

JRC SCIENCE FOR POLICY REPORT

Energy R&I financing and patenting trends in the EU

*Country dashboards
2017 edition*

Fiorini, A., Georgakaki, A.,
Jimenez Navarro, J. P.,
Marmier, A., Pasimeni, F.,
Tzimas, E.

2017



This publication is a Science for Policy report by the Joint Research Centre (JRC), the European Commission's science and knowledge service. It aims to provide evidence-based scientific support to the European policymaking process. The scientific output expressed does not imply a policy position of the European Commission. Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use that might be made of this publication.

Contact information

Name: Aliko Georgakaki
Email: Aliko.Georgakaki@ec.europa.eu
Tel.: +31 224 56 5133

JRC Science Hub

<https://ec.europa.eu/jrc>

JRC109654

EUR 29003 EN

PDF	ISBN 978-92-79-77295-5	ISSN 1831-9424	doi:10.2760/519466
Print	ISBN 978-92-79-77296-2	ISSN 1018-5593	doi:10.2760/605647

Luxembourg: Publications Office of the European Union, 2017

© European Union, 2017

Reuse is authorised provided the source is acknowledged. The reuse policy of European Commission documents is regulated by Decision 2011/833/EU (OJ L 330, 14.12.2011, p. 39).

For any use or reproduction of photos or other material that is not under the EU copyright, permission must be sought directly from the copyright holders.

How to cite this report: Fiorini, A., Georgakaki, A., Jimenez Navarro, J., Marmier, A., Pasimeni, F. and Tzimas, E., Energy RandI financing and patenting trends in the EU: Country dashboards 2017 edition, EUR 29003 EN, Publications Office of the European Union, Luxembourg, 2017, ISBN 978-92-79-77295-5, doi:10.2760/519466, 10.2760/605647, JRC109654.

All images © European Union 2017

Energy R&I financing and patenting trends in the EU

The report monitors the progress made by EU Member States concerning two key indicators identified in the Integrated Strategic Energy Technology Plan Communication, namely the level investment in R&I (by both the public and private sector) and trends in patents. To do so, a collection of country dashboards are presented containing the relevant information, summarised for each EU Member State and SET Plan action, providing a quick overview of each EU Member State within the European framework.

The information presented is produced according to the JRC in-house methodology for monitoring R&I in Low Carbon Energy Technologies and is consistent with the R&I indicators included in the 3rd State of the Energy Union Report.

Contents

- Acknowledgements 1
- Executive summary 2
- Introduction..... 4
- Quick guide to the dashboards 6
- Austria 10
- Belgium..... 12
- Bulgaria 14
- Croatia 16
- Cyprus 18
- Czech Republic 20
- Denmark 22
- Estonia..... 24
- Finland..... 26
- France..... 28
- Germany 30
- Greece 32
- Hungary 34
- Ireland 36
- Italy..... 38
- Latvia 40
- Lithuania 42
- Luxembourg 44
- Malta 46
- Netherlands 48
- Poland..... 50
- Portugal 52
- Romania..... 54
- Slovakia 56
- Slovenia 58
- Spain 60
- Sweden 62
- United Kingdom..... 64
- European Union..... 66
- Key Messages 68
- List of figures 71
- References 72

Acknowledgements

The authors would like to acknowledge counterparts at the European Patent Office and International Energy Agency for their continuing collaboration and support of this work.

Authors

Fiorini, A.

Georgakaki, A.

Jimenez Navarro, J. P.

Marmier, A.

Pasimeni, F.

Tzimas, E.

Executive summary

Monitoring innovation activities in the energy field in the EU is essential to assess the progress towards the achievement of the European Energy system transformation. This transformation not only ensures the decarbonisation of the European Energy system, in line with the Paris agreement, but also contributes to energy security and the competitiveness of the European economy in global energy markets.

This report monitors the progress made by EU Member States concerning two key indicators identified in the Integrated Strategic Energy Technology Plan Communication, namely the level of investment in R&I in terms of both private (expenditure by businesses and industry) and public (Member States' national programmes and instruments) and trends in patents. To do so, a collection of country dashboards are presented containing the relevant information, summarised for each EU Member State, providing a quick overview of each country.

The information presented is produced according to the JRC in-house methodology for monitoring R&I in Low Carbon Energy Technologies and is consistent with the R&I indicators included in the 3rd State of the Energy Union Report.

Policy context

The Communication 'Towards an Integrated Strategic Energy Technology (SET) Plan: Accelerating the European energy system transformation' (C(2015) 6317 final) called for a further strengthened SETIS, the information system that manages and operates the monitoring and reporting scheme of the SET Plan. SETIS supports the implementation and continuous development of the integrated SET Plan, through a more diligent and intelligent use of available information, data and reporting practices by stakeholders and Member States. In this context, the monitoring and reporting activities of SETIS support the following objectives:

- The Annual State of the Energy Union Report: SETIS monitors and reports on a number of key indicators that are used to measure progress in the implementation of the fifth dimension of the Energy Union, i.e. on research, innovation and competitiveness.
- SET Plan implementation: SETIS reports as necessary, addressing various aspects of SET Plan implementation, in agreement and collaboration with the MS.

Main findings

- Public investment in R&I in the SET Plan actions increased from EUR 2.6 billion in 2007 to EUR 4.2 billion in 2010; it remained around that level for the period 2010-2015 (most recent year for which information is available).
- Public investments in four Member States, France, Germany, Italy and the UK account for approximately 70% of the total EU R&I investment. France is the largest public investor in R&I, followed by Germany; they account for near a quarter and a fifth of the EU total, respectively.
- Private investment in R&I in the SET Plan actions increased from EUR 11 billion in 2007 to EUR 16 billion in 2013 (most recent year for which data is available).
- Throughout the period 2007-2013, private investment has consistently accounted for around 80% of the total R&I expenditure in SET Plan actions.
- The German private sector is the largest contributor to R&I activities in SET Plan actions. Investment in 2013 reached EUR 7 billion, equal to 46% of private investment at EU level. France ranked second with a share of 16%.

- In the period 2007-2013, the number of patents in topics relevant to the SET Plan actions increased by an average 15% annually.
- The specialisation index, based on the patenting intensity in each SET Plan action reveals that in the reference period 2007-2013 the EU has increased specialisation in renewable fuels and bioenergy, as well as batteries and e-mobility compared to the rest of the world; it has also retained a specialisation advantage in renewables and energy efficiency in buildings, although this has been reducing over time.

Related and future JRC work

The SETIS input to the Annual State of the Energy Union Report and its annual report "Energy R&I financing and patenting trends in the EU" in the context of the SET Plan are based on the methodology developed by JRC SETIS and presented in the Science for Policy Report "Monitoring R&I in Low-Carbon Energy Technologies".

Quick guide

The introduction provides the context for monitoring the progress made by EU Member States concerning the three key indicators identified in the Integrated Strategic Energy Technology Plan Communication. It also includes a short guide on how to read the dashboards and interpret the indicators. The information is presented as a collection of country dashboards, providing a quick overview of each EU Member State within the European framework, and for the EU as a whole. The key messages at EU level and for each of the SET Plan actions are summarised in the final section.

Introduction

The Energy Union framework strategy, COM(2015)80 (European Commission, 2015a), has called for an integrated governance and monitoring process to ensure that energy-related actions at all levels, from European to local, contribute to the Energy Union's objectives. This inter alia includes improved data collection, analysis and intelligence mechanisms that pool the relevant knowledge and make it easily accessible to all stakeholders; and an annual reporting on the state of the Energy Union to address key issues and steer the policy debate. Furthermore, in its Communication 'Towards an Integrated Strategic Energy technology (SET) Plan: Accelerating the European energy system transformation', C(2015)6317 (European Commission, 2015b), the European Commission proposed to develop a set of key performance indicators (KPIs) in order to measure progress in research and innovation (R&I) in Europe. This task was assigned to SETIS, the Strategic Energy Technologies Information System. SETIS manages and operates the monitoring and reporting scheme that supports the implementation and continuous development of the Strategic Energy Technology Plan (SET Plan), through a more diligent and intelligent use of available information, data and reporting practices by stakeholders and Member States.

In this context, SETIS monitors and reports two relevant KPIs that have been identified in the Integrated SET Plan Communication and have been included in the three State of the Energy Union reports (European Commission, 2015c, 2017a, b):

- the level of investment in R&I in terms of both private (expenditure by businesses and industry) and public (Member States' national programmes and instruments)
- trends in patents

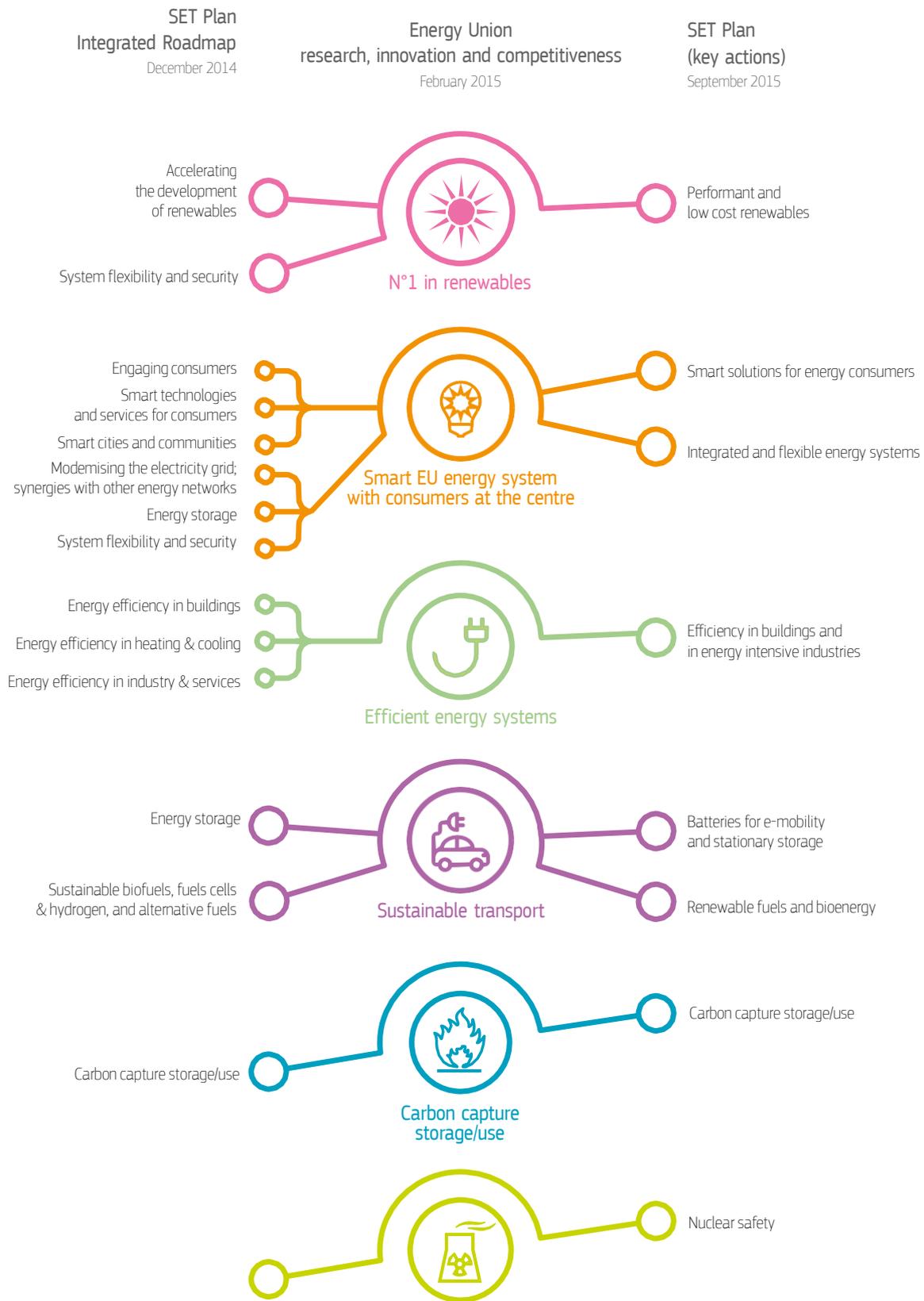
The report presents in greater detail the data behind the SETIS contributions to the 3rd State of the Energy Union report, broken down by SET Plan action, thus monitoring the progress made by EU Member States concerning the three key indicators identified in the Integrated Strategic Energy Technology Plan Communication. The information is presented as a collection of country dashboards, providing a quick overview of each EU Member State within the European framework, and for the EU as a whole.

Figure 1 (European Commission, 2016) shows a representation of the integrated SET Plan structure, and in particular the links between (i) the Energy Union R&I and Competitiveness priorities, (ii) the SET Plan Integrated Roadmap, and (iii) the 10 SET Plan actions. These links define the levels of reporting addressed by JRC SETIS.

The data reported has been compiled as follows:

- Public investment as available in the International Energy Agency RD&D Statistics database (IEA, 2017); for codes relevant to Energy Union Research Innovation and Competitiveness priorities. Public investment does not include funds from EU framework programmes or other funding instruments at EU level.
- Patent data based on the European Patent Office PATSTAT database (EPO, 2017). In the context of this document, the term 'patent' refers to patent families, rather than applications, as a measure of innovative activity. Patent families include all documents relevant to a distinct invention (e.g. applications to multiple authorities), thus preventing multiple counting. A fraction of the family is allocated to each applicant and relevant technology.
- Private investment as estimated by JRC SETIS.

The methodology behind the indicators is provided in detail in the relevant JRC Report "*Monitoring R&I in Low-Carbon Energy Technologies*" (Fiorini et al., 2017).



Source: Transforming the European Energy System through Innovation (European Commission, 2016)

Figure 1 The Integrated SET Plan Structure, representing the links between the Energy Union R&I and Competitiveness priorities, the SET Plan Integrated Roadmap and the 10 SET Plan actions.

Quick guide to the dashboards

Each of the dashboards provides information on public R&I investments, private R&I investments and patents, and is organised in five sections (Figure 2):

- Total values for public and private R&I investment for the most recent year in which data for all indicators are available, from this point forward called the 'reference year'. For this report the reference year is 2013;
- Public R&I investment; data does not allow reporting on batteries and e-mobility, so the action is not included in this section;
- Private R&I investment;
- Patenting trends;
- Specialisation index for 2007 and 2013;
- Combined chart of R&I investments and patents.

Except for section (a), which provides total values, in all other sections information is provided at the level of the SET Plan actions

Sections (b), (c) & (d), show (Figure 3, left to right):

- Total values for the reference year, 2013;
- Share in EU28 of the country under analysis per action for the reference year 2013;
- Total value trends for the period including the five previous years to the most up to date year available (i.e. 2010 to 2015).

Public and private R&I investment is in EUR million, patent trends are given as the number of patent families.

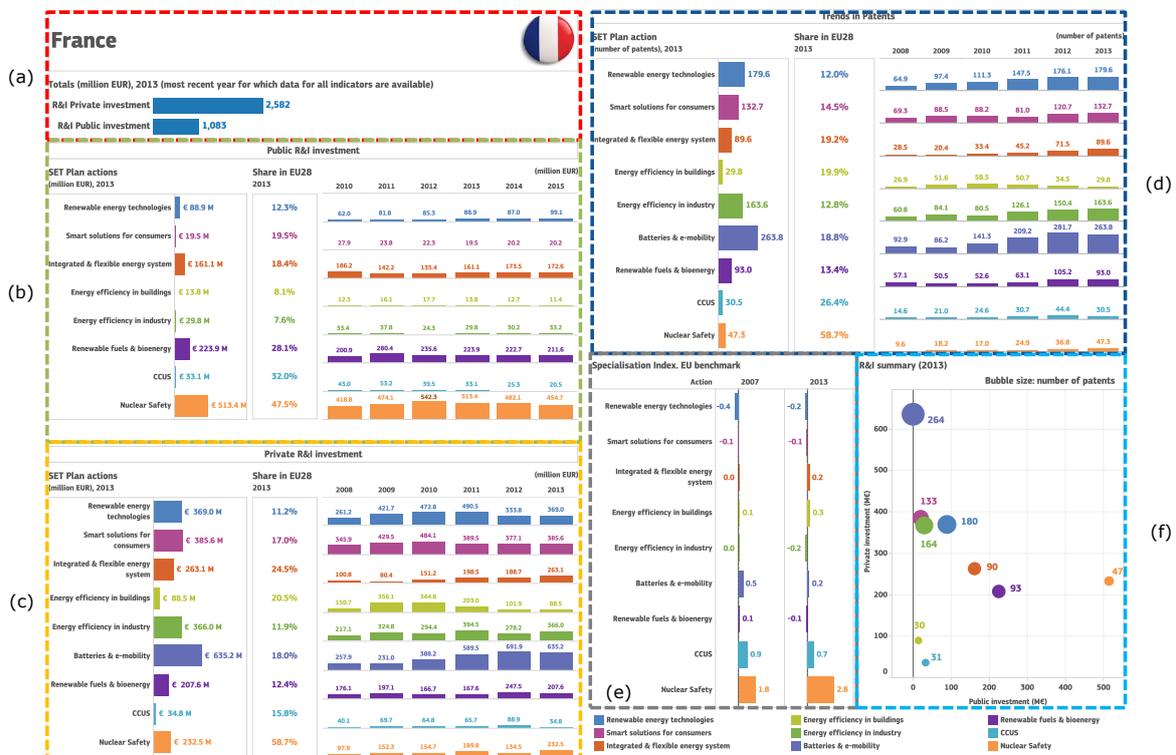


Figure 2 Country dashboard layout: (a) total public & private R&I investment, (b) public R&I investment per SET Plan action, (c) private R&I investment per SET Plan action, (d) patent families per SET Plan action, (e) specialisation index and (f) combined summary chart.

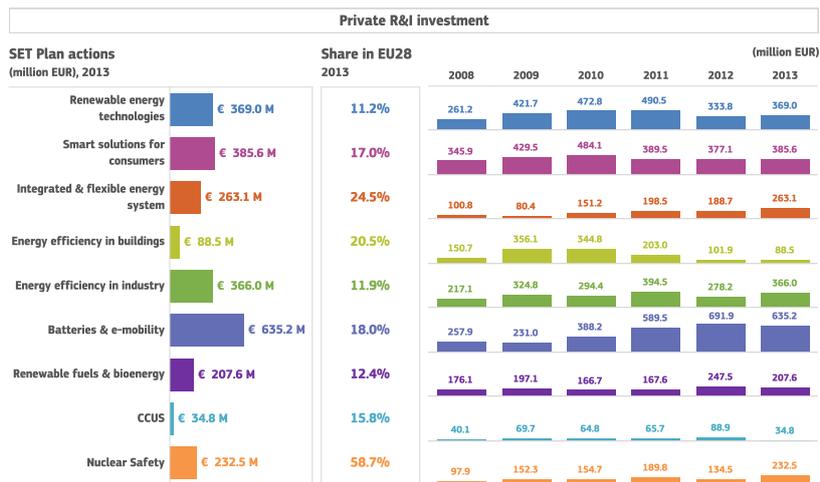


Figure 3 Private R&I investment detail; from left to right: investment per SET plan action for the reference year (2013); share of the Member State in the EU for the same year; and time series.

Table 1 Data availability on public R&I investments for EU Member States.

Country	IEA member	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
AT	Y										
BE	Y										
BG	N										
HR	N										
CY	N										
CZ	Y										
DK	Y										
EE	Y										
FI	Y										
FR	Y										
DE	Y										
EL	Y	•	•	•							
HU	Y										
IE	Y										
IT	Y										
LV	N										
LT	N										
LU	Y										
MT	N										
NL	Y										
PL	Y										
PT	Y										
RO	N										
SK	Y										
SI	N										
ES	Y										
SE	Y										
UK	Y										

- Data from IEA statistics
- Data collected by JRC SETIS
- Data available at high level of aggregation - no breakdown by SET Plan Action

The time Series vary depending on data availability:

- Public R&I investment data is based on the reporting to the IEA (IEA, 2017); 20 Member States are IEA members, and the majority have reported up to 2015, while for some Member States provisional data is also available for 2016.
- In the case of private R&I investment and patents, the most recent year for which data is available is the reference year 2013.

Section (e) presents the specialisation index for a specific action. The specialisation index represents patenting intensity in each particular action for a given country relative to geographical area taken as reference. Mathematically:

$$SI = \left(\frac{\sum_i Patents}{\sum Patents} \Big|_j \right) / \left(\frac{\sum_i Patents}{\sum Patents} \Big|_{ref} \right) - 1$$

Where:

$i \equiv$ action considered

$j \equiv$ country considered

$ref \equiv$ geographical area of reference

For the country dashboards the area of reference is EU; for the EU dashboard the reference is the world.

According to the SI definition, for each country:

- $SI = 0$, research intensity equal to the EU,
- $-1 < SI < 0$, research intensity lower than the EU,
- $SI > 0$, research intensity higher than the EU.

The combined chart in section (f) compares public and private R&I efforts in each of the SET Plan actions for the reference year 2013, showing the balance between the public and private sector. The bubble sizes are proportional to the number of patent families/inventions, contrasting the magnitude and provenance of R&I investment with patenting trends.

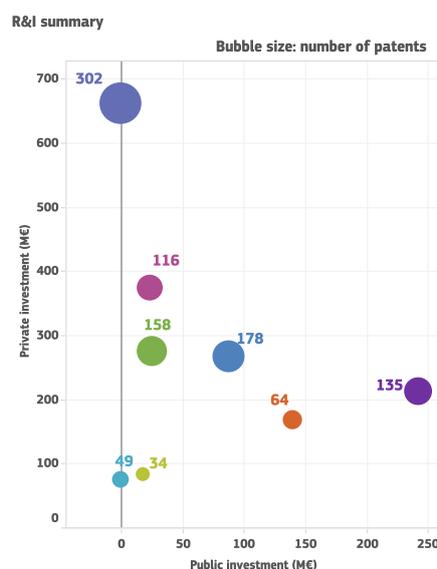


Figure 4 Combined chart contrasting public and private R&I investment and number of patents for the reference year 2013.

Country Dashboards

Austria

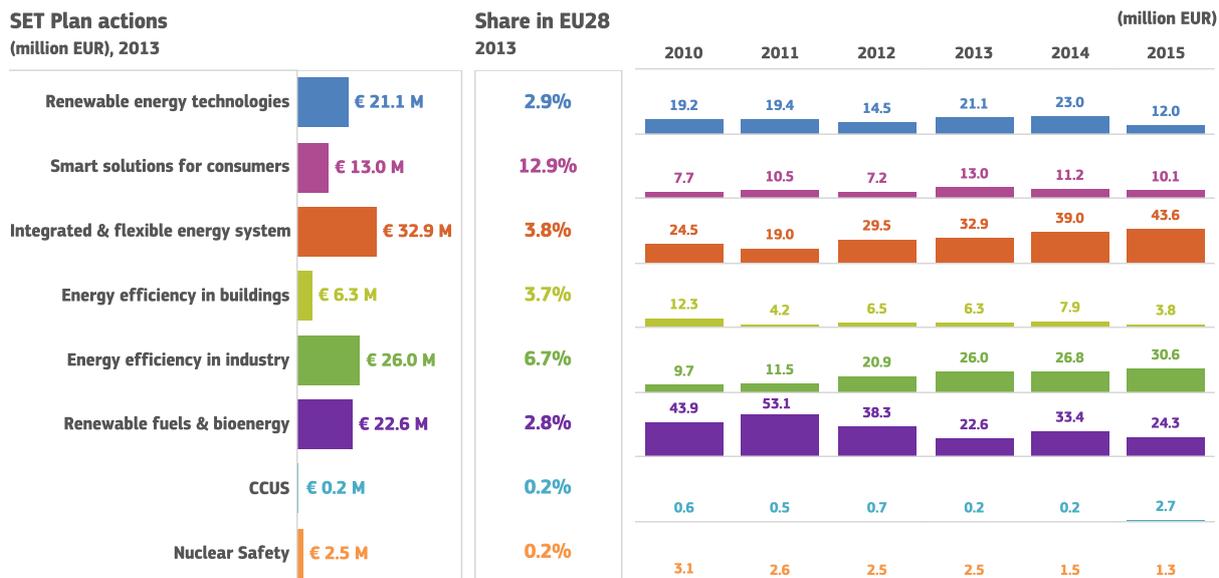


Totals (million EUR), 2013 (most recent year for which data for all indicators are available)

