Publicly Funded Energy Research
The Netherlands 2012 Monitoring Report

English summary of 'Monitor publiek gefinancierd energieonderzoek 2012'

A STUDY COMMISSIONED BY:

NL Agency

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Summary

NL Agency[1] annually commissions the "Publicly Funded Energy Research Monitor" on behalf of the Ministry of Economic Affairs. The monitoring report of 2012 provides an overview of public funding on energy research programmes, the involved funders/financers, intermediaries (funding partners) and contractors (recipients), as well as the specific research topics. The conclusions highlighted in this report serve as input for the continuing development of the Dutch national policy on energy research, and the database of the International Energy Agency (IEA).

S1 Overview of conclusions

- Public funding of energy research increased from 163 million euro in 2011 to 210 million euro in 2012[2]. This increase was due mainly because of the new Dutch innovation policy agenda, the "topsectorenbeleid" (top sector policy)[3]. This policy agenda was officially introduced in 2011, but in terms of actual public funding, commenced halfway through 2012.
- The top sector policy not only revived the funding of publicly funded energy research, but also caused some shifts in financial flows compared to the 'old' Energy Innovation Agenda ("IEA"). These shifts are explained below.
- The most notable shift in 2012 was the amount of funding managed by intermediary "NL Agency". In 2011, the managed energy research programmes by NL Agency were almost completely canceled due to the transition towards the top sector policy. NL Agency allocated 80 million euro out of the potential 120 million euro budget, since most top sector programmes commenced in the second half of 2012.
- The funding of energy research programmes provided by intermediary "NWO"[4] declined by 40% to 24 million euro in 2012. This decline was not directly linked to a decline of available budget, but because of a decline in grant applications that fulfilled the requirements of NWO standards for excellent scientific research.
- The Ministry of Economic Affairs is the largest public funder of energy research. In 2012 the Ministry financed 70% of the total public funding of energy research worth 148 million euro. With 40 million euro in 2012, the overall budget for energy research of the Ministry of Education,

[1] NL Agency is an agency of the Dutch Ministry of Economic Affairs that implements government policy for sustainability, innovation, and international business and cooperation.

[2] This amount excludes the direct funding by the Ministry of Education, Culture and Science of university-based research.

[3] The central element of the top sector policy is that universities, knowledge centres and companies in selected economic sectors (top sectors) cooperate in 'Top-consortia for Knowledge and Innovation' (TKI). These consortia perform R&D and other activities that lead to innovation funded with public and private recourses. The selected sectors are: Agri-food, Horticulture and plant propagation, High Tech, Energy, Logistics, Creative industry, Life sciences and Health, Chemicals and Water.

[4] The Netherlands Organisation for Scientific Research (NWO) funds thousands of top researchers at universities and institutes and steers the course of Dutch science by means of research programmes and by managing the national knowledge infrastructure.

Culture and Science (OCW) remained fairly stable compared to 2011 and 2010[5]. The public funding by the Ministry of the Interior and Kingdom Relations (BZK) of energy innovations in the urban environment was cut by half in 2012 (mainly due to the crisis in the Dutch construction sector).

- The 45% share of the IEA topic 'Renewable energy' in the total research budget for publicly funded energy research hasn't been as large as in 2012. Especially the subtheme 'biomass energy' within the topic 'Renewable energy' received much funding. With a 25% share in 2012, the IAE topic 'Energy efficiency' reached its lowest level since 2008.
- About half of the publicly funded energy research within the 'top sector Energy' is performed by the top-consortia for knowledge and innovation (TKI). Apart from that, about 25% of the remaining publicly funded energy research can be categorised as one of the research topics within the top sector Energy. The topics 'Bio-based Economy', 'Solar energy' and 'Natural gas' are the largest topics within the top sector Energy.
- Instead of a historical focus on demonstration projects within the old 'Innovation Agenda Energy', the top sector policy is focusing much more on industrial and fundamental research. As a result, the financial flow through intermediary NL Agency is increasingly directed towards universities and knowledge centres. Private contractors (companies) received much less public financing of energy research than in previous years. Nevertheless, the knowledge centres increasingly need to take notice of market developments, since their grant provisions depend more and more on the co-funding by private companies.
- Independent research by private contractors increasingly depends on tax incentives like 'WBSO'[6], 'RDA+'[7] and government credit programmes such as 'SEED-capital' and R&D-credits in contrast to regular research grants. These kind of policy instruments are not included in the results of this monitor.

