventional Drivetrain Vehicle Systems 5.3 Lightweight Construction/Materials
<b>6. Energy Storage Technologies</b>	6.1 Chemical Energy Storage 6.2 Electrical/Electromagnetic Energy Storage 6.3 Mechanical Energy Storage 6.4 Thermal Energy Storage
<b>7. R&amp;D Services</b>	7.1 Technology Roadmap: Adjusting Energy-intensive Industrial Processes to Fluctuating Energy Supply 7.2 Innovative Energy Technologies for Sports Facilities

## Submission

**Applications for research funding** must be submitted exclusively via eCall (<https://ecall.ffg.at>) to the Austrian Research Promotion Agency. The full set of proposal documents must be submitted in good time, at the latest by the respective submission deadline.

- Projects with a **research funding** volume of **up to 2 million euros: Wednesday, 21 September 2016, 12:00**
- **Flagship projects** with a **research funding** volume **over 2 million euros: Thursday, 23 February 2017, 12:00**

Late submissions (after 12:00) will not be accepted and will be excluded from the selection process.

Registrations for mission2market and submissions for the study2market instrument are to be sent to aws. For more information, see [www.awsg.at/study2market](http://www.awsg.at/study2market).

## Information and advice

An overview of the funding agencies, their functions and tasks as well as contact details can be found in Chapter 5.0.

## Please note:

If the formal requirements for a project submission in accordance with the conditions and criteria of the funding/financing instrument are not met (see Chapter 4.0) and the deficiencies cannot be corrected, the funding/financing application will fail the formal check.

The respective application **will without exception be excluded from the further procedure and will be formally rejected** in accordance with the principle of equal treatment of applications. A detailed check list specifying the conditions and criteria of the respective funding/financing instrument can be found at the beginning of the corresponding application forms (Project Description).

Funding may only be granted if it has an incentive effect. The new RTI Guidelines (Themen-FTI-RL) therefore require all project partners to declare via eCall whether the funding leads to a change in their behaviour.

## Submission options for specific topics

Instrument	Cooperative Basic Research	Exploratory Project	Individual Project IR	Cooperative R&D Project	Flagship Project	R&D Services	mission2market study2market
<b>Brief description</b>	Cooperative R&D project of oriented basic research	Pilot study for R&D project	Individual project of industrial research	Cooperative R&D project	Strategic cooperative R&D project over 2 million euros	Provision of a specific R&D service	Support in transfer to market
<b>The following topics are available for funding under the individual instruments:</b>							
<b>1 Emerging Technologies:</b>	X						
<b>2 Energy Efficiency:</b> Energy Efficiency in Trade and Industry; Energy-Efficient Products; Fuel Cells and Hydrogen; Hybrid Systems for Heating, Cooling and Ventilation		X	X	X	X		X
<b>3 Renewable Energies:</b> Bioenergy, Photovoltaics, Solar Thermal Energy, Deep Geothermal Energy, Heat Pump, Hydropower, Wind Power		X	X	X	X		X
<b>4 Smart Grids:</b> Power Grids, Thermal Grids		X	X	X	X		X
<b>5 Mobility and Transport Technologies:</b> Combustion Engine Drivetrains, Vehicle System, Lightweight Construction/Materials		X <sup>3</sup>		X			X
<b>6 Energy Storage Technologies:</b> Chemical, Electrical/ Electromagnetic, Mechanical and Thermal Energy Storage		X	X	X	X		X
<b>7 R&amp;D Services:</b> Technology Roadmap: Adjusting Energy-intensive Industrial Processes to Fluctuating Energy Supply; Innovative Energy Technologies for Sports Facilities						X	
<b>Key data</b>							
<b>Max. funding volume (EUR)</b>	60,000 to max. 1 million	max. 200,000	max. 1 million	100,000 to max. 2 million	over 2 million	none	max. 100,000
<b>Financing</b>	none	none	none	none	none	max. 100 %	none
<b>Funding rate</b>	max. 100 %	50 % to 80 %	45 % to 70 %	35 % to 85 %	35 % to 85 %	none	max. 50 %
<b>Project duration</b>	max. 3 years	max. 1 year	max. 3 years	max. 3 years	2 to max. 4 years	see Topic Area 7	max. 1 year
<b>Cooperation required</b>	yes	no	no	yes	yes	no	no
<b>Combined funding of environmental investments by Kommunkredit Public Consulting</b>	no	no	no	yes	yes	no	no
<b>Budgets in euros (indicative)</b>	1 million	15 million (of which 6 million are reserved for Flagship Projects)					
<b>Submission deadline for all call topics</b>	21 Sept. 2016 12:00				23 Feb. 2017 12:00	21 Sept. 2016 12:00	Open Call
<b>Application language</b>	German				English	German	German
<b>Information on the web</b>	<a href="http://www.ffg.at/Kooperatives-Projekt-GLF">www.ffg.at/Kooperatives-Projekt-GLF</a>	<a href="http://www.ffg.at/Sondierung">www.ffg.at/Sondierung</a>	<a href="http://www.ffg.at/Einzelprojekt-IF">www.ffg.at/Einzelprojekt-IF</a>	<a href="http://www.ffg.at/Kooperatives-FuE-Projekt">www.ffg.at/Kooperatives-FuE-Projekt</a>	<a href="http://www.ffg.at/Leitprojekt">www.ffg.at/Leitprojekt</a>	<a href="http://www.ffg.at/FuE-Dienstleistung">www.ffg.at/FuE-Dienstleistung</a>	<a href="http://www.awsg.at/study2market">www.awsg.at/study2market</a>

<sup>3</sup>) The funding instrument Exploratory Project is only available for TF 5/5.3 Lightweight Construction/Materials



# 2.0 Strategic Focus and Goals of the Programme

## 2.1 Programme strategy

The Energy Research Programme of the Austrian Climate and Energy Fund contributes towards the provision of safe, sustainable and affordable energy and mobility solutions. The programme covers the entire value-added chain from energy generation to usage.

The programme is based on the Strategic Energy Technology Plan of the European Commission "Towards an Integrated Roadmap", the "Energy Research Strategy for Austria", the results of the "Strategy Process e2050" and evaluations of previous calls. The Austrian Climate and Energy Fund engages in regular stakeholder dialogue on topics of future research funding with representatives from industry and research. The outcomes of these discussions have also been included in the priority setting for the funding programme.

The research and technology programme of the Austrian Climate and Energy Fund is aimed at:

- Promoting **technology fields with high potential in terms of economic development, boosting innovation and reducing greenhouse gas emissions**
- Bridging the extended **timeframes involved in moving energy technology developments into commercial use**, which – in some cases – far exceed business planning and costing schedules
- Reducing the high **technological and economic risks** involved in research and technology development not covered by the market
- **Reducing the cost** of innovative, highly efficient technologies with the goal of encouraging market penetration
- Supporting **industry** as the driving force in accelerating market penetration

## 2.2 Programme goals

The following three goals were set in order to meet the overall objectives of the Austrian Climate and Energy Fund in accordance with the programme strategy. Only project proposals which make a substantial contribution towards meeting these programme goals will receive a positive evaluation.

### Goal 1: Contribution towards meeting the energy, climate and technology policy targets of the Austrian government

Priority is given to technological developments and measures which make a significant contribution towards increasing the efficiency of the energy system and the share of renewable energy in the energy mix.

### Goal 2: Increase in the affordability of renewable energy and innovative energy and mobility technologies

Cost reductions for highly innovative technologies and the development of innovative business models are key requirements for accelerated market penetration.

### Goal 3: Development and safeguarding of the technological leadership and international competitiveness

of Austrian companies and research institutes in the field of innovative energy and mobility technologies. The strengthening of technological expertise and competitiveness will also enhance Austria's position as a business location and innovation centre and open up new perspectives for supporting Austria's international climate protection policy.

# 3.0 Topic Areas of the Call

The proposed project must have its key focus on 1 of the Call topics and/or research themes described below but may also address more than one area. Projects must achieve **significant technological progress in at least 1 of the topic areas**. Unless expressly provided otherwise, the Call topics and research themes are not restricted in terms of their application (mobility, power, heat etc.).

Funding can also be provided for **other than the applications and system variants listed below in individual cases**, provided that the project is of particular scientific, technical or economic significance, characterised by a high innovation and emission reduction potential and in compliance with the programme goals and evaluation criteria (see relevant Technical Guidelines).

## TOPIC AREA 1 Emerging Technologies

'Emerging Technologies' supports the development of **future and emerging energy and mobility technologies** which are not expected to be ready for the market until 2025.

The aim is to promote novel, unconventional approaches based on latest scientific and technological findings from key research areas such as mathematics, physics, chemistry, biology, materials and nanosciences that enable a quantum leap in energy conversion and usage and translate them into application-oriented research.

**The focus is therefore on basic research** in engineering and science disciplines with a strong orientation towards future applications in the energy and mobility sectors. The Call invites research projects that are defined as 'oriented basic research' in the Frascati Manual (OECD 2002) or meet Technology Readiness Levels 1 to 3 according to the definition of the US Department of Energy. For more detailed information, see Chapter 4.0.

This generally includes all areas required for coping with the key challenge of reducing greenhouse gas emissions **at the interface between basic research and potential future applications in the energy or mobility system**.

**NOTE:** Research projects focusing on production and processing methods for new advanced materials and new functions based on innovative surfaces and surface processes are not covered by this Call. Such projects can be submitted to the RTI Initiative "Production of the Future" of the Federal Ministry for Transport, Innovation and Technology (bmvit).

The following fields of research are of particular interest:

- **Materials research**,<sup>4</sup> e.g. coatings, electronic materials, thermoelectric materials, dielectric elastomers, thin film materials, composite and hybrid materials, phase change materials, organic materials, ionic liquids, high-temperature materials, membrane and catalyst materials etc.
- **Optical technologies**, e.g. optoelectronics, plasmonics, photonic processes and tools, hybrid optics, metamaterials, innovative nanostructures etc.
- **Chemical energy conversion:** heterogeneous reactions, biophysical chemistry, molecular theory and spectroscopy, innovative new combustion processes
- **Bionics** for applications, such as e.g. constructional bionics, sensor bionics, structural bionics, motion bionics, device bionics, process bionics, climate and energy bionics
- **Development and test methods** (in connection with research infrastructure) for DC systems: C-/P-Hardware-in-the-Loop (HIL), digital control for power electronics and rapid prototyping for product (time to market, energy density, reliability, efficiency) and technology development (wide bandgap, controller etc.) for new applications in the power grid and interfaces to other energy networks (hydrogen, heat etc.).

## TOPIC AREA 2 Energy Efficiency and Energy Saving

Optimising energy usage is a permanent challenge for economy. Energy efficiency means reducing energy costs, thus strengthening the competitiveness of Austria and reducing the use of natural resources and the

<sup>4</sup>) This Topic Area is aimed at the development of new materials. Materials testing in application is covered by Topic Areas 2 to 6.



associated environmental burden caused primarily by the emission of greenhouse gases and air pollutants.

Funding is designed to promote the continuous further development of existing and creation of new technologies and components not yet established on the market.

**NOTE:** Projects focusing on building optimisation and modernisation are not covered by this Call. Such projects can be submitted to the “City of the Future” funding programme of the bmvit and the “Smart Cities Initiative” of the Climate and Energy Fund.