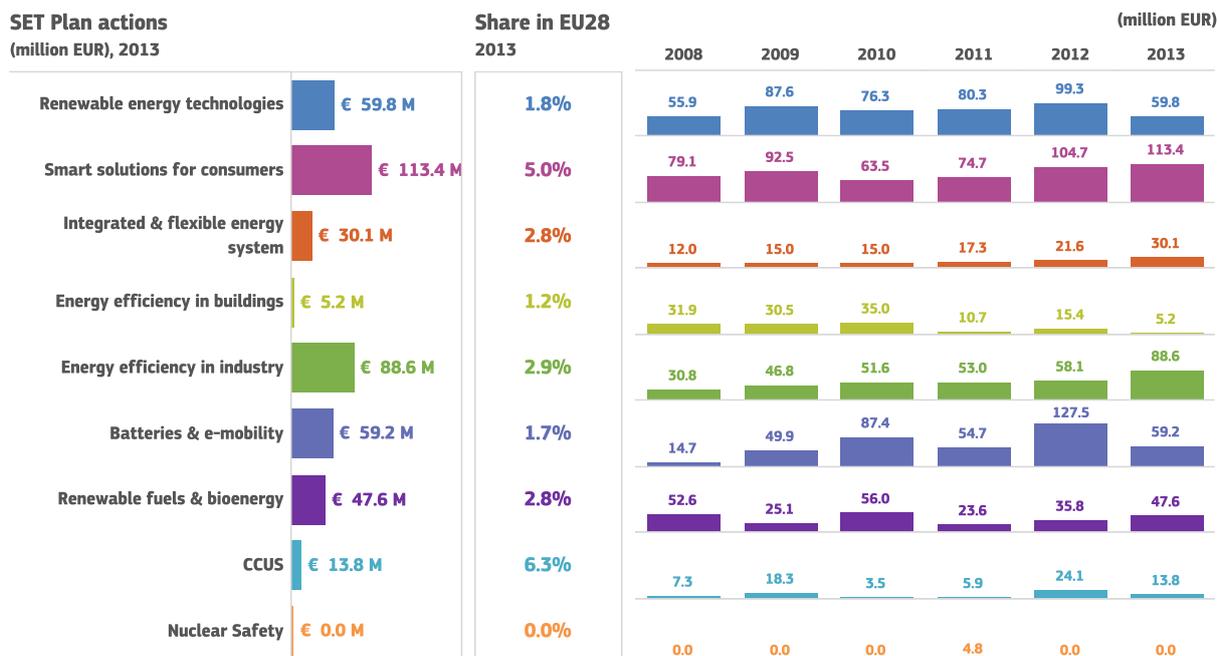
R&I Private investment **418**

R&I Public investment **125**

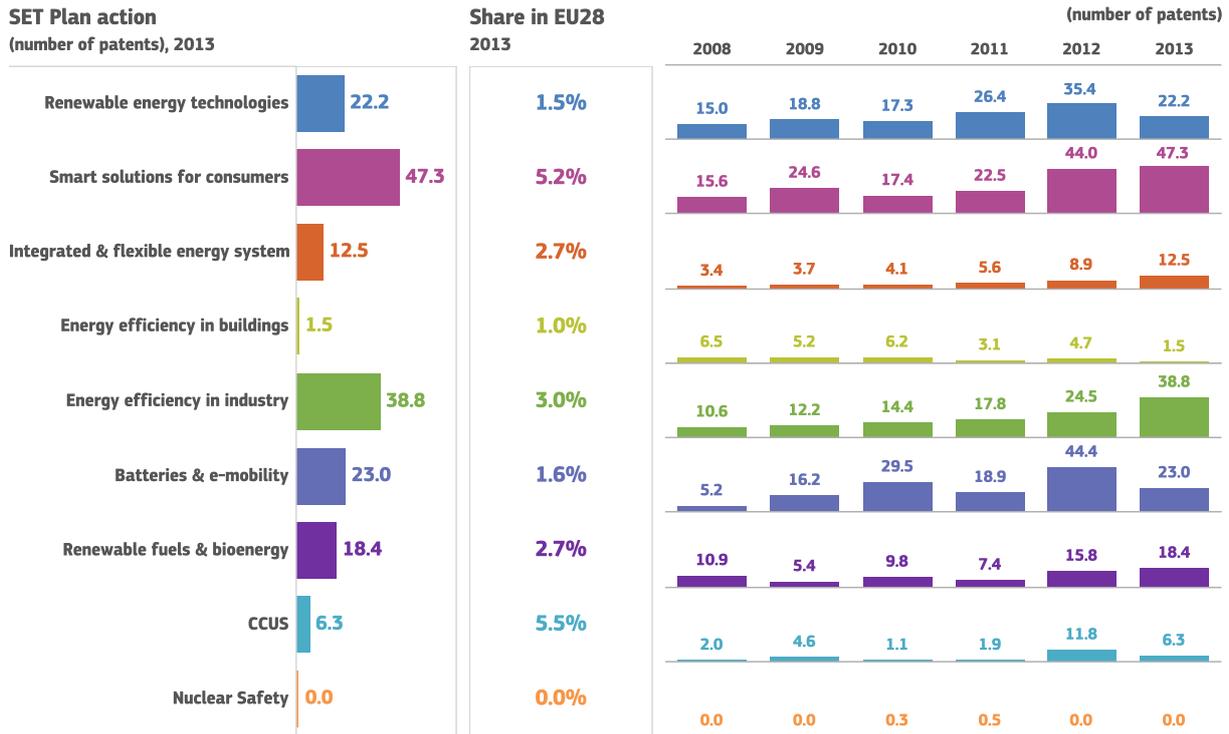
Public R&I investment



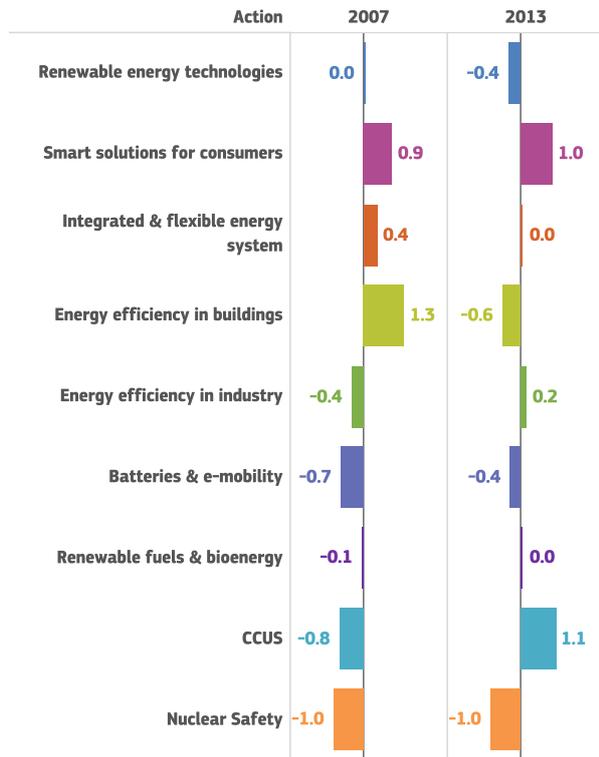
Private R&I investment



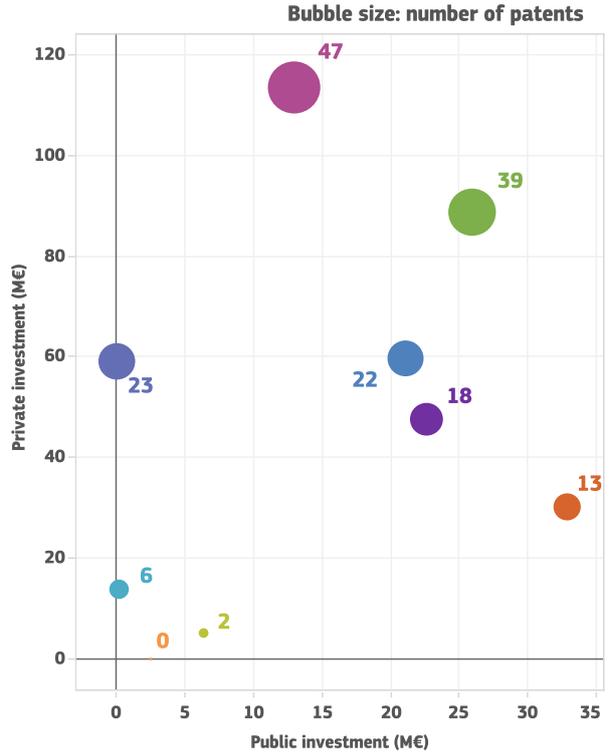
Trends in Patents



Specialisation Index. EU benchmark



R&I summary (2013)



- Renewable energy technologies
- Energy efficiency in buildings
- Renewable fuels & bioenergy
- Smart solutions for consumers
- Energy efficiency in industry
- CCUS
- Integrated & flexible energy system
- Batteries & e-mobility
- Nuclear Safety

Belgium

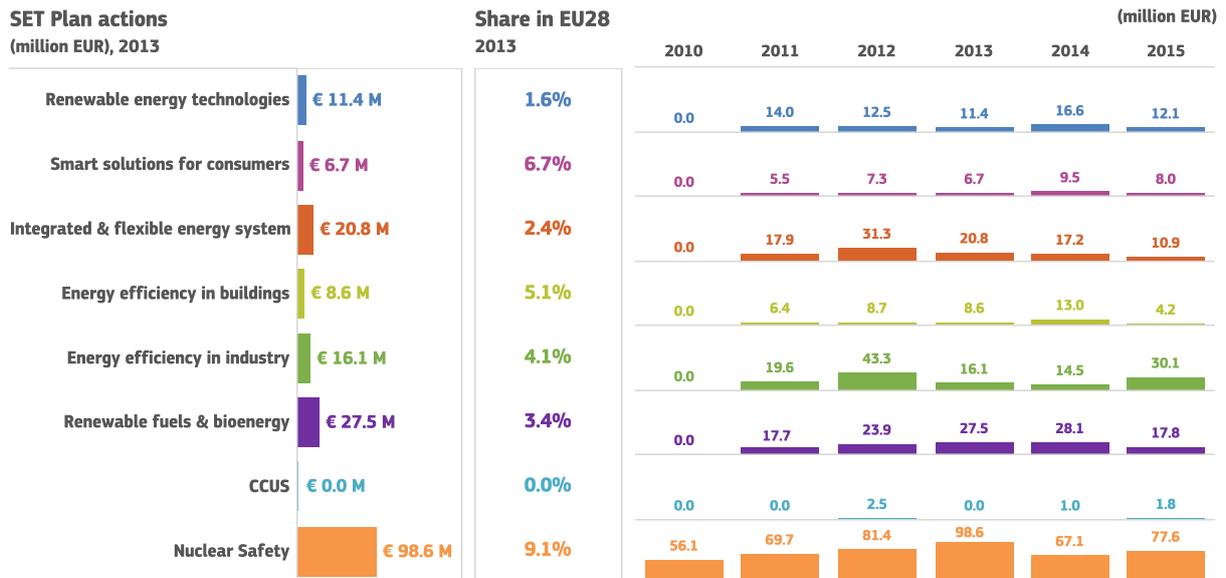


Totals (million EUR), 2013 (most recent year for which data for all indicators are available)

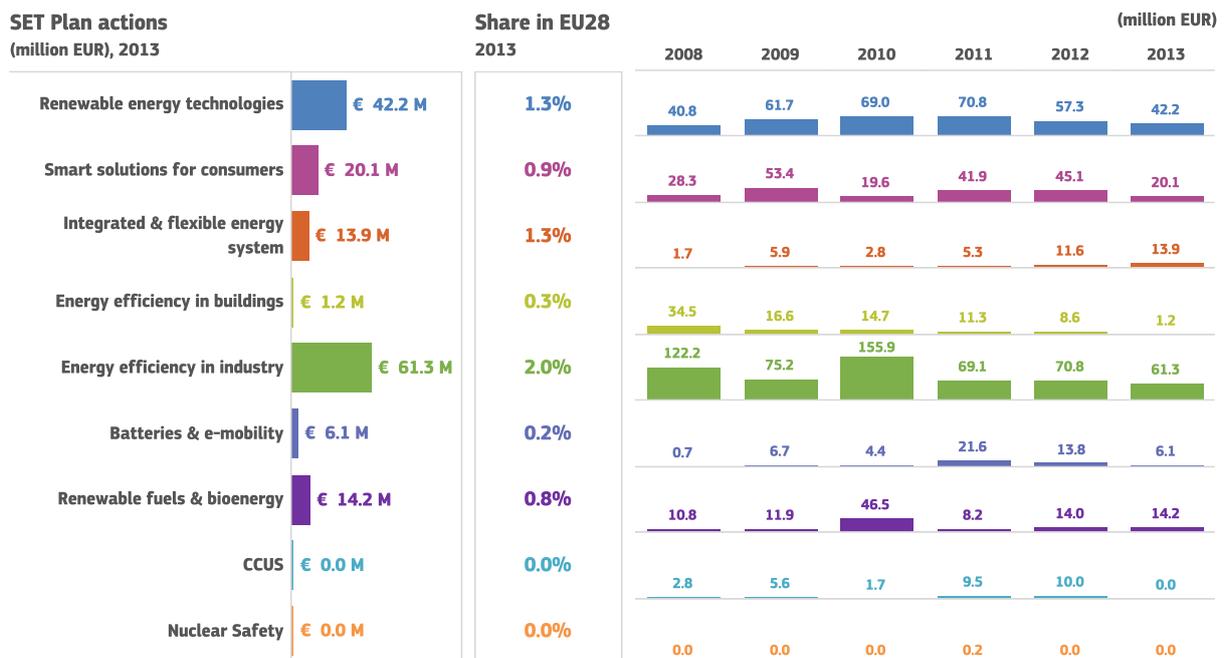
R&I Private investment **159**

R&I Public investment **190**

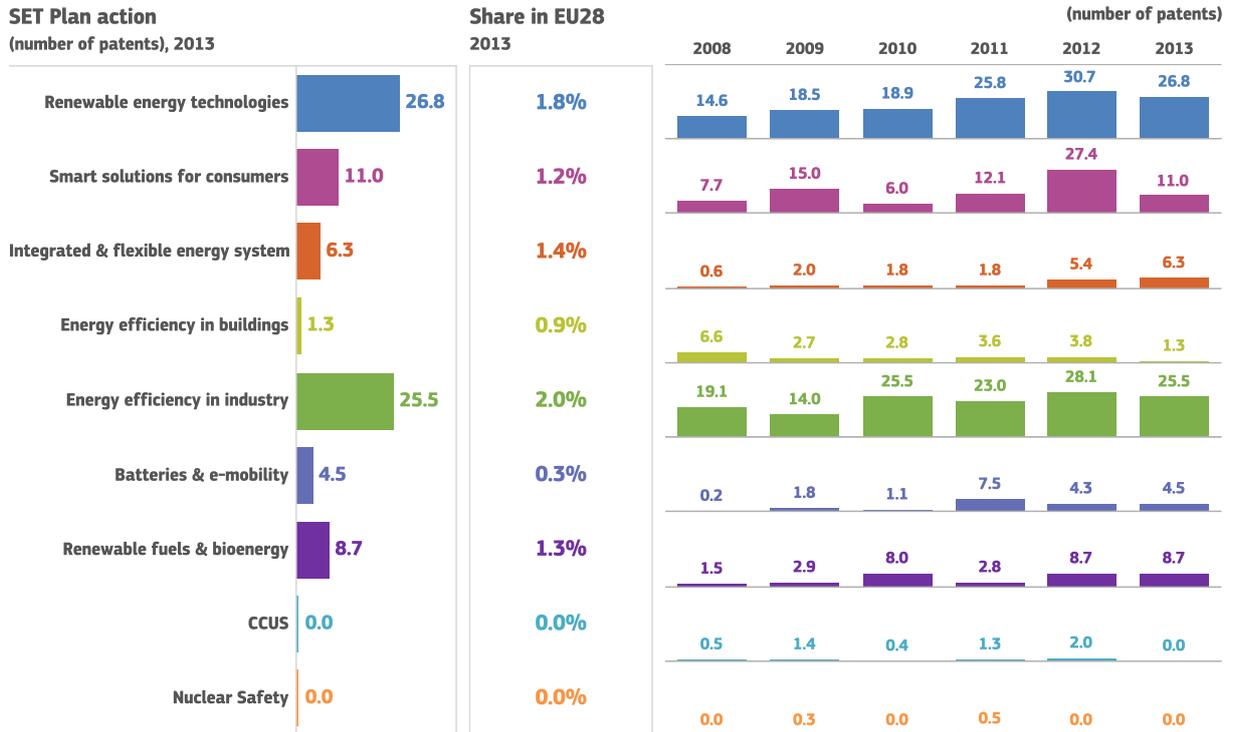
Public R&I investment



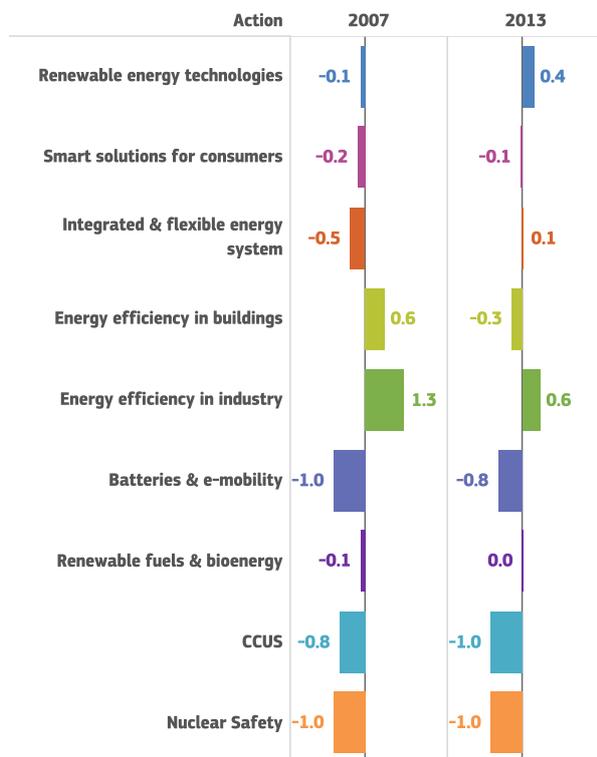
Private R&I investment



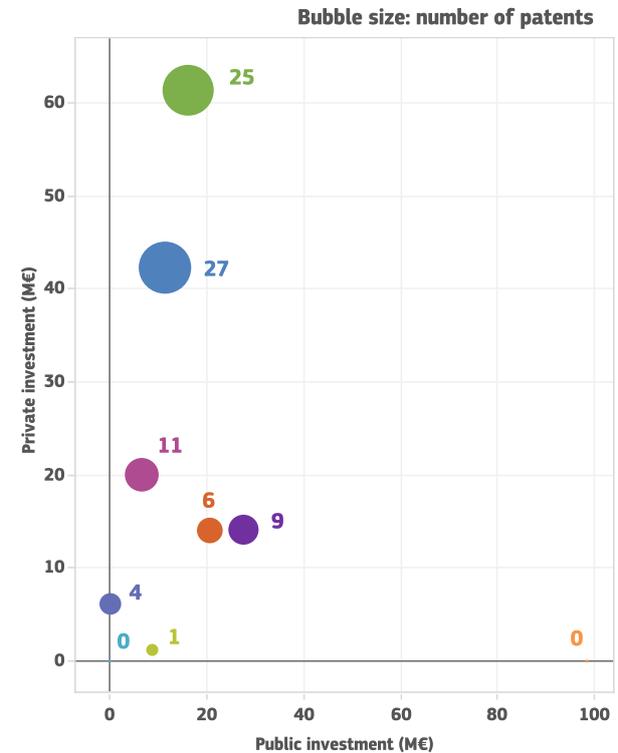
Trends in Patents



Specialisation Index. EU benchmark



R&I summary (2013)



- Renewable energy technologies
- Energy efficiency in buildings
- Renewable fuels & bioenergy
- Smart solutions for consumers
- Energy efficiency in industry
- CCUS
- Integrated & flexible energy system
- Batteries & e-mobility
- Nuclear Safety

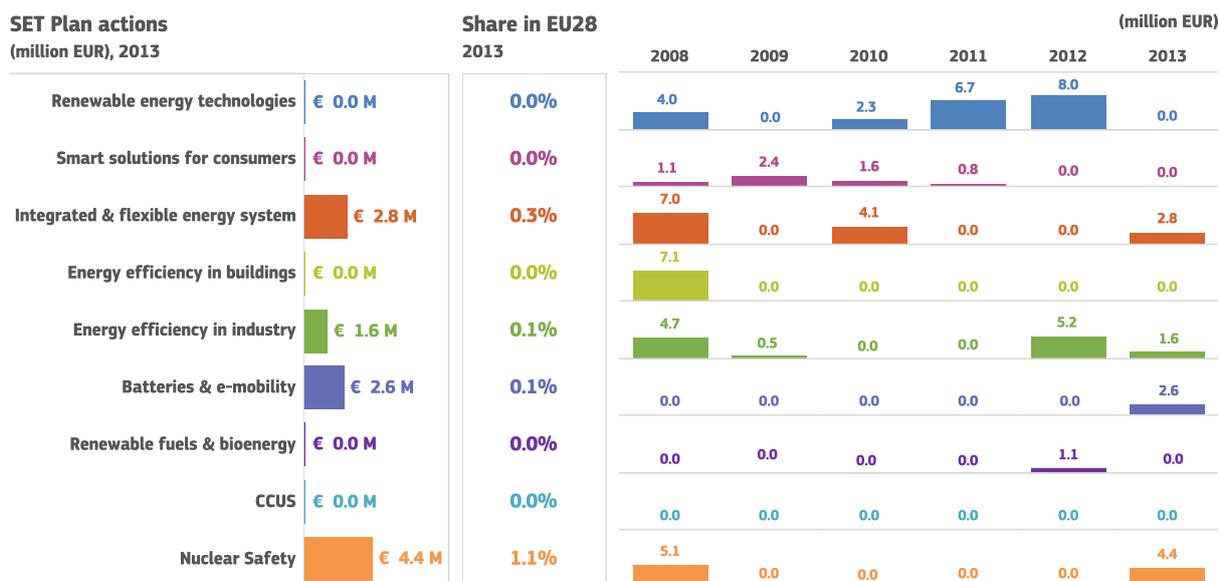
Bulgaria



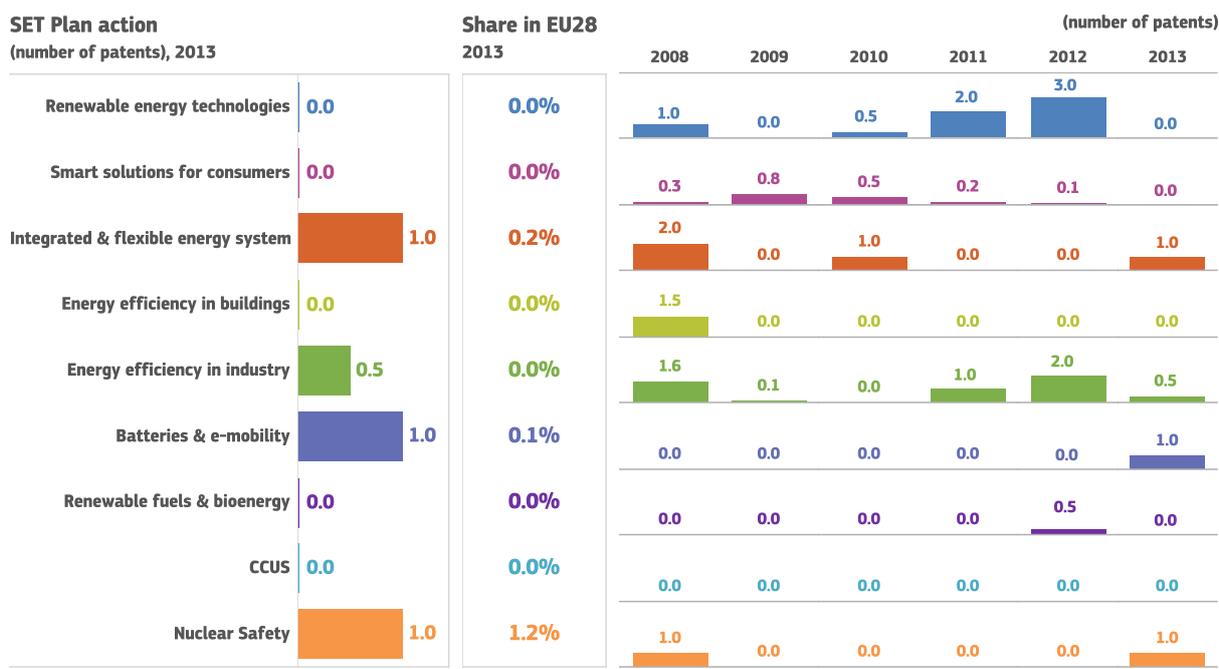
Total (million EUR), 2013 (most recent year for which data for all indicators are available) *

R&I Private investment | 11.4

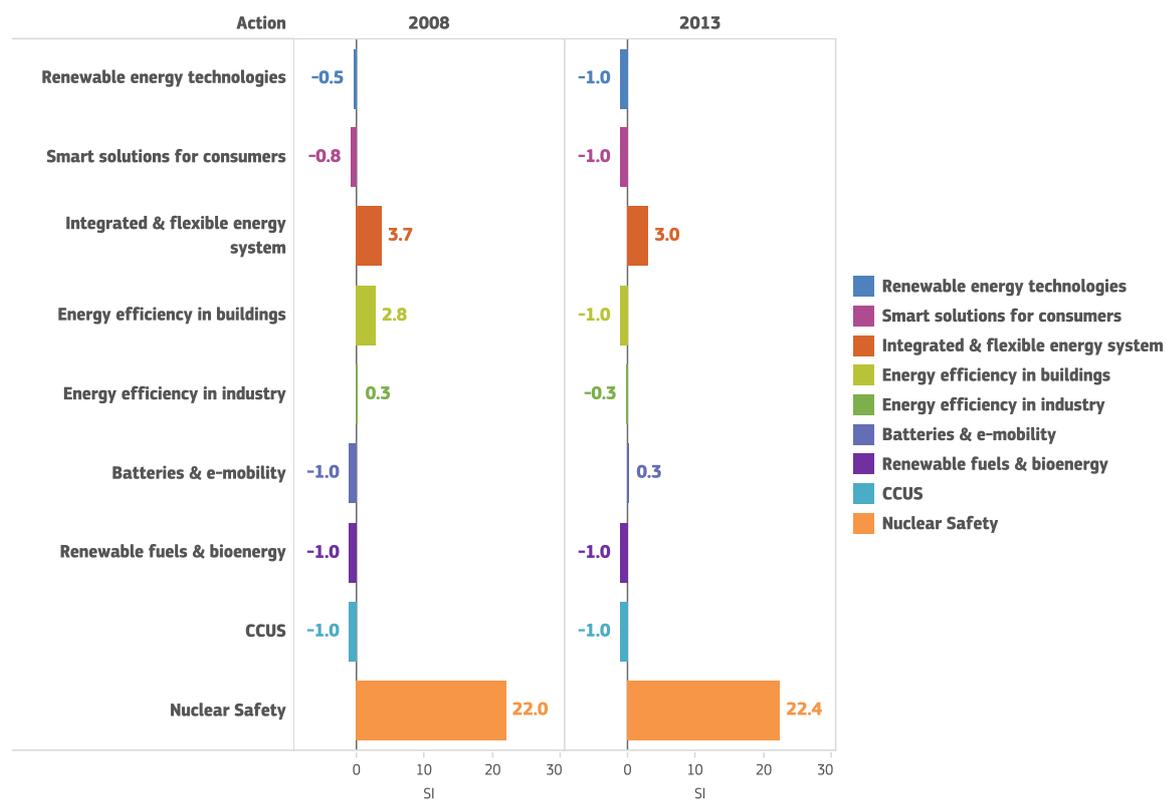
Private R&I investment



Trends in patents



Specialisation Index. EU benchmark **



Note

* Bulgaria is not a member of the IEA; data on public R&I expenditure are not available.

