

The logo for PV ERA NET features the text "PV ERA NET" in a bold, black, sans-serif font. The text is centered between two curved lines: a yellow line above and a blue line below. Both lines have a slight shadow effect, giving them a three-dimensional appearance. The background of the entire page is white, with a solid blue vertical bar on the left side.

PV ERA NET

**Organisation, Strategy,
Objectives and Priorities of
Photovoltaic Research and
Technological Development
Programmes in
PV ERA NET States**

Survey Report 2010
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Table of Contents

Introduction and Structure	3
General Observations	4
Austria	8
Denmark	11
France	14
Germany	18
Greece	22
The Netherlands	25
North-Rhine-Westphalia	28
Sweden	31
Switzerland	34

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Introduction and Structure

PV ERA NET is a European network of programme coordinators and managers in the field of photovoltaic solar energy (PV) research and technological development (RTD). The consortium comprises major key stakeholders in the field of national and regional RTD programmes involving photovoltaics (PV). The consortium comprises ten partners from nine states and their national and regional RTD programmes (or parts of programmes). These participating states (regions) are: Austria, Denmark, France, Germany, Greece, The Netherlands, North-Rhine-Westphalia (Germany), Sweden and Switzerland.

The general objectives of the network are to further enhance the cooperation between regional and national RTD programmes in an efficient, pragmatic and flexible way, thereby providing substantial added value to the individual programmes, to the network and to the European Research Area as a whole. This cooperation shall result in further improving the effectiveness of the RTD programmes both on an individual and global level in terms of programme management and RTD activities.

The Photovoltaic European Research Area Network PV ERA NET is open to any other interested country or region in Europe, which carries out PV RTD programmes and projects. As such, the Survey Report can be extended to other countries participating in information exchange and cooperation.

This Survey Report presents key features of the PV ERA NET states and their programmes, namely:

- Organisations Involved in PV ERA NET and PV RTD Programming
- Set-up and strategy of the programme involved
- Objectives
- Priorities

The states and their programme(s) are presented side by side in the same format. The goal of this report is to provide an essential overview over each of the country and the programme(s) involved. The report is not intended to make any direct comparisons, lest than any evaluation of the programmes.

General Observations

There are about twenty RTD (sub) programmes involved in the nine participating states. The survey presents concise information on these programmes for each country.

Some very general observations can be made by looking at the different programmes:

Programme **context**: PV is mostly embedded in larger RTD programmes. In about half of the programmes and states, PV is part of an energy RTD (sub) programme. In about a fourth of the programmes and states, PV is part of a technology, renewable energy, PV dedicated and / or general RTD (sub) programme (see table 1; note: states can have several programmes providing different contexts for PV RTD).

Programme **extent**: Most programmes involved do not cover all PV RTD in a country. In most states, there is more PV RTD done and more public spend on PV RTD than is assessed (with)in the programmes involved in PV ERA NET (see tables 3 – 11).

Context and extent both reflect different **policies** in the states. This has consequences on the type of **strategy** applied for PV and how focused and comprehensive a programme is with respect to PV RTD. There are different strategies for PV RTD, sometimes there is no clear strategy specific for PV.

The picture is less diverse for the types of programme **ownership** and **management**. Most programmes are owned by ministries and managed by government agencies (see table 2). The “day-to-day” management tends to involve other (semi-private and private) organisations, where additional technical expertise is found.

The **scope** of the programmes with respect to PV depends on the (diverse) policies and strategies. Programmes can cover all or parts of the development chain from basic R&D to demonstration or parts of the development chain can be found in different (sub) programmes.

The programmes respectively countries involved cover a large share of public **spend** on PV RTD in Europe. This share amounts to around 140 MEUR for the participating programmes respectively states. On a very general level, it can be stated that PV RTD is becoming more important.

Most states and programmes do not have a **budget** specified for PV RTD.

Table 1: PV ERA NET States' Programmes and Sub-programmes and their Orientation (Main Location of PV RTD Activities)

State	Programme F = full programme S = sub-programme	Dedicated PV programme	PV in renewable energy programme	PV in energy programme	PV in general technology programme	PV in general RTD programme	PV in general programme
Austria	Austrian Technologies for Sustainable Development (at:sd)	F			X		
	Building of Tomorrow	S			X		
	Factory of Tomorrow	S			X		
	Energy Systems of Tomorrow	S		X	X		
Denmark	Energy technology Development and Demonstration Programme (EDDP)	F		X			
	Public Service Obligation (PSO) programme	F	X				
	Strategic Research in Renewable Energy	F	X				
	Danish National Advanced Technology Foundation	F			X		
France	ADEME's Solar Photovoltaic Electricity RTD Programme	S	X				
	ANR's HABISOL R&D Programme (Solar and energy efficient buildings)	S		X			
	OSEO's PV R&D Activity	S				X	
Germany	5th Federal Programme on Energy Research - "Innovation and New Energy Technologies" Sub-programme on renewable energies	S	X	X			
	"Organic PV" to be funded within the programmes "Optical Technologies", "Materials Innovations for Industry and Society-WING" and "Basic Research Energy"	S	X	X			
	"Solar Energy Technology of the next Generation" within the program ""Basic Research Energy 2020+""	S		X			
Greece	Operational Programme for Competitiveness (OPC)	F					X
	OPC - Research & Technology Development (RTD)	S				X	
The Netherlands	Energy Research Strategy	F		X			
	Energy Research Subsidy Long Term (EOS-LT)	S		X			
	Energy Research Subsidy Demonstration (EOS-DEMO)	S		X			
	Energy Research Subsidy New Energy Research (EOS-NEO)	S		X			
	Energy Research Subsidy Unique Opportunities Regulation (EOS-UKR)	s		X			
North-Rhine-Westphalia	Efficient use of energy, of renewable energy sources and energy efficiency (progres.NRW)	F	X	X			
	Cluster EnergieForschung.NRW	F	X				
Sweden	Long-term energy research programme	F		X			
	Swedish national co-financed programme for PV systems and applications (SolEI)	S	X				
Switzerland	Swiss Photovoltaic RTD programme	F	X				

Table 2: PV ERA NET States' Programmes and Sub-programmes and their Owners and Managers