## TA 2/2.1 Energy Efficiency in Trade and Industry<sup>5</sup>

The primary aim is to reduce emissions from manufacturing processes while maintaining or even improving product quality. Research efforts should concentrate on the development and deployment of new processes and materials for the efficient design of production processes in terms of energy, resource and material consumption and the development of the required processes and equipment. The focus is on processes (at component, process and multi-process level) based on chemical, thermal, mechanical and electrical energy along the entire process chain.

Of special interest are life cycle analyses and the development of visualisation specifications for self-control and motivation of staff working in energy-intensive industries as part of research and technology development projects.

**NOTE:** The development of industrial production processes is covered by the RTI Initiative “Production of the Future”. Relevant projects, i.e. projects not primarily focusing on increasing energy efficiency, in combination with resource efficiency should, thus, be submitted to the RTI Initiative. Please contact the FFG for advice in cases of doubt. Research projects primarily focusing on Industry 4.0, biobased industry or recycling are not part of this Call. Such projects can be submitted to the “Production of the Future” programme of the bmvit.

The following R&D areas are based on the R&D roadmap “Energy Efficiency in Energy-Intensive Industries”,

commissioned by the Austrian Climate and Energy Fund, which was completed in November 2014.

The focus is on the following areas:

- Energy efficiency through **materials research** for new or optimised production processes and for ensuring a consistently high product quality when introducing new energy- and resource-efficient production processes (e.g. efficient material use, recycling): secondary alloys, materials for additive manufacturing, fibre-reinforced materials, improved corrosion properties etc.)
- **Optimisation of existing and development of new energy- and resource-efficient production processes and products<sup>6</sup>** using simulations and experiments, e.g. through modification of process parameters, substitution of materials and consumables, deployment of new or improved components or processes and reorganisation of production
  - Innovative developments in **thermal processing technology** (in particular in the iron and steel, non-ferrous metal, light metal, cement, mineral extraction and processing industries): furnace and burner technologies, hardening and smelting processes, drying processes, heat treatment, joining technologies, direct induction etc.
  - Development of alternative or optimised **chemical processes**: PAT methods, development of efficient continuous process and separation technologies, energy-efficient reaction technology and process chemicals, shorter process chains, innovative reactor technologies (e.g. membrane technologies), catalysis etc.
  - Energy-efficient **manufacturing technologies**: net shape methods (SPS, MIM, additive manufacturing), surface technology, innovative casting methods, energy integration in production plants etc.
  - Improved **process engineering in the pulp and paper, automotive, textile, food and beverage industries**
- Development of methods and models for flexible production based on the **integration of new storage and conversion technologies** (e.g. power-to-gas, LAES liquid air energy storage)
- **Highly efficient electrical energy usage:**
  - Highly efficient **electric motors** and optimised systems (motor plus components such as gears, fans, pumps, compressors), variable speed control
  - Electrical **plant engineering**

<sup>5</sup>) Industrial trade according to § 7 of the Trade and Industry Code (GewO) 1994

<sup>6</sup>) The development of industrial production processes is covered by the RTI initiative “Production of the Future”. Relevant projects, i.e. projects not exclusively focusing on increasing energy efficiency, should therefore be submitted to the RTI Initiative. Please contact the FFG for advice in cases of doubt.

- **Optimised distributed generation systems for power, heating and cooling:** new plant, generator and thermoelectric concepts, load and fuel flexibility (e.g. use of special gases, biomass combustion), integration of storage systems, new materials and material technologies
- New **high-temperature superconductor** technologies in industrial applications, e.g. electric motors, automation components, DC induction heating etc.
- Use of **waste heat and integrated waste heat storage** (e.g. exhaust gas, waste water etc.) employing thermal storage systems, high-temperature heat pumps, ORC, thermoelectric systems, latent heat storage units, use of supercritical CO<sub>2</sub>, finned tube heat exchangers etc.; waste heat storage for batch processes is of special interest
- **Low exergy systems** for the process-integrated use of renewable heat with a focus on the medium temperature range (100° to 250 °C): development of hydraulic and system engineering concepts, computer-based tools for integral planning, evaluation and operation etc.
- New approaches for the use of **secondary raw materials and fuels** (e.g. process gas, plastic waste etc.)
- **Production of efficient secondary energy sources** from industrial organic waste, e.g. by pyrolysis, hydrothermal methods, gasification, liquefaction, synthesis and and product gases
- Combined **technologies for the separation of air pollutants** (dust, nitrogen etc.) **and increased efficiency** in industrial production processes, such as e.g. exhaust gas condensation by means of heat pumps, open sorption technologies (“chemical heat pump”), catalytic denitrification, hot gas filtration etc.
- Energy-efficient processes and technologies for the **separation** (e.g. post-combustion or oxyfuel technology) **and (in-plant) recycling of greenhouse gases** from industrial production processes
- Energy-efficient water treatment, e.g. heat recovery from waste water, water collection, treatment, distribution and supply systems, etc.
- Efficient **mechanical** milling, agglomeration, separation and mixing **processes**
- Highly efficient **drive technologies** (highly efficient motors for stationary applications, gear technology etc.)
- **Energy management,<sup>7</sup> process integration and process intensification** based on simulation and numerical optimisation with the aim to improve

the energy efficiency of industrial processes and production sites or integrate them into the regional energy system

- Use of innovation of **measurement, sensor and control technology** for the energy optimisation of industrial processes

## TA 2/2.2 Energy-Efficient Products

Increasing the energy efficiency of products is a key topic of the current work programme of the Austrian Federal Government. It provides a substantial contribution to achieving the specified climate and energy policy goals and offers opportunities to manufacturers, consumers and the general public.

The Ecodesign Directive of the European Union provides the framework for the energy-efficient and sustainable design (‘ecodesign’) of energy-related products<sup>8</sup>. Measures need to be taken at the design stage, since this is where the energy use, environmental burden and the majority of costs incurred during the lifecycle are determined.

The following R&D areas are based on the “R&D Roadmap for Energy-Efficient Products” commissioned by the Climate and Energy Fund, which was completed in October 2015.

The call invites proposals for the technological (further) development and demonstration of energy-related products in the following areas:

- energy-efficient and reliable **heating, ventilation and air-conditioning systems** for stationary and mobile applications, e.g. natural refrigerants, alternative refrigeration technologies, innovative control concepts, overall system optimisation, sensors etc.;
- **highly efficient cooling devices and systems** for industrial use (food wholesale and retail, food processing, catering and hotel industry, etc.):
  - **natural refrigerants** based on hydrocarbons and CO<sub>2</sub>;
  - **alternative refrigeration technologies**, e.g. Stirling refrigeration process or magnetocaloric, thermoelectric and thermoacoustic cooling concepts;
  - **speed-controlled compressors**;
  - **innovative control concepts** (incl. proactive maintenance management and energy use

<sup>7</sup>) Applicants are asked to avoid duplication of klima:aktiv energy efficiency activities and to make use of synergies. The development of manuals, management systems or planning tools for industrial enterprises is not part of this Call.

<sup>8</sup>) Energy related products are products whose use in any way influences the consumption of energy. This includes devices that are operated with energy as also products which do not use energy themselves but influence energy consumption during their use.

monitoring), e.g. smart controllers for detecting opening hours, integration of compressor and device control systems and innovative network concepts;

- **alternative device concepts** replacing open front coolers, e.g. sensor controlled doors or automatic optimal positioning of items in the refrigerated section;
- **digitally controlled hydraulic drives**, e.g. cascade use of valves and optimal control options;
- **energy and cost-efficient illumination** (primarily based on LED technology) including operating devices and lights for indoor and outdoor use (self-powered street lights, outdoor lights, façade and media lights) meeting high quality standards (e.g. energy efficiency, lifetime, colour rendering, control, masking):
  - innovative **LED modules** and lighting **technologies**;
  - energy-efficient **drivers and chokes**: increased efficiency during operation and minimal stand-by energy consumption etc.;
  - **control systems** including light management, dimming and daylight usage (in combination with artificial lighting or smart combination with photovoltaics);

The investigation of physiological and biological effects (health) of light can also be integrated into research and development projects.

- **energy efficient energy monitoring systems with interfaces for user feedback** and interaction;
- **strategies** and products **reducing the stand-by consumption of grid-connected products and systems**, e.g. communications modules for electrical devices with minimal ('nearly zero') stand-by consumption;
- **energy aware devices**: products and systems able to detect and control their own energy use or avoid unnecessary consumption (stand-by);
- (further) **development** of energy efficient and durable **electrical and electronic components** for cost-competitive application in energy-related products in the following areas:
  - **thermal management** of printed circuit boards for end-user technologies (lighting, mobile end devices etc.): materials research, new design concepts etc.;
  - **integration of active and passive components** with the aim to substantially increase energy efficiency in specific applications;
  - **application of energy-efficient semiconductor components** in new topologies (systems), especially in the areas of heating, ventilation and air-conditioning (HVAC) and lighting;
  - **increased efficiency of switch-mode power supplies** through new, alternative concepts featuring higher efficiency and lower component costs;

- **electric (bearingless) motors**, e.g. valve motors, motors for industrial machines, e-bikes or vehicles;
- (further) development and application of self-powered electromechanical **sensors in energy-related products** based on ferroelectric materials and printed or large-area thin-film sensors;
- **smart (stand-by features) self-sufficient systems**: components and materials for energy-efficient (stand-by) systems, energy storage units and energy harvesting for (stand-by) systems.

Applicants are encouraged to involve future users in product development and to take into account environmentally friendly product disposal and recovery or re-cycling of the materials used in the product design.

**NOTE:** Research projects focusing on technological ICT principles are not part of this Call. Such projects can be submitted to the bmvit funding programme "ICT of the Future".

## TA 2/2.3 Fuel Cells and Hydrogen

The aim is to accelerate market introduction of hydrogen and fuel cell technologies through:

- 1) technology development for stationary fuel cell use aimed at increasing power density and lifetime, optimising system operation, reducing the production costs and optimising the production of hydrogen and methane along the entire process chain, from CO<sub>2</sub> separation and electrolysis through to methanation and power generation (gas to power)
- 2) Demonstration of hydrogen and fuel cell technologies in pilot projects for mobile fuel cell use in vehicles, including the associated fuel infrastructure

The following R&D areas are based on the "RTI Roadmap Power-to-Gas for Austria" commissioned by the bmvit, which was completed in November 2014. Also taken into account is the strategy process for "Long Range eMobility with Hydrogen" of the Fuel Cell & Hydrogen (FCH) Cluster Austria carried out within the framework of the Austrian Agency for Alternative Propulsion Systems (A3PS).

**NOTE:** Projects with a focus on mobile fuel cell use should concentrate on a demonstration in pilot projects and hydrogen production. Only cooperative projects of experimental development may be submitted. Technology developments for the mobile application of fuel cells and hydrogen technologies are covered by regular calls under the bmvit R&D funding programme "Mobility of the Future".

