


The European Strategic Energy Technology Plan

SET-Plan

Towards a low-carbon future




EUROPEAN COMMISSION

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Introducing the SET-Plan

We are facing worldwide climate change, a situation which calls for an effective low-carbon policy and efficient energy technologies.

The European Union (EU) is tackling the challenge through a policy whose target is nothing less than the transformation of the entire energy system, with far-reaching implications on how we source and produce our energy, how we transport and trade it, and how we use it.

In short, we must make low-carbon technologies affordable and competitive – a market choice. This is the core idea behind the **European Strategic Energy Technology Plan (SET-Plan)**.

The EU's approach focuses on the European Industrial Initiatives (EII). Industry-led, the EIIs aim to strengthen industrial participation in energy research and demonstration, boost innovation and accelerate deployment of low-carbon energy technologies. EIIs target sectors in which working at EU level adds most value, and technologies for which the barriers, the scale of the investment and the risk involved can be better tackled collectively.

The SET-Plan includes:

- The European Industrial Bioenergy Initiative
- The European CO_2 Capture, Transport and Storage Initiative
- The European Electricity Grid Initiative
- The Fuel Cells and Hydrogen (FCH) Joint Technology Initiative
- The Sustainable Nuclear Initiative
- Energy Efficiency – The Smart Cities Initiative
- The Solar Europe Initiative
- The European Wind Initiative

- The SET-Plan Steering Group (SET-Group)
- The European Energy Research Alliance (EERA)
- The SET-Plan Information System (SETIS)

The European Industrial Bioenergy Initiative

Aims

The European Industrial Bioenergy Initiative addresses the technical and economic barriers to the further development and accelerated commercial deployment of selected state-of-the-art bioenergy technologies. This is with a view to achieving greenhouse gas emission savings of 60 % for bio-fuels and bio-liquids under the sustainability criteria of the EU Directive on renewable energy (*).

Activities

- Up to about 30 industrial-size demonstration and/or first-of-their-kind industrial plants across Europe aiming to deploy innovative and sustainable bioenergy value chains with large global market potential for numerous biomass resources, taking advantage of different geographical, climatic and logistical conditions.
- A set of activities on biomass resources for bioenergy leading to improved cooperation between stakeholders and developing the feedstock market.
- Longer-term research and demonstration concerning emerging and innovative bioenergy value chains that will be commercially available beyond 2020.

Investment

The cost of this initiative is estimated at €9 billion over ten years.

© Abengoa Bioenergía Nuevas Tecnologías

(*) Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources.

The European CO_2 Capture, Transport and Storage Initiative

Aims

CO_2 capture and storage (CCS) is a technology with great potential to minimise the impact on our planet of the continued use of fossil fuels. It can contribute approximately 20 % of the global CO_2 emissions reductions achievable by 2050, significantly helping to avert climate change. The central objective of the initiative on CO_2 capture and storage is to further demonstrate and develop the most promising CCS technologies in power generation and in other energy-intensive industries that use fossil fuels (mainly coal and gas). The ultimate goal is to achieve commercial viability of CCS under the EU Emission Trading Scheme by 2020.

Activities

- A large demonstration programme aiming at the construction and operation of up to 12 industrial-scale CCS projects by 2015. Each project will integrate and test existing components of CCS, demonstrating the feasibility of the concept and generating knowledge that will help to reduce costs, orientate further research and technological development (R&D) and increase public awareness about the benefits of the technology.
- A research programme building on and complementing the CCS demonstration activities. It will focus on the continued development of more efficient components for individual CCS technologies that could be commercially available around 2020. It should also enable CCS to have a wide range of commercial applications in energy-intensive industries.

Investment

The cost of the CCS Initiative will total some €13 billion over ten years, depending mainly on the number and size of demonstration plants built.

Vattenfall's CCS pilot plant, © Vattenfall

The European Electricity Grid Initiative

Aims

The European Industrial Initiative on the electricity grid looks to develop, demonstrate and validate, at scale, the technologies, system integration and processes to:

- enable the transmission and distribution of up to 35 % of electricity from dispersed and concentrated renewable sources by 2020 and make electricity production completely decarbonised by 2050;
- further integrate national networks into a truly pan-European, market-based network;
- optimise the investments and operational costs involved in upgrading the European electricity networks to respond to the new challenges;
- guarantee a high quality of electricity supply to all customers and engage them as active participants in energy efficiency;
- anticipate new developments such as the electrification of transport.