State	Programme F = full programme S = sub-programme	Programme Owner			Programme Manager		
		Ministry	Government Agency	Others	Ministry	Government Agency	Others
Austria	Austrian Technologies for Sustainable Development (at:sd)	F	AT1			AT2	
	Building of Tomorrow	S	AT1			AT2	
	Factory of Tomorrow	S	AT1			AT2	
	Energy Systems of Tomorrow	S	AT1			AT2	
Denmark	Energy technology Development and Demonstration Programme (EDDP)	F		DK1		DK1	
	Public Service Obligation (PSO) programme	F			DK2		DK2
	Strategic Research in Renewable Energy	F	DK3			DK4	
	Danish National Advanced Technology Foundation	F	DK3				DK5
France	ADEME's Solar Photovoltaic Electricity RTD Programme	S		FR1		FR1	
	ANR's HABISOL R&D Programme (Solar and energy efficient buildings)	S		FR2			FR3
	OSEO's PV R&D Activity	S		FR4			
Germany	5th Federal Programme on Energy Research - "Innovation and New Energy Technologies" Sub-programme on renewable energies	S	DE1			DE3	
	"Organic PV" to be funded within the programmes "Optical Technologies", "Materials Innovations for Industry and Society - WING" and "Basic Research Energy"	S	DE1 / DE2			DE3 / DE4	
	"Solar Energy Technology of the next Generation" within the program "Basic Research Energy 2020+"	S	D2			D3	
Greece	Operational Programme for Competitiveness (OPC)	F	GR1			GR1	
	OPC - Research & Technology Development (RTD)	S	GR1			GR2	
The Netherlands	Energy Research Strategy	F	NL1			NL2	
	Energy Research Subsidy Long Term (EOS-LT)	S	NL1			NL2	
	Energy Research Subsidy Demonstration (EOS-DEMO)	S	NL1			NL2	
	Energy Research Subsidy New Energy Research (EOS-NEO)	S	NL1			NL2	
	Energy Research Subsidy Unique Opportunities Regulation (EOS-UKR)	s	NL1			NL2	
North-Rhine-Westphalia	Efficient use of energy, of renewable energy sources and energy efficiency (progres.NRW)	F	NW1			NW2	
	Cluster EnergieForschung.NRW	F	NW3			NW2	
Sweden	Long-term energy research programme	F	SE1			SE2	
	Swedish national co-financed programme for PV systems and applications (SolEI)	S		SE2	SE3		SE4
Switzerland	Swiss Photovoltaic RTD programme	F	CH1				CH2

Table 2 bis: List of Organisations Involved according to Table 2

Austria	AT1 Ministry of Transport, Innovation and Technology BMVIT
	AT2 Research Promotion Agency FFG
Denmark	DK1 Danish Energy Authority (DEA / ENS)
	DK2 Energinet.dk (TSO)
	DK3 Ministry of Science, Technology and Innovation (VUT)
	DK4 Strategic Research Council under the Ministry of Science, Technology and Innovation (VUT)
	DK5 Danish National Advanced Technology Foundation
France	FR1 Agency for Environment and Energy Management (ADEME)
	FR2 French National Research Agency (ANR)
	FR3 Atomic Energy Commissariat (CEA), Delegation NTE
	FR4 Industrial Development Agency (OSEO)
Germany	DE1 Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)
	DE2 Federal Ministry of Education and Research
	DE3 Project Management Organisation PtJ
	DE4 VDI Technologiezentrum GmbH
Greece	GR1 Ministry of Development
	GR2 General Secretariat for Research and Technology (GSRT)
The Netherlands	NL1 Ministry of Economic Affairs (MinEZ)
	NL2 NL Agency, Directorate Energy and Climate Change
North-Rhine Westphalia	NW1 Ministry of Economic Affairs and Energy (MWME)
	NW2 Project management organisation Energy – Technology – Sustainability (Projektträger ETN)
	NW3 Ministry of Innovation, Science, Research and Technology (MIWFT)
Sweden	SE1 Ministry of Enterprise, Energy and Communications
	SE2 Swedish Energy Agency
	SE3 Industry (Swedish stakeholders)
	SE4 Board of financing partners, project coordinator from company Elforsk AB (utility)
Switzerland	CH1 Swiss Federal Office of Energy (SFOE)
	CH2 NET Nowak Energy & Technology Ltd

Austria

Update April 2009

Organisations Involved in PV ERA NET and PV RTD Programming

The Federal Ministry of Transport, Innovation and Technology (BMVIT) and its Austrian Research Promotion Agency (FFG) represent Austria in PV ERA NET.

The Federal Ministry of Transport, Innovation and Technology (BMVIT) is the largest funder of technology research in Austria. The department of Energy and Environmental Technologies of BMVIT initiated and designed the stimulation programme “Austrian Technologies for Sustainable Development” (at:sd).

Austrian Research Promotion Agency (FFG) is 100% owned by the government and the ownership interests are governed by BMVIT and the Austrian Ministry for Economy and Labour. FFG is responsible for all administrative tasks in at:sd.

The University of Applied Sciences Technikum Vienna, Institute of Renewable Energy, with its new Education-Programmes on “Renewable Urban Energy Systems” with a focus on Photovoltaics gives thematic input and technical-scientific expertise in the field of PV to the programme at:sd.

Set-up and strategy of the programme involved

The Austrian Programme of Technologies for Sustainable Development (at:sd) aims at bringing about a structural change in the Austrian economy by demonstrating that the first steps of acting in accordance with the criteria of sustainable development are both possible and profitable even in our present day economy. It initiates and supports trend-setting R&D projects up to the implementation of exemplary pilot projects: fundamental studies / new concepts, cooperation projects between R&D and industry, technology and component development and, finally, demonstration projects. The programme pursues its objectives by means of clearly defined thematic emphasis, thematic calls for tenders sequentially built one upon each other, and through networking of individual projects in order to create synergies. The cooperation between different stakeholders, research (academic & non-academic) and industry shall be enhanced within the programme.

The programme is structured in three sub-programmes “Building of Tomorrow”, “Factory of Tomorrow”, “Energy Systems of Tomorrow”. Each of the sub-programmes is supported by an accompanying programme management (“umbrella management”) that has the responsibility to ensure proactive promotion of the programme and project generation as well as to provide support for submitters and to advance networking among the projects.

“Building of Tomorrow” has considered BiPV RTD projects. “Factory of Tomorrow” included PV in the topic of production processes. “Energy Systems of Tomorrow” addresses PV RTD on systems and components.

Due to the fact that critical mass in the field of PV is partly missing in Austria, research on PV is mainly done in international cooperation projects and programmes. In the course of ERA Net, research on PV shall be more connected with the objectives of at:sd. Furthermore, Austrian strengths and developments in the field of PV shall become apparent. Through the participation of at:sd in international programme cooperations PV research should be strengthened.

Objectives

The overall objective of at:sd is to improve living conditions and competitiveness. In order to achieve this, the following key issues are pursued:

- Integration of ecological and social systems: increase in resource efficiency, enhanced use of renewable energy sources, optimisation of the benefit of system solutions, consideration of ecological and social systems
- Secure Austria as a business location in the long-term: increase cost-efficiency, create secure and high-value jobs, increase innovation ability, sustainable development of space and location
- Increase in the R&D quality: strengthening scientific competence, improve diffusion processes and implementation, strengthening the international position, promotion of methodical innovations

Relevant objectives of the sub-programmes are:

- Factorial improvement of the overall ecological balance of buildings with emphasis on energy efficiency
- Increase of the share of renewable materials in the building sector
- Increase of energy- and material efficiency, avoidance of waste and emissions, uncoupling of creation of value and consumption of resources
- the improvement of the overall efficiency of energy systems and their components
- the provision of a technological basis for the increased integration of renewable energy sources
- increase of the competitiveness of sustainable energy technologies
- the improvement of the cooperation between science and economy
- the extension of the Austrian technological strengths

The results obtained shall be implemented through trend-setting demonstration projects, e.g. buildings, production processes, (regional) model systems.

Priorities

“Building of Tomorrow” supports R&D projects concerning energy efficiency in the building sector, the use of renewable energy sources and the use of ecological building materials as well in new buildings as in the refurbishment of buildings.

“Factory of Tomorrow” supports R&D projects in the field of sustainable and innovative production processes, industrial and commercial product service systems and use of renewable resources / raw materials.