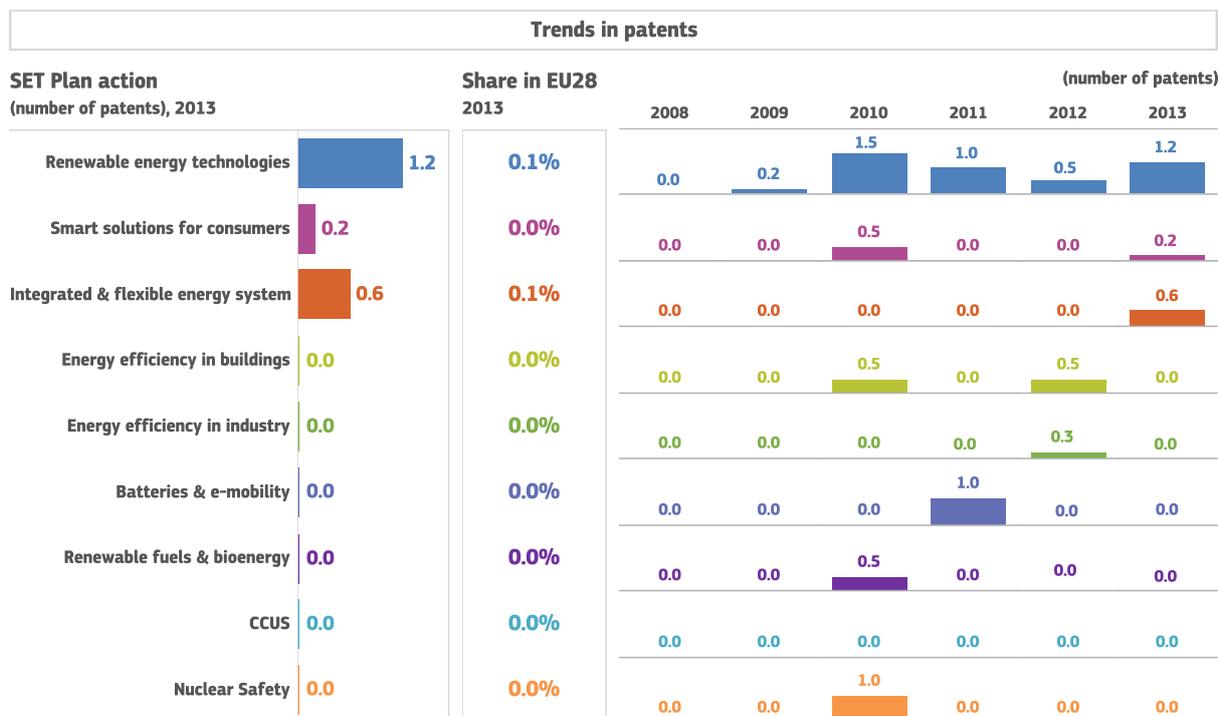
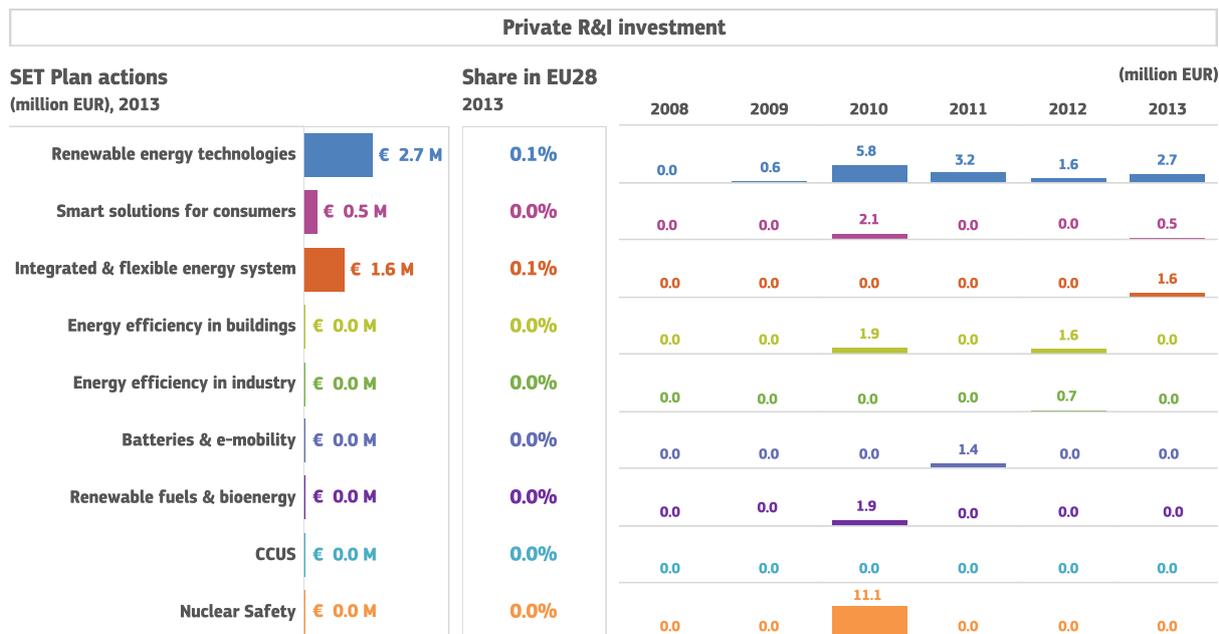
** Due to lack of data for 2007, the Specialisation Index is calculated for 2008.

Croatia

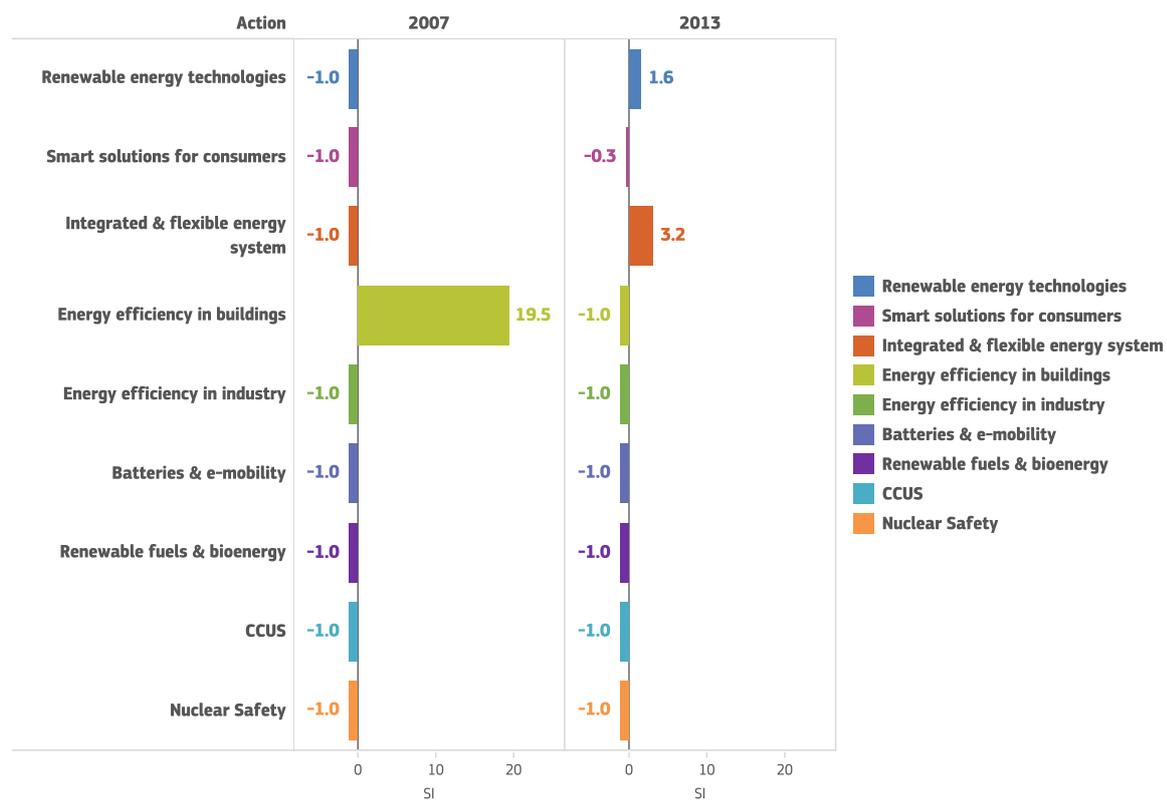


Total (million EUR), 2013 (most recent year for which data for all indicators are available) *

R&I Private investment | 4.8



Specialisation Index. EU benchmark



Note

* Croatia is not a member of the IEA; data on public R&I expenditure are not available.

Cyprus



Total (million EUR), 2013 (most recent year for which data for all indicators are available) *

R&I Private investment | 5.1

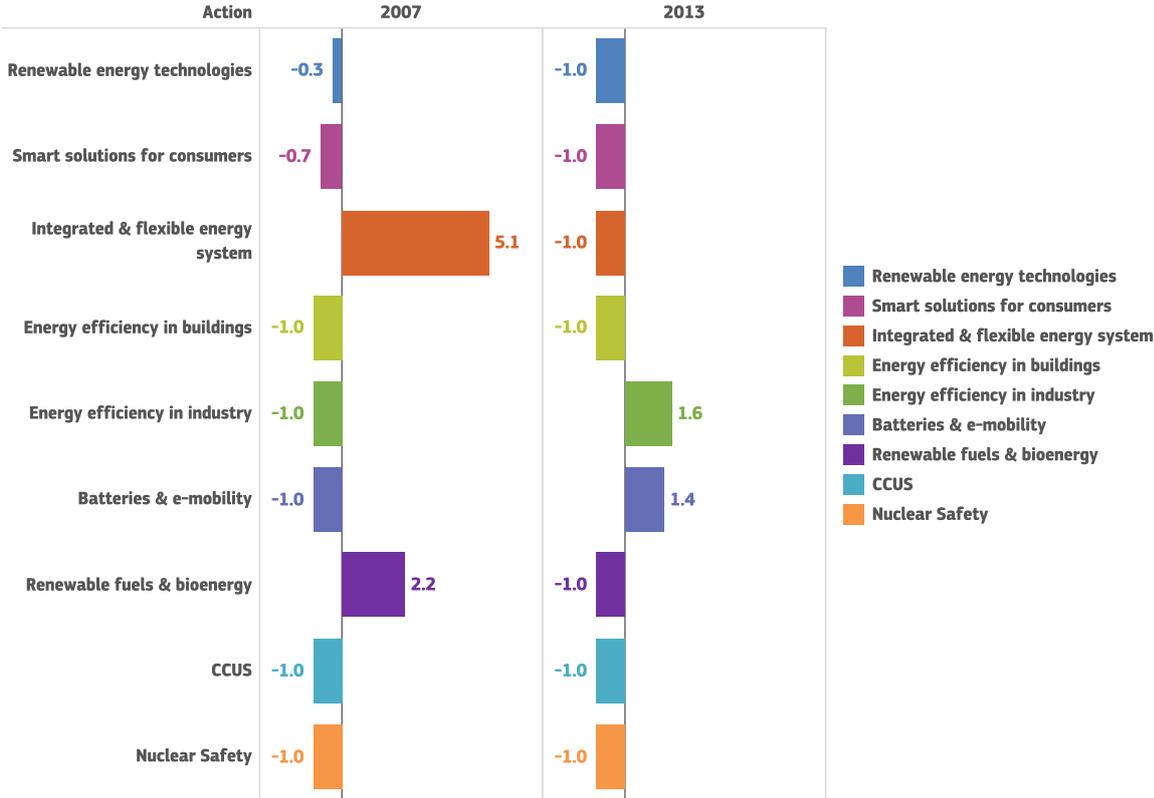
Private R&I investment

SET Plan actions (million EUR), 2013		Share in EU28 2013	2008 2009 2010 2011 2012 2013					
			(million EUR)					
Renewable energy technologies	€ 0.0 M	0.0%	9.6	6.5	0.0	0.7	2.2	0.0
Smart solutions for consumers	€ 0.0 M	0.0%	0.7	0.0	0.0	0.0	0.0	0.0
Integrated & flexible energy system	€ 0.0 M	0.0%	0.4	0.0	0.0	0.0	0.0	0.0
Energy efficiency in buildings	€ 0.0 M	0.0%	0.0	0.0	0.0	0.0	0.0	0.0
Energy efficiency in industry	€ 2.5 M	0.1%	2.9	0.0	3.2	0.8	0.0	2.5
Batteries & e-mobility	€ 2.6 M	0.1%	0.3	0.0	0.0	0.0	2.7	2.6
Renewable fuels & bioenergy	€ 0.0 M	0.0%	1.5	0.0	0.0	0.0	1.4	0.0
CCUS	€ 0.0 M	0.0%	0.0	0.0	0.0	0.0	0.0	0.0
Nuclear Safety	€ 0.0 M	0.0%	0.0	0.0	0.0	0.0	0.0	0.0

Trends in patents

SET Plan action (number of patents), 2013		Share in EU28 2013	2008 2009 2010 2011 2012 2013					
			(number of patents)					
Renewable energy technologies	0.0	0.0%	2.5	1.9	0.0	0.7	1.0	0.0
Smart solutions for consumers	0.0	0.0%	0.3	0.0	0.0	0.0	0.0	0.0
Integrated & flexible energy system	0.0	0.0%	0.1	0.1	0.0	0.0	0.0	0.0
Energy efficiency in buildings	0.0	0.0%	0.0	0.0	0.0	0.0	0.0	0.0
Energy efficiency in industry	1.0	0.1%	0.5	0.0	0.7	0.3	0.0	1.0
Batteries & e-mobility	1.0	0.1%	0.1	0.0	0.0	0.0	1.0	1.0
Renewable fuels & bioenergy	0.0	0.0%	0.3	0.1	0.0	0.0	0.5	0.0
CCUS	0.0	0.0%	0.0	0.0	0.0	0.0	0.0	0.0
Nuclear Safety	0.0	0.0%	0.0	0.0	0.0	0.0	0.0	0.0

Specialisation Index. EU benchmark



Note

* Cyprus is not a member of the IEA; data on public R&I expenditure are not available.

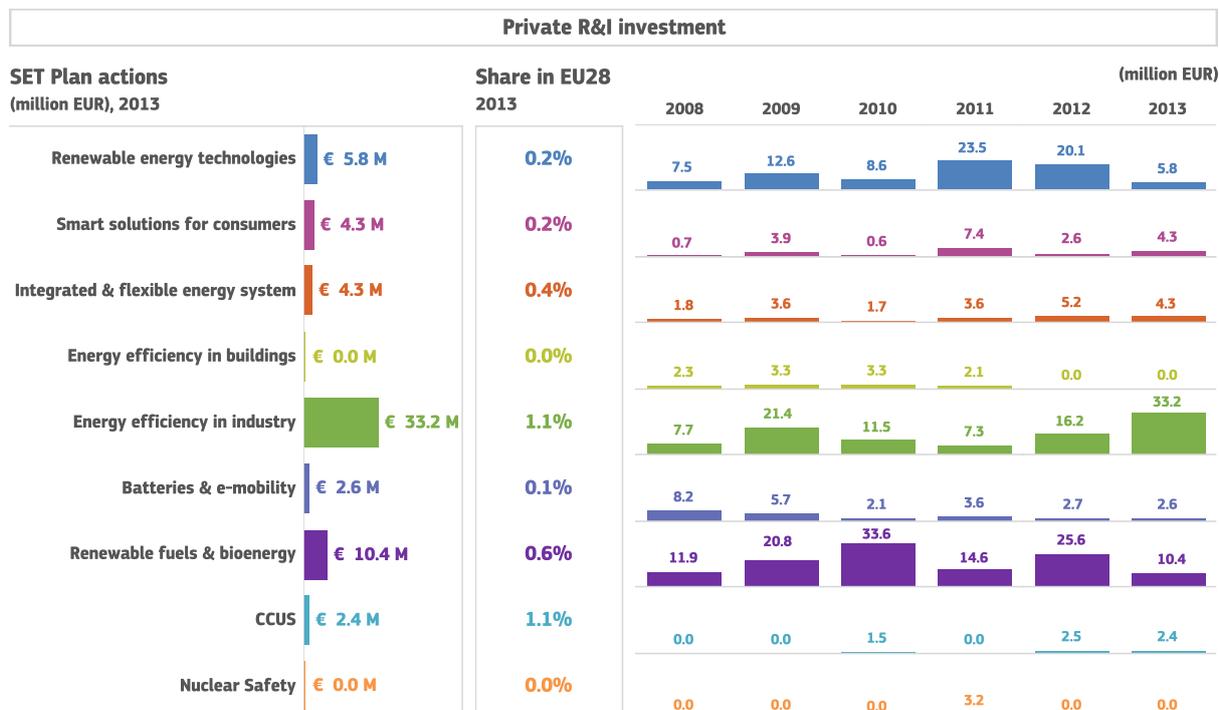
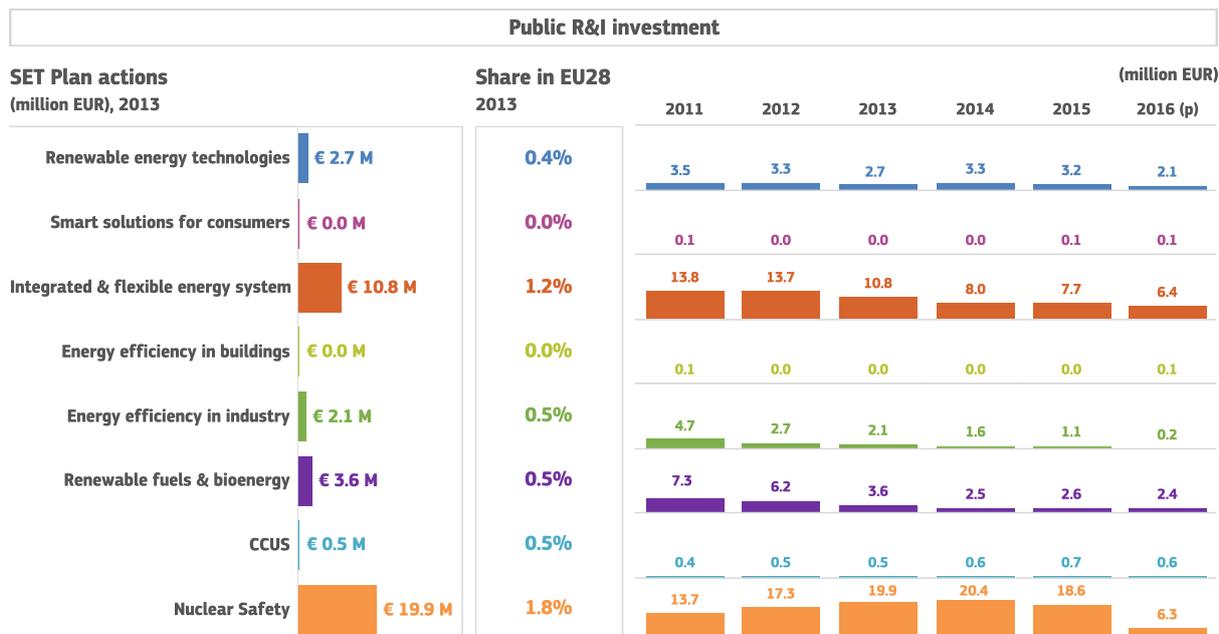
Czech Republic

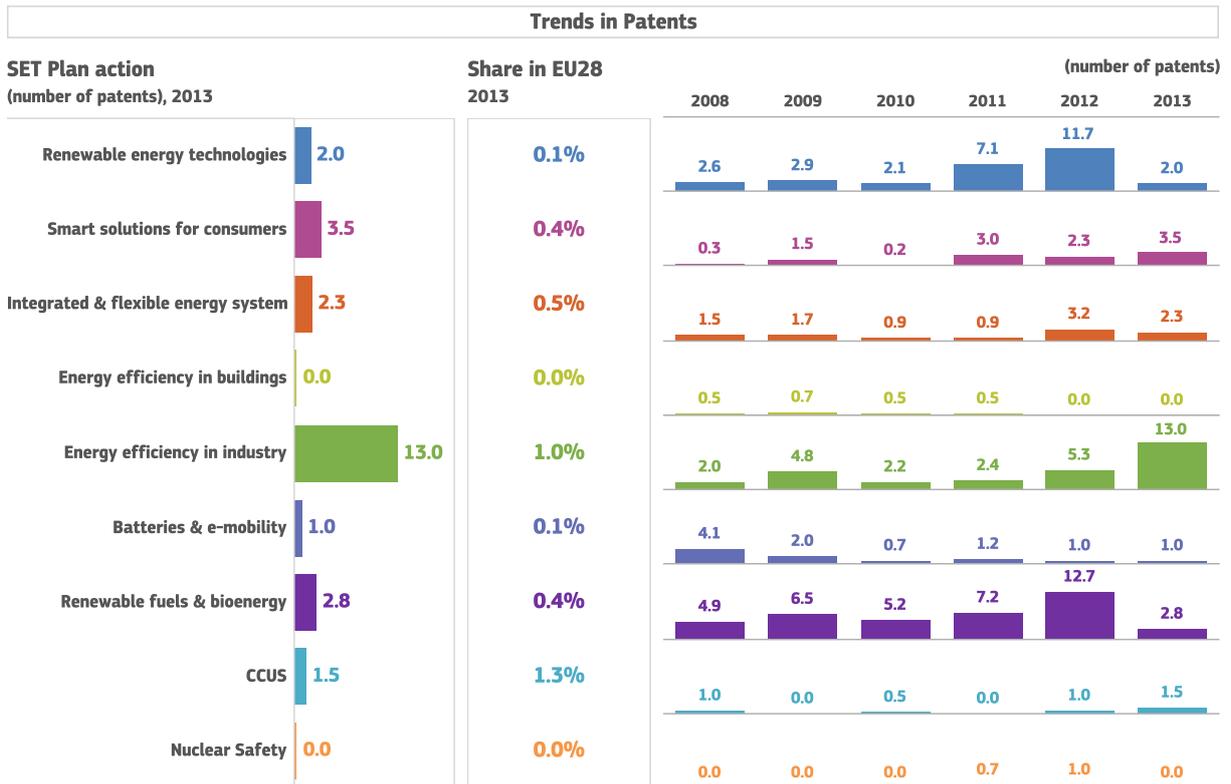


Totals (million EUR), 2013 (most recent year for which data for all indicators are available)

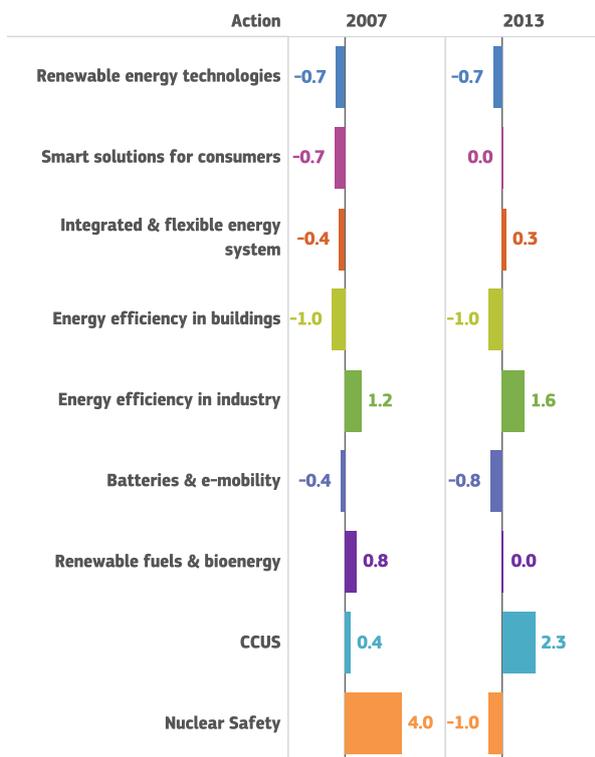
R&I Private investment | **63**

R&I Public investment | **40**

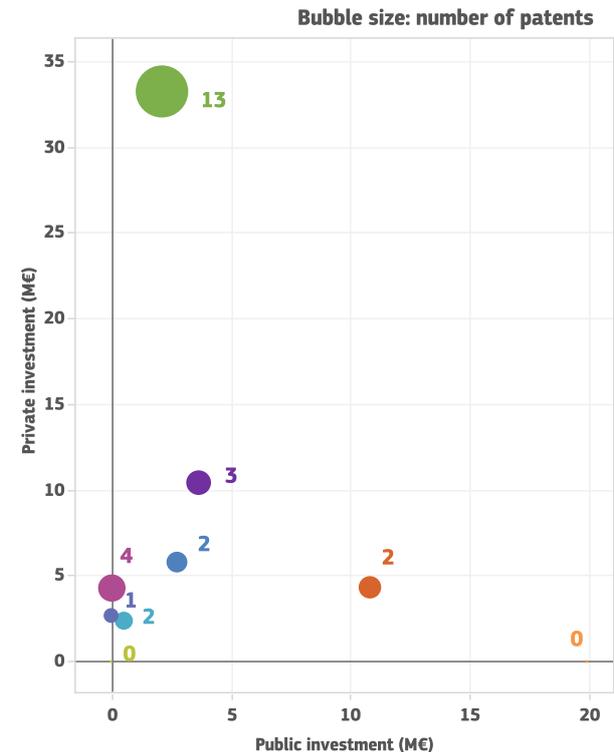




Specialisation Index. EU benchmark



R&I summary (2013)



Note

The public R&I investment values reported for 2016 are provisional (p) and amount to EUR 18 million in total; the respective total figure for 2015 was EUR 34 million, 6% lower than 2014. Data in the 2015/16 submission correspond to the application of an improved methodology by the Member State.