© European Union/Patrick Mascart

Activities

- An integrated R&D and demonstration programme.
- A network of up to 20 large-scale demonstration projects covering diverse geographical, social and climatic conditions.
- A technical support structure to monitor project progress according to common indicators and to enable successes to be replicated across Europe.

Investment

The cost of this initiative is estimated at €2 billion over ten years excluding the costs of generic assets used in the demonstration.

The Fuel Cells and Hydrogen (FCH) Joint Technology Initiative

Aims

This European Industrial Initiative is working to speed up the development of hydrogen-supply and fuel-cell technologies to enable the industry to take the large-scale commercialisation decisions necessary for mass market introduction in the timeframe 2015-2020.

Activities

The programme, implemented by the Fuel Cells and Hydrogen Joint Undertaking (FCH JU), covers applications from road transport to stationary power generation and portable applications, as well as hydrogen production and distribution. Industry leads the programme planning, with the aim of overcoming technical and other barriers to the mass market introduction of fuel-cell and hydrogen applications.
The programme comprises:

- long-term and breakthrough-orientated research, pre-competitive research and technological development;
- large-scale demonstration projects in road transport, stationary power generation and early market applications as well as hydrogen production and infrastructure;

© Forschungszentrum Jülich

- support actions such as education and training activities, development of regulations, codes and standards and life-cycle assessment.

Investment

The FCH JU has a ring-fenced budget of €1 billion for the years 2008-2013 financed in equal parts by the European Commission and the industry.

The Sustainable Nuclear Initiative

Aims

The European Sustainable Nuclear Industrial Initiative will demonstrate the long-term sustainability of nuclear energy. The initiative will design and construct demonstration reactors of a new generation of nuclear technology – so-called Generation IV – based on fast neutron reactors and closed fuel cycles. Compared with current nuclear plants, this advanced technology will make 50-100 times more efficient use of uranium resources, will generate less long-lived radioactive waste and will reduce proliferation risks. It will also have favourable safety characteristics by maximising inherent and passive safety features. The first demonstration reactors are expected to come into operation from 2020. The operational experience gained should then pave the way for the commercial deployment of this technology from 2040.

The initiative is piloted by members of the Sustainable Nuclear Energy Technology Platform, a forum representing over 80 industrial and R&D organisations from across Europe.

Activities

- The design and construction of demonstration reactors: a sodium-cooled fast reactor (SFR) and alternative designs using lead or gas-cooled technology (LFR, GFR).
- Pilot fuel fabrication workshops for the start of operation of the demonstration plants.
- A coordinated R&D programme for reactor safety, performance, lifetime management and waste management, serving both future Generation-IV reactors and the continued safe operation of existing nuclear plants that currently provide ⅓ of the EU's electricity and ⅔ of its low-carbon energy.
- Developing the necessary supporting research infrastructures.

Investment

The estimated cost of this initiative is €7-10 billion over ten years.