“Energy Systems of Tomorrow” supports R&D projects concerning renewable energy sources, energy efficiency and system innovations, more specifically:

- Net integration and net management in connection with decentralised energy production based on renewable energy sources: develop technologies to support the integration of renewable energy sources (horizontal technologies), improve technologies to produce energy for decentralised net integration (vertical technologies)
- Innovative production and service systems: logistic systems and raw material management for the use of energy from biomass, innovative component developments for multifunctional energy centres, development of systems and the development of innovative components respectively for poly-generation, models for operators of multifunctional energy centres and external energy services, new services in order to improve energy efficiency
- Specific need for the development of technologies: all kind of technologies for energy production, technologies to improve energy efficiency

Table 3: General Information on PV RTD Programming in Austria

Programme	Austrian Technologies for Sustainable Development (at:sd)
Ownership	Federal Ministry of Transport, Innovation and Technology (BMVIT)
Management	Austrian Research Promotion Agency (FFG)
Focus	Technologies for sustainable development
Time Frame	1999 - 2009
Website	www.nachhaltigwirtschaften.at

Denmark

Update August 2010

Organisations involved in PV ERA NET and PV RTD programming

The national transmission system operator (TSO) Energinet.dk represents Denmark in PV ERA NET. Energinet.dk is an authority under the Ministry of Climate and Energy. Energinet.dk administers the Public Service Obligation Programme (PSO) in terms of the Forskel and the ForskVE programmes.

The Danish Energy Agency (DEA / ENS in Danish) is an authority under the Ministry of Climate and Energy. DEA administers the Energy technology Development and Demonstration Programme (EDDP), which grants subsidies to R&D&D in the area of energy technologies.

The Ministry of Science, Technology and Innovation (VTU) administers the programme Strategic Research in Renewable Energy.

Danish National Advanced Technology Foundation, whose general objective is to enhance growth and strengthen employment by supporting strategic and advanced technological priorities within the fields of research and innovation. Furthermore, the foundation shall make a special effort to promote research and innovation in small and medium-sized enterprises.

Coordination between these structures exists in terms of formal hearings, informal exchange of information and overlap of technical experts in advisory groups.

Set-up and strategy of the programme involved

PV RTD (funding) is split up in four different programmes (PSO, EDDP, Strategic Research in Renewable Energy, and Danish National Advanced Technology Foundation). The Public Service Obligation (PSO) programme has two pillars: a) Programme for Environmentally Benign Electricity Generation Technologies administrated by Energinet.dk and b) Programme for Efficient Use of Electricity, administrated by Elfor (Association of Danish electricity utilities/companies). The first mentioned is again sectionalized in the ForskEl programme targeting pre-commercial R&D of environmentally benign electricity generating technologies and the ForskVE programme in support of deployment and demonstration of new and emerging RE technologies such as PV, wave power and bio-gasification with a focus on creating "lighthouse" projects. The Energy technology Development and Demonstration programme (EDDP), which in 2007 replaced the former Energy Research Programme (EFP) located in the administration of the DEA has a focus on applied research, development and large scale demonstration.

The Strategic Research in Renewable Energy is located in the administration of Strategic Research Council under the Ministry of Science, Technology and Innovation. The programme is focused on fundamental renewable energy R&D.

The development of PV technology is therefore recognised as an important part of the energy RTD programmes. However, Denmark, presently, has no specific PV RTD programme nor an allocated budget for

PV RTD in any of the different energy RTD programmes. In collaboration between Energinet.dk and DEA and a recently created Danish PV industrial association (DSF) an updated national PV strategy for research, development and demonstration has been published in 2010. A National PV Advisory Group is obliged to keep the so called PV Dialogue Group informed of national and international activities in the field of PV. The Dialogue Group broadly represents Danish PV stakeholders and encompasses some 35 professionals. This group, which may be replaced by the DSF, contributes to the formulation of the Danish national PV strategy. The objective of this national PV strategy is cost reduction via coordination of domestic and EU level RTD&D actions and strengthening of domestic R&D&D forums and industries.

Objectives

The main objectives of the programmes are R&D&D of energy technologies and energy effective solutions, enabling Denmark – in line with the technological development – at any time to draw full benefits both in the Danish energy system as well as in exports and in contributions to the international development.

Priorities

The thematic priorities of the programmes are environmental friendly energy technologies and renewable energy. The programme of Strategic Research in Renewable Energy is a classic research programme, whereas the EDDP and Forskel and ForskVE (PSO) programmes have a broader range from research to development, including demonstration. Especially the EDDP and the ForskVE programmes have a strong focus on development and demonstration. National strategies have recently been elaborated in the fields of wind energy, bio energy, bio fuels, PV, hydrogen and fuel cells, wave energy, and energy effective solutions.

In the field of PV RTD the strategy focuses on the following main activity areas:

1. Si feedstock for high yield solar cells
2. Third generation cell types (PEC, polymer cells)
3. Inverter technology
4. System technology – integration in the electricity system
5. Building integrated systems
7. Design and architecture – multifunctional solutions
8. Demonstration
9. International co-work (IEA, EU networks)
10. Different analyses of the conditions for the dissemination of PV

The PV strategy represents guidelines for the funding of the EDDP and PSO programmes, but since the strategy has the character of a national PV RTD strategy, it is expected that the PV funding for Strategic Research in Energy to a high degree will follow the PV strategy concerning the research areas 1-4.

Besides the environmental aspects the EDDP and PSO programmes also focus on energy supply security, competitive economy of the new energy forms, strengthening of research institutes and industry related to new energy technologies, and international collaboration.

Table 4: Denmark - General Information on PV RTD Programming

Programme	Energy technology Development and Demonstration Programme (EDDP)	Public Service Obligation Programme (PSO)	Strategic Research in Energy	Danish National Advanced Technology Foundation
Ownership	Danish Energy Agency (ENS)	Energinet.dk	Ministry of Science, Technology and Innovation (VTU)	Ministry of Science, Technology and Innovation (VTU)
Management	Danish Energy Agency (ENS)	Energinet.dk	Strategic Research Council	Danish National Advanced Technology Foundation
Focus	Energy RTD in general with strong focus on D&D in renewables	RTD on environment-friendly electricity technologies; demonstration of new RE	Strategic research in renewable energy	Growth and strengthen employment by supporting strategic and advanced technological priorities within the fields of research and innovation.
Time Frame	Since 1976	Since 1998; ForskVE since 2008	2003 – 2005 (expected to be prolonged)	Since 2005
Website	www.energiforskning.dk			

France

Update August 2010

Organisations involved in PV ERA NET and PV RTD programming

The Agency for Environment and Energy Management (ADEME) represents France in PV ERA NET.

There are three national agencies funding photovoltaic (PV) RTD projects: ADEME, the National Research Agency (ANR) and the industrial development agency OSEO:

- ADEME is a governmental organisation in charge of promoting the use of renewable energy sources including solar PV electricity. ADEME depends upon two different ministries: Ministry of Ecology, Energy, Sustainable Development and Sea (MEEDDM) and Ministry of Higher Education and Research. ADEME manages a PV-specific programme. The agency must report to its supervising ministries the results of its policy within the framework of a Government/ADEME multiannual contract.
- ANR, the National Agency for Research is a public organization created in February 2005. ANR is in charge of promoting research projects on all science disciplines.
- OSEO is a public organization created in 2005 which mission is to provide innovation support and funding to French SMEs and VSEs .

The three agencies fund photovoltaic R&D projects undertaken by industry and public research organizations (CNRS, CEA), as well as other research institutions (INES, the new Institute for Solar Energy, Universities, Engineering schools, etc.).