The following areas are of particular interest:

- Cost-efficient **materials with enhanced energy efficiency, long-term stability and reliability** optimised for stationary application, especially for high-temperature applications (SOFC and SOEC) with the aim to increase operating temperature and reduce degradation, e.g. increase in active surface areas and catalytic properties of electrodes, reduced thicknesses of new noble metal-free catalysts and improved membranes, corrosion resistance of stack materials, (further) development of light-metal hydrides and covalent hydrogen storage materials, metal-organic framework compounds for hydrogen storage
- Efficient and flexible **electrolysers** (PEM high-pressure electrolysis, alkaline electrolysis, high-temperature electrolysis etc.), e.g. through robust electrolysis stacks, efficient electrochemical reactions, upscaling and smart connection of individual systems
- Efficient **methanation** (biological, chemical, catalytic)
- (Further) development of the **fuel cell stack**, e.g. low- and high-temperature PEM, SOFC, MCFC, DMFC etc.
- Improved **fuel cell components** (optimised electrolytes, (nano) membranes, sensors, inverters, interconnectors and ion-conducting materials etc.)
- Efficient and cost-efficient **systems**, upscaling, system control strategies and system integration
- **(Further) development and application of simulation tools, measurement and testing systems and (high dynamic) test rigs** for PEM FC as well as SOFC systems and components
- Accelerated **ageing tests** for FC systems and in-situ analysis of damage mechanisms in polymer electrolyte membrane fuel cells (PEMFC)

**NOTE:** Research projects primarily focusing on the adaption of stationary fuel cells for urban energy systems are not part of this Call.

Such projects can be submitted to the bmvit funding programme "City of the Future" or the "Smart Cities Demo" programme of the Climate and Energy Fund.

## TA 2/2.4 Hybrid Systems for Heating, Cooling and Ventilation

Hybrid systems combine at least 2 energy conversion technologies into 1 compact system which can supply an entire building with heat via integrated control concepts.

Of special interest are combinations of solar thermal, biomass, photovoltaics, heat pumps, gas condensing boiler technology and/or thermal storage. **Combinations with oil condensing boiler technology are not part of this Call.** The focus is on the (further) development of individual components and modular systems which can be varied in a defined range, in particular:

- Integrated **multi-component hybrid systems** as 'black box' solutions or plug and function combinations for building, renovation and construction
- **Simulation tools** for hybrid energy systems for efficient and smart system design and development of intelligent **control concepts**
- **Analysis and fault detection methods** based on intelligent algorithms
- Improved interaction within the overall system using **adaptive and flexible automation**, e.g. use of smart meters and integration of weather forecasts to improve smart home design

Monitoring and yield control of hybrid heating, cooling and ventilation systems are eligible for funding if they form an essential part of a technology development project and help validate newly developed systems.

## TOPIC AREA 3 Renewable Energies

The funding of research and development is designed to help renewable energies become established on the market by consistently improving technologies and reducing the cost of manufacture and application. This is designed to increase the share of renewable energy in total energy consumption and reduce greenhouse gas emissions.

**Field tests, monitoring and yield monitoring of the newly developed systems will only be funded if they are essential for technology development.**

**NOTE:** Research projects primarily focusing on the development of technologies for urban energy systems are not part of this Call. Such projects can be submitted to the bmvit funding programme "City of the Future" or the "Smart Cities Demo" programme of the Climate and Energy Fund.

## TA 3/3.1 Bioenergy

Funding is available for new technologies and innovative approaches which aim to turn biogenic raw and waste

<sup>9)</sup> This Call only addresses biofuel projects focusing on the development of second- and third-generation biofuels.

materials into a competitive alternative to fossil fuels. The Call focuses on innovative energy and cost-efficient processes, new products and materials for the domestic and international market. It is recommended to examine the type, availability and potentials of the biomass to be used in the application.

Funding is available for new technological developments or substantial modifications to existing technologies. Innovative technological concepts for the efficient operation of existing green electricity plants are encouraged.

The following R&D areas are based on the strategy paper “Research and Innovation for Heating and Cooling with Renewable Energy Sources” commissioned by the bmvit, which was completed in April 2014.

(Further) Technological development in the following R&D areas is of particular importance:

- Methods and processes for **biomass treatment** designed to enhance energy density and/or storage properties
- Improving the **storage and combustion properties** of biogenic fuels<sup>9</sup> (e.g. torrefaction) including (further) development of practical methods for predicting failures (e.g. slagging), emissions and lifetimes of bioenergy plants
- Efficient production of **secondary energy carriers** from biogenic raw materials and agricultural and industrial waste, e.g. pyrolysis, hydrothermal methods, gasification, liquefaction, fermentation, synthesis and product gases, multi-feedstock processes. It is recommended to include an exergetic analysis of the proposed process in the application
- (Further) Development and demonstration of **bio-mass gasification technologies** (synthetic natural gas, hydrogen or hythane from biomass) for small- and large-scale applications, including technologies for synthesis gas processing, use of low-cost biogenic raw materials and wastes, intelligent control concepts, synthetic natural gas as storage medium for renewable energy
- Efficient low-emission **small- and micro-scale combustion units** based on new combustion concepts, integration of storage materials, intelligent combustion and output control, reliable DeNO<sub>x</sub> technologies (including retrofitting)
- Smart grid-enabled **micro-combined heat and power (CHP) systems < 5 kW<sub>el</sub>** in terms of power-to-heat ratio, thermal and electrical integration of thermogenerators and optimised operating performance
- Reliable and economically competitive **small-scale biomass-combined heat and power (CHP) systems** (10 – 250 kW<sub>el</sub>) based on reliable heat transfer concepts and operating methods for biomass CHPs which either prevent or eliminate deposition and corrosion problems on heat exchangers through appropriate cleaning concepts and material selection
- **Multi-fuel boilers up to 1 MW<sub>th</sub>**, e.g. for the combustion of fuels with difficult ash-melting properties
- Highly efficient and available **large-scale biomass CHPs**, e.g. through improved control concepts, appropriate heat exchanger materials for higher steam temperatures (up to 600 °C) in permanent operation
- Innovative **smart control solutions** for optimising resource-efficient bioenergy plants by reducing process fluctuations due to external influences (e.g. varying fuel qualities), increasing the degree of automation or extending the load range for partload operation
- Cost-efficient and reliable **PM separation technologies** for small- to medium-scale applications (up to 1 MW), e.g. combustion catalysts (including combined CO/HC catalysts), electrostatic precipitators and fabric filters
- **Combined technologies for dust removal and increased efficiency** in medium- to large-scale plants, e.g. active exhaust gas condensation using heat pumps or open sorption technologies (“chemical heat pump”)
- Cost-efficient optimised **sensors for combustion control**, e.g. combined sensor systems such as CO/lambda or HC/lambda sensor systems
- Optimised technologies and supply chains for **bio-methane and hydrogen from biogenic resources** in large- and small-capacity ranges which also reduce negative environmental effects; use of additives (enzymes, minerals etc.) for higher gas yield; development of advanced measurement and control systems

### TA 3/3.2 Photovoltaics<sup>10</sup>

Reducing costs is the key to further expansion of photovoltaics (PV). Funding is available for research and development projects which contribute to cost reductions through enhanced efficiency, efficient manufacturing processes, new process steps, materials, scalability or standardisation as well as extended component service life.

<sup>10)</sup> Research and development projects focusing mainly on the “substitution of critical mineral resources” are covered by the “Production of the Future” programme.



Consideration of disposal and recycling aspects of PV modules in research and technology development projects is encouraged.

Topics eligible for funding include in particular:

- Development and demonstration of modules for **functional building integration** (e.g. new integration concepts, multifunctional concepts etc.) and for **special applications** (e.g. consumer products, emergency telephones etc.) and suitable (mechanical and electrical) installation systems for standard-compliant and economically efficient integration
- Development of **material combinations and manufacturing processes for flexible photovoltaic elements** (e.g. films, coatings, spray processes, inkjet printing, substrates) for building and special applications
- Development of **innovative components (modules, encapsulation, power electronic systems, cabling, connector systems etc.)** which help reduce system losses, increase system voltage and efficiency and optimise the system design
- Optimisation and increase of the **lifetime** of all components (e.g. system concepts ensuring long lifetime even under extreme ambient conditions)
- Optimisation and development of photovoltaic systems in terms of **performance and functionality** (including intelligent systems, innovative system application and topologies as well as interactions with buildings and grids, electronics and intelligent modules, loads or storage systems)
- Research and development of **inorganic/organic hybrid solar cells and technologies** e.g. optimised nano-structuring, cost-efficient methods, embedding organic semiconductors between inorganic nanorods etc.
- Development and testing of new **quality assurance methods and tools** at component and system level, e.g. simulation and early detection of defects and failures, analysis of ageing mechanisms and their interactions, fire protection, monitoring of performance parameters in terms of geographical, topographical, climatic or ambient impact, development of measurement and testing methods for innovative PV technologies etc.
- **Upscaling of pilot production** of novel solar cell designs
- **Ultra-short term prediction** (nowcasting) of solar radiation using different measurement instruments (sky cams etc.): development of data acquisition and processing systems and prediction models, business cases and use scenarios.

### TA 3/3.3 Solar Thermal Energy

The funding priorities are focused on reducing cost through mass production and easy installation as well as increasing efficiency in solar thermal energy production. The following R&D areas are based on the "Roadmap: Solar Heat 2025" commissioned by the Ministry for Transport, Innovation and Technology (bmvit), the Ministry of Agriculture, Forestry, Environment and Water Management (bmlufw) and the Ministry of Science, Research and Economy (bmwfw), which was published in December 2014.

The Call addresses (further) developments and demonstration in the following fields:

- **New materials** (e.g. polymer materials, nano-materials) for collectors and system components
- **Unglazed low-temperature collectors** for hybrid systems
- Standardised system solutions for **large-scale solar thermal systems (> 0.5 MW)** offering a better price-performance ratio, e.g. (self-supporting) collector fields, aerodynamic collector geometries, optimised hydraulics, innovative control systems, calculation and simulation tools for designing systems with guaranteed performance
- High-performance **medium-temperature collectors** in the temperature range between 100 and 250°C for application in industry, district heating or new power plant concepts in the medium capacity range (hybrid combined heat, power and cooling systems)
- Development and demonstration of **prefabricated multifunctional solar facade systems** (combined with thermal insulation, energy conversion (power and heat), storage, ventilation and sanitary installations as well as transparent building elements)
- Low-cost and highly efficient **recooling systems** for both thermally and electrically driven cooling systems taking special account of power consumption, water consumption, hygiene and cost in connection with the site of deployment (climatic zone) (e.g. 2-stage chiller combined with new collector technology, optimised control strategies etc.)
- Testing methods for **lifetime prediction** (e.g. performance stability, ageing behaviour) under realistic service conditions (e.g. specimen and component testing for plastic collector components)

The installation of solar thermal pilot systems with a collector area of over 50 m<sup>2</sup> or 100 m<sup>2</sup> as well as measurement methods for performance and quality analysis can be funded under the "Large-Scale Solar Thermal Plants Subsidy Scheme" of the Climate and Energy Fund.



### TA 3/3.4 Deep Geothermal Energy

In Austria, there are three promising regions for geothermal development: the Vienna Basin, the Styrian Basin and the Molasse Zone.

The following R&D areas are based on the study “Geo-Energy 2050: Potential of Deep Geothermal Energy for District Heating and Power Production” commissioned by the Austrian Climate and Energy Fund, which was completed in June 2014.