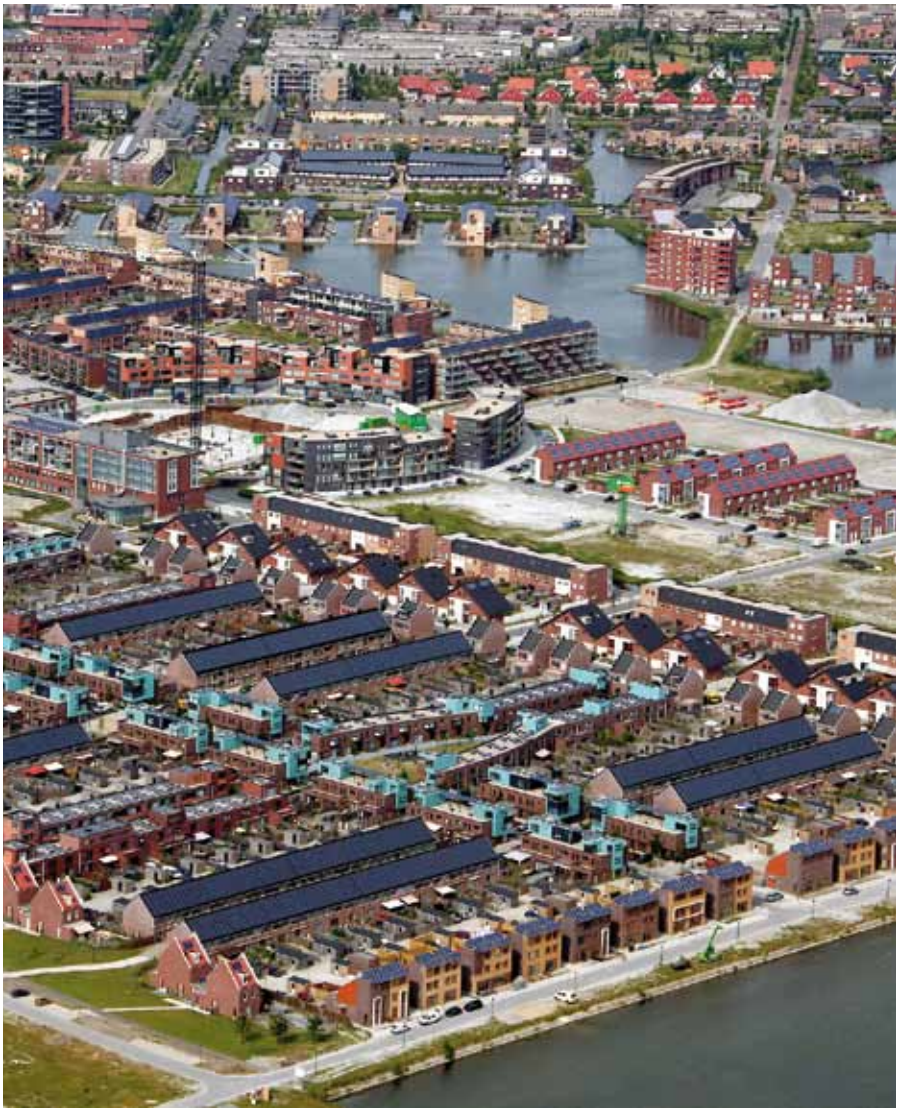
© Electricité de France

Energy Efficiency – The Smart Cities Initiative

Aims

The Smart Cities Initiative aims to improve energy efficiency and to step up the deployment of renewable energy in large cities going even further than the levels foreseen in the EU energy and climate change policy. This initiative will support cities and regions that take pioneering measures to progress towards a radical reduction of greenhouse gas emissions through the sustainable use and production of energy. It will bring the cities involved to the forefront of the development of the low-carbon economy.

The initiative will be underpinned by concrete activities being prepared at the time of publication.



Jan Tuyp for City of Heerhugowaard, 2008

The Solar Europe Initiative

Aims

The European Industrial Initiative on solar energy focuses on photovoltaics (PV) and concentrating solar power (CSP) technologies.

The objective is to make these technologies more competitive and to facilitate their large-scale penetration in urban areas and green-field locations as well as their integration into the electricity grid.

Activities

- A R&D programme focused on enhancing the performance and lifetime of PV systems and components, and on developing key technologies for the interface with the power grid.
- PV pilot production plants for innovative and cost-effective manufacturing processes, suitable for mass production.
- A R&D and demonstration programme for CSP technologies focused on reducing generation, operation and maintenance costs, improving operational flexibility and energy dispatchability, and minimising the environmental and water-use footprint.
- A portfolio of demonstration projects of power production in decentralised applications and in urban communities such as building integrated concepts and innovative, centralised power plants at an industrial scale of high-MW range.

© Solúcar Abengoa

Investment

Taking the aforementioned R&D programmes into account the investment cost of the solar initiative is estimated at €16 billion over ten years.

The European Wind Initiative

Aims

The European Wind Initiative aims to make wind energy more competitive, to harness the potential of offshore resources and deep waters, and to facilitate grid integration of wind power.

Activities

- Development of more accurate mapping of wind resources and of capacity potentials in Europe including hostile and complex environments.
- 5-10 new testing facilities for new turbine systems.
- Up to 10 demonstration projects of next-generation turbines including a 10-20 MW prototype.
- At least 4 prototypes of new offshore structures tested in different environments.
- Demonstration of new manufacturing processes (including logistics strategies and erection techniques in remote and often hostile weather environments).
- Demonstration of industrial-scale grid integration (seeing wind farms as 'virtual power plants').

Investment

Assuming that the initiative will be supported by a comprehensive research programme to bring about constant improvements in wind energy systems, the cost is estimated at €6 billion over ten years.