Set-up and strategy of the programme involved

Photovoltaic activities in France are undertaken under favourable political conditions. The focus of the Framework Law on energy is on energy efficiency and the diversification of CO₂ free energy sources. A new government initiative, called "Grenelle of Environment", has been launched in 2007 in order to achieve the national ambition in terms of energy efficiency and Renewable Energy Sources (RES). As a result, fifty operational measures were taken by the government for RES during phase 1 (Nov. 2008). The main objective is to cover 23% final energy consumption through RES, meaning for PV, 5 400 MW installed capacity in 2020. Feed-in tariffs for PV are also maintained till 2012 and a new tariff for simplified integration has been created (Table 1).

Table - Feed-in tariffs for photovoltaic electricity in France (2010)

<i>Tariff EUR/kWh</i>	<i>Mainland France</i>	<i>Overseas territories and Corsica</i>
Basic tariff	0,314	0,40
Simplified integration to the building	0,42	
Building integrated photovoltaics (nominal system power ≤ 250 kW)	0,50 or 0,58 depending on the type of building	

The aim of this special rate for building integrated photovoltaics is to create a national economic sector by promoting the integration of solar installations into the French landscape as harmoniously as possible. The

main problem is that this special tariff involves the delicate task of classifying the various types of equipment that might fall into this category.

Feed-in tariff contracts are signed for a 20 year period and are to be revised every year on the basis of a specific inflation index. The financial act passed in December 2008 specifies that the proceeds from the sale of PV generated electricity will now be exempt from taxation through income tax when the associated system does not exceed 3 kW.

PV comes under the research section of the Law similarly to hydrogen and carbon dioxide sequestration (these three topics are selected by the National Agency for Research).

The solar photovoltaic research programme of ANR focuses on PV materials, components, and BIPV. ADEME's PV programme is mainly targeting industrial RTD and PV system issues. ADEME is also focusing on measures essential (quality, reliability, performance, etc.) for market uptake.

Objectives

The main photovoltaic programmes are those of ADEME and ANR.

Their main objectives are the development of:

- advanced solutions for electricity generation in the building sector with a particular emphasis on fully integrated components;
- competitive industries in the field of manufacturing of components and PV systems;
- close cooperation between business community and researchers strengthening international research and the national industry position;
- as a consequence, job creations.

ADEME's PV programme also consists in implementing objectives fixed by the "Grenelle of Environment".

The PV RTD programmes of ADEME and ANR aim at:

- increasing the cost effectiveness of PV components and systems (manufacturing cost reduction, operation and maintenance cost reduction, long term reliability of PV systems);
- increasing the overall quality and performance of PV systems;
- facilitating the integration of PV modules into the building envelope;
- easing the homologation and standardisation of components and system

Since 2005, the two agencies ANR and OSEO have complemented ADEME's work and have contributed to leveraging more money for PV R&D. For the first time in 2008, ADEME and OSEO associated funding in a major project called "Solar Nano Crystal" (2008-2012) which aims to accelerate innovations in the production of crystalline silicon PV materials, cells and modules. Within the frame of this project, a manufacturing pilot plant is being to be built.

Another major R&D project is POLYSIL, financed by the ADEME, the Rhône Alpes region and a number of local authorities. It was launched in December 2009. The aim of this project, which has been allocated an R&D budget of 15 MEUR, is to design a new generation of amorphous silicon modules, using technologies developed in research laboratories. SOLSIA is a young start-up company which coordinates the work schedule implemented by the laboratories in conjunction with companies.

In parallel, ANR launched in 2008 a new research programme running for 3 years. The agency chose to combine in a programme called "HABISOL" works on building and PV to underline the importance of BIPV. Height new R&D projects have been identified in 2009 and they added to the forty two R&D projects being supported by ANR and ADEME since 2005.

Priorities

The PV RTD programmes, undertaken by ADEME, ANR and OSEO, are geared towards the development of materials and production processes leading to high yield/low cost processes, high conversion efficiency of cells/modules and low cost components and applications. Cooperation between industry and public research institutions is essential to promote innovation and make successful technology transfers.

The thematic priorities of the PV RTD programme are:

- industrial and pre-industrial materials (wafer-based silicon and thin film Cu-In-Se and amorphous silicon) and high yield/low cost processes (feedstock silicon, multicrystalline silicon, thin film Cu-In-Se electrodeposited, tandem cells based on amorphous silicon thin films, low environment impact processes);
- materials such as organic materials (polymers and molecules) and new PV cell structures;
- building integration of PV modules;
- reliability, quality assurance, standardisation of products, homologation, installation monitoring, etc.;
- institutional cooperation (EC, IEA, IEC).

The ADEME PV programme also includes:

- training: researcher training through PhD research grants and training of installers and field project managers;
- communication and dissemination of information (general public information brochure, technical guides for professionals, seminar and workshop proceedings, etc.).

The ANR goals are to develop academic and application-oriented research and promote public-private partnership and technological transfer through the funding of research projects selected by a peer review process. The Atomic Energy Commissariat (CEA) has been selected to carry the administrative management responsibility for the ANR photovoltaic RTD grants.

OSEO does not hold a PV programme identified as such but answers to industrial solicitations. OSEO has a long tradition of supporting EUREKA projects. OSEO works mainly with reimbursable subsidies.

Table 5: France - General Information on PV RTD Programming

Programme	ADEME's Solar Photovoltaic Electricity Programme	ANR's Solar Photovoltaic R&D Programme (2005-2007) and HABISOL R&D Programme (2008-2010)	OSEO's PV R&D Activity
Ownership	Agency for Environment and Energy Management (ADEME)	National Agency for Research (ANR)	Industrial Development Agency OSEO
Management	Renewable Energy Department of Agency for Environment and Energy Management (ADEME/DER)	Atomic Energy Commissariat (CEA), delegation New energy technologies	OSEO
Focus	Materials and industrial manufacturing processes. Balance-of-system components and PV systems. Standards, quality assurance, safety and environmental aspects. Socio-economic aspects and enabling research.	Materials, cells and modules for building integration (silicon, thin film, emerging and novel PV technologies).	Industrial PV materials, processes, components
Time Frame	Main industry projects end 2008. New programme starts 2009.	New organisation since February 2005. Projects started in 2005. New three year programme since 2008.	New organisation since 2005. Formerly ANVAR
Website	www.ademe.fr	www.agence-nationale-recherche.fr	www.oseo.fr

Germany

Update August 2010

Organisations involved in PV ERA NET and PV RTD programming

In Germany Research and Development (R&D) is currently conducted under the 5th Programme on Energy Research called “Innovation and New Energy Technologies” which was published in July 2005. Under this framework the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) as well as the Federal Ministry of Education and Research (BMBF) support R&D on different aspects of PV. Main parts of this programme are administrated by the Project Management Organisation PtJ in Jülich.

In June 2007, the BMBF published a call on “Organic PV” which is funded in the frame of 3 different programmes. The call aims for an acceleration of the development of the organic PV technologies by using a combination of basic research, application-oriented materials research and development in connection with the corresponding process technologies. The call is jointly administrated by the VDI Technologiezentrum GmbH and PtJ.

In July 2007, the BMBF published a call on “Solar Energy Technology of the next Generation”. The funding should contribute to enhance the application of thin film solar cells on the basis of compound semi conductors, amorphous and microcrystalline silicon. The call is administrated by PtJ.