Research funding is available for the advancement of technologies for the cost-efficient generation and use of heat and power from geothermal reservoirs for applications in thermal grids as well as in trade and industry. Another focus is on exploration risk assessment and seismic exploration of potential sites with a view to prospecting and exploiting hydrothermal reservoirs in Austria.

The following topics are of particular interest:

- **Materials research** for the development and expansion of geothermal wells, prospection and exploitation of geothermal reservoirs and plant operation taking into account the impact of high temperatures, high pressure and high corrosiveness
- Processes and methods for the **numerical modelling and simulation of geothermal reservoirs** and use of mathematical-physical methods for analysing, predicting and optimising the geothermal system and its individual components (exploration, drilling, reservoir management etc.) in order to quantify the exploration, drilling and operation risks
- (Further) development of **system components and exploration technologies** such as seismic methods, drilling technologies, innovative exploration methods or the development and optimisation of components designed for geothermal applications (e.g. pumps, filters, measurement systems, pipes) involving high temperatures, pressures and corrosive conditions as well as reliable and energy-efficient low-maintenance operation
- Adaptation and optimisation of technologies and systems for **electricity generation in geothermal power plants** (organic Rankine cycle [ORC] and Kalina cycle plants) and adaptation to the geothermal conditions in Austria (temperatures below 100°C, maximum discharge rates of 100 l/s) and the development of suitable recooling concepts
- Collection, assessment and interpretation (for the broad public) of (existing) **geophysical and seismic data**, definition of geothermal aquifers, depths, thicknesses, temperature levels and fault zones of these aquifers

### TA 3/3.5 Heat Pumps

Heat pump technology is influenced by all European guidelines aimed at increasing energy efficiency and the share of renewable energy sources as well as to reducing greenhouse gas emissions.

In order to enhance the competitiveness of heat pumps in the future, it is necessary to reduce the system costs for applications in vehicles, buildings (new buildings and renovation), district heating/cooling networks and in industry in general.

The following R&D areas are based on the strategy paper “Research and Innovation for Heating and Cooling with Renewable Energy Sources” commissioned by the bmvit, which was completed in April 2014.

This Topic Area addresses the development of new materials and working substances, the development and optimisation of components and systems as well as technological solutions for effective integration of these technologies into smart grids, in particular:

- **Outside air heat pumps** enabling hot water generation even at low outside temperatures
- **Micro-heat pumps** below 2 kW, e.g. through (further) development or deployment of suitable (e.g. modulating) compressors or the development of refrigeration cycles for systems combined with heat-recovery ventilation etc.
- **High-temperature heat pumps** through new refrigerants and refrigeration cycle concepts for higher temperature levels, new heat exchangers, e.g. for direct use of condensed gases (flue gas, exhaust air, drying processes etc.), compressors and lubrication methods for evaporation temperatures of up to 100 °C
- **Sorption heat pumps**, e.g. gas-driven absorption heat pumps or sorption systems for thermally driven cooling (e.g. desiccant systems combined with air humidification and dehumidification)
- Highly efficient low-noise **heat pump components** and their **interactions** in terms of energy and noise reduction throughout the year
- **Noise absorption measures** for the heat pump and the buildings in the immediate vicinity
- Concepts for **efficient hot water supply**, e.g. use of waste heat for cooling
- Generic **integration and control concepts**
- **Combined heat source systems** (e.g. ground/air) to reduce space requirements

### TA 3/3.6 Hydropower

Austria has a long tradition of using hydropower. Hydropower forms a cornerstone of the country's renewable energy policy and supplies over half of the national power requirements. Hydropower plays an important role in the energy mix covering both base load as well as providing a buffer during periods of peak load.

In contrast to conventional hydropower, exploiting the power of the sea is still only in the demonstration phase. As a technology provider, Austrian industry has the greatest opportunities in growing export markets.

The R&D focus areas listed below are based on the "Hydro Equipment Technology Roadmap" issued by the Hydro Equipment Association in 2013.

The following research areas are of particular interest:

- **Materials development**, e.g. for wear-free generators and corrosion- and erosion-resistant materials for hydropower and marine energy installations
- **Provision of flexibility** (e.g. grid services such as primary reserves or cold starts for the grid): new generation of turbines and pumps with variable speeds (0 % to 100 % load), modularisation of plant components, power electronics and electronic inverters, modelling and simulation of interactions between hydropower plant and grid etc.
- **Increase in hydropower production** through modernisation, new hydropower plants and multi-functional application of hydropower: optimisation of the thermal and electromagnetic design of generators based on simulation and validation, computer-based methods for modelling the interaction between water and turbine structure (virtual test rigs), new methods and tools for lifetime prediction and quality assurance at component level
- **Increase in the application range of pumped storage power plants** (small pump storage systems between 1 to 20 MW, pump storage systems for low head hydropower [10 to 30 metres] for use at sea coasts, pump storage systems for high-head hydropower [up to 1400 metres] for use, e.g. in abandoned underground tunnels; pump storage systems which can transport greater density in addition to water and can, thus, be operated in a space-saving manner): standardisation of components and technologies, new turbine design for upgrade of pump storage facilities and low-head turbine solutions etc.
- (Component) Development and demonstration of **controllable micro-hydropower plants** in the distribution network

- Maximal **sustainable hydropower expansion**: substitution of mineral oil products for turbine lubrication (e.g. biodegradable lubricants, lubricant-free bearings), fish-friendly design, use of residual water for energy production

### TA 3/3.7 Wind Power

Research funding is focused on developing **technology for micro, small and large wind power plants for use on buildings, on land and at sea**. Research and technology development projects which also consider the potential of decreasing the ecological footprint of plant engineering (construction, operations, repowering, removal, recycling and materials selection) are encouraged.

In principle, funding is available for studies accompanying larger R&D projects that examine the social acceptance of technological developments. These studies should be formulated as best practice measures and help drive wind power expansion in Austria.

The Climate and Energy Fund supports the following R&D areas with the aim of reducing specific costs whilst increasing the availability and environmental sustainability of wind power plants:

- Development and use of **suitable materials**, e.g. lightweight design, hybrid materials, plastic components, materials and composites for modular design, optimised casting materials, optimised surface coatings for corrosion protection as well as avoidance of ice formation etc.
- **Transfer of findings from other technology areas**, e.g. aerospace, bionics
- Development of new **drivetrain concepts and configurations**, further development and increase in the reliability of gears and bearings, concepts for grid support and provision of system services including effects on drive train loading
- (Further) Development of **electronic components and elements**, e.g. generators, power electronics, sensor technology
- (Further) Development of **rotor blades** (aerodynamic and aeroacoustic properties, weight reduction, innovative control concepts)  
Projects involving the (further) development of small-scale wind power plants must take into account the special framework conditions (low wind speed, high turbulence) and the working principle and optimisation of energy concentrators.
- (Cross-company) **Standardisation** of components, assemblies and interfaces with the aim of reducing production costs

- (Further) Development of innovative and cost-efficient **foundation and tower concepts** for on-shore and off-shore wind power plants, e.g. corrosion protection, further development in view of increasing plant sizes (e.g. lattice towers)
- Optimisation and cost reduction of **construction and logistics processes as well as maintenance and operation** (e.g. condition monitoring systems for plants or components and/or innovative information and communication technologies for control, remote diagnosis and repair)
- Technological adjustment and optimisation of wind power plants to **site-specific conditions in Austria**, e.g. aviation safety requirements (lighting), wind power in (pre-)alpine areas (e.g. ice throw) or in forested areas

Installation and associated technical research in test fields and test sites, i.e. on commercial wind farms, is welcome as a means of testing the technologies in practice.

## TOPIC AREA 4 Smart Grids

The growing share of renewable energy and distributed power generation requires adaptations to the energy grids. The research topics range from the development of new components and equipment, simulation for planning and interoperable safe grid operation through to demonstration.

Applicants are encouraged to submit research and technology development projects involving infrastructure development across energy sources.

No funding is available for the development of “smart-meters” and innovative approaches to the visualisation of energy consumption behaviour.

**NOTE:** Research projects primarily focusing on smart grid applications in urban energy systems are not part of this Call. Such projects can be submitted to the bmvit funding programme “City of the Future” or the “Smart Cities Demo” programme of the Climate and Energy Fund.

### TA 4/4.1 Power Grids

This topic focuses on the development of innovative, technically mature solutions for the planned long-term investments in the power grid and the demonstration in real-world energy systems and grid sections.

The following R&D areas are based on the results of the **Smart Grids 2.0** strategy process initiated by the bmvit. The following topics are of special interest:

- System architectures for the integration of **information and communication technologies (ICT)** in future smart grids with a special focus on interoperability, security, safety, privacy, resilience and system convergence
- Open **interoperable ICT, control and automation solutions** for the integration of distributed energy resources and storage units
- **Methods and concepts supporting the development process** – from design to evaluation to validation – **of smart grid components and systems** with the aim of shortening time to market, e.g. model-based design concepts for smart grid automation systems, information models for system, application, control and communication aspects etc.
- Approaches and methods for the **flexible configuration of electrical storage systems** in terms of operational strategy, communication interfaces and components (battery, inverter, control)
- Methods for the support and monitoring of grid integration of generators and electric mobility taking into account the **interactions with energy and communication networks**
- **Data-based analysis of meter and sensor data for grid monitoring** to improve system efficiency, load modelling and forecasting. Cross-domain linking of data sources for enhanced data analysis of system energy efficiency (e.g. traffic models, wind, PV, meteorology)
- **Optimised use, forecast and prediction models** taking into account demand response, including proof of concept
- **Methods, tools and basic technologies**, e.g. safety-relevant grid components, power electronic systems, hybrid systems (e.g. transformers with additional functions based on power electronics), semiconductor technologies (new topologies for silicon [Si] and wideband gap [WBG]), passive components, cooling technologies, integration of communication technologies into smart grid components etc.) for innovative, secure and reliable **smart grid architectures** designed to enhance the security, reliability and efficiency of future energy systems
- Components and systems (e.g. architectures, control approaches, communication etc.) for the **integration of grid-coupled storage and power-to-gas systems** into smart grid concepts and applications (e.g. grid services, provision of flexibility etc.)
- Innovative **monitoring, diagnosis and control concepts** for intelligent energy networks
- **Resilient and future-proof ICT solutions** for the integration of distributed energy sources and

storage systems for reliable smart grids and methods for determining the reliability of networked smart grid systems

- **Validation and testing methods** for smart grids/power systems

The Climate and Energy Fund requests applicants to refer to the Smart Grid Architecture Model (SGAM, developed as part of the European standardisation mandate M490) in their application (in particular the project concept, project structure and work schedule).

**NOTE:** Research projects exclusively focusing on technological ICT principles are not part of this Call. Such projects can be submitted to the bmvit funding programme "ICT of the Future".

## TA 4/4.2 Thermal Grids

The Austrian Climate Change Adaptation strategy gives expanding district heating and cooling networks high priority. The Call encourages the submission of system solutions for highly integrated thermal grids (heating and cooling networks) designed to cope with the dynamic developments in thermal energy supply and grid operation, future grid expansion and integration of different technologies (heat and power from renewable energy sources, industrial waste heat, thermal storage systems etc.) as well as dynamic demand and load behaviour of consumers.