Estinnes wind farm, © European Union/Mario Dionisio

The SET-Plan Steering Group (SET-Group)

What is it?

The European Union Steering Group on Strategic Energy Technologies (SET-Group) is a group of high-level representatives from the EU Member States, chaired by the European Commission. Norway, Switzerland and Turkey also participate as observers.

What is its mission?

The SET-Group coordinates the implementation of the SET-Plan by providing a high-level discussion platform and a flexible framework for strategic planning and implementation. It works to maximise the cost-effective contribution that technology can make to achieving Europe's energy goals.

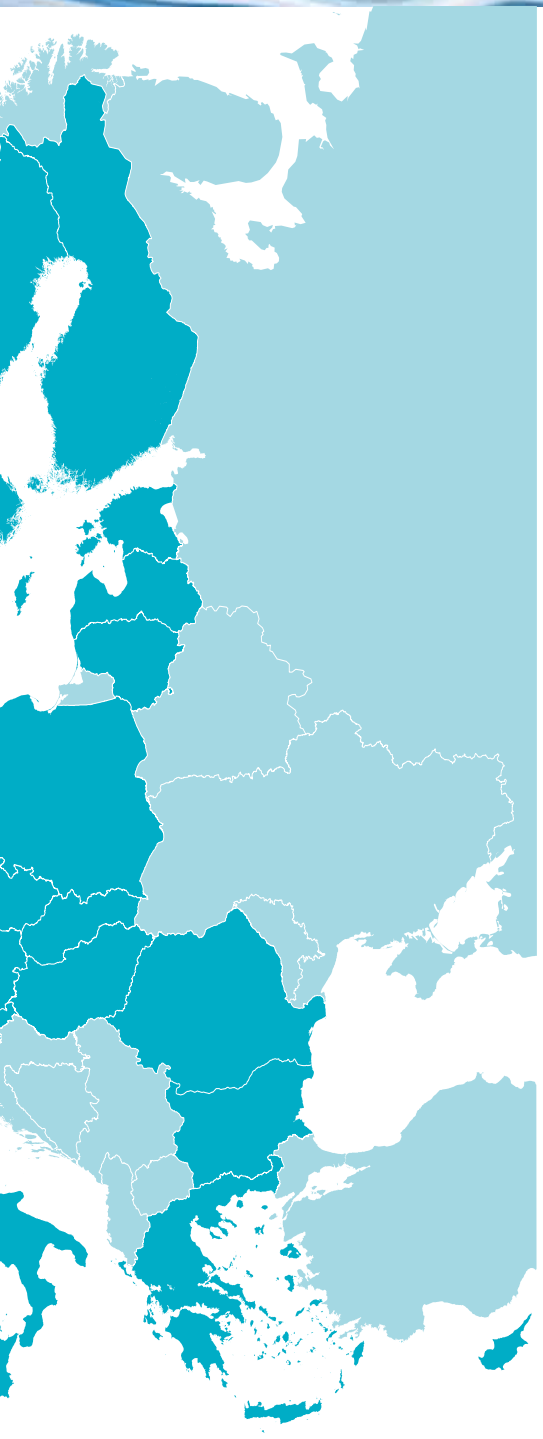
What are its main objectives?

- **Steering** the implementation of the European Energy Technology Policy.
- **Fostering** European joint actions and measures.
- **Identifying** resources available to contribute to the financing of joint actions.

How does it work?

To take forward the implementation of the SET-Plan through dialogue and strategic planning, the SET-Group mainly:

- **reviews** different technologies, discusses roadmaps and proposes common objectives/milestones as required to bring the technologies to the market;
- **conceives and launches** joint programming actions and initiatives between groups of Member States interested in pursuing the various technology avenues;
- **identifies** resources available and assesses regularly whether they are adequate to achieve the objectives of the SET-Plan;
- **facilitates** the process of attracting and leveraging private investment;
- **builds on** synergies to achieve maximum impact while avoiding overlap;
- **monitors and reviews** the progress of SET-Plan-related procedures.



The European Energy Research Alliance (EERA)

What is it?

The European Energy Research Alliance (EERA) – founded by leading European research institutes – aims to accelerate the development of new energy technologies with the help of Joint Research Programmes supporting the SET-Plan by concentrating activities and resources, combining national and EU sources of funding and maximising complementarities and synergies.

What are its main objectives?