In 2008, the BMBF published its concept paper “Basic Energy Research 2020+” aiming for the support of long-term R&D on renewable energies which is complementary to the BMU funding. Concerning PV, currently there are three focal points of engagement.

- A joint initiative of BMBF addresses the development of organic solar cells. Currently there are 13 projects running with a total amount of public funding of 55 MEUR.
- Networks aiming for the development of thin film technologies were initiated in 2008. They put emphasis on topics like material sciences including nanotechnology, new experimental or analytical methods and the usage of synergies with other fields of research like microelectronics or bionics. In 2009, 8 co-ordinated research projects were started receiving a total amount of funding of 20 MEUR.
- Additionally, the BMBF funds the development of the cluster “Solarvalley Mitteldeutschland” as part of the Federal High-Tech Strategy. This cluster comprises most of Germany’s PV industry and received grants of 40 MEUR for the next four years.

In December 2008, the BMU released a new open call for tender which is open until end of 2010. Concerning PV the addresses five focal points:

- Silicon wafer technology, especially the production of solar silicon reduced material consumption and the development of new cell and module concepts for future industrial productions.
- Thin film technologies, especially transfer of concepts and processes into an industrial environment and investigation of degradation processes aiming for long term stable structures.
- System technology, especially for decentralised grids and standardisation of island systems for global applications.
- Concentrated Solar PV and other alternative concepts which are both suitable for power application and feasible for industrial production.

- Cross-cutting issues like enhancement of lifetime of all system components, avoidance of materials which are harmful to the environment, reduction of energy usage in the production and recycling.

PtJ is an independent unit in the Research Centre Jülich and benefits from the excellent infrastructure as well as from close contact with topical research. Since 1974, the PtJ has been supporting the Federal Government.

PtJ is, on the one hand, an authorised funding agency for the government and some Federal States and, on the other, a partner for the scientific and industrial community and the public in general.

In addition to national tasks, PtJ is responsible for a number of international activities: For the Sixth Framework Programme of the European Union PtJ has been nominated by the German Ministries in agreement with the EU-Commission as the National Contact Point (NCP) for a number of thematic fields. Aiming at the coordination of Member States programmes and promoting the European Research Area (ERA), PtJ is participating in 16 EU projects, being the consortium leader in 5 ERA-Net projects.

Set-up and strategy of the programme involved

The 5th Energy Research Programme was originally designed to be valid for the period from 2006 to 2008. It was now extended until 2010. The Programme covers research on renewable energies, energy efficiency and the institutional funding for research on energy technologies at the national research centres.

Photovoltaic (PV) is part of the sub programme on renewable energies. It is understood that the PV R&D concept "Photovoltaic Research 2004-2008" developed under the former 4th Programme and published in June 2004 continues. The R&D concept puts emphasis on

- the consequent implementation of R&D results into production,
- a further reduction of costs for PV cells, modules and systems by decreasing production costs and by improving the overall system efficiency and
- the consideration of environmental issues related to the production and operation of PV systems.

Objectives

In order to provide the targets set by the PV R&D concept with concrete goals, a national R&D roadmap was developed in 2005. This roadmap was elaborated together with representatives from industry and research institutes. It puts emphasis on a stable decrease of the costs of electricity from PV by demanding the need for an efficient consumption of raw materials, especially of silicon, as well as higher efficiencies in general, long-term stability of all system components and innovative production technologies.

The PV R&D concept and roadmap are designed to support the German PV industry to reach, maintain and extend their leadership in all relevant disciplines. To achieve this goal, key-projects in the areas silicon wafer technology, thin-film concepts and system technologies are funded.

Priorities

Within the PV R&D programme priority is given for

- Crystalline silicon is still the most important material for manufacturing solar cells. In 2005 extra funds were available for the realisation of the PV Technology Evaluation Centre (PV-TEC). PV-TEC deals with the development of new silicon solar cell concepts and is designed to facilitate the transition from laboratory to production. Other research projects deal with efficient silicon ingot production and innovative rear contact cells.
- Thin-film technologies have the potential for a cost-effective large area production but today's market share is still low. R&D efforts on CIS technology bear their first fruit as a 15 MW pilot production line is set up. The basis of this development was laid in the 1980's which proofs that a reliable long-term support is of great importance. Beside CIS technology, the development of crystalline Silicon thin-films and amorphous Silicon is supported. For the latter technology currently facilities for high volume production are being set up.
- Concentrating photovoltaics (CPV) which is a good option in locations with high levels of direct solar irradiation. This is more the case in Southern Europe than Germany, for example. There concentrating photovoltaics with a current system efficiency of 25 % are more advantageous than standard modules, which at present achieve 15 % efficiency.
- PV System Technology: With an increasing number of grid-connected PV systems their integration into the electricity networks is of growing interest. The latest developments address high quality three phase inverters as well as inverters which provide added value by improving the local grid quality.
- Organic Solar cells with new PV-materials which give a chance of enormous cost reductions and of completely new product visions like transparent PV, large area PV or integrated power supply of electronic devices.

In 2009 the BMU support for R&D projects on PV amounted to about 32,9 MEuro share by 141 projects in total. The distribution of the budget shows that the focal point is still on silicon wafer technology (50% of the budget). The second centre of attention lies on thin-film technologies (32% - almost evenly shared between silicon and CIS thin-film technologies). Following the call for tender, the development of system technology (8%), alternative technologies especially concentrating PV (2%) and crosscutting issues (8%) are funded as well. During 2009, 35 new grants were contracted. The funding for these projects amounts to 31.4 MEUR in total.

Table 6: Germany - General Information on PV RTD Programming

Programme	5 th Federal Programme on Energy Research - "Innovation and New Energy Technologies" Sub-programme on renewable energies	
Ownership	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)	Federal Ministry of Education and Research (BMBF)
Management	Project Management Organisation PtJ	PtJ, VDI Technologiezentrum GmbH
Focus	Renewable energies, energy efficiency and energy related institutional funding Sub-programme on renewable energies: photovoltaic, wind energy, low temperature solar thermal applications, concentrating solar power, geothermal energy, biomass	Renewable energies, energy efficiency and energy related institutional funding Sub-programme "Basic Energy Research 2020+": Development of organic solar cells
Time Frame	2006 – 2008, now extended until 2010	
Website	http://www.erneuerbare-energien.de http://www.fz-juelich.de/ptj/	

Greece

Update April 2008

Organisations involved in PV ERA NET and PV RTD programming

The General Secretariat for Research and Technology (GSRT) and the Centre for Renewable Energy Sources (CRES) represent Greece in PV ERA NET.

The Ministry for Development (MoD) and its General Secretariat for Research and Technology (GSRT) are the authorities responsible for drafting the RTD policy in Greece.

GSRT supports through its programmes the research activities of both the country's scientific research institutes and those of its productive industry. It represents Greece in relevant institutions of the European Union, thus bringing the country's research and technology activities into line with the requirements of the international community. Within RTD and innovative demonstration actions, the Hellenic Government and in particular MoD has built up a so-called "decentralised" structure for the creation, national strategy and announcement of programmes in energy. In R&D, the first level of control is GSRT, which acts as a purely public organisation, without participation in EU projects. From its present structure, GSRT does not plan a national strategy in the field of energy. This role is formally given to CRES, which acts as the government's advisor on energy policy matters.