Denmark



Totals (million EUR), 2013 (most recent year for which data for all indicators are available)

R&I Private investment **528**

R&I Public investment **160**

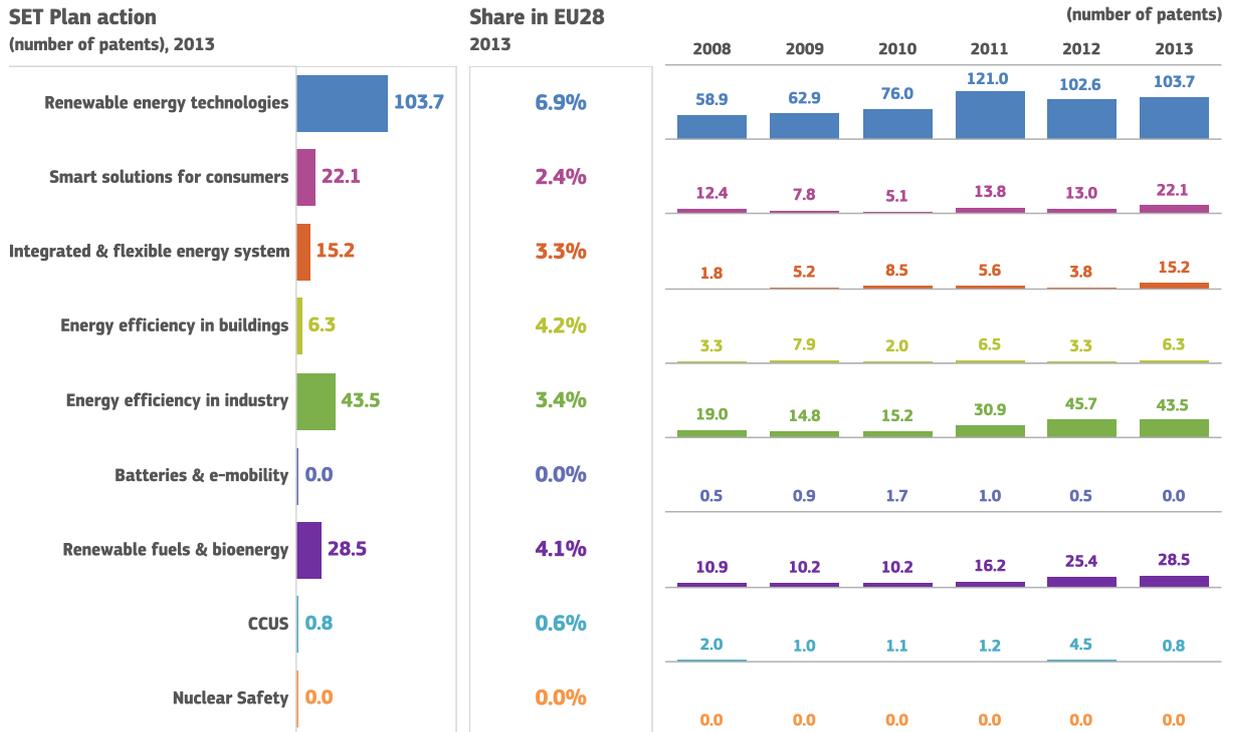
Public R&I investment

SET Plan actions (million EUR), 2013	Share in EU28 2013	(million EUR)					
		2011	2012	2013	2014	2015	2016 (p)
Renewable energy technologies	6.4%	33.5	35.2	46.3	37.3	47.2	36.9
Smart solutions for consumers	9.7%	5.9	3.5	9.7	12.8	5.8	4.7
Integrated & flexible energy system	3.0%	41.6	31.0	26.5	18.9	27.6	22.5
Energy efficiency in buildings	4.6%	1.1	4.3	7.8	1.2	7.1	1.5
Energy efficiency in industry	4.1%	7.9	8.2	15.8	19.9	14.7	12.5
Renewable fuels & bioenergy	6.4%	76.4	61.6	51.2	56.5	39.2	18.1
CCUS	0.1%	0.2	0.2	0.1	0.2	0.2	0.2
Nuclear Safety	0.2%	1.3	5.3	2.6	2.6	2.6	2.7

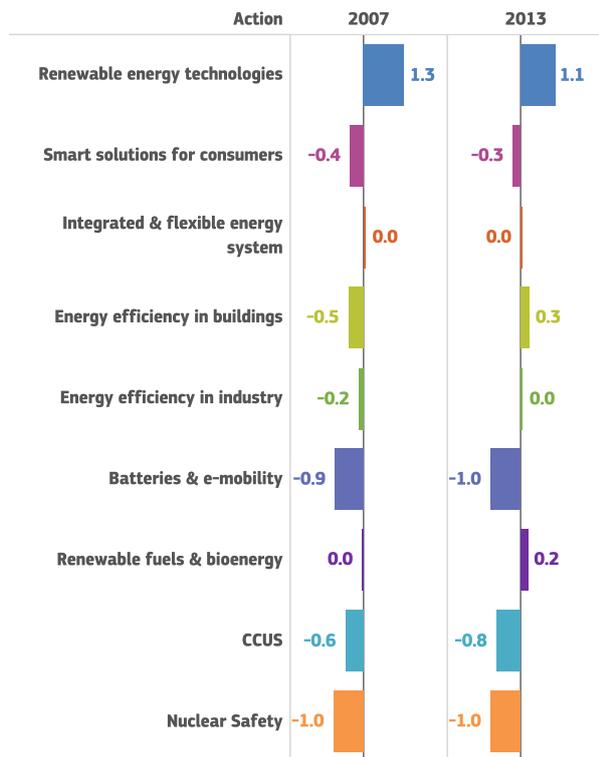
Private R&I investment

SET Plan actions (million EUR), 2013	Share in EU28 2013	(million EUR)					
		2008	2009	2010	2011	2012	2013
Renewable energy technologies	7.1%	204.1	226.4	279.5	380.0	231.7	234.3
Smart solutions for consumers	2.1%	50.0	34.3	20.0	49.2	31.6	48.1
Integrated & flexible energy system	3.2%	6.4	19.2	33.9	17.6	9.6	34.6
Energy efficiency in buildings	4.8%	13.5	41.0	10.3	23.2	8.8	20.5
Energy efficiency in industry	3.0%	72.7	59.9	62.1	93.0	130.1	93.0
Batteries & e-mobility	0.0%	1.4	3.1	8.1	2.9	0.0	0.0
Renewable fuels & bioenergy	5.8%	63.3	66.8	43.7	50.8	93.2	96.9
CCUS	0.4%	10.9	5.3	4.1	4.5	12.7	0.8
Nuclear Safety	0.0%	0.0	0.0	0.0	0.0	0.0	0.0

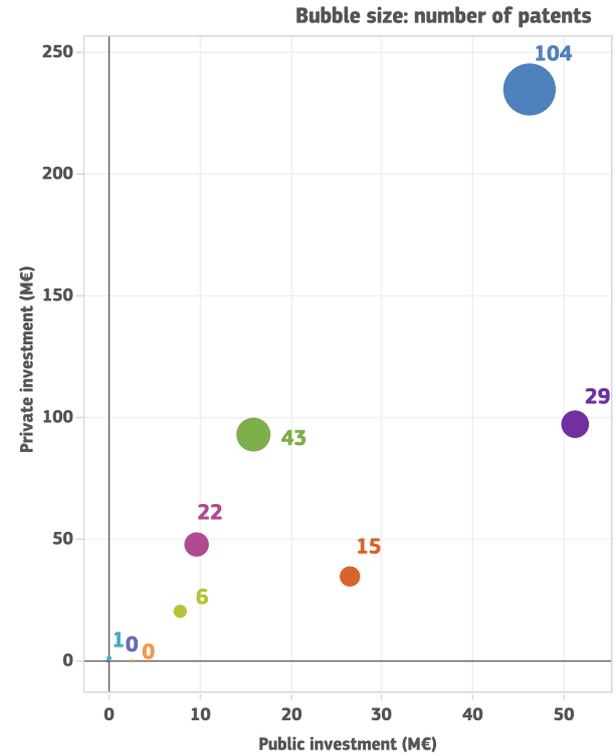
Trends in Patents



Specialisation Index. EU benchmark



R&I summary (2013)



Note

The values reported for 2016 are provisional (p) and amount to a total of EUR 99 million; the respective figure for 2015 was € 144 m, 3% lower than 2014.

Estonia



Totals (million EUR), 2013 (most recent year for which data for all indicators are available)

R&I Private investment | 5.1

R&I Public investment | 2.5

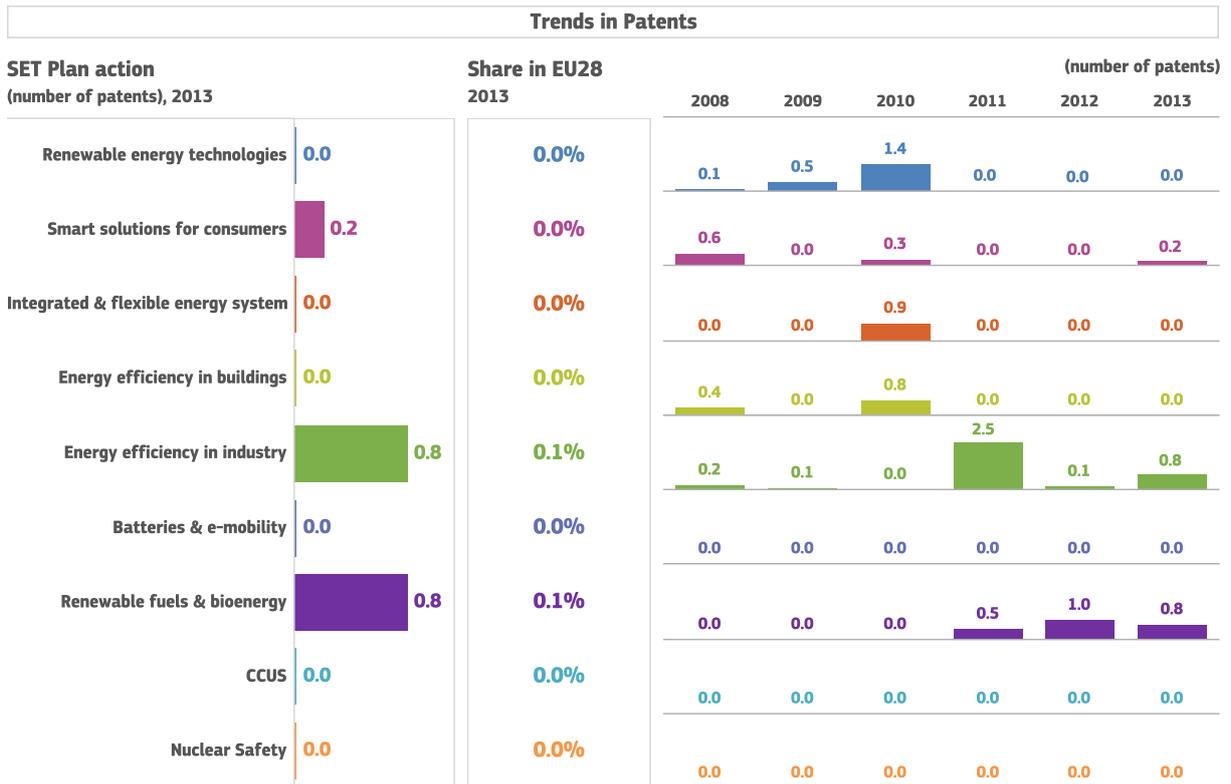
Public R&I investment

SET Plan actions (million EUR), 2013	Share in EU28 2013	2009* 2010* 2011 2012 2013 2014					
		(million EUR)					
Renewable energy technologies	0.1%	n.a.	n.a.	3.4	0.2	0.8	0.8
Smart solutions for consumers	0.0%	n.a.	n.a.	0.0	0.4	0.0	0.0
Integrated & flexible energy system	0.2%	n.a.	n.a.	2.2	1.0	1.5	1.5
Energy efficiency in buildings	0.1%	n.a.	n.a.	0.0	0.1	0.1	0.0
Energy efficiency in industry	0.0%	n.a.	n.a.	0.0	0.1	0.0	0.0
Renewable fuels & bioenergy	0.0%	n.a.	n.a.	2.1	0.0	0.0	0.0
CCUS	0.0%	n.a.	n.a.	0.5	0.0	0.0	0.0
Nuclear Safety	0.0%	n.a.	n.a.	0.0	0.2	0.1	0.1

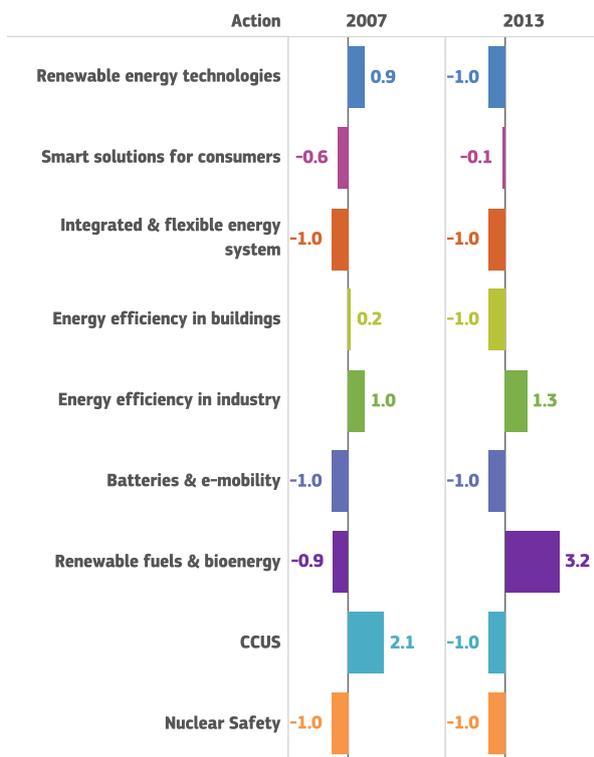
* Over the 2009-2010 period, Estonia did not report R&I spending

Private R&I investment

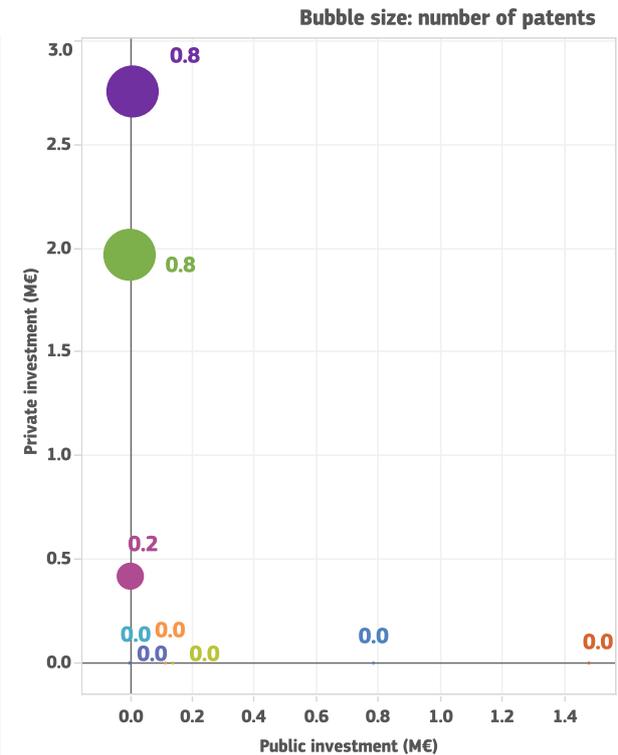
SET Plan actions (million EUR), 2013	Share in EU28 2013	2008 2009 2010 2011 2012 2013					
		(million EUR)					
Renewable energy technologies	0.0%	0.0	2.0	5.2	0.0	0.0	0.0
Smart solutions for consumers	0.0%	2.7	0.0	2.2	0.0	0.0	0.4
Integrated & flexible energy system	0.0%	0.0	0.0	3.9	0.0	0.0	0.0
Energy efficiency in buildings	0.0%	1.9	0.0	4.5	0.0	0.0	0.0
Energy efficiency in industry	0.1%	0.8	0.6	0.0	1.9	0.3	2.0
Batteries & e-mobility	0.0%	0.0	0.0	0.0	0.0	0.0	0.0
Renewable fuels & bioenergy	0.2%	0.0	0.0	0.0	2.4	4.5	2.8
CCUS	0.0%	0.0	0.0	0.0	0.0	0.0	0.0
Nuclear Safety	0.0%	0.0	0.0	0.0	0.0	0.0	0.0



Specialisation Index. EU benchmark



R&I summary (2013)



Note

* Estonia did not report data on public R&I expenditure over the period 2009-2010.

Finland

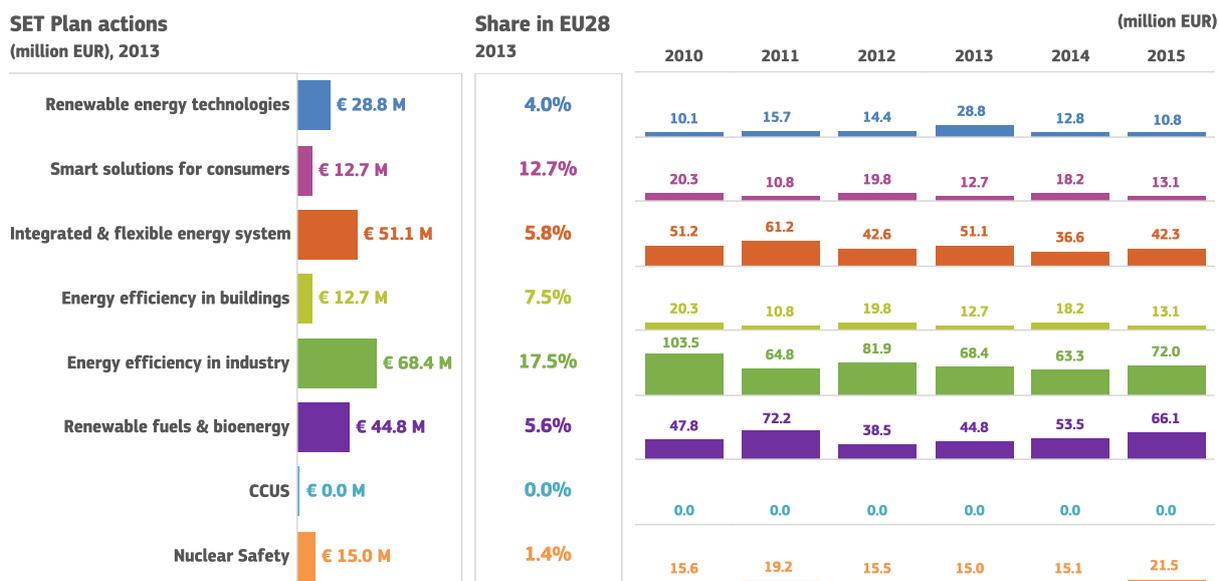


Totals (million EUR), 2013 (most recent year for which data for all indicators are available)

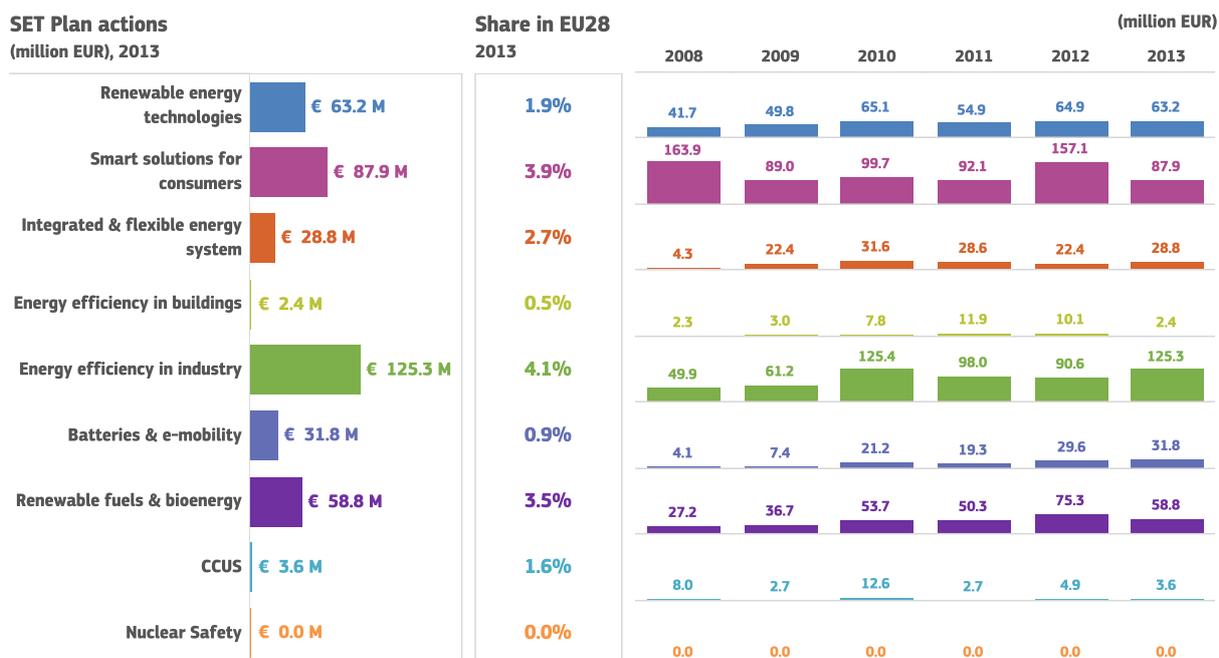
R&I Private investment **402**

R&I Public investment **234**

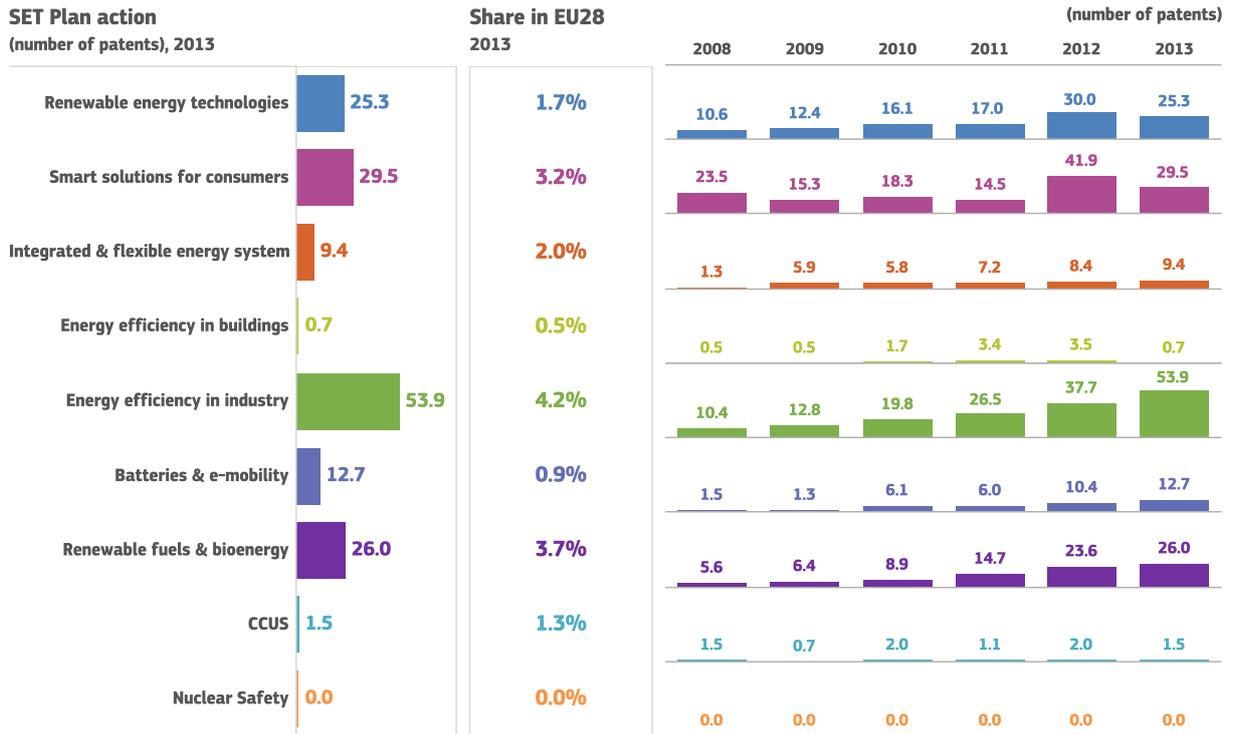
Public R&I investment



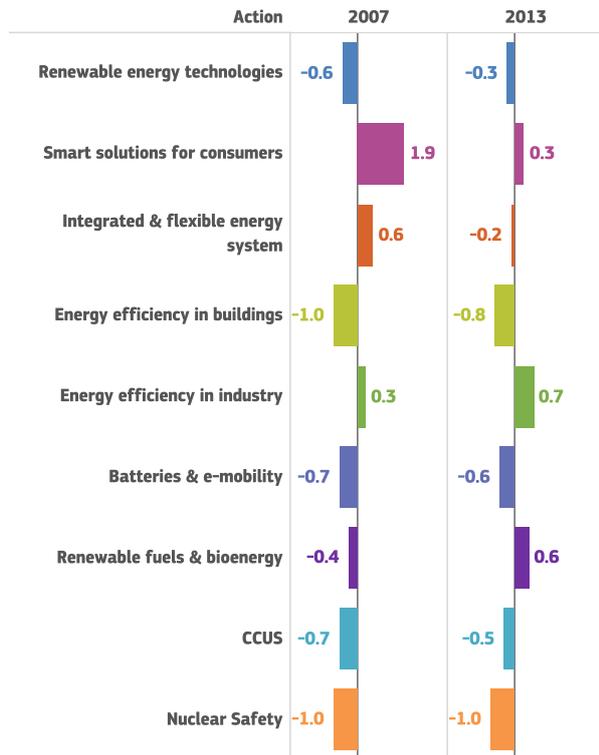
Private R&I investment



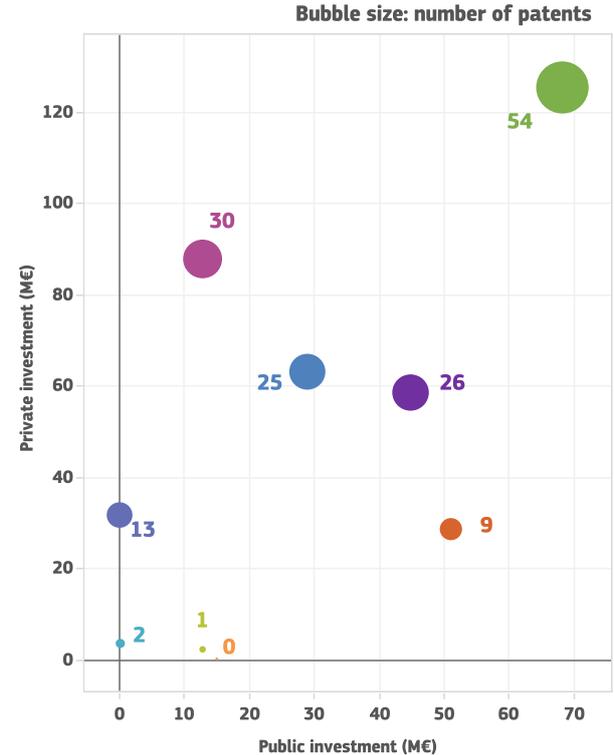
Trends in Patents



Specialisation Index. EU benchmark



R&I summary (2013)