S2 Publicly funded energy research in 2012

Public funding for energy research increased from 163 million euro in 2011 to 210 million euro in 2012[8] (see Figure S.1). This increase is the result of the top sector policy. This policy agenda was officially introduced in 2011, but in terms of actual public funding commenced halfway through 2012. Nevertheless, the amount of public funding in energy research was at the same level as in 2007 and 2009[9].

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5 This amount excludes the direct funding by the Ministry of Education, Culture and Science.

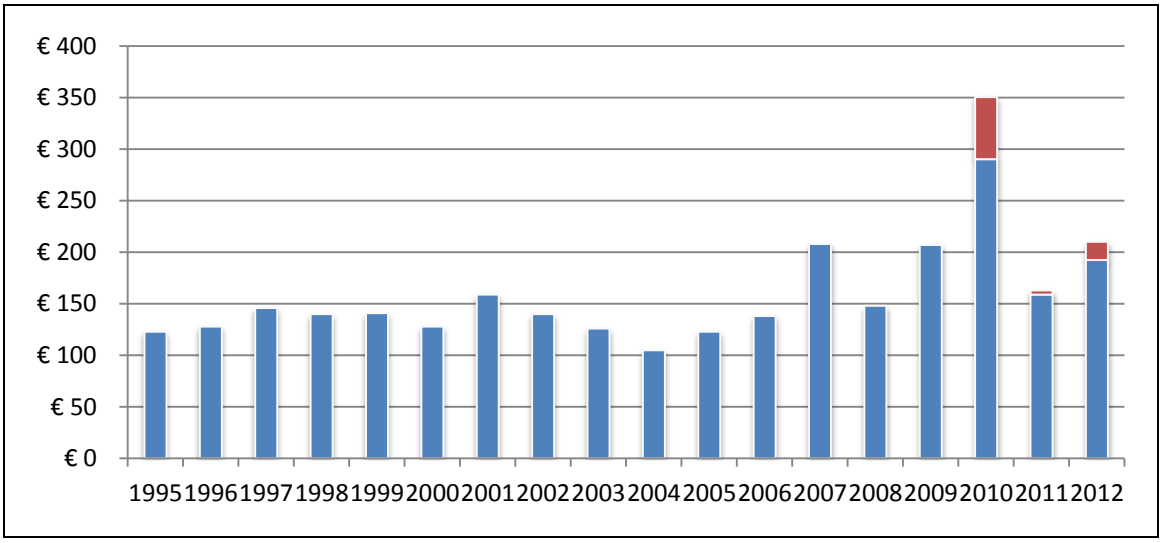
6 WBSO is a Dutch Research and Development (R&D) tax credit that provides a fiscal facility for companies, knowledge centres and self-employed persons who perform R&D work.

7 The Research & Development Allowance (RDA) is a Dutch tax allowance for investments in R&D. It concerns investments in, among other things, the rent of equipment, the purchase of materials and investments in a laboratory.

8 This amount excludes the direct funding by the Ministry of Education, Culture and Science of university-based research.