CRES is the national centre for renewable energies (RES), rational use of energy and energy saving (ES). It is a public entity, supervised by the Ministry of Development and has financial and administrative independence. CRES has been appointed by the government as the main consultant in energy matters including national policy, strategy, planning and programme management.

Set-up and strategy of the programme involved

The Operational Programme for Competitiveness (OPC) is under the European Community Support Framework 2000–2006. OPC covers a broad spectrum of activities for trade, industry, tourism, energy as well as research and technology. The so-called OPC–RTD Programme is managed by GSRT and is the part of OPC focusing on RTD activities. OPC–RTD has a long list of priorities broken down into measures and the measures broken down again in a wide range of actions.

Objectives

The main objective of the OPC–RTD programme is to bring research organisations closer to the industry through the formation of consortia in order to improve collaboration for the development of innovative products and services in the RES and ES sectors. For RES, the programme aims at the reduction of cost and the improvement of efficiency of relevant technologies.

RTD for improving Greek economic competitiveness is divided into the following objectives:

- Improvement of economic competitiveness
- Technological upgrading of the production potential and promotion of innovation
- Creation and development of new enterprises
- Upgrading of the technological and innovation potential in existing enterprises
- Promotion of collaboration between research and business units
- “Opening up” of the Greek research system and international cooperation
- Concentration of funds in priority fields and creation of units or networks of excellence with global recognition and national / regional exploitability
- Education of researchers; training-public awareness of technological, scientific and innovation issues
- Development and expansion of infrastructure.

Priorities

Most relevant actions for renewable energy and PV in the OPC–RTD programme are:

- PAVET stands for “Programme for the Development of Industrial Research and Technology”, while PAVET-NE is addressed to New Enterprises which have been operating for less than 5 years before the submission of a proposal. Both PAVET and PAVET-NE cover a broad spectrum of RTD thematic priorities, PV included.
- PEPER is the “Programme for the Promotion of Demonstration Projects and Innovation”. PEPER is focused on technology demonstration projects promoting the development of industrial prototypes.
- “Research and Technological Development Consortia in Sectors of National Priority” for renewable energy sources (RES) and energy saving promotes cooperation between enterprises and research entities on a long-term basis for the development of products and services that will contribute to cost reduction and improvement of the effectiveness of RES, optimum integration of RES in the electricity production networks and the development of new technologies and energy saving applications for buildings, industry and transport. The Programme supports both industrial research and initial demonstration (pre-competitive research). In the field of PV technology, emphasis is given to the following RTD areas: grid inverters, prototype PV modules and small stand-alone PV systems, development of PV modules for building components and applications of BIPV and thermal PV (T-PV) systems.
- PENED is the “Reinforcement Programme of Human Research Manpower” promoting training of university graduates or post-graduates in cutting-edge sectors. The priority sectors of PENED include bio-sciences, RES and energy conservation, environmental protection and restoration, natural disaster forecasting, urban environment upgrading, automation and micro-technology, new and improved materials and processing procedures etc.

Table 7: Greece - General Information on PV RTD Programming

Programme	Operational Programme for Competitiveness (OPC)
Ownership	Ministry of Development
Management	Ministry of Development for OPC General Secretariat for Research and Technology for OPC-RTD
Focus	General sectors in RTD include: “research excellence”, “technological innovation and research” and “human resources”.
Time Frame	2000 - 2006
Website	www.antonistikotita.gr

The Netherlands

Update August 2010

Organisations involved in PV ERA NET and PV RTD programming

The agency NL Agency, Directorate Energy and Climate Change represents the Netherlands in PV ERA NET.

The Ministry of Economic Affairs (MinEZ) is the owner of the Energy Research Subsidy (EOS) programme(s). NL Agency, Directorate Energy and Climate Change - as agency for sustainability and innovation of the Ministry of Economic Affairs - manages the Energy Research Subsidy (EOS) programme(s).

Set-up and strategy of the programme involved

The different programmes supporting PV RTD in the Netherlands are the instruments contributing to following short to medium (a) and long term (b) policies:

1. Implementation of RE to contribute to the fulfilment of the Kyoto - obligations and the EC Directives on renewable energy (a)
2. Implementation of a sustainable energy supply system ensuring the reliability of supply for the long term (b)
3. Strengthening of the Dutch scientific position in the field of energy technologies (b)

The strategy chosen was to support the process from new technology to consumer product, with a focus changing from fundamental research to market introduction from the early 1990ies to 2001. At the end of 2004 the Ministry of Economic Affairs (MinEZ) started the Energy Research Strategy with a new direction being based on:

- One approach for energy research
- Coherent set of instruments
- Selection of spearheads in close consultation with market players
- Focus on areas of importance for future Dutch energy supply
- Division over strong areas and import areas

The new Energy Research Subsidy (EOS) programme is a collection of energy programmes covering the full range from long term (EOS-LT) to pilot- and demonstration projects (EOS-DEMO) incorporating also programmes, (originally) falling under other schemes: New Energy Research (NEO), Energy Subsidy for Collaborative Projects (ES) and the Unique Opportunities Regulation (UKR).

In total the Energy Research Subsidy (EOS) comprises five different programmes:

1. The NEO programme gives a platform to new, innovative and high-risk ideas for energy conversion that are far from introduction to the market
2. EOS-LT covers more conventional energy topics by pre-selected spearheads. EOS-LT focuses on long term research on energy technologies, which are not expected to hit the market within 10 years.
3. ES supports the technology transfer from energy R&D to industry through collaborative R&D activities, involving both the researchers and the industry. As a special energy oriented sub-programme of the IS scheme, ES was added to the energy research programmes in 2006
4. The Unique Opportunities Subsidy (UKR) deals with development projects aiming at the transfer from technology to product. The UKR programme is a programme of the Energy Transition scheme.

5. EOS DEMO supports demonstration activities to test and proof the applicability of new products in standard market situations.

Though presently the Netherlands do not have a specific PV RTD programme, nor an allocated budget for PV RTD in the general programmes, PV RTD can be supported in virtually all programmes mentioned. Furthermore, an additional fund for innovation in the built environment and BIPV and a regional innovation impulse for the PV industry “Peaks in the Delta” have been recently set up.

Objectives

The main objective of the EOS programmes is to stimulate RTD and Demonstration, from which the results will a) contribute to a sustainable energy provision in the long term and b) strengthen the international position of the Dutch energy research activities.

Priorities

Prior to the opening of the programme 26 key energy research areas, divided over focal points and knowledge import themes, were identified. This was done through a broad consultation amongst energy research experts. Focal points are technology areas, which are expected to give a large contribution to the realisation of a sustainable Dutch energy supply and in which the Netherlands have a strong position. Knowledge import themes are areas, which are expected to contribute significantly to a sustainable Dutch energy supply but in which the position of other countries is stronger than that of the Netherlands.

These 26 research areas are clustered in five research areas, with each area containing the focal points and knowledge import themes:

- Energy efficiency in the industry and the agricultural sector
- Biomass
- New gas / clean fossil energy production
- Built environment (urban areas)
- Generation and grids

The most important areas for PV are found in two fields of attention, namely “built environment” and “generation and grids”.