The following R&D areas are based on the results of the "R&D Roadmap for District Heating and Cooling: Innovations from Austria" commissioned by the Austrian Climate and Energy Fund, which was completed in October 2015.

The projects should explore the following aspects in connection with concrete, real-world energy systems and grid sections:

- **Development and optimisation of innovative concepts for transfer stations** as an interface between loads and district heating/cooling networks through (further) development and integration of new technologies (e.g. heat pumps for integration into the return flow), (further) development of innovative control concepts, cost-efficient integration of suitable sensors and actuators into existing transfer stations including fault detection algorithms
- **Power-to-heat** as a flexible option for the integration of renewable energies into district heating networks including (further) development of innovative generation technologies at the interfaces between energy

networks (e.g. micro CHP, high-temperature heat pumps [modular design for fast response-to-load changes, increase of annual coefficient of performance, cost reduction etc.]), novel integration concepts and control strategies. Research topics closely related to night storage heating are not part of this Call

- **Integration concepts for renewable heat** (solar thermal, (high-temperature) heat pumps, geo-thermal heat), e.g. investigation of centralised vs. decentralised approaches, cascade heat, hydraulics, innovative control concepts and operating strategies, "cold" district heating networks (flow temperatures 30 to 50 °C), development of specific components (e.g. [seasonal] thermal stores, standardised solar transfer stations for linking and controlling collector fields to ensure constant outlet temperatures) including micro-grids etc.
- Development and optimisation of **retrofitting strategies for existing networks** taking into account future requirements (distributed generation, load changes, temperature levels)
- Highly efficient **thermal cooling systems** including but not limited to the use of new materials for thermally driven adsorption, absorption and desiccant systems, efficient recooling units and system standardisation etc.
- Development of strategies and technologies for **reducing return temperatures** (e.g. optimisation of customer installations) and for **preventing legionella** in low-temperature networks

## Topic Area 5 Mobility and Transport Technologies for Optimised Energy Efficiency and Climate Protection

Traffic is one of Austria's largest emitters of greenhouse gases. In addition to continuing incremental improvements to established vehicle technologies, we need innovations which lead to efficient overall systems and significant ecological advantages to contribute to reaching agreed climate goals.

Vehicles with conventional drivetrains will continue to dominate the market in the short and medium term. Therefore, we need to optimise conventional drivetrains in order to significantly reduce CO<sub>2</sub> and pollutant emissions in the short term. If we are to reach the ambitious goals set out in the European Union's 2011 Transport White Paper, a key challenge will be developing energy-efficient drive technologies, integrating them into the overall vehicle concept and reducing vehicle weight.

Research will address all types of two- and four-wheel road vehicles as well as off-road applications. Evaluation criteria include significant increases in energy efficiency and strong reductions in greenhouse gas emissions. These must go far beyond incremental developments to existing technologies and demonstrate a high degree of innovation.

**Project submissions are exclusively limited to the following topic areas.**

**NOTE:** Research and development projects focusing on the development of alternative drives in TA 5/5.1 and TA 5/5.2 are not part of this Call. Such projects can be submitted to the “Mobility of the Future” programme of the bmvit or “Austrian Electromobility Flagship Projects” of the Climate and Energy Fund.

### TA 5/5.1 Combustion Engine Drivetrain Components and Integration into the Drive System

Further improvements of drivetrain components usually require a higher R&D effort than incremental improvements of combustion engines in order to meet the climate protection targets set out in this Call. The envisaged solutions must be able to be implemented economically assuming that costs will fall as production volumes rise. Planned improvements of combustion engines and drivetrains cannot come at the expense of pollutant emissions and must meet emission limits which are due to be tightened in the foreseeable future both on the test bench and on the road.

With regard to the objectives set out above, R&D projects in this field may cover **all components** in a conventional vehicle drivetrain (including highly efficient, extremely compact and affordable drivetrain components and subsystems), in particular:

- **Optimisation of the combustion engine** (including exhaust aftertreatment)
- Innovative **control systems**
- Optimisation of **auxiliary systems**
- **Adaptation of the combustion engine and the fuel system for alternative fuels**
- Optimisation of the **transmission** as an important interface between the combustion engine and the traction drive
- **Integration of the components into the overall drive system**

This topic area does not include control and development of alternative drives.

**Admissible instrument:** Cooperative R&D Project of Industrial Research or Experimental Development

### TA 5/5.2 Conventional Drivetrain Vehicle Systems

The second area covers improvements of the energy efficiency of vehicles with conventional drivetrains. Hence, the focus is on the **integration of the conventional drivetrain into the vehicle system** including development and testing tools (simulation and measurement equipment) which must lead to a significant increase in energy efficiency and a substantial reduction in greenhouse gas emissions.

Of particular interest are:

- **Optimised layout of the drivetrain**
- Innovative **electronic control** of all vehicle components for a complete energy-optimised vehicle including auxiliaries

The generic development of electronic components and control software is not part of this Call.

**Admissible instrument:** Cooperative R&D Project of Industrial Research or Experimental Development

### TA 5/5.3 Lightweight Construction/ Materials

The lightweight construction focus of the Call addresses projects designed to reduce the overall weight of the vehicle and its drive components in order to significantly increase energy efficiency and reduce greenhouse gas emissions. In contrast to TA 5/5.1 and TA 5/5.2, the lightweight projects invited under TA5/5.3 of this Call include all surface transport vehicles (two-wheel and four-wheel road vehicles of all vehicle classes and off-road applications such as rail vehicles and ships) and all drive systems (combustion engine and alternative drives).

The proposed projects may focus on developing and testing new materials and material combinations, on developing and applying virtual development and testing methods, on shaping new materials (including structural optimisation and bionics) and on developing bodyworks and vehicle parts from the individual components using appropriate joining techniques.

A key requirement is that the development of methods and materials is aimed at application in the overall vehicle and/or vehicle components rather than focusing on generic structural and materials research without relation to mobility applications.

Efficient manufacturing processes are vital if lightweight construction developments are to be successfully positioned in the market. Consequently, the projects' results must be economically realisable/practicable.

Life cycle assessments, including recycling, are an important factor for consideration when using new materials in overall vehicle structures and must be included in the project proposal.

Funding is available for projects in the following areas:

- Application of **light metals, plastics, bionic materials and composites** for use in vehicles (including characterisation in terms of computability)
- Innovative **lightweight design concepts** in vehicle construction and their simulation for the development process
- Innovative **forming, joining and machining processes** for optimised component design
- Use and combination of **innovative materials** for the development of lightweight components
- **Component integration for lightweight drivetrain and body design**

**Admissible instrument:** Exploratory Project, Cooperative R&D Project of Industrial Research or Experimental Development

## TOPIC AREA 6 Energy Storage Technologies<sup>11</sup>

The Call focuses on the development of cost-efficient energy storage technologies that implement innovative storage concepts, use new materials (storage material, insulation etc.) and can be optimised for specific applications. Funding is provided for research and development projects ranging from the development of the required simulation tools to the experimental implementation of new storage concepts for stationary and mobile applications as well as the development of innovative control systems for optimal integration into the load management of buildings, vehicles, processes or power and heat networks.

In the field of mobile applications, this Call is limited to mechanical storage technologies as well as thermal and thermochemical storage technologies for thermal

management in vehicles while battery development for vehicles is funded under the "Mobility of the Future" call of the bmvit. Synergies of the application of mechanical, thermal and thermochemical storage technologies in stationary and mobile applications must be exploited.

**NOTE:** Research projects primarily focusing on storage technologies for urban energy systems are not part of this Call. Such projects can be submitted to the bmvit funding programme "City of the Future" or the "Smart Cities Demo" programme of the Climate and Energy Fund.

### TA 6/6.1 Chemical Energy Storage

This topic invites the submission of projects aimed at increasing the power and energy density, cycle stability, system security and reliability of stationary storage systems and reduce their costs.

In the field of mobile applications, this Call only covers the development of thermochemical storage technologies for use in vehicles (e.g. sorption storage for thermal management of the passenger compartment, engine or catalyst).

A special focus is on the following topics:

- (Further) Development of **electrochemical accumulators** (e.g. lithium-ion, post-lithium and redox flow batteries): substantial increase in specific power and specific energy as well as energy density and power density through the use of novel storage materials and reduction in space requirements
- (Further) Development of **chemical energy storage media** and demonstration of the entire system chain from production to storage to use
- Innovative approaches, material and system developments for **thermochemical storage systems** (e.g. sorption systems)
- Methods and approaches for **assessing and improving the overall safety and security** (electrical, chemical, cyber security) of lithium-based storage devices at component and system level;
- Improved **monitoring and diagnosis methods for battery management systems** for optimal usage and safe operation of lithium ion batteries

<sup>11)</sup> Research and development projects focusing mainly on the "substitution of critical mineral resources" are covered by the "Production of the Future" programme.



## TA 6/6.2 Electrical/Electromagnetic Energy Storage

This topic is aimed at increasing the efficiency and reducing the costs of alternative central and distributed energy storage solutions.

- (Further) Development of **double layer capacitors**
- Innovative technical approaches and materials for **superconducting storage systems**

## TA 6/6.3 Mechanical Energy Storage

This topic is aimed at increasing the efficiency and reducing the costs of alternative central and distributed energy storage solutions.

Further development of pumped storage power plant technology is included in Topic Area 3/3.6 Hydropower.

A special focus is on the following issues:

- Development of new concepts for centralised and distributed **compressed air energy storage systems**: adiabatic concepts for the use of compression heat, modular compressed air energy storage etc.
- Development of innovative **flywheel energy storage systems**: improved bearing concepts or non-contact bearings, efficient coupling structures between mass storage units and motor/generator

## TA 6/6.4 Thermal Energy Storage

Research and development projects should focus on innovative thermal energy storage units with higher energy densities and functionality than conventional storage technologies and enable new applications in buildings, vehicles, thermal networks and industrial waste heat use for both heating and cooling. Research activities should include the areas of materials development, measurement and sensor technology, component and system design and environmental compatibility.

The Call addresses new thermal storage concepts for a broad temperature range (0–350 °C), concepts for scalable charging and discharging and measurement concepts for thermokinetic characterisation. The performance of benefit and life cycle analyses is encouraged.

Innovations are required in the following fields:

- Improved materials properties of **phase change materials (PCM)** and **thermochemical storage materials (TCM)** to increase storage kinetics (conductivity, moisture absorption), storage density, process capability, strength, cycle stability and ageing

- **Sensors and measurement methods** for quantifying storage capacity, state of charge and the process relevant parameters (state of matter, moisture, mass and volume flow rates etc.) and **calorimetric methods** for characterising materials properties under conditions relevant to practical application
- **Component development** aimed at reducing conversion losses, **reactor and process engineering methods** (e.g. improving heat transfer through sorption reactors) for open and closed sorption concepts
- **System concepts** for new applications (e.g. mobile heating and cooling systems with sorptive or latent heat storage)
- **Integration of thermal storage units into thermal processes (industry, CHPs, solar thermal plants) and thermal grids** as well as development of operating strategies, especially for temperature levels above 100 °C
- **Innovative system control** (predictive or adaptive control in combination with heat demand analysis), integration of grid management into distributed storage management, operation control for seasonal storage applications

## TOPIC AREA 7 R&D Services

In this category, the Climate and Energy Fund will provide funding for only 1 project. To be considered eligible for funding, the study must answer the key questions to the fullest possible extent and the application must obtain an excellent rating from the evaluation committee. The involvement of stakeholders in the project consortium will be an essential aspect in the evaluation.