The EERA aims to strengthen, expand and optimise EU energy research capabilities through the sharing of world-class national facilities in Europe and the joint realisation of pan-EU programmes focusing on bringing energy technologies to the level of maturity where they can be embedded in industry-driven research. The main objectives of the EERA are:

- **accelerating** the development of new energy technologies;
- **working towards** a long-term, durable integration of excellent research capacities dispersed across the EU;
- **strengthening** Europe's capacity to initiate and execute large high-risk, high-gain R&D programmes.

How does it work?

While contributing to the SET-Plan and strengthening EU research the EERA aims to:

- **identify and define** Joint Programmes of research to be carried out by EERA coalitions consistent with the SET-Plan and taking into account the activities of European Technology Platforms and industry groupings;
- **share** information and strategic plans to help identify strengths, weaknesses, overlaps and gaps, in order to determine potential areas for coordinated effort;
- **engage** proactively with industry to create and build on partnerships of mutual interest and benefit.

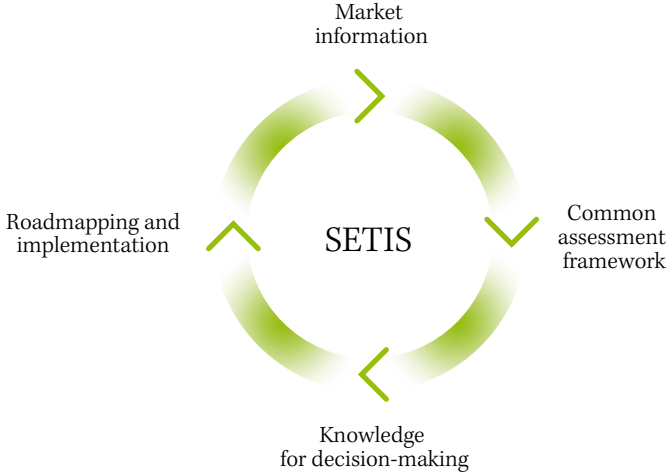
The SET-Plan Information System (SETIS)

What is it?

SETIS is the European Commission's Information System for the SET-Plan led by the Joint Research Centre.
It supports the strategic planning and implementation of the SET-Plan.
It makes the case for technology options and priorities, monitors and reviews progress regarding implementation, assesses the impact on policy, and identifies corrective measures if needed.

What are its main activities?

- **Assessing** low-carbon technological pathways with respect to their technical performance and cost-effectiveness, as well as their potential contribution to greenhouse gas emission reduction and to the EU's security of energy supply.
- **Estimating** current public and private R&D and demonstration expenditures for the SET-Plan's low-carbon technology priorities.
- **Contributing** to the definition of the roadmaps for the SET-Plan technology development programmes through the European Industrial Initiatives (agreed priorities, objectives and milestones, synergies).
- **Evaluating** the overall progress of the technology development programmes through dedicated reporting mechanisms and agreed Key Performance Indicators.
- **Analysing** issues and developments related to spatial planning and infrastructure and studying the transition to a low-carbon economy.
- **Simulating** the evolution of the EU's energy technology mix and measuring the impact of the SET-Plan implementation.



Working in partnership

SETIS works in close collaboration with European stakeholders such as the European Technology Platforms, industrial stakeholders, trade associations, the European Energy Research Alliance, international organisations and the finance community.

Do you want to know more?

The SET-Plan
http://ec.europa.eu/energy/technology/set_plan/set_plan_en.htm

Renewable Energies
http://ec.europa.eu/energy/renewables

The European Industrial Bioenergy Initiative
www.biofuelstp.eu/eibi.html

The European CO_2 Capture, Transport and Storage Initiative
www.zeroemissionsplatform.eu

The European Electricity Grid Initiative
www.smartgrids.eu

The Fuel Cells and Hydrogen (FCH) Joint Technology Initiative
http://ec.europa.eu/research/fch

The Sustainable Nuclear Initiative
www.snetp.eu

Energy Efficiency – The Smart Cities Initiative
http://ec.europa.eu/energy/efficiency

The Solar Europe Initiative
www.eupvplatform.org
www.rhc-platform.org/cms

The European Wind Initiative
www.windplatform.eu

The SET-Plan Steering Group (SET-Group)
http://ec.europa.eu/energy/technology/set_plan/steering_group_en.htm

The European Energy Research Alliance (EERA)
www.eera-set.eu

The SET-Plan Information System (SETIS)
http://setis.ec.europa.eu

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