The PV related “Built environment” spearhead areas are:

- System approach for built environment and local energy production
- PV solar energy: multicrystalline-silicon PV-technology
- PV solar energy: thin film PV technology (inorganic en organic solar cells)

The PV related “Generation and grid connection” spearhead areas are:

- Electricity transport, certainty of delivery, grid connection, power electronics
- Electricity conversion, power quality, custom power, converters, EMC

The PV related “Generation and grids” knowledge import area is:

- Electricity storage, small scale storage and system application (incl. super capacitors)

Table 8: The Netherlands - General Information on PV RTD Programming

Programme	New Energy Research (NEO)	Energy Research Subsidy (EOS)	Energy Subsidy for Collaborative Projects (ES)	Unique Opportunities Regulation (UKR)
Ownership	Ministry of Economic Affairs (MinEZ)	Ministry of Economic Affairs (MinEZ)	Ministry of Economic Affairs (MinEZ)	Ministry of Economic Affairs (MinEZ)
Management	NL Agency, Directorate Energy and Climate Change	NL Agency, Directorate Energy and Climate Change	NL Agency, Directorate Energy and Climate Change	NL Agency, Directorate Energy and Climate Change
Focus	Energy conversion (high-risk ideas)	Energy RTD	Technological innovations	Transition to a sustainable energy supply
Time Frame	Since 2002, renewed annually	Since 2005, renewed annually	Since 2006, renewed annually	Since 2005, renewed annually
Website	-			

North-Rhine-Westphalia

Update April 2009

Organisations involved in PV ERA NET and PV RTD programming

Two ministries and the project management organisation ETN represent North-Rhine-Westphalia (NRW) in PV ERA NET. ETN is also the coordinator of PV ERA NET.

The Ministry of Economic Affairs and Energy (MWME) with its energy department is responsible for all questions of energy supply including innovative energy sources and energy efficiency. It is the owner of the programme for efficient use of energy, of renewable energy sources and energy saving (progres.NRW).

The Ministry of Innovation, Science, Research and Technology (MIWFT), among other tasks, supports research projects, networking and technology transfer in a wide range of technological fields.

North-Rhine-Westphalia organises since 2007 its research and funding activities in 16 different clusters. Two of them are concerning PV-activities: Cluster EnergieWirtschaft.NRW, (Energy Economy) which is mainly supported by the Ministry of Economic Affairs and Energy (MWME), and Cluster EnergieForschung.NRW (Energy Research), which is supported by the Ministry of Innovation, Science, Research and Technology (MIWFT). Within these clusters, calls for proposals are released at least once a year. Topics differ widely between very specific calls (e.g. call for innovative hydrogen storage) and open calls for all energy-related proposals.

Projekttraeger Energie – Technologie – Nachhaltigkeit (ETN) (Project management organisation Energy - Technology – Sustainability) is a project and programme management agency acting on behalf of four NRW ministries. In the fields of renewable energies (RE) and energy efficiency ETN has the task of supervising and managing funding programmes as well as advising the federal state government on questions of strategic planning. ETN is an organisational department of Research Centre Juelich. ETN manages among other duties the calls for EnergieForschung.NRW and EnergieWirtschaft.NRW as well as the „progres.NRW“ programme by the Ministry of Economic Affairs and Energy.

Set-up and strategy of the programme involved

The strategy of NRW funding activities bases on competition. Funding shall be provided mainly by the performance of regular calls. The best proposals are selected by independent experts and in the following invited to hand in full proposals for funding. 16 different clusters have been setup in NRW, within these clusters calls for proposals are released at least once a year. Two cluster concerning PV are existing: Cluster EnergieWirtschaft.NRW and Cluster EnergieForschung.NRW. Both clusters are of more general character but comprise PV as important parts.

Within the Cluster EnergieWirtschaft.NRW, the programme for efficient use of energy, of renewable energy sources and energy efficiency (progres.NRW) addresses enterprises for technical development and demonstration of new energy technologies. Progres.NRW also includes a non-innovative market implementation part.

The programme owner provides for exchange in terms of cooperation and coordination of objectives and activities and use synergies in having a common programme manager (ETN) and a common communication agency.

Objectives

The main general objectives of the progres.NRW programme are:

- The reduction of barriers against, and the enhancement of, efficient energy use and the use of RE
- Proving the technical and economic viability of technical research results and transferring them into applications
- The reduction of investment risks in the context of development and use of innovative energy technologies
- Facilitating the integration of innovative energy solutions into energy supply
- Achieving considerable effects on employment and contributing to a sustainable change of the regional industry structure
- Contributing to primary energy savings and to the reduction of CO₂ emissions

Priorities

The progres.NRW programme scope ranges from technical development to demonstration projects. Current priority topics are:

- Fuel cells and hydrogen technology
- Use of renewable energy sources (biomass, solar, geothermal, water, wind)
- Clean coal technologies
- Products and processes promoting the efficient use of energy and resources
- Concepts and studies promoting the use and implementation of efficient energy use and RE

PV-related priorities: Due to the adaptation of funding activities to the existing regional PV RTD and industry structure, the PV activities are mainly focussed on crystalline silicon cell and module technology. Another important area until recently has been the demonstration of building-integrated PV.

The Cluster EnergieForschung.NRW comprehends the research in the whole range of energy technologies. The cluster is split into three sectors:

- Centralized energy production (power station technology on the basis of fossil fuel, nuclear energy and solar thermal energy)
- Decentralized energy production (fuel cell and hydrogen, photovoltaic, storage of electricity and heat)
- Biological production of energy carrier (bio refinery as keyword).

As cross-sectional issues energy grids and energy economics integrate these three sectors.

Table 9: North-Rhine-Westphalia - General Information on PV RTD Programming

Programme	Cluster EnergieWirtschaft.NRW (Energy Economy) Efficient use of energy, of renewable energy sources and energy efficiency (progres.NRW)	Cluster EnergieForschung.NRW (Energy Research)
Ownership	Ministry of Economic Affairs and Energy (MWME)	Ministry of Innovation, Science, Research and Technology (MIWFT)
Management	Project management organisation Energy – Technology – Sustainability (Projekttraeger ETN)	Project management organisation Energy – Technology – Sustainability (Projekttraeger ETN)
Focus	Energy efficiency and renewable energies	Energy research in the whole field of energy technologies
Time Frame	Since 2007	Since 2007
Website	www.progres.NRW.de	www.cef.nrw.de

Sweden

Update August 2010

Organisations involved in PV ERA NET and PV RTD programming

The Swedish Energy Agency represents Sweden in PV ERA NET.

The Swedish Energy Agency is the national authority for energy policy issues. The mission of the Swedish Energy Agency is to promote the development of Sweden's energy system so that it will become ecologically and economically sustainable. The Swedish Energy Agency owns and manages the long-term energy RTD programme and co-owns and co-finances an applied PV R&D programme (the SolEI programme) together with the PV and building industry and utility companies.

The Swedish Energy Agency obtains its budget for energy-related RTD from the Ministry of Enterprise, Energy and Communications.

Set-up and strategy of the programme involved

The objective of the Swedish energy policy is to establish an ecologically and economically sustainable energy system and to secure energy supply. This is to be achieved in collaboration with energy companies and industry in general, municipalities and the research community. International collaboration takes place in several forums, not least within the EU. The main emphasis is on energy-efficiency and the promotion of the use of renewable energy, such as biomass, hydropower, wind power and PV.

If compared to the previous long-term energy RTD programme, there was a shift in 2005 towards stronger emphasis on the commercialisation of the results. In the latest long-term energy RTD programme, which succeeded in 2009, there was also the addition that projects with limited or no energy relevance for the Swedish energy system but with global energy relevance and potential for strengthening Swedish industry can receive funding.