- Renewable energy technologies
- Energy efficiency in buildings
- Renewable fuels & bioenergy
- Smart solutions for consumers
- Energy efficiency in industry
- CCUS
- Integrated & flexible energy system
- Batteries & e-mobility
- Nuclear Safety

France

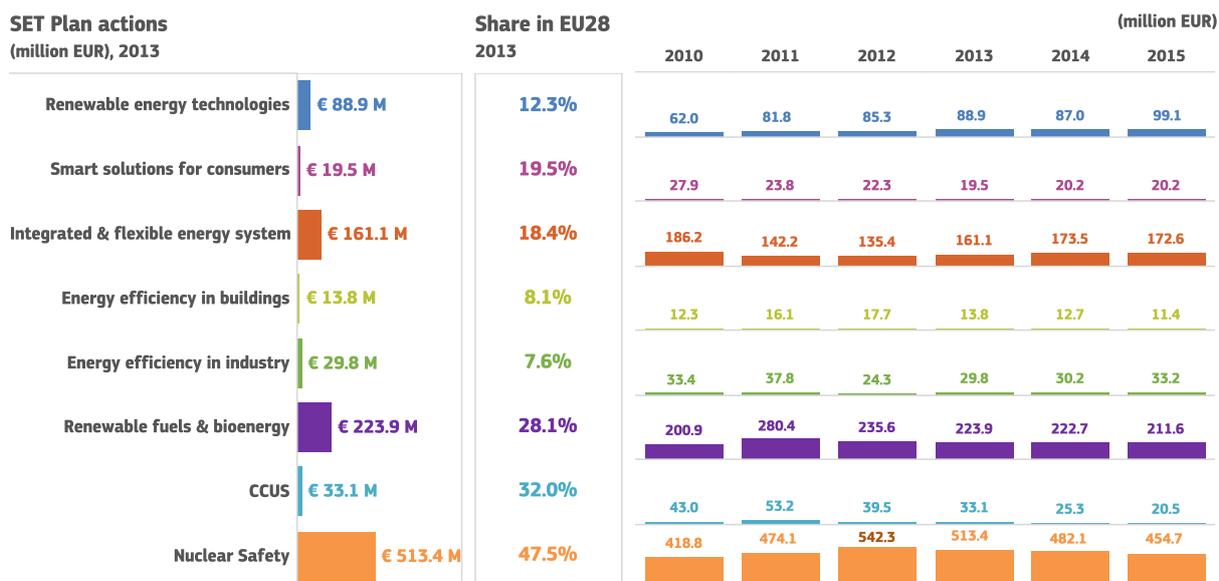


Totals (million EUR), 2013 (most recent year for which data for all indicators are available)

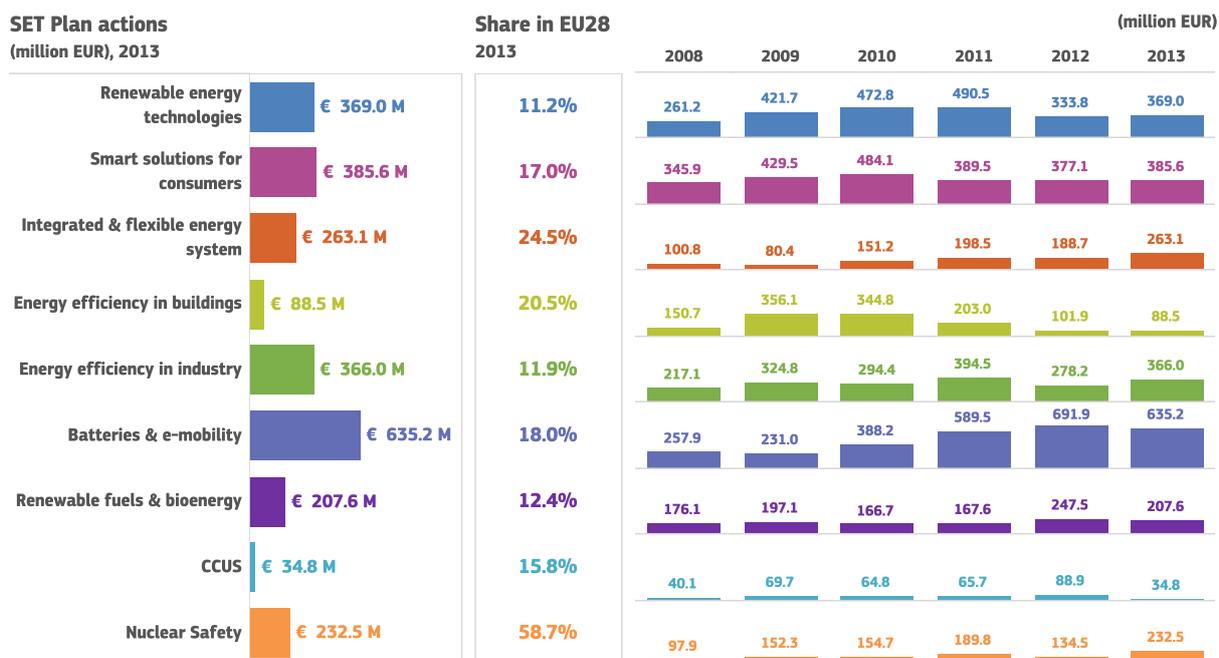
R&I Private investment **2,582**

R&I Public investment **1,083**

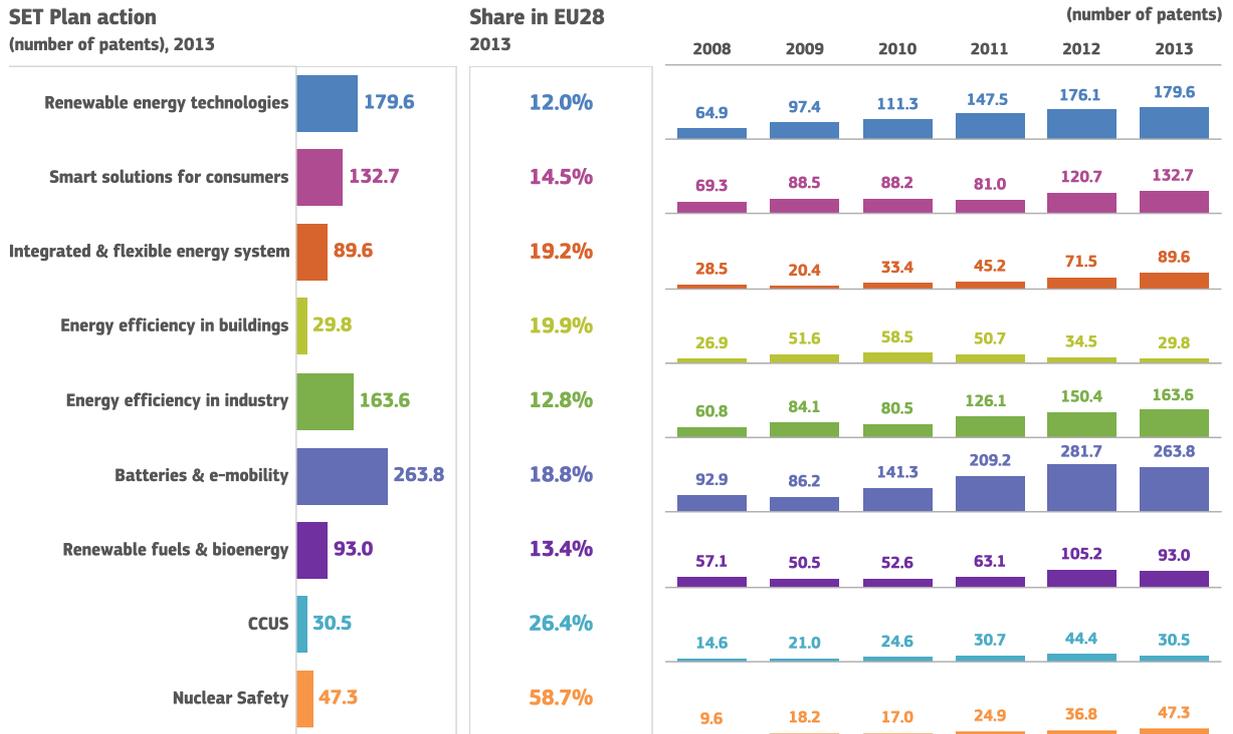
Public R&I investment



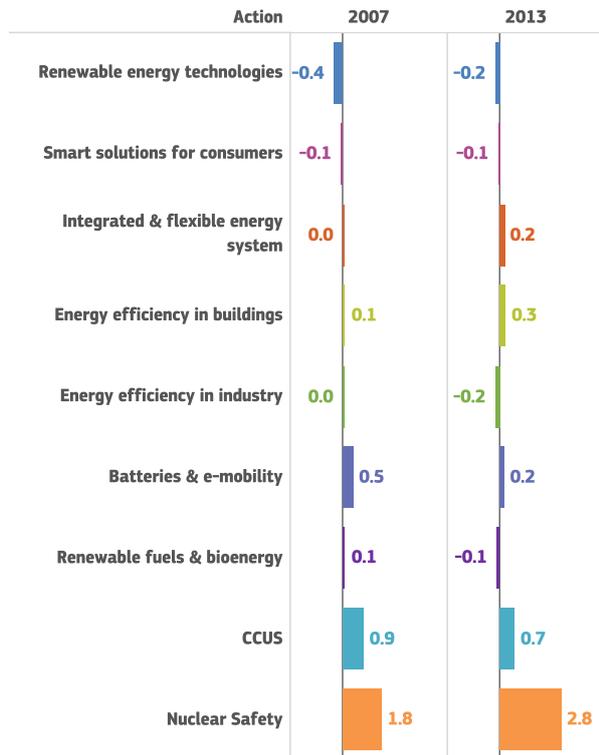
Private R&I investment



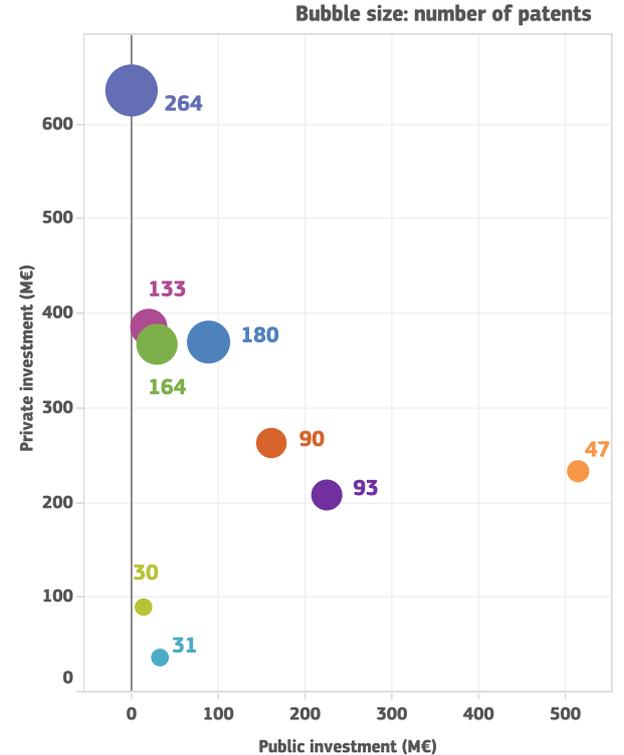
Trends in Patents



Specialisation Index. EU benchmark



R&I summary (2013)



- Renewable energy technologies
- Smart solutions for consumers
- Integrated & flexible energy system
- Energy efficiency in buildings
- Energy efficiency in industry
- Batteries & e-mobility
- Renewable fuels & bioenergy
- CCUS
- Nuclear Safety

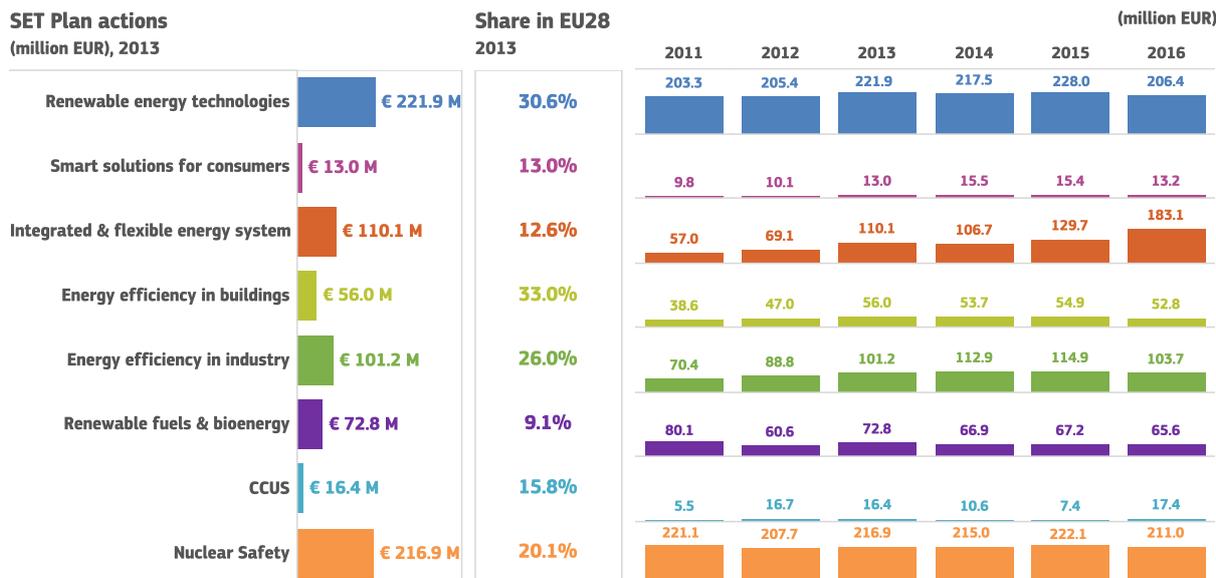
Germany



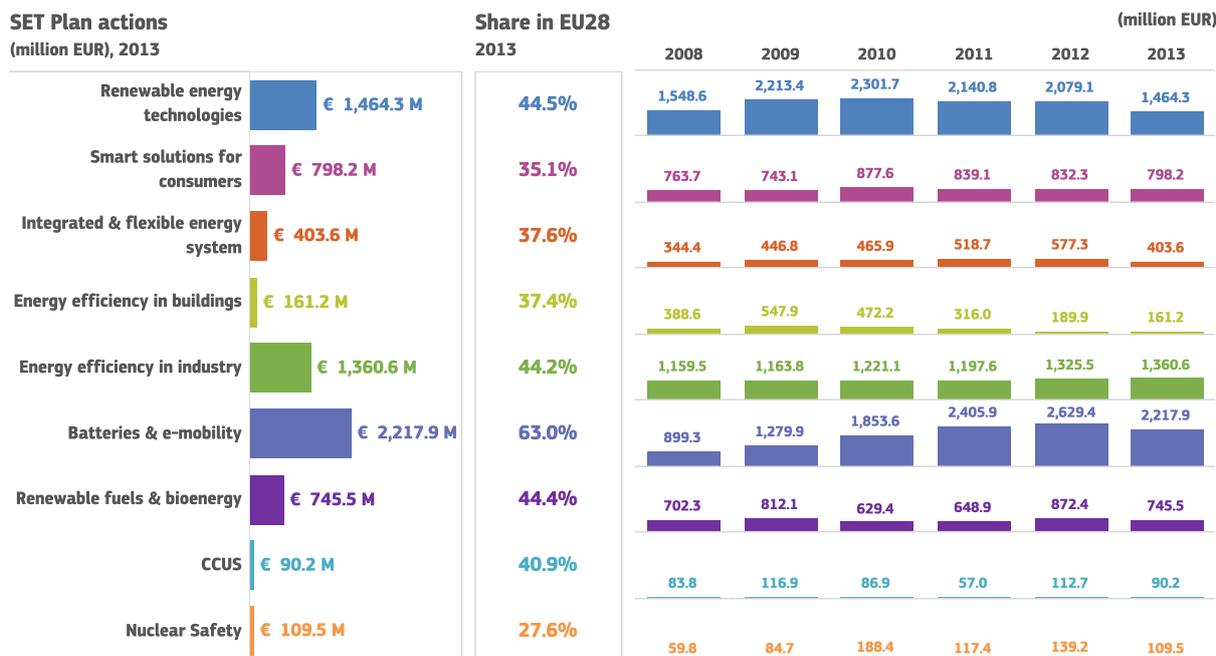
Totals (million EUR), 2013 (most recent year for which data for all indicators are available)



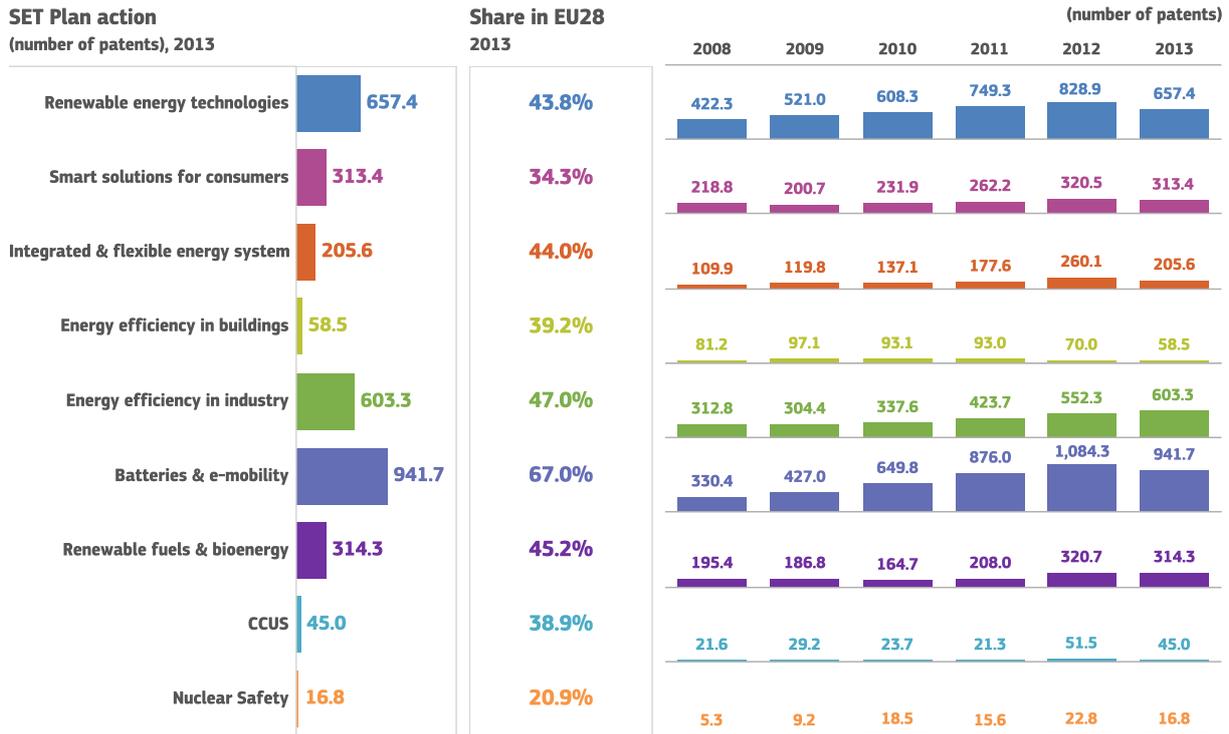
Public R&I investment



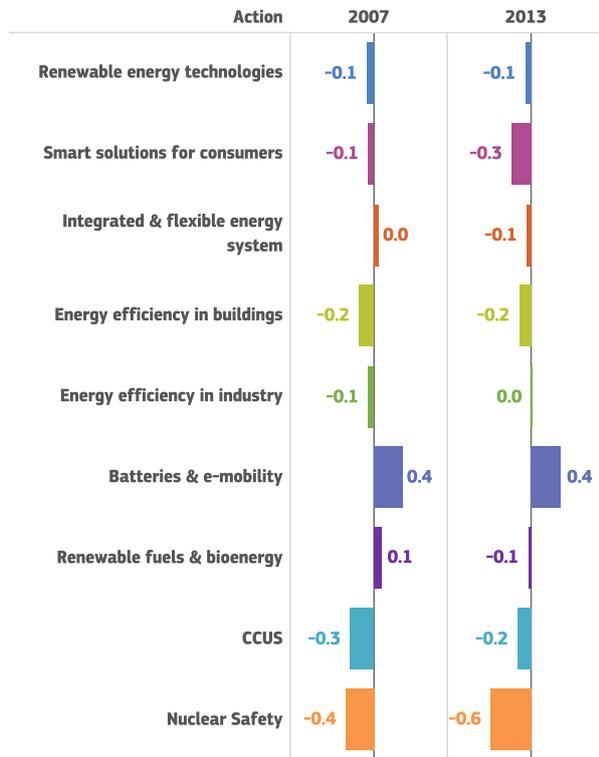
Private R&I investment



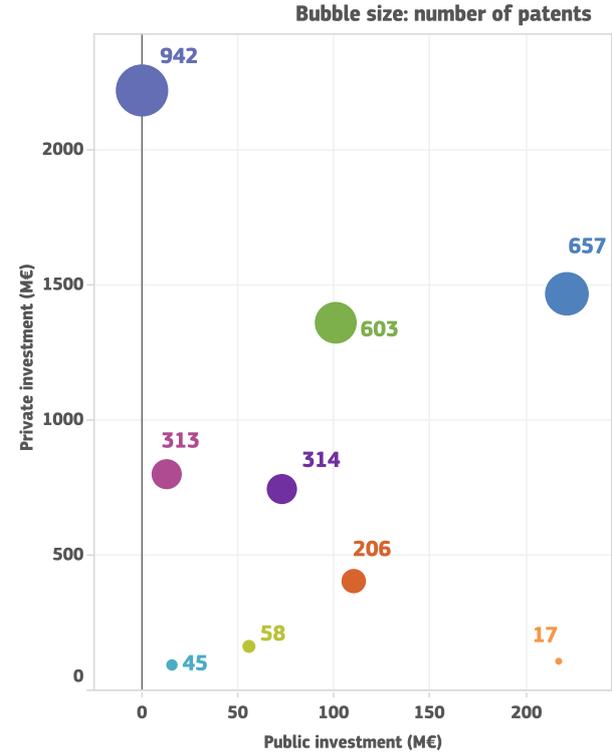
Trends in Patents



Specialisation Index. EU benchmark



R&I summary (2013)



- Renewable energy technologies
- Energy efficiency in buildings
- Renewable fuels & bioenergy
- Smart solutions for consumers
- Energy efficiency in industry
- Batteries & e-mobility
- CCUS
- Integrated & flexible energy system
- Nuclear Safety

Greece



Totals (million EUR), 2011 (most recent year for which data for all indicators are available)

R&I Private investment | 26

R&I Public investment | 6

Public R&I investment

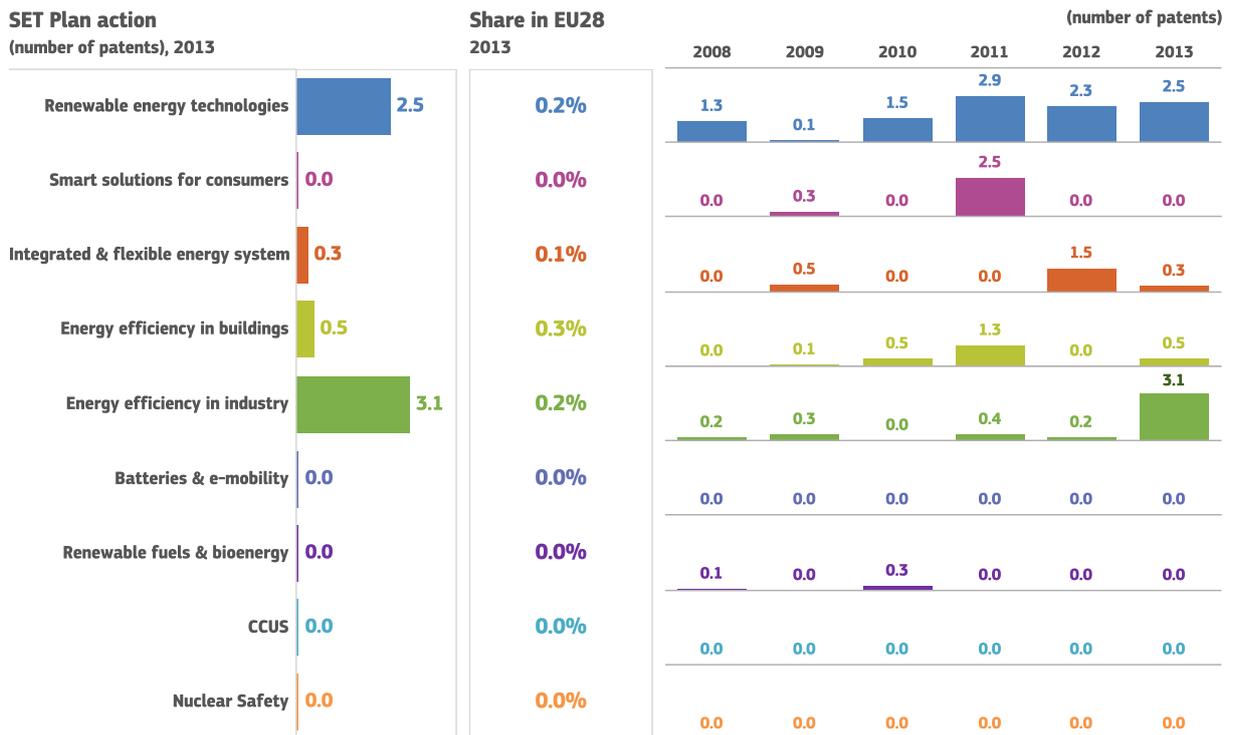
SET Plan actions (million EUR), 2011	Share in EU28 2011	(million EUR)					
		2006	2007*	2008*	2009*	2010	2011
Renewable energy technologies	0.3%	6.8	n.a.	n.a.	n.a.	2.4	2.1
Smart solutions for consumers	0.0%	0.0	n.a.	n.a.	n.a.	0.0	0.0
Integrated & flexible energy system	0.3%	4.5	n.a.	n.a.	n.a.	3.7	1.9
Energy efficiency in buildings	0.3%	0.8	n.a.	n.a.	n.a.	0.3	0.6
Energy efficiency in industry	0.1%	0.8	n.a.	n.a.	n.a.	0.3	0.6
Renewable fuels & bioenergy	0.1%	0.0	n.a.	n.a.	n.a.	0.6	0.5
CCUS	0.0%	0.0	n.a.	n.a.	n.a.	0.0	0.0
Nuclear Safety	0.0%	0.1	n.a.	n.a.	n.a.	0.0	0.0

* Over the 2007–2009 period, Greece reported spending on average EUR 15.5 million on Energy R&I per year. However the breakdown of this figure per SET-Plan action is not available.