### TA 7/7.1 Technology Roadmap: Adjusting Energy-intensive Industrial Processes to Fluctuating Energy Supply

The increasing share of fluctuating renewable energy sources creates the challenge of balancing power generation and consumption. Making consumption more flexible and using energy storage mechanisms are appropriate measures for overcoming this obstacle. The key issues associated with renewable power supply are mirrored in the challenges faced by the transmission and distribution infrastructure.

With energy-intensive industry in Austria responsible for around 30 % of final energy consumption, there is significant potential for improving flexibility. Energy-

intensive industrial processes optimally adapted for future energy systems featuring a greater share of fluctuating power generation need to be designed according to different principles than those applied to date. New approaches are required to go beyond pure demand side management and demand response, or at least fully exploit this potential within intelligent network structures. Future energy systems need technologies tailored to key processes in energy-intensive industries.

### Subject of the Call

The starting point for this R&D service is the question of how energy-intensive industrial processes can be designed to cope with fluctuating energy supply whilst maximising the use of renewable energy and integrating power, heat and gas networks and storage technologies in an intelligent manner. Fields of action for research, technology and innovation policy need to be identified. The technology roadmap is intended to create the preconditions which will enable Austria to become the key provider of these tailored technologies and processes by 2030.

The industries to be considered include the chemical and petrochemical, mechanical and industrial engineering, minerals, automotive, food and drink, non-iron, iron and steel, paper, cellulose and cement industries.

The following subjects are to be examined within the framework of this R&D service:

- **Modelling and evaluating the potential** to reduce energy supply costs in energy-intensive industries in Austria by 2050 through flexibility measures, to reduce greenhouse gas emissions, and to integrate surplus or fluctuating renewable energy in value creation processes;
- **Identify and classify key industrial processes** whose energy demands can be adapted so that they can be used to balance fluctuating energy supply taking economic aspects into account;
- **Analyse the technical, (energy) economic and legal framework conditions** involved in making energy-intensive industrial processes more flexible, and integrating them into the supply structure (network infrastructure topics, etc.);
- Define a **strategic research agenda** for the development of new, and adaption of existing, processes with the aim of efficiently using electricity generated from renewable sources in place of fossil fuels in energy-intensive processes: thematic focuses, timetable (short, medium and long term), RTI instruments

(basic research, industrial research, experimental development, demonstration), increasing the technology readiness level (determining starting point and goal) and qualitative evaluation of the benefits in Austria in terms of added value, the potential to reduce CO<sub>2</sub> and pollutant emissions, resource consumption and energy supply costs in industry, etc.;

- **Technology policy recommendations** designed to promote flexible energy-intensive processes adjusted to fluctuating power supply.

### Method

The technology roadmap must be drawn up according to the IEA guidelines on the development of energy technology roadmaps.

The method must be presented and substantiated in a clear and comprehensive manner in the proposal. Both the models used to assess potential and the measures to ensure data availability must be described in detail. The technology roadmap must be developed based on relevant national and international studies, expert interviews and workshops.

Close cooperation with companies, e.g. from energy-intensive industries, and relevant technology providers is necessary. Their willingness to cooperate must be documented in relevant form (e.g. written expression of interest, declaration of willingness to sit on a programme advisory board) and increases the relevance of the tender. Creating a website is not part of the R&D service.

### Qualification of bidders

Inter- and transdisciplinary cooperation between engineering and science disciplines and e.g. economics and law is required. The bidders must provide evidence of experience in the following areas:

- Development of technological concepts to increase efficiency and flexibility in industrial production including potential technology approaches;
- Analysis of technical, (energy) economic and legal framework conditions to increase flexibility in energy-intensive industrial processes;
- Technical, economic and ecological assessment of energy projects in the industrial sector.

**Instrument:** R&D Service

**Project duration:** max. 15 months. The research agenda must be presented in month 9 of the project.

**Budget:** max. EUR 120,000 (excl. VAT)

## TA 7/7.2 Innovative Energy Technologies for Sports Facilities

Sport is an important multiplier for climate protection and can help establish the topic as a social issue. The aim of this R&D service is to use international case studies to draw up instructions for planning and implementing strategies for sports facilities in Austria, and to develop guidelines for decision-makers and planners. The focus lies on sports facilities (especially stadiums, sports halls, etc.) which seat crowds of 10,000+.

### Subject of the Call

This R&D service is designed to explore the technical potential for an intelligent power supply and its integration into energy systems of sports facilities (new construction and refurbishment). Bidders are requested to develop action fields for innovative technological solutions, identify best practice examples at home and abroad, and draw up a technology catalogue of Austrian technology providers as well as guidelines for decision-makers in Austria:

- Identify, analyse and evaluate **action fields** for implementing innovative energy technologies in sports facilities. The evaluation must be made on the basis of (qualitative) criteria such as technical feasibility, efficiency, CO<sub>2</sub> reduction potential and degree of innovation.
- Identify and describe (incl. technical key data) at least 20 **best practice examples** worldwide, including 10 examples where sports facilities have been completely refurbished.
- Draw up **guidelines for decision-makers** including recommendations for implementation in sports facilities. Options for refurbishment as well as new construction must be outlined. A German and an English version must be provided.
- Draw up a **technology catalogue** as a reference for Austrian technology expertise. The catalogue must be provided in English and German.

The following topics must be covered:

- sustainable energy production;
- energy efficient building and end use technologies;
- energy networks & storage.

The following must be included:

- Description of 6 relevant best-practice examples from Austria and abroad which were implemented using Austrian technologies, including photos
- 1-page description for each technology provider, including logo and contact details

### Method

The method must be presented and substantiated in a clear and comprehensive manner in the proposal based on work packages. These include goals, description, methodology, milestones and results.

The tender must include a proposal for the structure and scope of the guidelines for decision-makers and for the structure of the technology catalogue.

Relevant actors, e.g. technology providers, designers and owners of sports facilities must be involved. Their willingness to cooperate must be documented in relevant form (e.g. written expression of interest) and increases the relevance of the tender.

The R&D service does not include creating a website or designing and printing the guidelines and the technology catalogue.

### Qualification of bidders

The bidder's technical and scientific expertise must be presented. The bidders must provide evidence of experience in the following areas:

- Development of energy concepts for large-volume buildings and structures;
- Research and technology development for renewable, efficient and intelligent energy technologies (components, control systems, overall system);
- Technical, economic and ecological assessment of energy projects in the field of large-volume buildings and structures.

**Instrument:** R&D Service

**Project duration:** max. 5 months

**Budget:** max. EUR 50,000 (excl. VAT)

# 4.0 Administrative Instructions

## 4.1 Specific requirements

### 4.1.1 Cooperative oriented basic research

Topic Area 1 “Emerging Technologies” focuses on **basic research in engineering and science disciplines** with an enhanced orientation towards future applications in the energy field. The Call invites research projects that are defined as oriented basic research in the Frascati Manual (OECD 2002):

“Oriented basic research may be distinguished from pure basic research as follows:

- Pure basic research is carried out for the advancement of knowledge, without seeking long-term economic or social benefits or making any effort to apply the results to practical problems or to transfer the results to sectors responsible for their application.
- Oriented basic research is carried out with the expectation that it will produce a broad base of knowledge likely to form the basis of the solution to be recognised or expected, current or future problems or possibilities.”

This Topic Area deliberately does **not focus on applied/ industrial research or experimental development** as is the case in Topic Areas 2 to 5. For definitions and differences between industrial research and experimental development see the Technical Guidelines for Cooperative R&D Projects.

#### Funding requirements

The Climate and Energy Fund has defined the following criteria and conditions in order to safeguard the character of **oriented basic research** in line with the goals of this Topic Area:

- A project qualifies as oriented basic research if more than half of the eligible project costs can be classified as TRL 1 and the remaining research activities do not exceed TRL 3 throughout the project duration (TRL = Technology Readiness Level as defined by the U.S. Department of Energy).
- At least 2 research institutions have to cooperate.
- The planned results must be relevant for a broad range of applications in the field of energy conversion, energy storage and energy efficiency. Evidence of this potential relevance for application can be provided as follows:

- **Submission of at least 1 Letter of Intent (LOI) of a company based in Austria upon application.** LOIs can be informal but must clearly state that

- The company in question is interested in the research activities and research results since these are of relevance for their own business and innovation activities.  
The company may, but is not required to, expand their commitment to support the project. A company may, for example, issue an LOI stating that they are willing to contribute their own experiences and expertise to the project in kick-off meetings, interim reviews or even during the project and, thus, strengthen the character of oriented basic research of research institutions and increase research efficiency in terms of potential future application.
- The LOIs must be duly signed and submitted via eCall.
- A larger number of LOIs will illustrate the high potential application relevance of the research topic.

- **Companies are eligible to participate as project partners, but do not receive funding.** Their participation must be justified in the proposal. The extent of their involvement can be specified in the funding agreement. For details please refer to the Technical Guidelines for Cooperative Projects of Oriented Basic Research.
- The projects must be characterised by high complexity and development risks.
- The projects must be characterised by high R&D efficiency and effectiveness.
- The Funding of **literature analyses is limited to max. 10 % of total eligible costs.**
- The funding of **dissemination activities** is limited to **scientific publications and presentations** of (interim) research results to potential future Austrian industry and science partners (not limited to companies that have contributed LOIs for the application) and science.
- Events and publications addressed to **the general public** and the preparation and maintenance of project websites are not eligible for funding.

## Classification according to technology readiness levels

The following diagram and descriptions illustrate the concept of the 9 technology readiness levels (TRL) defined by the U.S. Department of Energy. The definitions of TRLs 1 to 3 are provided to enable a correct assignment of the projects in accordance with the specified goals. The description of TRL 4 is provided to illustrate the distinction between TRL 3 and TRL 4.

### TRL 1: Basic principles observed and reported

This is the lowest level of technology readiness. Scientific research begins to be translated into applied R&D. Examples might include paper studies of a technology's basic properties or experimental work that consists mainly of observations of the physical world. Supporting information includes published research or other references that identify the principles that underlie the technology.

### TRL 2: Technology concept and/or application formulated

Once basic principles are observed, practical applications can be invented. Applications are speculative, and there may be no proof or detailed analysis to support the assumptions. Examples are still limited to analytic studies.