9 Even though, NL Agency allocated only 67% of the total budget for energy research in 2012.

Figure S.1 Annual governmental expenditure on energy research 1995-2012 (in million euro, the red bar reflects the estimated additional expenditure resulting from a change in methodology)

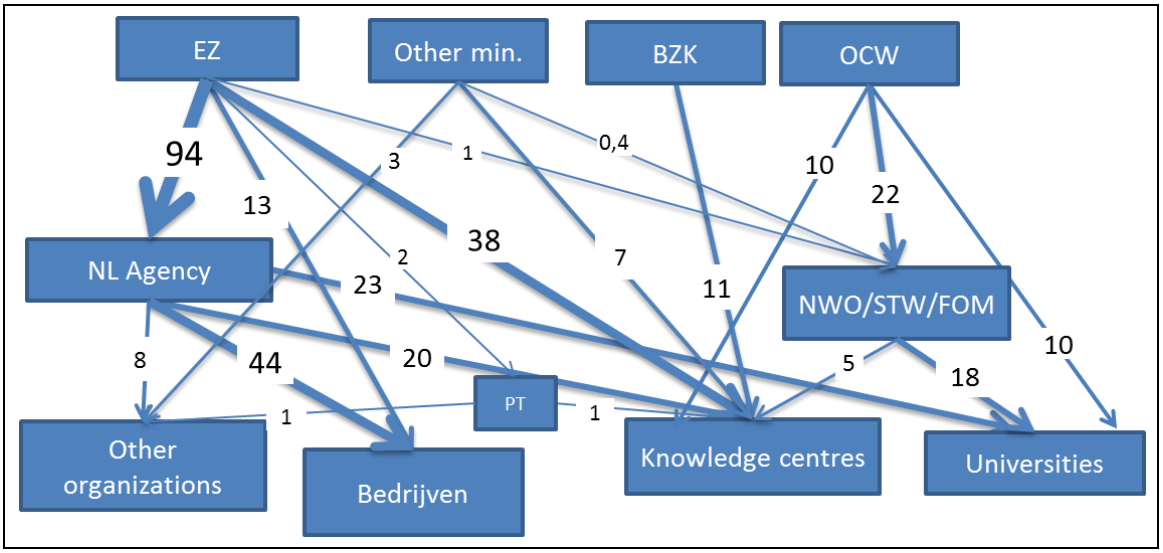


Only the labelled budgets for energy research of the Ministries and intermediaries have been included in the total of 210 million euro. This amount excludes the direct funding mechanisms of the Ministry of Education, Culture and Science for universities, and measures such as fiscal benefits (e.g., WBSO and RDA+), and government credit programmes.

S3 Funders, intermediaries, and contractors

As in most previous years, the Ministry of Economic Affairs (EZ) was the largest public funder of energy research in 2012. As a result of the top sector policy, funding partner 'NL Agency' witnessed a significant increase in managed research budget for energy research.

Figure S.2 Financial flows of publicly funded energy research between funders, intermediaries and contractors in 2012 (in million euro, excluding direct funding of university-based research by OCW)



Funders/financers

With an overall budget of 148 million euro (see Table S.1), the Ministry of Economic Affairs remained the largest financer of publicly funded energy research in 2012. The Ministry of Education, Culture and Science is the second largest funder with a budget of 41 million euro. This excludes the direct funding of university-based energy research, with the exception of the 10 million euro investment of universities in the top-consortia for knowledge and innovation. The Ministry of the Interior and Kingdom Relations (IKR) invested 11 million euro in energy research in 2012, compared to 24 million euro in 2011. This decline is the result of the crisis in the construction sector in the Netherlands, resulting in less programmes for energy innovation in the urban environment.

Intermediaries

NL Agency is the largest funding partner (intermediairy) in terms of publicly funded energy research. The managed budget by NL Agency trippled from 28 million euro in 2011 to 94 million euro in 2012 (see Table S.1). Only in 2010, was this amount higher as a result of the Energy Innovation Agenda, and its many programmes. The funding of energy research programmes provided by intermediary NWO declined by 40% to 24 million euro in 2012 and 42 million euro in 2011. This decline was not directly linked to a decline of available budget, but because of a decline in grant applications that fulfilled the requirements of NWO standards for excellent scientific research.