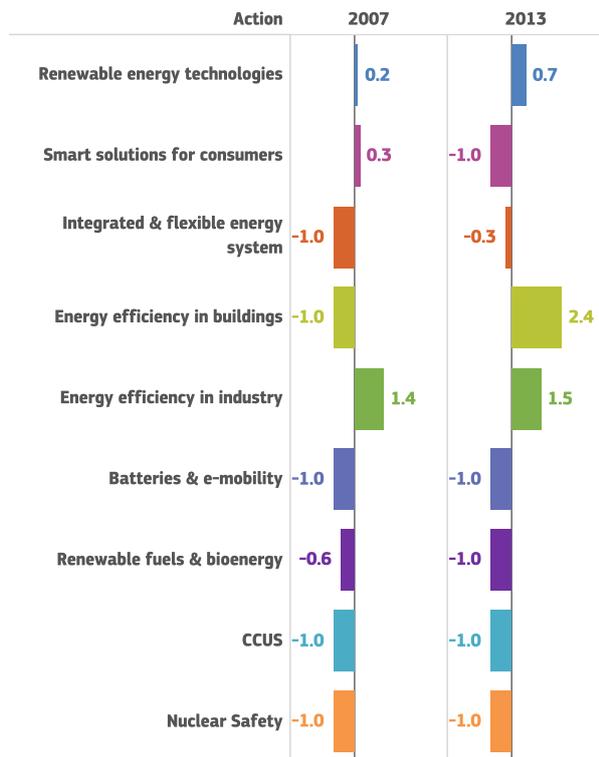
Private R&I investment

SET Plan actions (million EUR), 2011	Share in EU28 2011	(million EUR)					
		2008	2009	2010	2011	2012	2013
Renewable energy technologies	0.2%	5.2	0.3	6.4	8.7	4.2	6.4
Smart solutions for consumers	0.5%	0.0	1.8	0.0	11.9	0.0	0.0
Integrated & flexible energy system	0.0%	0.0	2.2	0.0	0.0	4.4	0.9
Energy efficiency in buildings	0.6%	0.0	0.6	2.3	4.8	0.0	1.7
Energy efficiency in industry	0.0%	1.1	1.4	0.0	0.5	0.6	8.7
Batteries & e-mobility	0.0%	0.0	0.0	0.0	0.0	0.0	0.0
Renewable fuels & bioenergy	0.0%	0.3	0.0	1.0	0.0	0.0	0.0
CCUS	0.0%	0.0	0.0	0.0	0.0	0.0	0.0
Nuclear Safety	0.0%	0.0	0.0	0.0	0.0	0.0	0.0

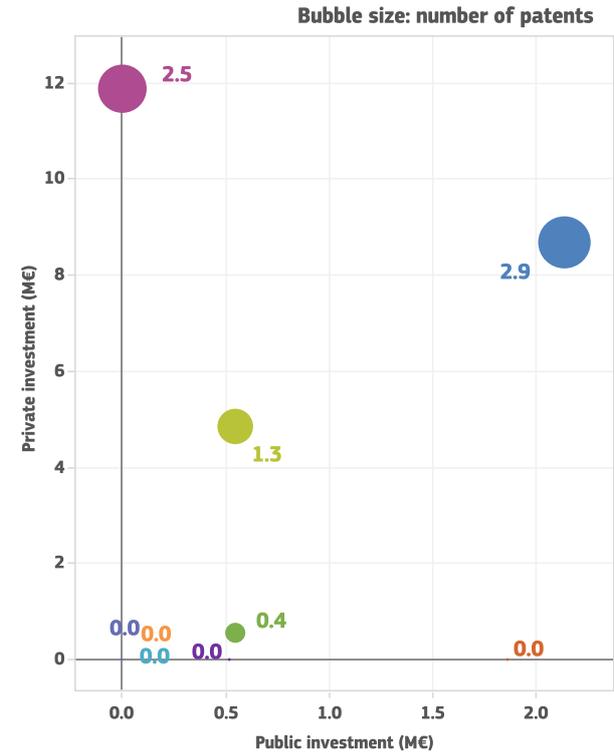
Trends in Patents



Specialisation Index. EU benchmark



R&I summary (2011)



- Renewable energy technologies
- Smart solutions for consumers
- Integrated & flexible energy system
- Energy efficiency in buildings
- Energy efficiency in industry
- Batteries & e-mobility
- Renewable fuels & bioenergy
- CCUS
- Nuclear Safety

Note

*Over the period 2007-2009, Greece reported on average EUR 15.5 million of investment in Energy R&I per year. The breakdown of this figure per SET Plan action is not available.

Hungary



Totals (million EUR), 2013 (most recent year for which data for all indicators are available)

R&I Private investment | 31

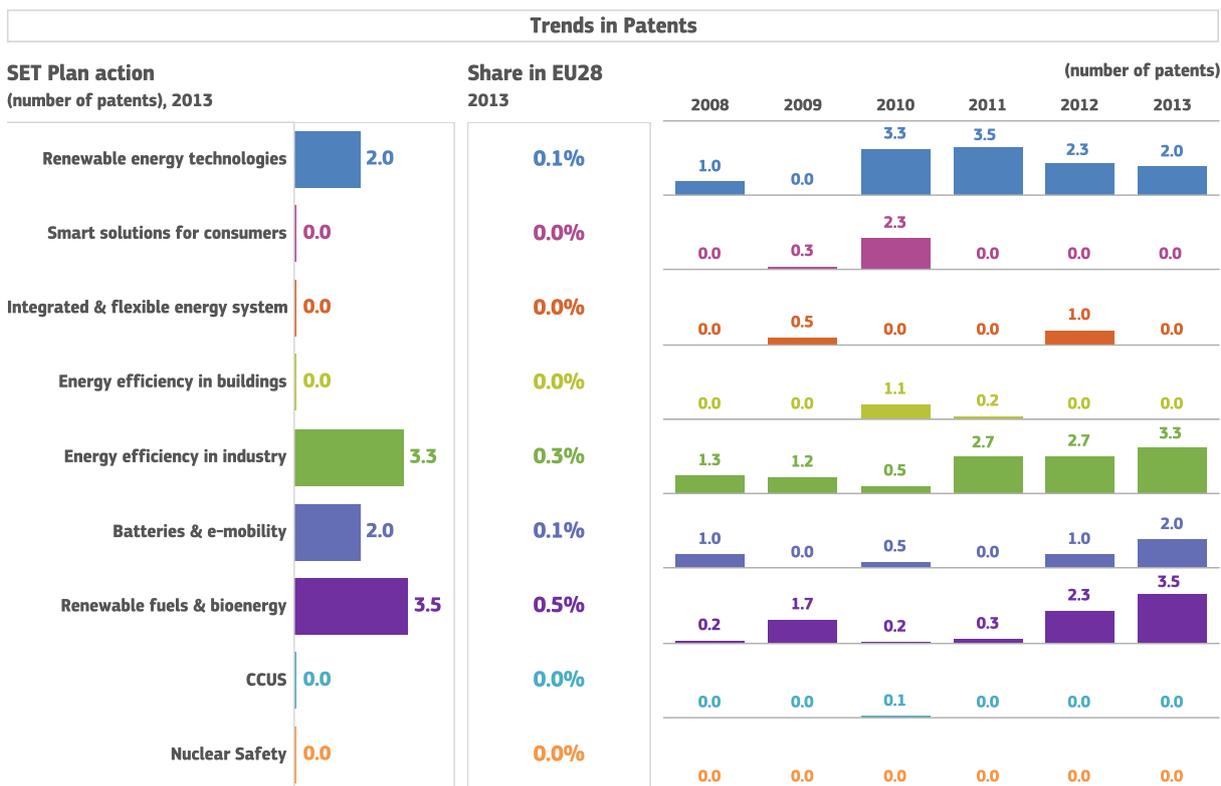
R&I Public investment | 9

Public R&I investment

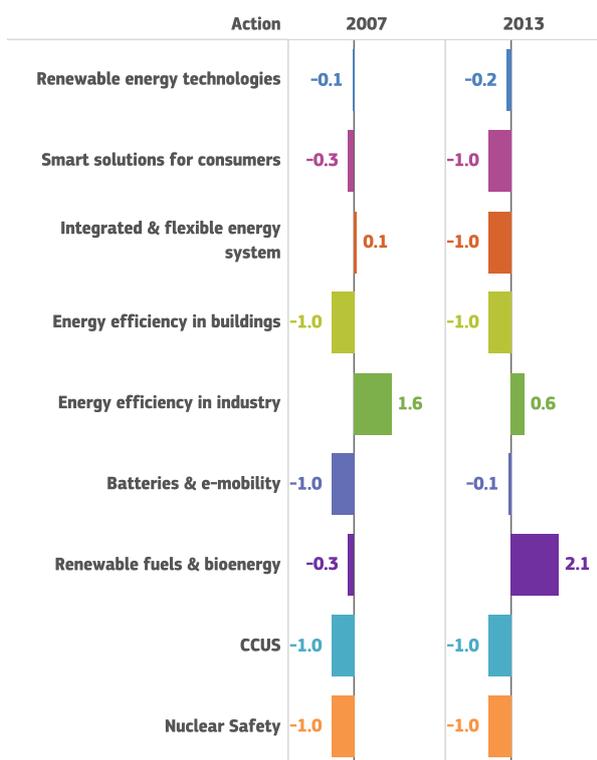
SET Plan actions (million EUR), 2013	Share in EU28 2013	(million EUR)					
		2011	2012*	2013	2014	2015	2016 (p)
Renewable energy technologies € 0.5 M	0.1%	0.1	n.a.	0.5	0.8	1.1	3.4
Smart solutions for consumers € 0.0 M	0.0%	7.5	n.a.	0.0	0.0	0.0	0.0
Integrated & flexible energy system € 8.4 M	1.0%	0.6	n.a.	8.4	3.5	4.8	18.8
Energy efficiency in buildings € 0.0 M	0.0%	7.5	n.a.	0.0	1.2	1.7	2.0
Energy efficiency in industry € 0.0 M	0.0%	41.7	n.a.	0.0	1.2	1.7	2.0
Renewable fuels & bioenergy € 0.1 M	0.0%	24.5	n.a.	0.1	0.0	0.0	0.0
CCUS € 0.0 M	0.0%	0.0	n.a.	0.0	0.0	0.0	0.0
Nuclear Safety € 0.1 M	0.0%	0.4	n.a.	0.1	0.0	0.1	0.7

Private R&I investment

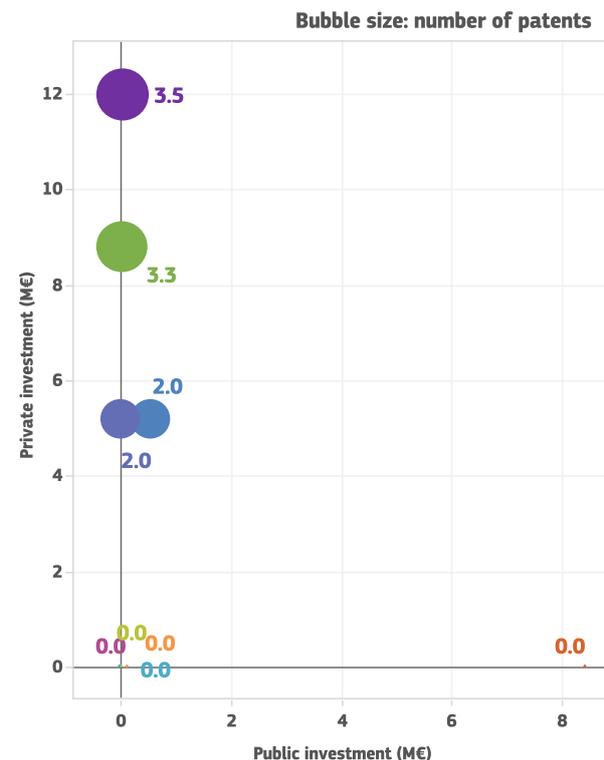
SET Plan actions (million EUR), 2013	Share in EU28 2013	(million EUR)					
		2008	2009	2010	2011	2012	2013
Renewable energy technologies € 5.2 M	0.2%	3.7	0.0	12.2	9.4	5.6	5.2
Smart solutions for consumers € 0.0 M	0.0%	0.0	0.7	10.4	0.0	0.0	0.0
Integrated & flexible energy system € 0.0 M	0.0%	0.0	1.6	0.0	0.0	3.0	0.0
Energy efficiency in buildings € 0.0 M	0.0%	0.0	0.0	5.4	0.6	0.0	0.0
Energy efficiency in industry € 8.8 M	0.3%	6.6	2.4	2.9	5.0	7.2	8.8
Batteries & e-mobility € 5.2 M	0.1%	2.7	0.0	1.2	0.0	2.7	5.2
Renewable fuels & bioenergy € 12.0 M	0.7%	1.1	10.3	0.3	0.7	10.6	12.0
CCUS € 0.0 M	0.0%	0.0	0.0	0.5	0.0	0.0	0.0
Nuclear Safety € 0.0 M	0.0%	0.0	0.0	0.0	0.0	0.0	0.0



Specialisation Index. EU benchmark



R&I summary (2013)



Note

*Due to a change in the reporting methodology for public R&I investments, the MS is revising data up to 2012 and did not submit any figures for that year. It is not clear whether this data will be changed or discarded, thus causing retroactive changes in the time series of subsequent reports. Data for 2016 are provisional (p).

Ireland

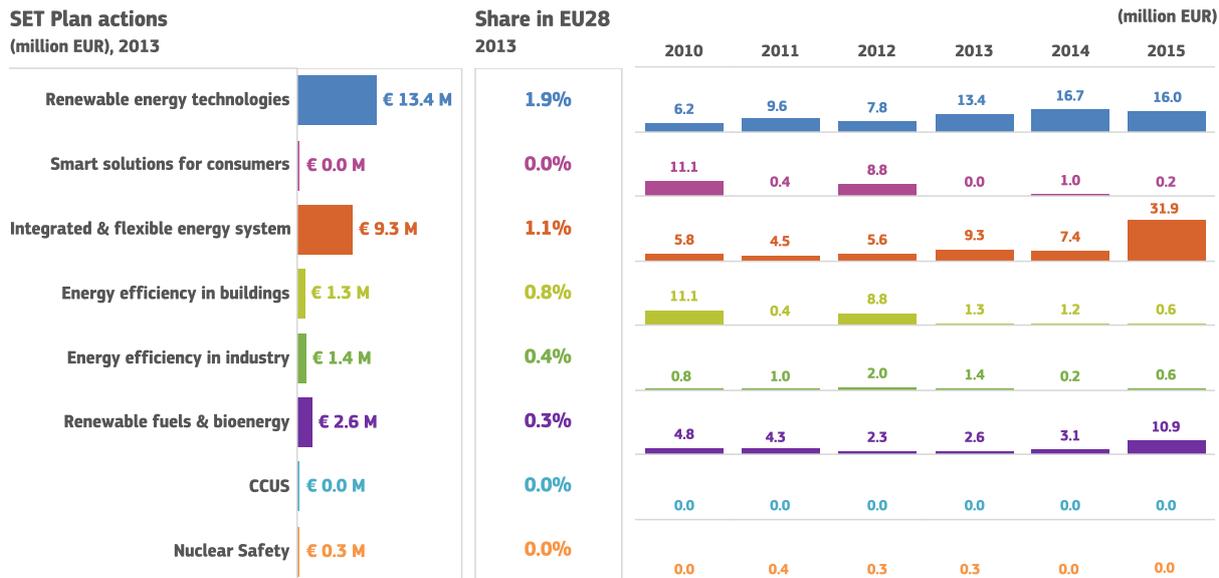


Totals (million EUR), 2013 (most recent year for which data for all indicators are available)

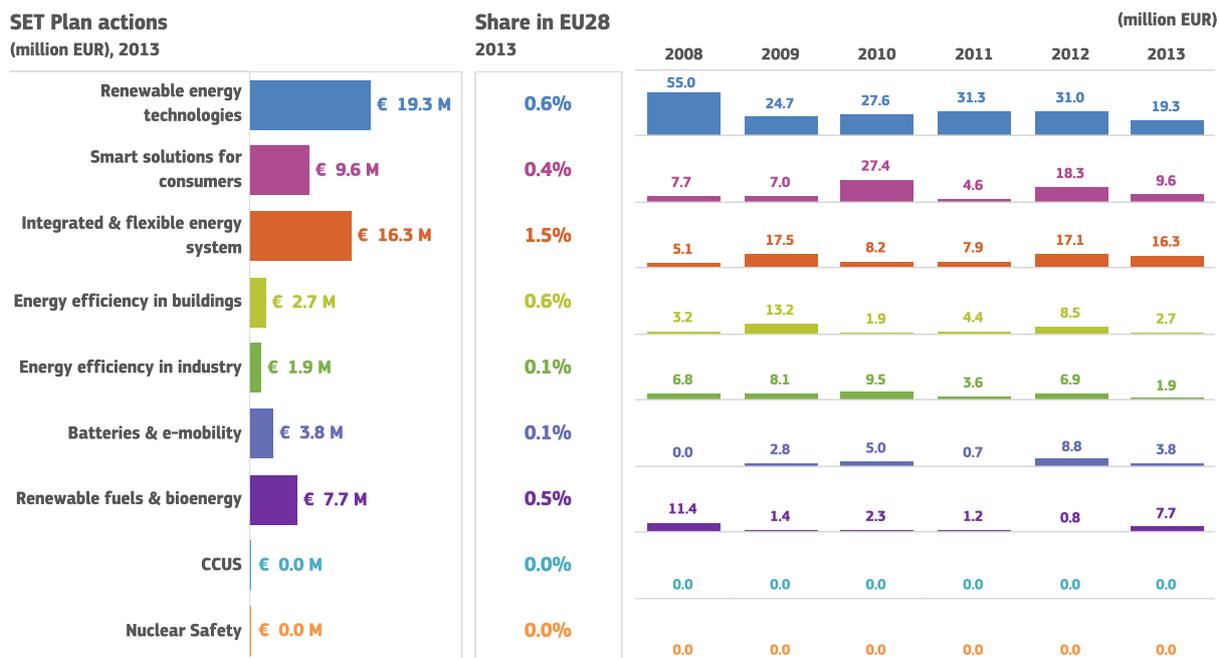
R&I Private investment | 61

R&I Public investment | 28

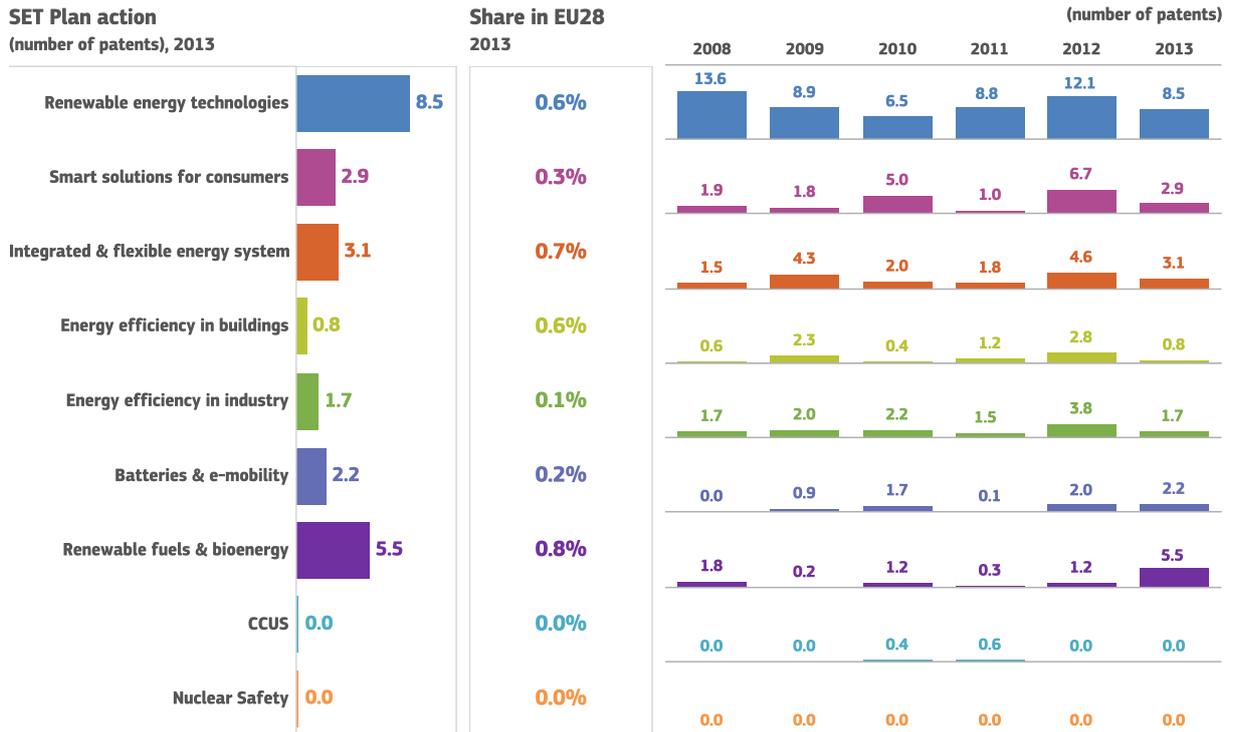
Public R&I investment



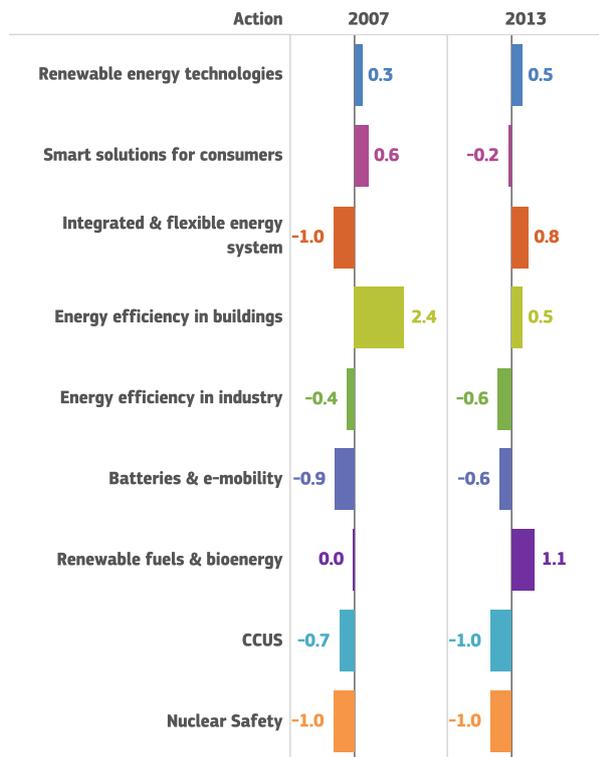
Private R&I investment



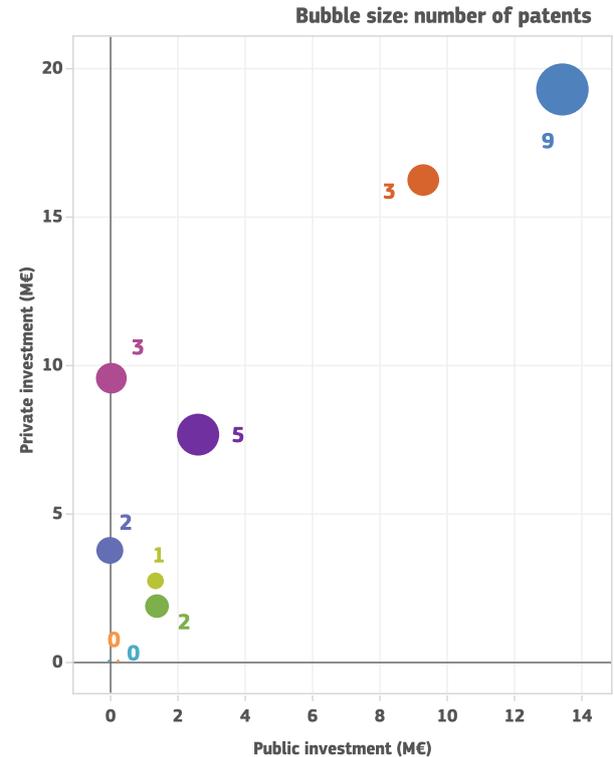
Trends in Patents



Specialisation Index. EU benchmark



R&I summary (2013)