The Swedish Energy Agency defines, initiates and finances a diverse set of RTD instruments (e.g. research institutes, competence centres, individual and groups of projects, traditional programmes, etc.). The agency is highly flexible in selecting projects for funding – provided that projects are in line with the objectives of Swedish energy policy.

Sweden does not have one comprehensive RTD programme with a given budget for PV alone. Instead, PV RTD is included in the long-term energy RTD programme, for which the Swedish Energy Agency is responsible. During 2010, the long-term energy programme includes:

- The SolEI programme, which focuses on PV systems and their applications. The programme is co-financed by the Swedish Energy Agency and the Swedish industry (utility companies, manufacturing companies, construction companies and property managers). The programme includes applied RTD on (1) PV as an energy source and (2) PV as a building component. A new phase of SolEI started in 2008 and runs until the end of 2011.

- In addition to the SolEI programme there are several PV projects running. The largest projects are on CIGS thin film solar cells (Uppsala University, Midsummer), Dye sensitised solar cells (Uppsala University, KTH and Swerea IVF) and polymer solar cells (Linköping University and Chalmers).

Objectives

The main objectives of the SolEI programme are:

- To support the diffusion of PV in Sweden.
- To test, develop and demonstrate applications for grid-connected (mainly building-integrated) PV and stand-alone PV systems
- To identify, study and provide knowledge about PV issues to interest groups and to increase the level of knowledge of PV systems and strengthen networks among actors along the whole value chain.

Priorities

SolEI comprises technological development, information dissemination and objective analysis (both technical and non-technical) of applications and costs of PV systems. SolEI closely follows the rapid international development for PV in general and grid-connected BIPV in particular. It also provides a basis for international exchange, such as Sweden's participation in IEA PVPS.

In addition, the programme performs studies of the feasibility, procurement, installation and operation of Swedish PV installations and it has implemented a web based monitoring system for grid-connected PV installations in Sweden. Development of concentrating PV systems and PV-thermal concepts are also included the programme.

The interest from the Swedish construction industry in the SolEI has increased due to the strong international development in the field of BIPV. The involvement of the building industry and property managers in the programme during the last few years has shifted the focus of the programme from stand-alone systems towards PV in buildings. Grid issues and the question of how to create a functioning regulatory framework for small PV systems that deliver electricity to the public grid, has been a hot topic for the Swedish PV market in recent years. An example of activities within the programme is several projects with the aim to identify problems and solutions regarding these issues.

Table 10: Sweden - General Information on PV RTD Programming

Programme	Long-term energy research programme	Swedish national co-financed programme for PV systems and applications (SoIEI)
Ownership	Ministry of Enterprise, Energy and Communications	Swedish Energy Agency and Swedish industry
Management	Swedish Energy Agency	A board appointed by the financing partners is responsible for programme budget as well as project selection. A project coordinator from company Elforsk AB is responsible for administration and day-to-day business
Focus	Energy research towards a long-term sustainable energy system	PV as an energy source and PV as a building component
Time Frame	Continuous (with regular evaluations of the programme)	2008-2011
Website	www.swedishenergyagency.se	www.elforsk.se/solei

Switzerland

Update August 2010

Organisations involved in PV ERA NET and PV RTD programming

Two organisations are formally involved in PV ERA NET: The Swiss Federal Office of Energy (SFOE) is responsible for the Swiss PV RTD Programme whereas NET Nowak Energy & Technology Ltd (NET) manages the programme.

SFOE is part of the Federal Department of Environment, Transport, Energy and Communications (Ministry) and is the government authority responsible for all energy related matters (policy, legislation, research, action programmes, etc.). The SFOE uses a decentralised management structure whereby the programme strategy and management is under the responsibility of qualified institutions (disregarding the type of institution – be it a university, agency or private company) acting officially and on behalf of the SFOE. With respect to the Swiss PV RTD programme, Stefan Nowak / NET is the official manager on behalf of SFOE.

Set-up and strategy of the programme involved

Under the ownership and coordination of SFOE, the Swiss PV RTD Programme deals specifically with PV RTD activities. To this end, the programme combines both the specific funding possibilities through SFOE as well as other national and regional funding agencies with their specific instruments in one comprehensive and coordinated programme. This definition of a RTD programme follows the Swiss Energy Research Master Plan and is part of the terms of reference for the programme management.

Based on strategic national policy targets (energy & environment, science & education, industry & society), the Federal Commission for Energy Research (CORE) - composed of 15 experts from a wide range of backgrounds - in cooperation with SFOE develops 4 years' RTD energy research master plans (present period 2008 – 2011), split up in programmes and sub-programmes. These energy technology specific programmes are supported by different national and regional government agencies, the research community and the private sector with an overall coordination by SFOE.

The individual RTD programmes develop their own 4 years' research master plans including implementation plans, which detail the research to be carried out. These research master plans have to be endorsed by CORE. One member of this commission serves as godfather for the individual RTD programmes and forms the link between the programme managers and CORE.

The Swiss PV RTD programme follows a system and application oriented approach, starting from basic research, over applied research, product development, pilot- and demo-installations all the way to market oriented activities.

By co-financing in a subsidiary way, SFOE actively leverages the research activities carried out. The Swiss RTD activities are supported by a wide range of different institutions and organisations along the whole value chain.

The comprehensive approach followed in the Swiss PV RTD Programme has benefits for the funding institutions involved on the one hand (e.g. coordination, transparency, effective attribution of funds, avoiding duplication, etc.) and for the PV RTD community on the other hand (e.g. one central contact, one stop shop, efficient support and guidance, etc.). At the same time, such an approach requires an important networking effort and good communication channels. Furthermore, confidence and impartiality are key aspects relevant for a successful programme management. Considerable effort and time is required until these “soft” but important factors are established and recognised by the RTD community.

Objectives

The main objectives of the programme are:

- Cost reduction / optimisation of PV systems (integral approach): the efforts undertaken in the individual research projects on the component level aim to reduce overall system costs, improve the efficiency, the reliability etc. of the whole PV system including engineering, material (modules, BOS), mounting, operation and quality assurance.
- Applicability (application oriented approach): transfer of the elaborated scientific results into practical solutions as well as industrial processes and products, where the collaboration with the industry is an important issue.

Quantitative targets by 2011 are:

- Module costs of 1,7 EUR per Wp
- System costs of 3,3 EUR per Wp

Priorities

The thematic priorities of the programme are:

- Cell technologies:
 - industrial manufacturing of solar cells and modules based on thin film technology
 - options of third generation solar cells (e.g. organic and polymer cells)
 - manufacturing processes for thinner wafers
- Modules and building integrated PV (BIPV):
 - components for promising solutions in building integrated PV systems
 - products tapping the synergy potential with building technologies (green buildings) and fuel cells (medium term)
- Electric system technology, including standardisation:
 - new components for grid-connected, stand-alone and hybrid systems
 - distributed generation systems and energy storage
- International institutional cooperation: EU, IEA, IEC

Table 11: Switzerland - General Information on PV RTD Programming

Programme	Swiss Photovoltaic RTD Programme
Ownership	Swiss Federal Office of Energy (SFOE)
Management	NET Nowak Energy & Technology Ltd
Focus	PV
Time Frame	Since 1985, executed in subsequent 4 year terms
Website	www.photovoltaic.ch