The Horticulture Marketing Board (PT, Productschap Tuinbouw) is also included in the monitoring report as an intermediary organisation. However, since PT is not acting upon instructions from a Ministry, the title “intermediary organisation” is not a 100% correct description of their role. Nevertheless, the Ministry of Economic Affairs contributes annualy 50% to research initiatives initiated by PT (performed by knowledge institutes).

Research contractors

The knowlegde centres are the largest research contractors of publicly financed energy research (see Table S.1). The share of research contracts that were made available to private companies in 2012 was very modest compared to previous years. In contrast to companies, universities witnessed a large increase in research funds as a result of the top sector policy[10].

Table S.1 Total overview of energy research 2008 – 2012 (in million euro).

	2008	2009	2010	2011	2012
Financers	**148**	**207**	**350**	**163**	**210**
Ministry of Economic Affairs (EZ)	117	181	306	92	148
Ministry of Education, Culture & Science (OCW)	18	20	42	44	41
Ministry of Infrastructure and the Environment (I&M)	0	1	3	3	0
Ministry of the Interior and Kingdom Relations (BZK)*	11	4	0	24	11
Other/unknown	2	0	0	0	10**
Intermediairies	**78**	**85**	**228**	**70**	**120**
NL Agency	63	66	183	28	94
NWO/STW/FOM	15	15	42	40	24
Horticulture Marketing Board (PT)	0	4	4	3	2
Other/unknown	0	0	0	0	0
Contractors	**148**	**207**	**350**	**163**	**210**
Knowledge centres	70	93	92	63	92
Universities	40	35	72	36	51
Companies	38	70	176	45	56
Other/unknown	0	9	11	19	11

* Budgets shown for the period 2008 – 2009 relate to the former Ministry of Housing, Spatial Planning and the Environment.

** Partnerships of several Dutch Ministries and contributions by local governments to the top-consortia for knowledge and innovation

S4 Topics and types of research

IEA

The International Energy Agency (IEA) compiles the data and figures from this monitoring report into its database. For that reason, this monitoring report includes a categorisation according to the system used by the IEA. As illustrated in Table S.2, the topics “Energy efficiency” and “Renewable energy” are traditionally the most important topics of publicly funded energy research in the Netherlands. In 2012, this was still the case, but as the share of Renewable energy (especially biomass) wit-

[10] In addition, we managed to identify 10 million euro of energy research performed by universities as a result of their share in the top-consortia for knowledge and innovation.

nessed a significant increase, research into Energy efficiency witnessed the opposite. Like the previous year(s), the Dutch public authorities are not investing in the IEA topic "Hydrogen and fuel cells", but there is a significant money flow to be viewed towards the topic "Other power and storage techs" (Smart Grids).