- Renewable energy technologies
- Energy efficiency in buildings
- Renewable fuels & bioenergy
- Smart solutions for consumers
- Energy efficiency in industry
- CCUS
- Integrated & flexible energy system
- Batteries & e-mobility
- Nuclear Safety

Italy

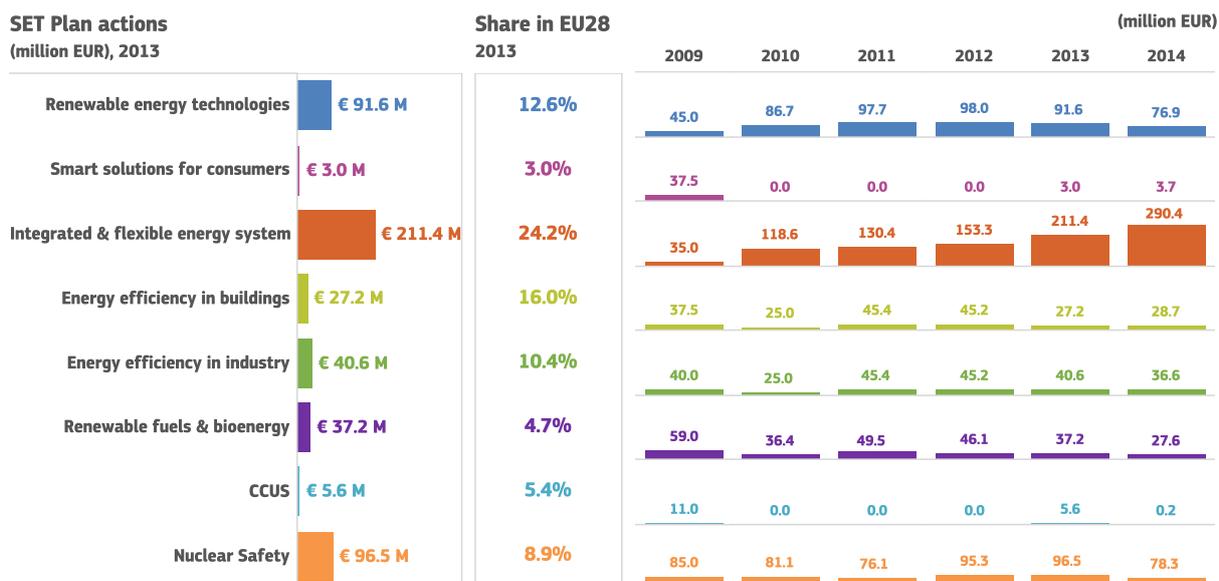


Totals (million EUR), 2013 (most recent year for which data for all indicators are available)

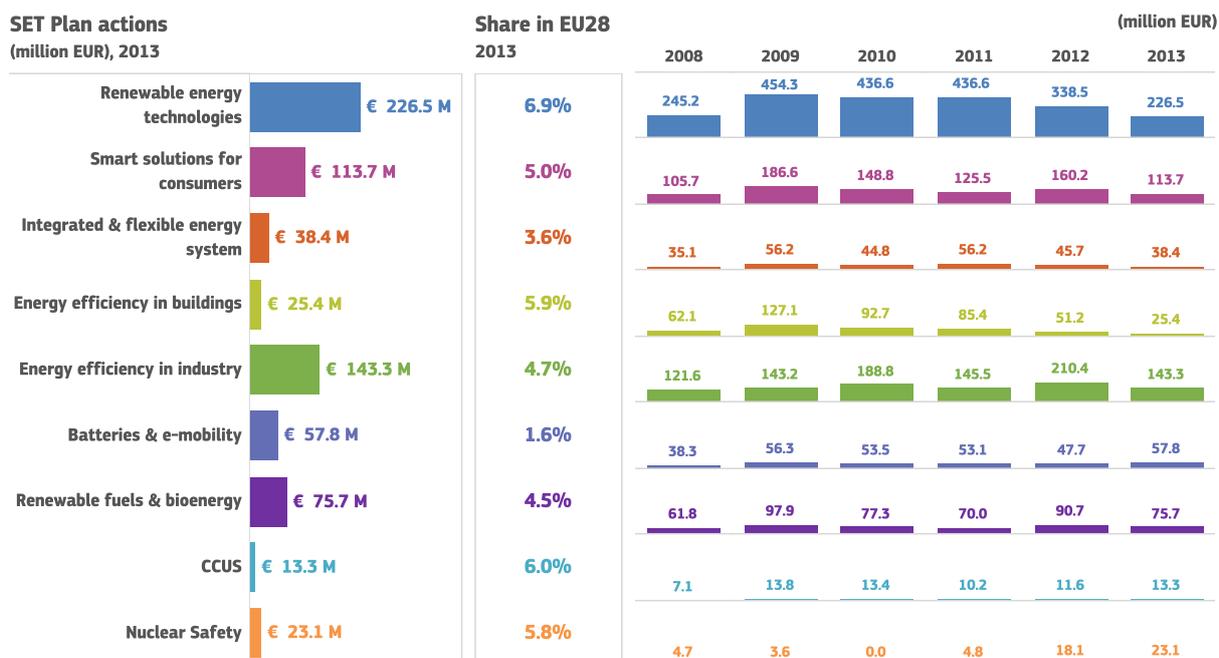
R&I Private investment **717**

R&I Public investment **513**

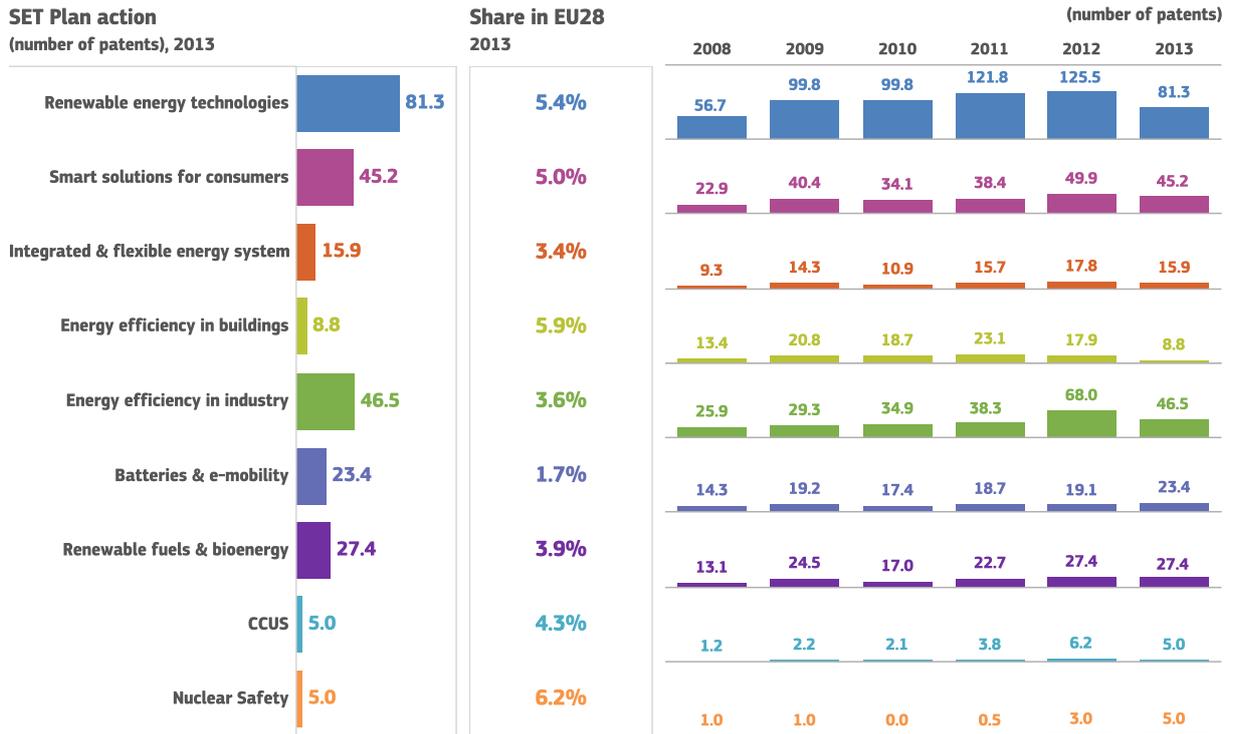
Public R&I investment



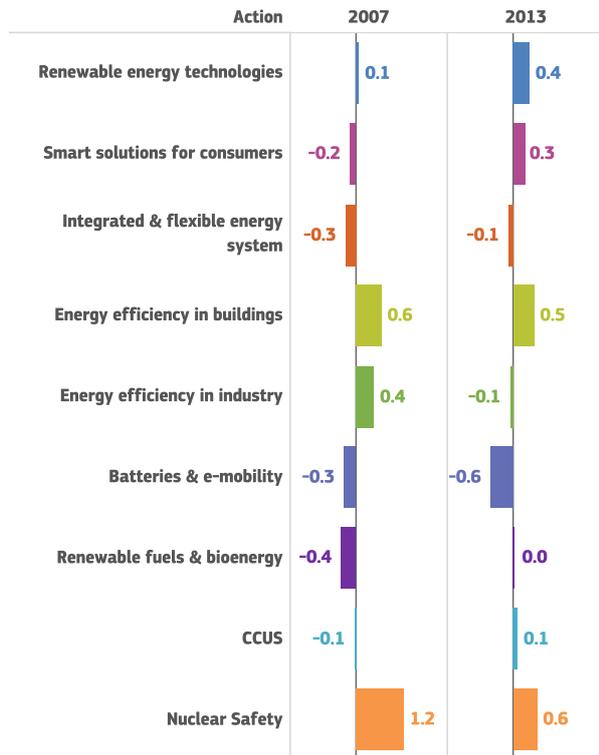
Private R&I investment



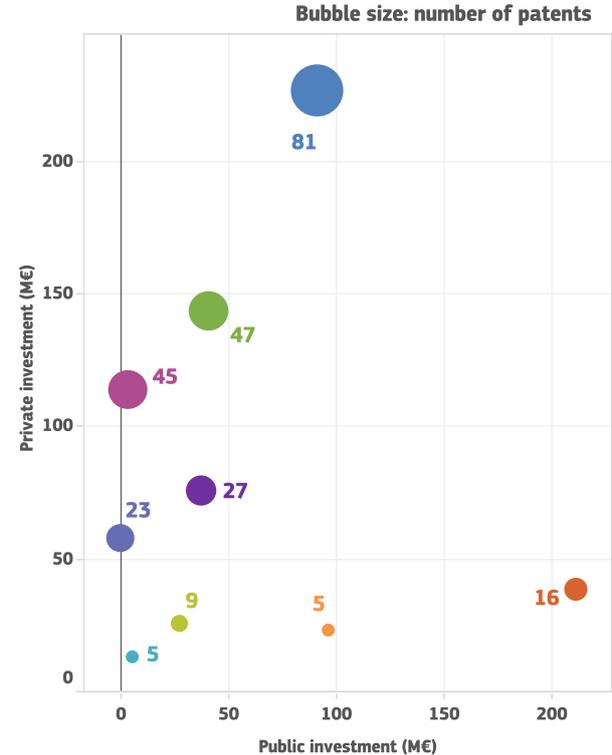
Trends in Patents



Specialisation Index. EU benchmark



R&I summary (2013)



- Renewable energy technologies
- Smart solutions for consumers
- Integrated & flexible energy system
- Energy efficiency in buildings
- Energy efficiency in industry
- Batteries & e-mobility
- Renewable fuels & bioenergy
- CCUS
- Nuclear Safety

Latvia



Total (million EUR), 2013 (most recent year for which data for all indicators are available) *

R&I Private investment | 1.4

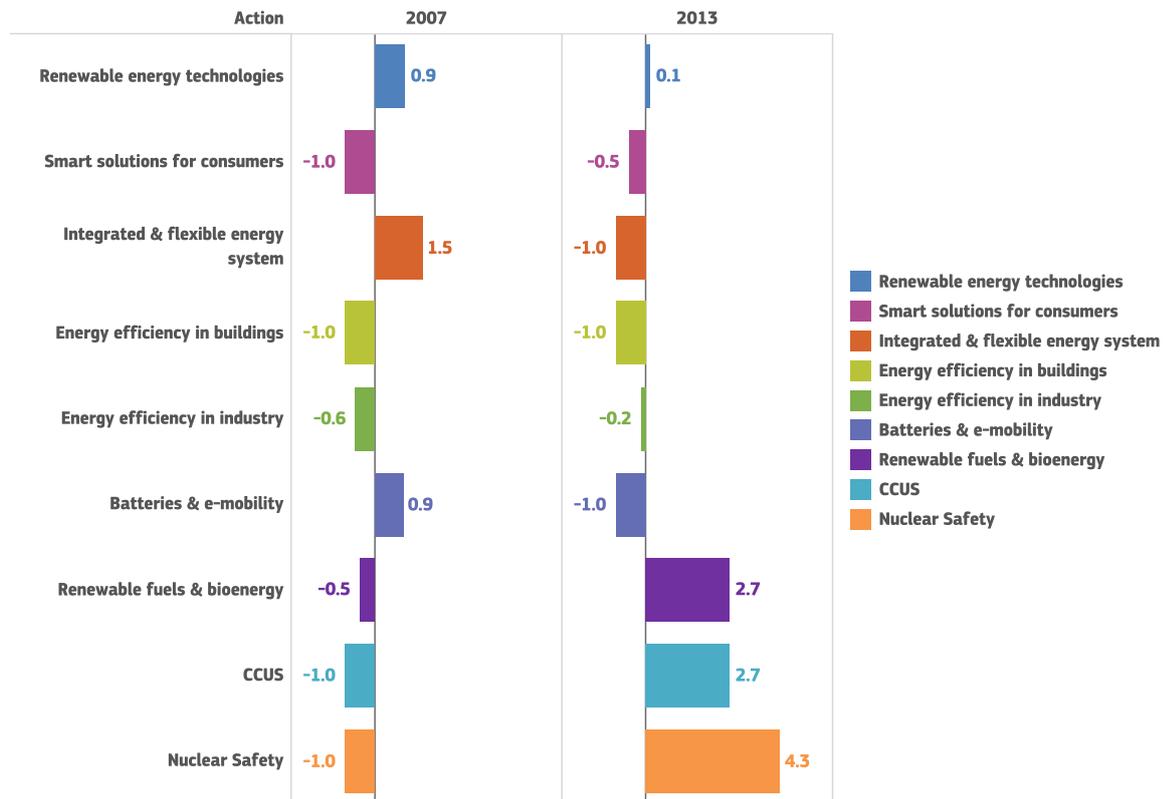
Private R&I investment

SET Plan actions (million EUR), 2013	Share in EU28 2013	2008 2009 2010 2011 2012 2013					
		(million EUR)					
Renewable energy technologies	0.0%	2.4	0.0	1.8	0.0	0.0	0.9
Smart solutions for consumers	0.0%	0.0	0.0	0.0	0.0	0.0	0.0
Integrated & flexible energy system	0.0%	0.0	1.3	0.0	0.0	0.0	0.0
Energy efficiency in buildings	0.0%	0.0	0.0	0.0	0.0	0.0	0.0
Energy efficiency in industry	0.0%	5.8	6.5	1.9	0.0	5.2	0.4
Batteries & e-mobility	0.0%	0.0	0.0	0.0	0.0	0.5	0.0
Renewable fuels & bioenergy	0.0%	0.0	2.8	0.0	0.0	0.0	0.0
CCUS	0.0%	0.0	0.0	0.0	0.0	0.0	0.0
Nuclear Safety	0.0%	0.0	0.0	0.0	0.0	0.0	0.0

Trends in patents

SET Plan action (number of patents), 2013	Share in EU28 2013	2008 2009 2010 2011 2012 2013					
		(number of patents)					
Renewable energy technologies	0.3%	4.7	2.5	3.5	7.0	3.0	4.0
Smart solutions for consumers	0.1%	0.0	0.0	0.0	0.0	0.0	1.0
Integrated & flexible energy system	0.0%	0.0	0.3	0.0	0.0	0.0	0.0
Energy efficiency in buildings	0.0%	0.0	0.5	0.0	0.0	0.0	0.0
Energy efficiency in industry	0.2%	1.5	1.9	2.5	0.0	1.6	2.5
Batteries & e-mobility	0.0%	0.0	0.0	0.0	0.0	0.6	0.0
Renewable fuels & bioenergy	0.9%	0.0	0.3	0.0	0.0	0.3	6.0
CCUS	0.9%	0.0	0.0	0.0	0.0	0.0	1.0
Nuclear Safety	1.2%	0.0	0.0	0.0	0.0	0.0	1.0

Specialisation Index. EU benchmark



Note

* Latvia is not a member of the IEA; detailed data on public R&I expenditure are not available. Public funding for energy-related research is managed under the National Research Programme LATENERGI, which reduced the budget from EUR 4.1 million in the financial period 2010-2013 to EUR 2.25 million in 2014-2017 (SWD(2017) 404 final, (European Commission, 2017b)).

Lithuania



Totals (million EUR), 2013 (most recent year for which data for all indicators are available)

R&I Private investment | 10

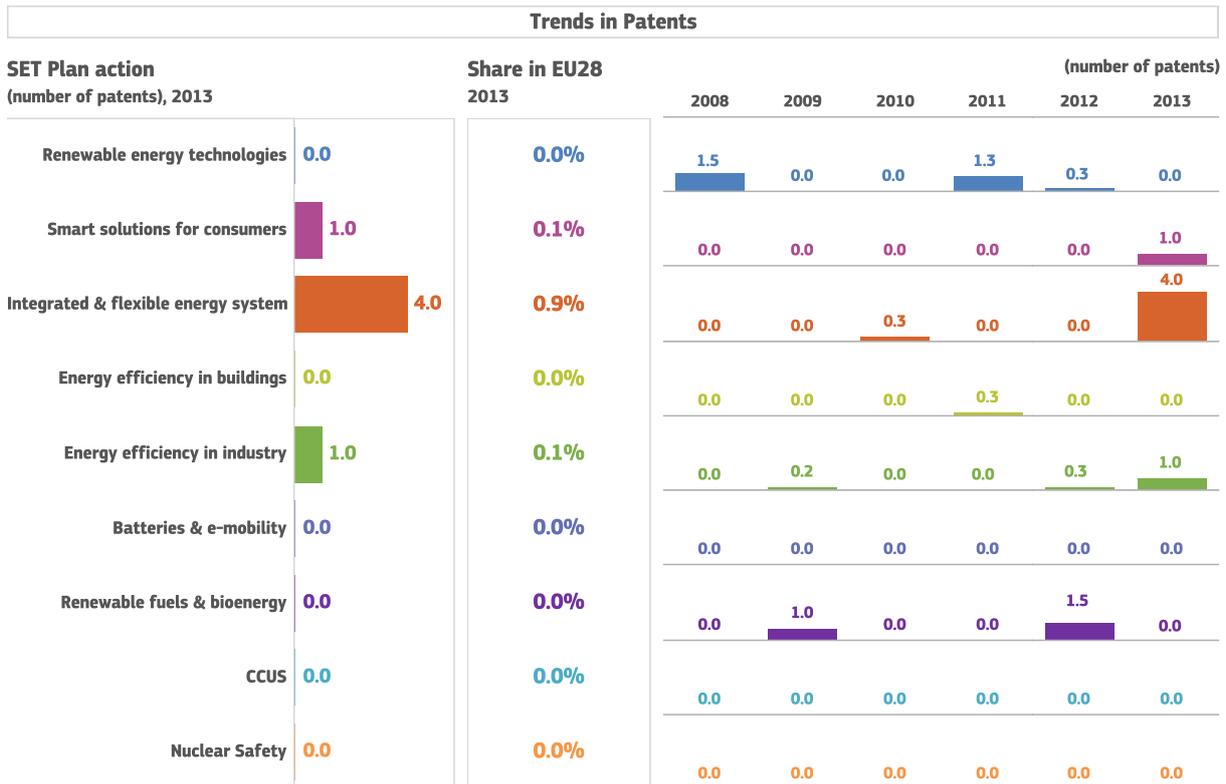
R&I Public investment | 3

Public R&I investment *

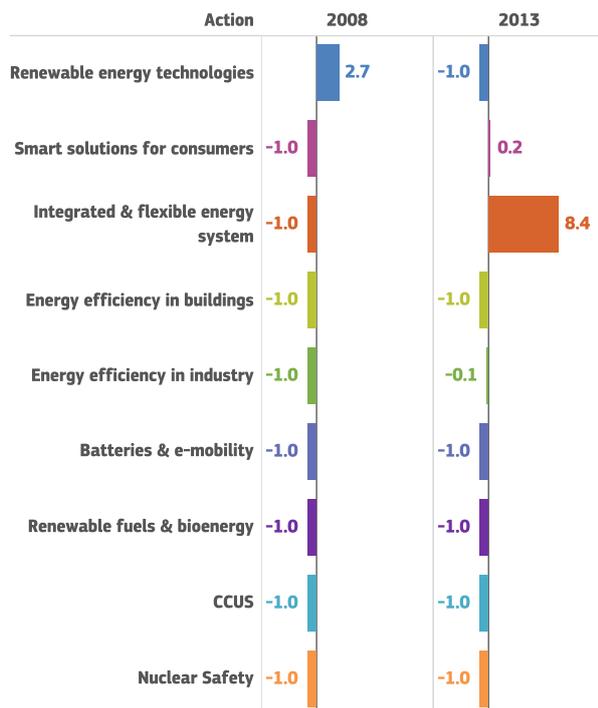
SET Plan actions (million EUR), 2013	Share in EU28 2013	2009 2010 2011 2012 2013 2014					
		(million EUR)					
Renewable energy technologies	€ 0.5 M 0.1%	n.a.	0.0	0.9	0.8	0.5	0.4
Smart solutions for consumers	€ 0.3 M 0.3%	n.a.	0.0	0.2	0.4	0.3	0.0
Integrated & flexible energy system	€ 0.2 M 0.0%	n.a.	0.0	0.2	0.6	0.2	0.3
Energy efficiency in buildings	€ 0.2 M 0.1%	n.a.	0.0	0.2	0.2	0.2	0.4
Energy efficiency in industry	€ 0.0 M 0.0%	n.a.	0.0	0.0	0.0	0.0	0.0
Renewable fuels & bioenergy	€ 1.5 M 0.2%	n.a.	0.0	0.1	2.0	1.5	1.2
CCUS	€ 0.0 M 0.0%	n.a.	0.0	0.0	0.0	0.0	0.0
Nuclear Safety	€ 0.0 M 0.0%	n.a.	0.0	0.0	0.0	0.0	0.0

Private R&I investment

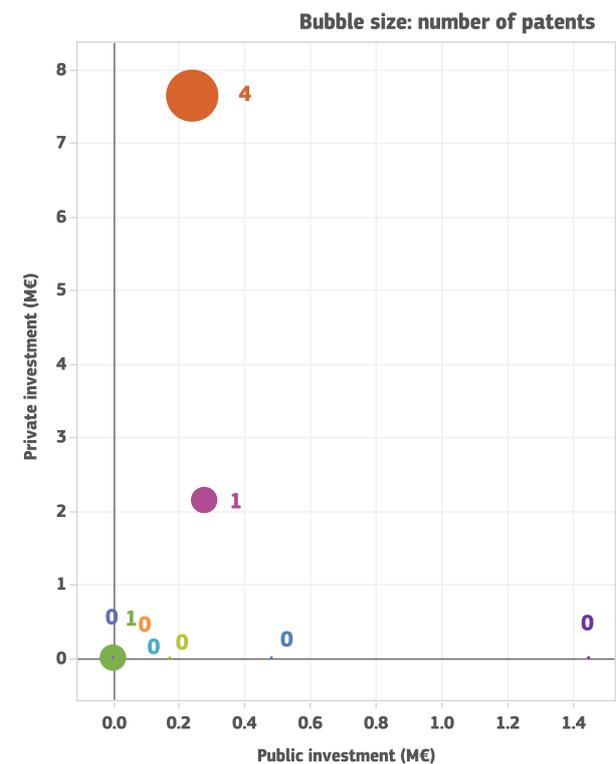
SET Plan actions (million EUR), 2013	Share in EU28 2013	2008 2009 2010 2011 2012 2013					
		(million EUR)					
Renewable energy technologies	€ 0.0 M 0.0%	1.8	0.0	0.0	4.0	0.0	0.0
Smart solutions for consumers	€ 2.1 M 0.1%	0.0	0.0	0.0	0.0	0.0	2.1
Integrated & flexible energy system	€ 7.6 M 0.7%	0.0	0.0	1.4	0.0	0.0	7.6
Energy efficiency in buildings	€ 0.0 M 0.0%	0.0	0.0	0.0	1.1	0.0	0.0
Energy efficiency in industry	€ 0.0 M 0.0%	0.0	1.1	0.0	0.0	0.0	0.0
Batteries & e-mobility	€ 0.0 M 0.0%	0.0	0.0	0.0	0.0	0.0	0.0
Renewable fuels & bioenergy	€ 0.0 M 0.0%	0.0	0.0	0.0	0.0	4.5	0.0
CCUS	€ 0.0 M 0.0%	0.0	0.0	0.0	0.0	0.0	0.0
Nuclear Safety	€ 0.0 M 0.0%	0.0	0.0	0.0	0.0	0.0	0.0



Specialisation Index. EU benchmark **



R&I summary (2013)



Note

* Lithuania is not a member of the IEA; data as collected by SETIS based on the annual reports of the Lithuanian National Science Programs Future Energy (Research Council of Lithuania).