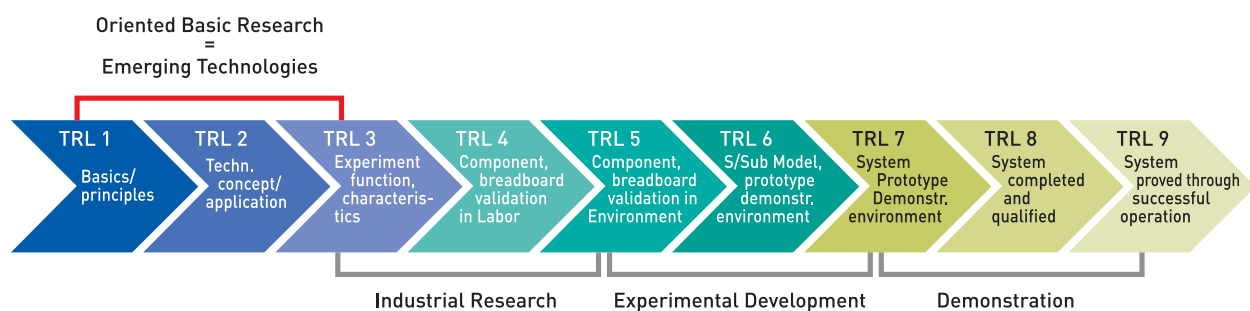
Supporting information includes publications or other references that outline the application being considered and that provide analysis to support the concept. The step up from TRL 1 to TRL 2 moves the ideas from pure to applied research. Most of the work is analytical or are paper studies with the emphasis on understanding the science better. Experimental work is designed to corroborate the basic scientific observations made during TRL 1 work.

### TRL 3: Analytical and experimental critical function and/or characteristic proof of concept

Active Research and Development (R&D) is initiated. This includes analytical studies and laboratory-scale studies to physically validate the analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative tested with simulants (simulants should match relevant chemical and physical properties). Supporting information includes results of laboratory tests performed to measure parameters of interest and a comparison to analytical predictions for critical subsystems. At TRL 3, the work has moved beyond the paper phase to experimental work that verifies that the concept works on simulants as expected. Components of the technology are validated but there is no attempt to integrate the components into a complete system. Modelling and simulation may be used to complement physical experiments.

### TRL 4: Component and/or system validation in laboratory environment

The basic technological components are integrated to ensure that the pieces will work together. This is relatively "low fidelity" compared with the eventual system. Examples include integration of ad-hoc hardware in a laboratory and testing with a range of simulants and small-scale tests on actual waste. Supporting information includes the results of the integrated experiments and estimates of how the experimental components and experimental test results differ from the expected system performance goals. TRL 4 to 6 represent the bridge from scientific research to engineering. TRL 4 is the first step in determining whether the individual components will work together as a system. The laboratory system will probably be a mix of on-hand equipment and a few special purpose components that may require special handling, calibration or alignment to make them function.



Source: Representation based on a diagram by the U.S. Department of Energy

A description of all technology readiness levels of the underlying concept and supporting information for project classification can be found in the Technology Readiness Assessment Guide DOE G 413.3-4A, 9-15-2011 (pages 9 to 12, Appendix A Glossary and Appendix F), of the U.S. Department of Energy available at: [www.directives.doe.gov/directives/0413.3-EGuide-04a/view](http://www.directives.doe.gov/directives/0413.3-EGuide-04a/view)

The Technology Readiness Assessment Guide DOE G 413.3-4A, 9-15-2011, of the U.S. Department of Energy is for orientation only and does not form an integral part of the Call documents.

## 4.1.2 Flagship projects

### Expression of interest

The Climate and Energy Fund requires consortia intending to submit a flagship project to submit an expression of interest by 23 September 2015 ([energieforschung@ffg.at](mailto:energieforschung@ffg.at)).

The expression of interest is not legally binding and will be treated confidentially. It will not be submitted to a jury and is not used for the preselection of projects. A template for the expression of interest is available at: [https://www.ffg.at/sites/default/files/allgemeine\\_downloads/thematische%20programme/Energie/eoi\\_leit-projekte\\_energieforschung.doc](https://www.ffg.at/sites/default/files/allgemeine_downloads/thematische%20programme/Energie/eoi_leit-projekte_energieforschung.doc)

### Obligatory preliminary meeting

In order to clarify stipulations and requirements, the submission of a flagship project requires an obligatory preliminary meeting with the Climate and Energy Fund and the Austrian Research Promotion Agency at the latest 1 month prior to the submission deadline. For more information, see the Technical Guidelines.

## 4.1.3 R&D Services

Please note that the financing of R&D Services forms an exemption as stated in sec. 10 para. 13 of the 2006 Public Procurement Act (BVerG) and is, thus, subject to a tendering process. The Climate and Energy Fund is the contracting entity for the R&D Services instrument. The FFG funding agency acts in the name and for the account of the Climate and Energy Fund.

The tender must include all information relevant for the assessment in accordance with the requirements specified in the present document.

By submitting a tender, the tenderer accepts the con-

tent of the present Guide and all other relevant documents in their entirety.

If a (sub-)contractor is mentioned in several tenders, the tenders in question will be excluded from the tendering process if it can be assumed that this multiple participation leads to a restriction or distortion of competition.

### Supplementary information

Requests for supplementary information about the R&D Services shall be sent exclusively by e-mail to the FFG ([energieforschung@ffg.at](mailto:energieforschung@ffg.at)) at the latest 21 days prior to the submission deadline, specifying the sender address (e-mail). The Climate and Energy Fund and the FFG will answer the requests as soon as possible, but at the latest 11 days prior to the submission deadline. The questions and answers will be published on the websites of the Climate and Energy Fund and the FFG. Requests for information cannot be sent after this date. The Climate and Energy Fund and the FFG will not comment on the evaluation of the tenders submitted during the tendering process.

### Public relations for a project

In addition to complying with the standard reporting obligations to the FFG specified in the financing contract, the recipient must coordinate all publications and presentations concerning a financed work or its results with the Climate and Energy Fund.

The project results will be published online on a programme website hosted by the Climate and Energy Fund. Costs incurred in the creation of project websites are not eligible for financing.

### Project advisory board

The R&D Services will be supported by project advisory boards consisting of representatives of the Climate and Energy Fund, bmvit and FFG. The Climate and Energy Fund will appoint additional experts from politics, science and business to the board, if required.

The task of the project advisory boards is to discuss the project results at a scientific and political level. They provide the opportunity to introduce the project results into political, social or scientific debate via different stakeholder groups.

Following signature of the contract, a kick-off meeting of the contracting parties and the project advisory board will be held in coordination with the contractor.

A meeting of the board members and the contracting parties will be held 4 weeks prior to the submission



deadline of interim and/or final reports, at least once a year.

The costs of preparation of and participation in such meetings must be taken into account in the tender.

## 4.2 Bonus for multilateral networking of industrial research activities

Energy and mobility technologies offer Austrian companies the chance to leverage their status as technology pioneers, not only in their national markets but particularly for export.

The Climate and Energy Fund supports Austrian companies wishing to take part in current Austrian International Energy Agency (IEA) activities or transnational (D-A-CH) partnerships within the framework of their own research and development activities.

Austrian companies take part by networking their energy research project with Austrian IEA projects or transnational (D-A-CH) research projects ("partner projects") and undertake joint activities to exchange research results.

These activities, including involvement in drawing up technology roadmaps, taking part in surveys, contributing to technology reports and policy papers and participating in workshops, can be included in the dissemination work package.

### Scale of funding

The funding available for these additional networking activities amounts to a maximum of 10 % of the total eligible costs for each company partner taking part in the networking activities, with a maximum annual funding limit of 7,000 euros per company partner.

### Preconditions

When deciding to fund these additional activities, the Climate and Energy Fund applies the following criteria and conditions with the aim of ensuring multilateral knowledge transfer:

- Outlining the networking activities in a separate work package should be part of the project description and a separate statement of the associated costs in the cost plan.
- The submission should be accompanied by a signed letter of interest by the project manager of the Austrian IEA project (task or annex) or, for transnational partnerships (D-A-CH), the coordinator of the foreign research project.
- If, upon submitting the project no funding agree-

ment or valid funding contract for the "partner project" is available yet, then the relevant project manager must confirm that an application for funding the "partner project" will be, or has been, made. The project description must be accompanied by information including the programme name, submission deadline, funding agency, short description etc.

- If a positive funding decision is made in the present Call, funding of the "partner project" is **not a prerequisite** for the conclusion of the relevant funding agreement. However, the costs for the multilateral networking work package will only be recognised after presenting proof that the "partner project" has been realised.
- If a relevant work package is included in the work plan, funding for the work package requires explicit approval from the jury.

These measures are a pilot scheme which will be evaluated for goal achievement. The results of this evaluation will determine whether these measures will be included in future calls.

### For more information, please contact the FFG:

**DI<sup>in</sup> Maria Bürgermeister-Mähr**

Programme Manager IEA

Telephone: +43 5 7755-5040

E-mail: maria.buergermeister-maehr@ffg.at

**DI<sup>in</sup> Karin Hollaus**

Telephone: +43 5 7755-5046

E-mail: karin.hollaus@ffg.at

## 4.3 Submission details

### 4.3.1 Research funding from the FFG

Projects must be submitted exclusively via **eCall** at <https://ecall.ffg.at>. The **project description** (scientific application) and the **cost plan** (spreadsheet part of the application) must be attached to the electronic application using the eCall upload function.

Applicants are requested to use the relevant templates. The funding conditions, application deadlines and funding criteria are described in the corresponding **Technical Guidelines**.

### 4.3.2 Supplementary environmental funding from Kommunalkredit Public Consulting

Cooperative R&D Projects for Experimental Development and Flagship Projects funded by the Austrian Climate and Energy Fund may also receive funding for demonstration and pilot facilities in cooperation with KPC under the 2015 funding guidelines of the National Environmental Fund (UFI). More detailed information on the relevant application modalities will be made available in a separate information sheet by the end of July 2016 at [www.ffg.at/3-AusschreibungEnergieforschung](http://www.ffg.at/3-AusschreibungEnergieforschung).

**NOTE:** If the funded measure qualifies as an energy saving measure in terms of end consumption according to the Federal Energy Efficiency Act (EEffG) it will be credited to the Climate and Energy Fund as a strategic measure according to § 5 (1) 17 of the EEffG in proportion to the funding granted. Obligated third parties may claim the eligible measures (in whole or in part) only for the part of the project costs exceeding the funding granted by the Climate and Energy Fund. This applies in particular if the measures are transferred by the funding recipient to the third party for the purpose of crediting them towards individual obligations according to § 10 EEffG.

The relevant documents are summarised in the following.

#### Overview of Call documents – funding

available for download at: [www.ffg.at/3-Ausschreibung-Energieforschung](http://www.ffg.at/3-Ausschreibung-Energieforschung)

<b>Cooperative Basic Research</b>	<ul style="list-style-type: none"> <li>– Technical Guidelines for Cooperative Basic Research</li> <li>– Project Description for Cooperative Basic Research</li> </ul>
<b>Exploratory Projects</b>	<ul style="list-style-type: none"> <li>– Technical Guidelines for Exploratory Projects</li> <li>– Project Description for Exploratory Projects</li> <li>– Declaration of Cooperation for Exploratory Projects</li> <li>– Declaration of SME Status (if required)**</li> </ul>
<b>Individual Projects IR*</b>	<ul style="list-style-type: none"> <li>– Technical Guidelines for Individual Projects IR</li> <li>– Project Description for Individual Projects IR</li> <li>– Declaration of SME Status (if required)**</li> </ul>
<b>Cooperative R&amp;D Projects IR or ED*</b>	<ul style="list-style-type: none"> <li>– Technical Guidelines for Cooperative R&amp;D Projects</li> <li>– Project Description of Cooperative R&amp;D Projects</li> <li>– Declaration of SME Status (if required)**</li> </ul>
<b>Flagship Projects</b>	<ul style="list-style-type: none"> <li>– Technical Guidelines for Flagship Projects</li> <li>– Project Description for Flagship Projects</li> <li>– Declaration of SME Status (if required)**</li> </ul>
<b>R&amp;D Services</b>	<ul style="list-style-type: none"> <li>– Technical Guidelines for R&amp;D Services</li> <li>– Affidavit (eCall)</li> <li>– Declaration of Commitment (eCall)</li> <li>– Tender</li> <li>– Model Contract</li> </ul>
<b>General cost regulations</b>	<ul style="list-style-type: none"> <li>– Cost Guidelines_2.0 (guidelines for the accounting of project costs)</li> </ul>

\*) IR: Industrial Research, ED: Experimental Development

\*\*) If no data is contained in the Austrian Business Compass (e.g. for associations, start-ups), a Declaration of the SME Status must be provided upon submission of the application. Applicants are requested to use the template provided by the FFG to categorise their enterprise for the last three years (as far as possible) according to the SME definition.