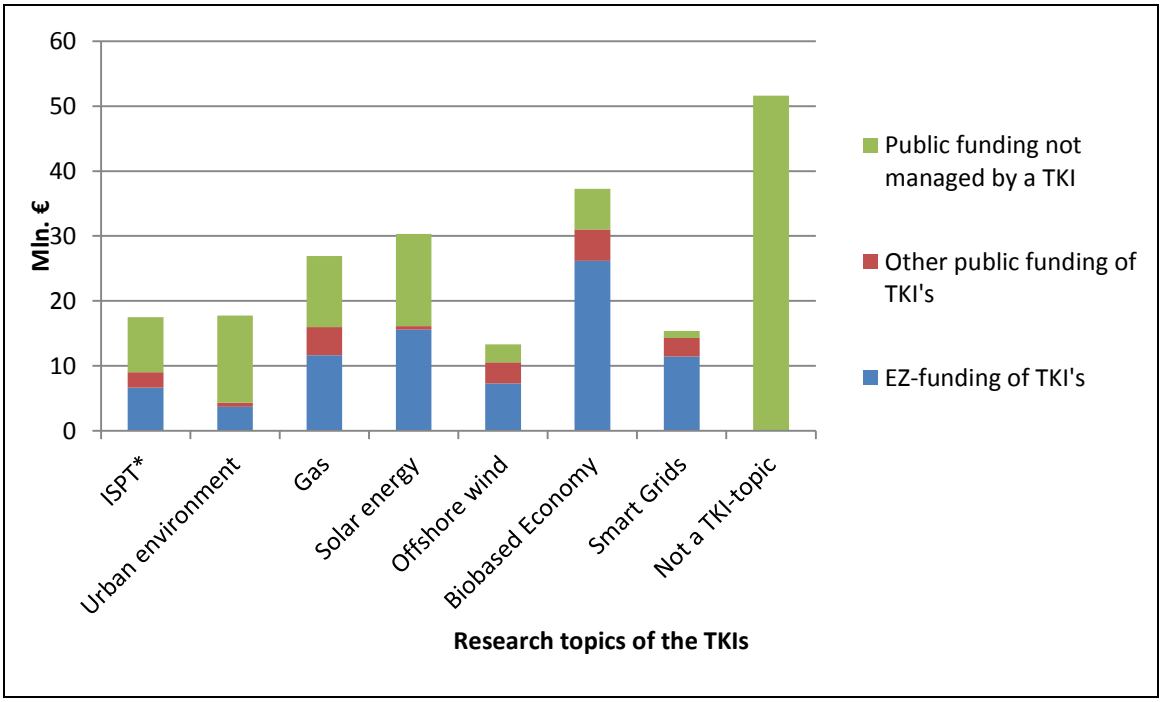
Table S.2 IEA distribution of topics amongst research contractors (in million euro and as a percentage of the total budget))

Themes	2008		2009		2010		2011		2012	
	Mio. €	%	Mio. €	%	Mio. €	%	Mio. €	%	Mio. €	%
Energy efficiency	44	29%	76	43%	145	41%	60	37%	53	25%
Fossil fuels	14	10%	19	11%	31	9%	9	6%	14	7%
Renewable energy sources	47	32%	46	26%	138	40%	54	33%	94	45%
Nuclear fission and fusion	17	11%	12	7%	18	5%	14	8%	13	6%
Hydrogen and fuel cells	9	6%	11	6%	4	1%	0	0%	0	0%
Other power and storage techs	9	6%	7	4%	4	1%	17	11%	19	9%
Other technologies or research	9	6%	6	4%	10	3%	10	6%	16	8%
Total	**148**	**100%**	**177**	**100%**	**350**	**100%**	**163**	**100%**	**210**	**100%**
% of total budget		100%		86%		100%		100%		100%

Top-consortia for knowledge and innovation (TKI)

In the top sector Energy, universities, knowledge centres and companies cooperate in top-consortia for knowledge and innovation (TKI). Each of the seven consortia within the energy sector has its own research topic (see Figure S.3). About 100 million euro of the 210 million euro publicly funded energy research can be addressed to research programmes within the TKIs. For the largest part, this 100 million euro is funded by the Ministry of Economic Affairs, but also by universities and knowledge centres. If we include publicly funded energy research programmes that are not managed by a TKI, we can categorise 75% of the total budget within the research topics of the top sector Energy. Approximately 50 million euro of publicly funded energy research such as 'energy efficiency in the agriculture sector' cannot be categorised in terms of TKI topics.

Figure S.3 Publicly financed energy research categorised in terms of TKI topics (2012)



*ISPT (energy efficiency in the industry) contains most likely some double-counting errors which we were not able to trace this year

Types of research programmes

The share of demonstration programmes as a percentage of the total budget dropped significantly as a result of the transition towards the top sector policy (see Table S.6). Industrial and fundamental research are the most important types of research programmes in the top sector policy. Especially the share of fundamental energy research financed by government grants has grown compared to previous years.

Table S.6 Distribution of funding amongst the different types of energy research (in million euro and as a percentage of the total budget)

	2008		2009		2010		2011		2012	
	Mio. €	%	Mio. €	%	Mio. €	%	Mio. €	%	Mio. €	%
Demonstration	22	15%	66	34%	102	29%	45	28%	25	12%
Experimental development	9	6%	7	3%	44	13%	14	8%	32	15%
Industrial research	78	54%	80	41%	168	48%	71	44%	88	42%
Fundamental research	32	22%	37	19%	27	8%	21	13%	55	26%
Transfer of knowledge	4	3%	7	4%	8	2%	12	7%	10	5%
Total/% of total budget	**145**	**100%**	**197**	**100%**	**350**	**100%**	**163**	**100%**	**210**	**100%**

Appendix A IEA-table

			2008	2009	2010	2011	2012	*Of which Demo*
A		**Energy efficiency**	**44**	**76**	**145**	**60**	**53**	***17***
1	1	Industry	15	21	42	7	17	*0*
1	2	Residential and commercial	17	14	34	26	13	*5*
1	3	Transport	3	2	23	2	1	*0*
1	4	Other	8	39	45	25	21	*13*
1	0	Energy efficiency unallocated	0	0	0	0	0	*0*
B		**Fossil fuels: oil, gas and coal**	**14**	**19**	**31**	**9**	**14**	***0***
B	**1**	***Oil and gas***	**8**	**7**	**3**	**6**	**11**	***0***
1	1	Enhanced oil and gas production	4	3	2	3	2	*0*
1	2	Refining, transport and storage of oil and gas	2	1	0	1	0	*0*
1	3	Non-conventional oil and gas production	0	0	0	1	1	*0*
1	4	Oil and gas combustion	1	0	0	1	1	*0*
1	5	Oil and gas conversion	0	0	0	0	1	*0*
1	6	Other oil and gas	0	2	0	0	1	*0*
1	0	Oil and gas unallocated	0	0	0	0	6	*0*
B	**2**	***Coal***	**1**	**0**	**0**	**0**	**0**	***0***
2	1	Coal production, preparation and transport	0	0	0	0	0	*0*
2	2	Coal combustion	0	0	0	0	0	*0*
2	3	Coal conversion (excluding IGCC)	0	0	0	0	0	*0*
2	4	Other Coal	0	0	0	0	0	*0*
2	0	Coal unallocated	0	0	0	0	0	*0*
B	**3**	***CO_2 Capture and Storage***	**6**	**13**	**29**	**4**	**3**	***0***
3	1	CO_2 capture/separation	5	6	9	2	1	*0*
3	2	CO_2 transport	0	0	5	1	0	*0*
3	3	CO_2 storage	1	6	8	1	1	*0*
3	0	CO2 unallocated	0	0	7	0	1	*0*
B	**0**	***Fossil fuels unallocated***	**0**	**0**	**0**	**0**	**0**	***0***

			2008	2009	2010	2011	2012	*Of which Demo*
C		**Renewable energy sources**	**47**	**46**	**139**	**54**	**94**	***6***
C	**1**	***Solar Energy***	**15**	**21**	**30**	**30**	**29**	***0***
1	1	Solar heating and cooling (including daylighting)	0	1	0	0	0	*0*
1	2	Photovoltaics	15	20	28	29	29	*0*
1	3	Solar thermal power and high-temp. applications	0	0	0	0	0	*0*
1	0	Energy efficiency unallocated	0	0	1	1	0	*0*
C	**2**	***Wind Energy***	**6**	**6**	**31**	**11**	**13**	***0***
2	0	Wind Energy	6	6	31	11	13	*0*
C	**3**	***Ocean Energy***	**0**	**0**	**1**	**0**	**0**	***0***
3	0	Ocean Energy	0	0	1	0	0	*0*
C	**4**	***Bio-Energy***	**26**	**18**	**66**	**8**	**49**	***6***
4	1	Liquid biofuels	1	1	2	0	1	*0*
4	2	Solid biofuels	11	10	6	3	0	*0*
4	3	Biogasses					9	*2*
4	4	Applications for heat and electricity	4	5	31	2	0	*0*
4	5	Other bio-energy	10	1	26	2	0	*0*
4	0	Energy efficiency unallocated	0	0	0	1	38	*4*
C	**5**	***Geothermal Energy***	**0**	**0**	**1**	**1**	**0**	***0***
5	0	Geothermal Energy	0	0	1	1	0	*0*
C	**6**	***Hydropower***	**0**	**0**	**0**	**0**	**0**	***0***
6	1	Large hydropower (> 10 MW capacity)	-	-	-	-	0	*0*
6	2	Small hydropower (< 10 MW capacity)	-	-	-	-	0	*0*
6	0	Energy efficiency unallocated	-	-	-	-	0	*0*
C	**7**	***Other renewable***	**0**	**0**	**10**	**4**	**2**	***0***
7	0	Other renewable	0	0	10	4	2	*0*
C	**0**	***Renewable unallocated***	**0**	**1**	**0**	**0**	**1**	***0***