### 4.3.3 Business funding from aws

The “mission2market” and “study2market” instruments of the Climate and Energy Fund provide funding for small- and medium-sized enterprises (SMEs) active in the fields of energy, mobility and building technologies. Applications are to be submitted directly to the Austria Wirtschaftsservice (aws), Walcherstraße 11, 1020 Vienna.

**Applications can be submitted on an ongoing basis.**

#### Target group

Small- or medium-sized enterprises (SMEs as defined in EU Competition Law) which have preferably carried out a research and development project as part of a relevant programme (e.g. Energy Research Programme of the Climate and Energy Fund, Smart Cities Initiative, City of the Future, Austrian Electromobility Flagship

Projects, Mobility of the Future). The project should have led to a marketable product/service.

#### mission2market

“mission2market” supports companies and start-ups in the fields of market analysis, business models and search for strategic industrial partners. Up to 3 analysis modules are available for each company.

[www.awsg.at/mission2market](http://www.awsg.at/mission2market)

#### study2market

The instrument “study2market” of the Climate and Energy Fund is designed to support the transfer of research results into the market by co-funding preparatory studies for investment projects. Funding is provided for external consulting costs up to a maximum of 50 % or 100,000 euros.

[www.awsg.at/study2market](http://www.awsg.at/study2market)

The aws funding instruments for the support of business investments are available on an ongoing basis.

### 4.4 Legal basis

Funding is subject to the guidelines for the promotion of economic/technical research, technological development and innovation (“FTI-Richtlinie 2015”, “Themen-FTI-RL”) pursuant to Section 11 (1–5) of the Research and Technology Promotion Act (FTFG) of the Federal Minister for Transport, Innovation and Technology (file no. bmvit-609.986/0011-III/12/2014) and of the Federal Minister for Science, Research and Economics (file no. bmwa-97.005/0003-C1/9/2014).

The company size shall be established in accordance with the corresponding SME definition specified in EU

competition law (from 1 January 2005: definition of small- and medium-sized enterprises in accordance with Commission Recommendation 2003/361/EC dated 6 May 2003, (OJ L 124 of 20 May 2003, pp. 36–41).

All EU provisions shall be applicable as amended.

Projects managed under programmes of the Climate and Energy Fund are subject to Section 7 (10) of the Climate Fund Act (KLI.EN-FondsG), which stipulates that the Executive Board of the Climate and Energy Fund decides on the granting of funding, the placing of contracts and the granting of financing for specific measures.

### 4.5 Data protection and publication of funding decision

In the event of a positive funding decision, the Climate and Energy Fund reserves the right to publish the name of the funding applicants, the funding decision, the rate and amount of funding as well as the title and a brief description of the project. All project applications submitted will only be forwarded to the departments and persons responsible for programme management as well as to the programme owner. All persons involved are bound by strict confidentiality rules.

### 4.6 Open Access – notes on publication

Visibility and easy availability of innovative results are essential to increase the impact of the programme. Where possible, all project results achieved under the programme will thus be published and made available online ([www.energieforschung.at](http://www.energieforschung.at), planned as from October 2016) by the Climate and Energy Fund in accordance with the principle of open access.

The projects funded under this Call and their results will be made available to the public in compliance with the Recommendation of the European Commission (2012/417/EU) on Open Access. The open access provisions do not apply to confidential information (e.g. related to patent applications or personal data).

To be able to present the project results in a clear and comprehensible manner, instructions for reporting on projects funded and carried out under the Energy Research Programme and corresponding events are made available in reporting guidelines, which also form an integral part of the agreement.

# 5.0 Contact and Advice

## 5.1 Programme mandate and responsibility

### Climate and Energy Fund

Gumpendorfer Strasse 5/22, 1060 Vienna  
Telephone: +43 1 585 03 90-0  
Fax: +43 1 585 03 90-11  
Email: [office@klimafonds.gv.at](mailto:office@klimafonds.gv.at)  
[www.klimafonds.gv.at](http://www.klimafonds.gv.at)

### CONTACT

#### **Mag.<sup>a</sup> Elvira Lutter**

Telephone: +43 1 585 03 90-31  
Email: [elvira.lutter@klimafonds.gv.at](mailto:elvira.lutter@klimafonds.gv.at)

## 5.2 Programme management

### Austrian Research Promotion Agency (FFG)

Thematic Programmes  
Sensengasse 1, 1090 Vienna  
Email: [energieforschung@ffg.at](mailto:energieforschung@ffg.at)  
Fax: +43 5 77 55-95040  
[www.ffg.at](http://www.ffg.at)

### INFORMATION AND ADVICE

#### **DI<sup>in</sup> Gertrud Aichberger** (Programme Leader)

Telephone: +43 5 77 55-5043  
Email: [gertrud.aichberger@ffg.at](mailto:gertrud.aichberger@ffg.at)

#### **DI Manuel Binder**

Telephone: +43 5 77 55-5041  
Email: [manuel.binder@ffg.at](mailto:manuel.binder@ffg.at)

#### **DI Johannes Bockstefl**

Telephone: +43 5 77 55-5042  
Email: [johannes.bockstefl@ffg.at](mailto:johannes.bockstefl@ffg.at)

#### **DDI<sup>in</sup> Ursula Bodisch**

Telephone: +43 5 77 55-5047  
Email: [ursula.bodisch@ffg.at](mailto:ursula.bodisch@ffg.at)

#### **DI<sup>in</sup> Maria Bürgermeister-Mähr**

Telephone: +43 5 77 55-5069  
Email: [maria.buergermeister-maehr@ffg.at](mailto:maria.buergermeister-maehr@ffg.at)

#### **Vukasin Klepic, MSc**

Telephone: +43 5 77 55-5069  
Email: [vukasin.klepic@ffg.at](mailto:vukasin.klepic@ffg.at)

#### **Mag. Urban Peyker, MSc**

Telephone: +43 5 77 55-5049  
Email: [urban.peyker@ffg.at](mailto:urban.peyker@ffg.at)

#### **Mag. Robert Schwertner**

Telephone: +43 5 77 55-5045  
Email: [robert.schwertner@ffg.at](mailto:robert.schwertner@ffg.at)

### TEAM LEADER ENERGY & ENVIRONMENT

#### **DI Mag. (FH) Clemens Strickner**

Telephone: +43 5 77 55-5060  
Email: [clemens.strickner@ffg.at](mailto:clemens.strickner@ffg.at)

The assignment of the topic areas to the individual FFG experts is shown in the table overleaf.

<b>1. Emerging Technologies</b>		Aichberger
<b>2. Energy Efficiency and Energy Saving</b>	2.1 Energy Efficiency in Trade and Industry 2.2 Energy Efficient Products 2.3 Fuel Cells and Hydrogen 2.4 Hybrid Systems for Heating, Cooling and Ventilation	Aichberger, Peyker Schwertner, Bocksteff Bürgermeister-Mähr Schwertner, Bocksteff
<b>3. Renewable Energies</b>	3.1 Bioenergy 3.2 Photovoltaics 3.3 Solar Thermal Energy 3.4 Deep Geothermal Energy 3.5 Heat Pump 3.6 Hydropower 3.7 Wind Power	Bürgermeister-Mähr Binder Aichberger Bodisch Aichberger Aichberger Bodisch
<b>4. Smart Grids</b>	4.1 Power Grids 4.2 Thermal Grids	Peyker Aichberger
<b>5. Transport and Mobility Technologies</b>	5.1. Combustion Engine Drivetrain Components and Integration into the Drive System 5.2 Conventional Drivetrain Vehicle Systems 5.3 Lightweight Construction/Materials	Klepik Klepik Klepik
<b>6. Energy Storage Technologies</b>	6.1 Chemical Energy Storage 6.2 Electrical/Electromagnetic Energy Storage 6.3 Mechanical Energy Storage 6.4 Thermal Energy Storage	Bürgermeister-Mähr Aichberger Bodisch Aichberger
<b>7. R&amp;D Services</b>	7.1 Technology Roadmap: Adjusting Energy-intensive Industrial Processes to Fluctuating Energy Supply 7.2 Innovative Energy Technologies for Sports Facilities	Aichberger Aichberger

**For questions concerning cost plans, please contact the FFG Project Controlling and Audit Department:**

**Ulrike Henninger**

Telephone: +43 5 77 55-6088

Email: [ulrike.henninger@ffg.at](mailto:ulrike.henninger@ffg.at)

**Mag.<sup>a</sup> (FH) Christa Jakes**

Telephone: +43 5 77 55-6083

Email: [christa.jakes@ffg.at](mailto:christa.jakes@ffg.at)

**For funding of investments in demonstration projects please contact:**

**Kommunalkredit Public Consulting GmbH**

Türkenstrasse 9, 1092 Vienna

[www.public-consulting.at](http://www.public-consulting.at)

CONTACT

**Katharina Meidinger, MSc**

Telephone: +43 1 316 31-356

Email: [k.meidinger@kommunalkredit.at](mailto:k.meidinger@kommunalkredit.at)

**Funding agency for research-to-market instruments:**

**Austria Wirtschaftsservice GmbH (aws)**

Walcherstrasse 11, 1020 Vienna

[www.awsg.at/study2market](http://www.awsg.at/study2market)

CONTACT AND ADVICE "STUDY2MARKET"

**Mag. Alfred Melamed**

Telephone: +43 1 501 75-324

Email: [a.melamed@aws.at](mailto:a.melamed@aws.at)

**Dr. Wilhelm Hantsch-Linhart**

Telephone: +43 1 501 75-311

Email: [w.hantsch@aws.at](mailto:w.hantsch@aws.at)

CONTACT AND ADVICE "MISSION2MARKET"

**DI Dr. Jürgen Pretschuh**

Telephone: +43 1 501 75-585

Email: [j.pretschuh@aws.at](mailto:j.pretschuh@aws.at)

#### Legal Notice

Owner, publisher and media owner:  
Climate and Energy Fund  
Gumpendorfer Strasse 5/22, 1060 Vienna

Programme coordination: Mag.<sup>a</sup> Elvira Lutter

Programme management:  
Austrian Research Promotion Agency,  
Kommunalkredit Public Consulting and  
Austria Wirtschaftsservice

Design and layout: r+k kowanz

Photo: Climate and Energy Fund/Ringhofer

Place of production: Vienna, June 2016