			2008	2009	2010	2011	2012	*Of which Demo*
D		**Nuclear fission and fusion**	**17**	**12**	**18**	**14**	**13**	**1**
D	**1**	***Nuclear Fission***	**10**	**8**	**9**	**8**	**9**	***1***
1	1	Light-water reactors (LWRs)	0	0	2	2	2	*0*
1	2	Other converter reactors	2	0	2	2	2	*0*
1	3	Fuel cycle	2	0	1	1	1	*0*
1	4	Nuclear supporting technologies	1	0	1	1	2	*0*
1	5	Nuclear breeder	0	0	0	0	0	*0*
1	6	Other nuclear fission	4	0	4	3	2	*0*
1	0	Energy efficiency unallocated	0	8	0	0	0	*0*
D	**2**	***Nuclear Fusion***	**7**	**5**	**9**	**5**	**5**	***0***
2	0	Nuclear Fusion	7	5	9	5	5	*0*
D	**0**	***Nuclear unallocated***	**0**	**0**	**0**	**0**	**0**	***0***
E		**Hydrogen and fuel cells**	**9**	**11**	**4**	**0**	**0**	***0***
E	**1**	***Hydrogen***	**2**	**5**	**1**	**0**	**0**	***0***
1	1	Hydrogen production	0	2	0	0	0	*0*
1	2	Hydrogen storage	1	0	1	0	0	*0*
1	3	Hydrogen transport and distribution	0	3	0	0	0	*0*
1	4	Other infrastructure and systems R&D	0	0	0	0	0	*0*
1	5	Hydrogen end uses (incl. combustion; excl. fuel cells)	0	0	0	0	0	*0*
1	0	Energy efficiency unallocated	0	0	0	0	0	*0*
E	**2**	***Fuel Cells***	**7**	**6**	**3**	**0**	**0**	***0***
2	1	Stationary applications	0	0	0	0	0	*0*
2	2	Mobile applications	0	0	1	0	0	*0*
2	3	Other applications	0	0	0	0	0	*0*
2	0	Energy efficiency unallocated	7	6	1	0	0	*0*
E	**0**	***Hydrogen and fuel cells unallocated***	**0**	**0**	**0**	**0**	**0**	***0***

			2008	2009	2010	2011	2012	*Of which Demo*
F		**Other power and storage technologies**	**9**	**7**	**4**	**17**	**19**	***1***
1	0	Electric power conversion	0	1	0	0	0	*0*
2	0	Electricity transmission and distribution	7	5	3	17	16	*1*
3	0	Energy storage	2	1	1	0	3	*0*
0	0	Other power and storage unallocated	0	0	1	0	0	*0*
G		**Other cross-cutting energy technologies or research**	**9**	**36**	**10**	**10**	**16**	***0***
1	0	Energy system analysis	1	1	4	1	1	*0*
2	0	Other	8	6	6	9	15	*0*
0	0	Cross-cutting energy technologies non allocated		30				
		Total	**148**	**208**	**350**	**163**	**210**	**25**