** Due to lack of data for 2007, the Specialisation Index is calculated for 2008.

Luxembourg



Totals (million EUR), 2012 (most recent year for which data for all indicators are available)

R&I Private investment | 61

R&I Public investment | 71

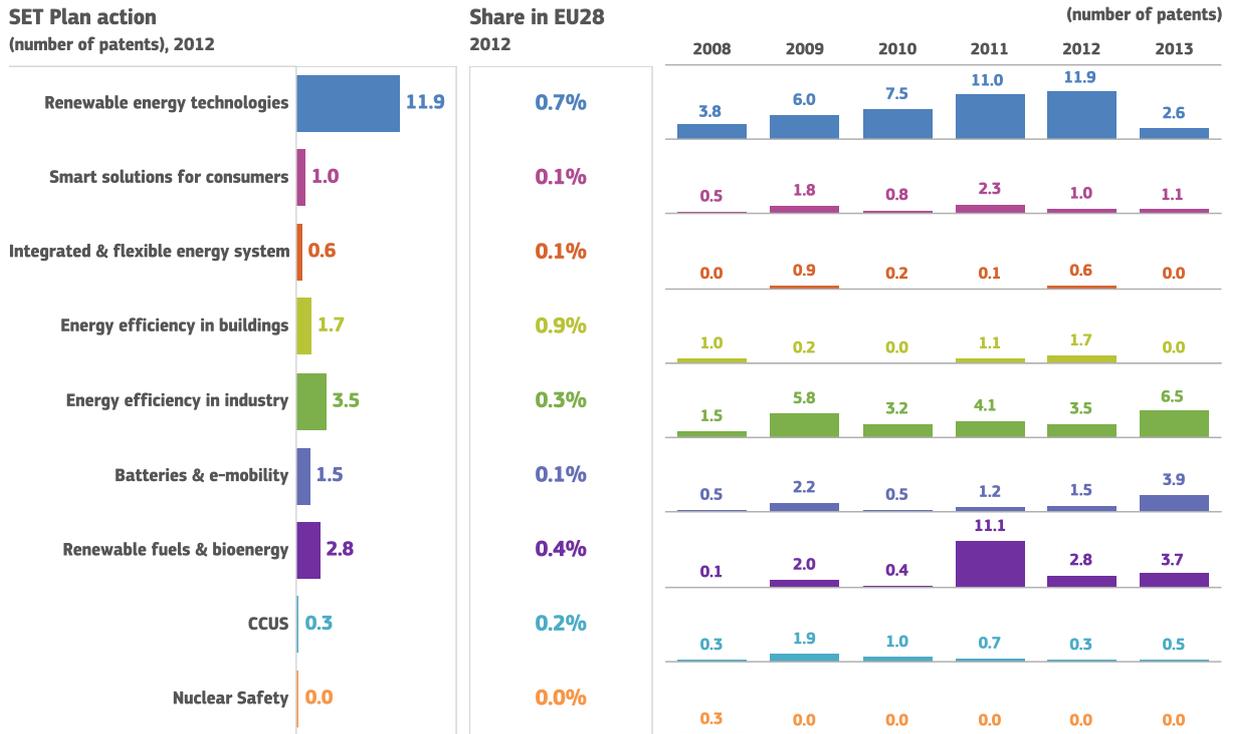
Public R&I investment

SET Plan actions (million EUR), 2012		Share in EU28 2012	Share in EU28 (million EUR)					
			2007*	2008*	2009*	2010*	2011	2012
Renewable energy technologies	€ 0.0 M	0.0%	n.a.	n.a.	n.a.	n.a.	0.7	0.0
Smart solutions for consumers	€ 7.4 M	6.7%	n.a.	n.a.	n.a.	n.a.	0.2	7.4
Integrated & flexible energy system	€ 6.6 M	0.9%	n.a.	n.a.	n.a.	n.a.	0.0	6.6
Energy efficiency in buildings	€ 4.6 M	2.3%	n.a.	n.a.	n.a.	n.a.	0.5	4.6
Energy efficiency in industry	€ 2.3 M	0.5%	n.a.	n.a.	n.a.	n.a.	9.6	2.3
Renewable fuels & bioenergy	€ 50.5 M	6.0%	n.a.	n.a.	n.a.	n.a.	13.6	50.5
CCUS	€ 0.0 M	0.0%	n.a.	n.a.	n.a.	n.a.	0.0	0.0
Nuclear Safety	€ 0.0 M	0.0%	n.a.	n.a.	n.a.	n.a.	0.0	0.0

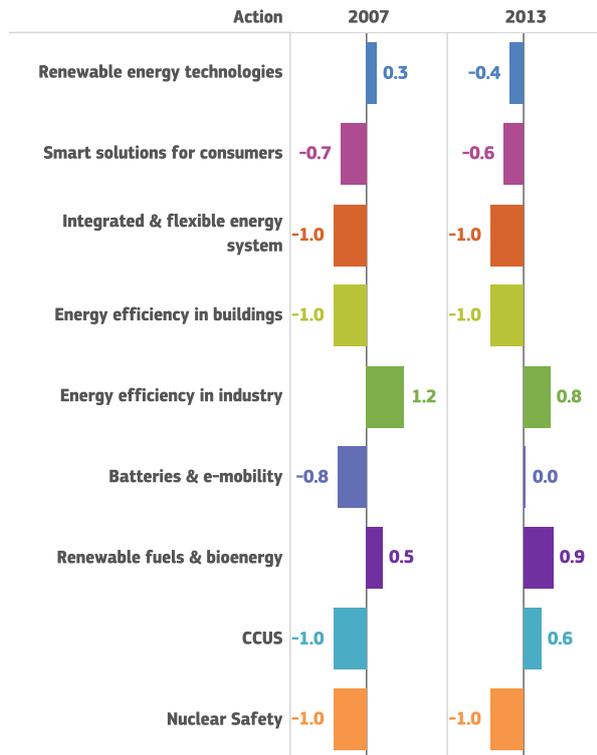
Private R&I investment

SET Plan actions (million EUR), 2012		Share in EU28 2012	Share in EU28 (million EUR)					
			2008	2009	2010	2011	2012	2013
Renewable energy technologies	€ 30.1 M	0.7%	13.8	24.7	28.1	34.1	30.1	6.1
Smart solutions for consumers	€ 3.9 M	0.2%	2.9	8.4	4.1	11.7	3.9	2.9
Integrated & flexible energy system	€ 1.5 M	0.1%	0.0	3.4	0.8	0.4	1.5	0.0
Energy efficiency in buildings	€ 4.7 M	0.9%	4.7	1.3	0.0	2.3	4.7	0.0
Energy efficiency in industry	€ 8.9 M	0.3%	5.6	27.0	13.1	14.7	8.9	16.6
Batteries & e-mobility	€ 3.8 M	0.1%	1.2	6.4	1.3	3.3	3.8	9.6
Renewable fuels & bioenergy	€ 7.1 M	0.4%	0.5	10.3	1.2	36.2	7.1	9.5
CCUS	€ 0.6 M	0.2%	1.4	9.2	4.7	2.8	0.6	1.2
Nuclear Safety	€ 0.0 M	0.0%	0.0	0.0	0.0	0.0	0.0	0.0

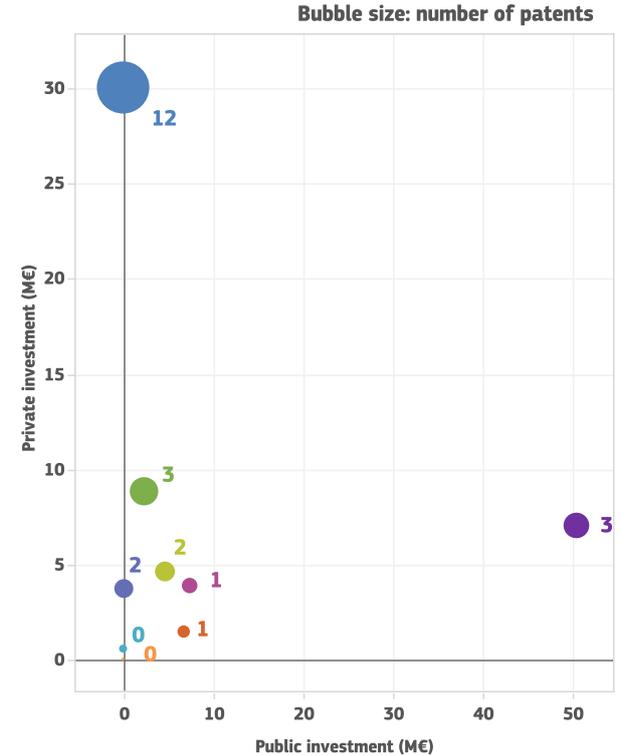
Trends in Patents



Specialisation Index. EU benchmark



R&I summary (2012)



- Renewable energy technologies
- Smart solutions for consumers
- Integrated & flexible energy system
- Energy efficiency in buildings
- Energy efficiency in industry
- Batteries & e-mobility
- Renewable fuels & bioenergy
- CCUS
- Nuclear Safety

Note

* Luxembourg did not report data on public R&I expenditure over the period 2007-2010.

Malta



Total (million EUR), 2013 (most recent year for which data for all indicators are available) *

R&I Private investment | 9.8

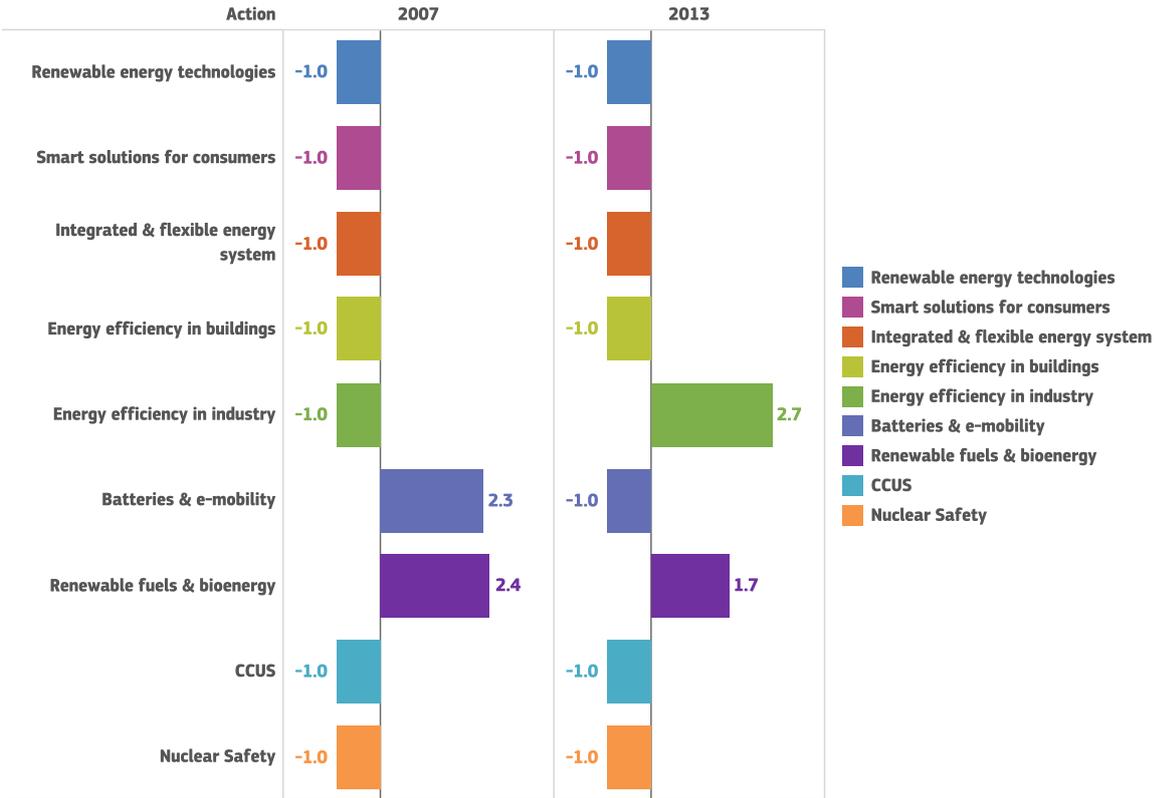
Private R&I investment

SET Plan actions (million EUR), 2013		Share in EU28 2013	Share in EU28 2013					
			2008	2009	2010	2011	2012	2013
Renewable energy technologies	€ 0.0 M	0.0%	0.0	1.2	3.5	3.2	0.0	0.0
Smart solutions for consumers	€ 0.0 M	0.0%	1.1	0.2	1.0	0.0	0.7	0.0
Integrated & flexible energy system	€ 0.0 M	0.0%	0.0	0.0	0.0	0.0	0.0	0.0
Energy efficiency in buildings	€ 0.0 M	0.0%	0.0	1.4	0.0	0.0	0.0	0.0
Energy efficiency in industry	€ 7.2 M	0.2%	0.0	0.0	0.0	0.0	2.1	7.2
Batteries & e-mobility	€ 0.0 M	0.0%	0.0	0.0	0.0	0.0	0.0	0.0
Renewable fuels & bioenergy	€ 2.6 M	0.2%	1.5	6.9	1.8	0.0	0.0	2.6
CCUS	€ 0.0 M	0.0%	0.0	0.0	0.0	0.0	0.0	0.0
Nuclear Safety	€ 0.0 M	0.0%	0.0	0.0	0.0	0.0	0.0	0.0

Trends in patents

SET Plan action (number of patents), 2013		Share in EU28 2013	Share in EU28 2013					
			2008	2009	2010	2011	2012	2013
Renewable energy technologies	0.0	0.0%	0.0	0.3	0.8	1.0	0.0	0.0
Smart solutions for consumers	0.0	0.0%	0.3	0.1	0.3	0.0	0.3	0.0
Integrated & flexible energy system	0.0	0.0%	0.0	0.0	0.0	0.0	0.0	0.0
Energy efficiency in buildings	0.0	0.0%	0.0	0.3	0.0	0.0	0.0	0.0
Energy efficiency in industry	2.5	0.2%	0.0	0.0	0.0	0.0	0.8	2.5
Batteries & e-mobility	0.0	0.0%	0.0	0.0	0.0	0.0	0.0	0.0
Renewable fuels & bioenergy	1.0	0.1%	0.3	1.0	0.3	0.0	0.0	1.0
CCUS	0.0	0.0%	0.0	0.0	0.0	0.0	0.0	0.0
Nuclear Safety	0.0	0.0%	0.0	0.0	0.0	0.0	0.0	0.0

Specialisation Index. EU benchmark



Note

* Malta is not a member of the IEA; detailed data on public R&I expenditure are not available. The Council for Science and Technology of Malta disbursed approximately EUR 0.94 million between 2015 and August 2017 in projects related to energy and low-carbon technologies through the FUSION programme (SWD(2017) 405 final, (European Commission, 2017b))

Netherlands

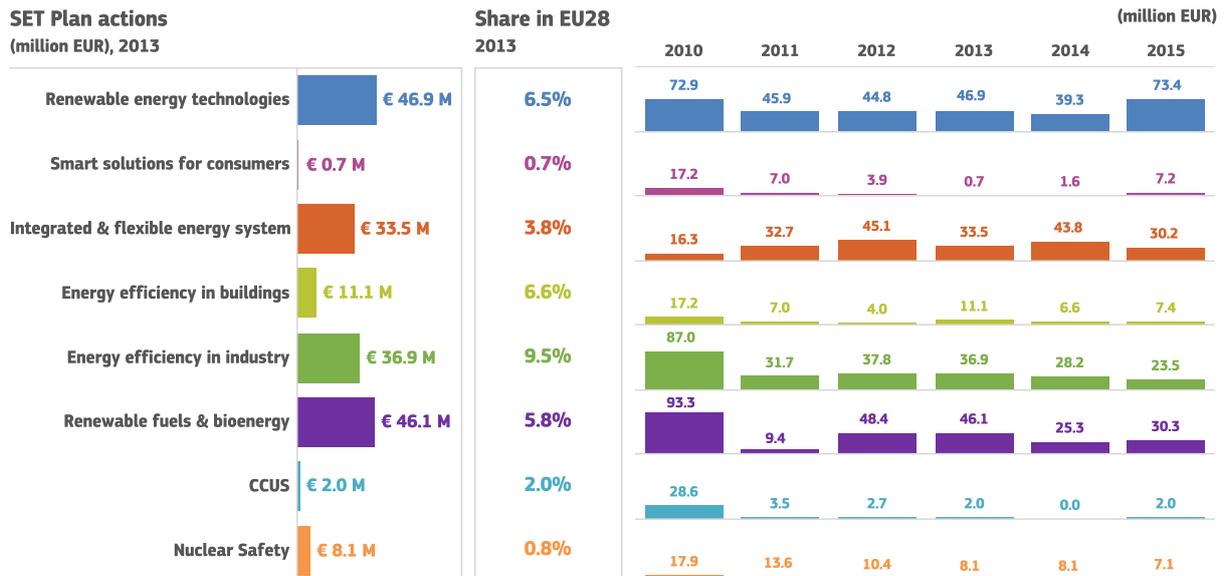


Totals (million EUR), 2013 (most recent year for which data for all indicators are available)

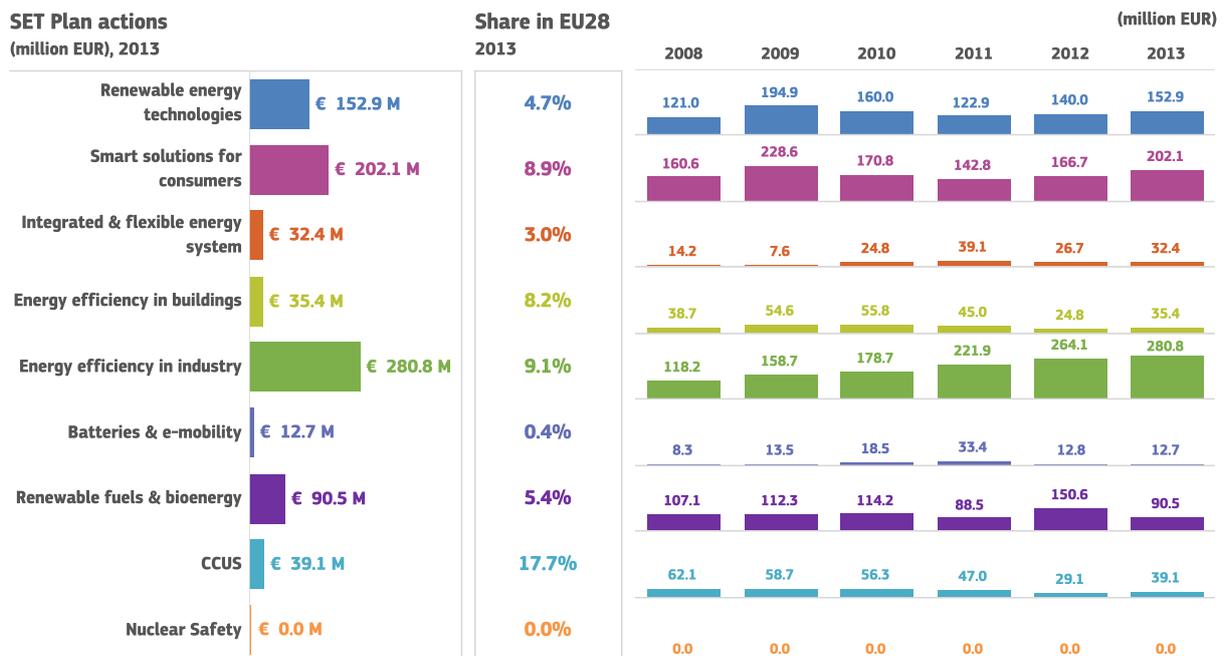
R&I Private investment **846**

R&I Public investment **185**

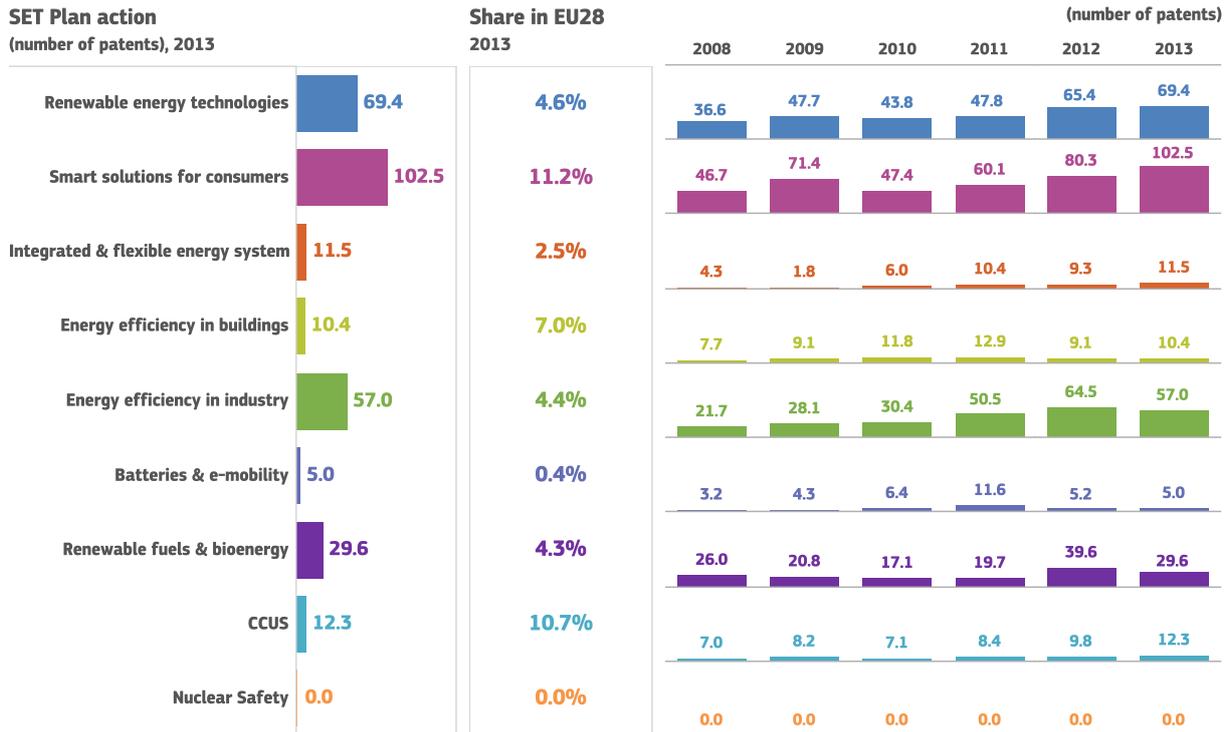
Public R&I investment



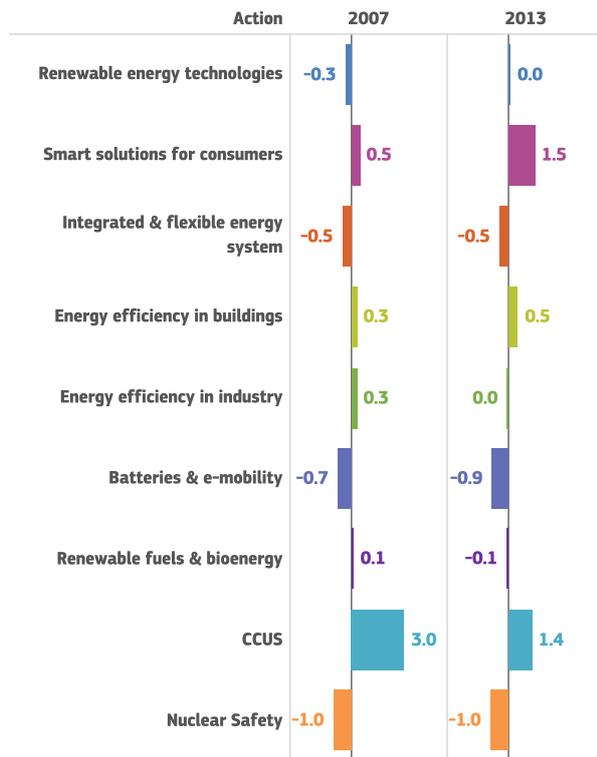
Private R&I investment



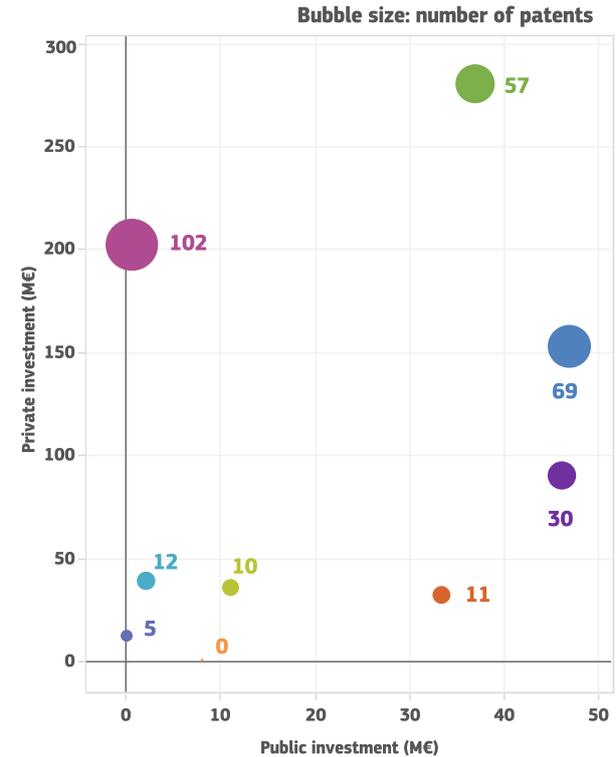
Trends in Patents



Specialisation Index. EU benchmark



R&I summary (2013)



- Renewable energy technologies
- Energy efficiency in buildings
- Renewable fuels & bioenergy
- Smart solutions for consumers
- Energy efficiency in industry
- CCUS
- Integrated & flexible energy system
- Batteries & e-mobility
- Nuclear Safety

Poland

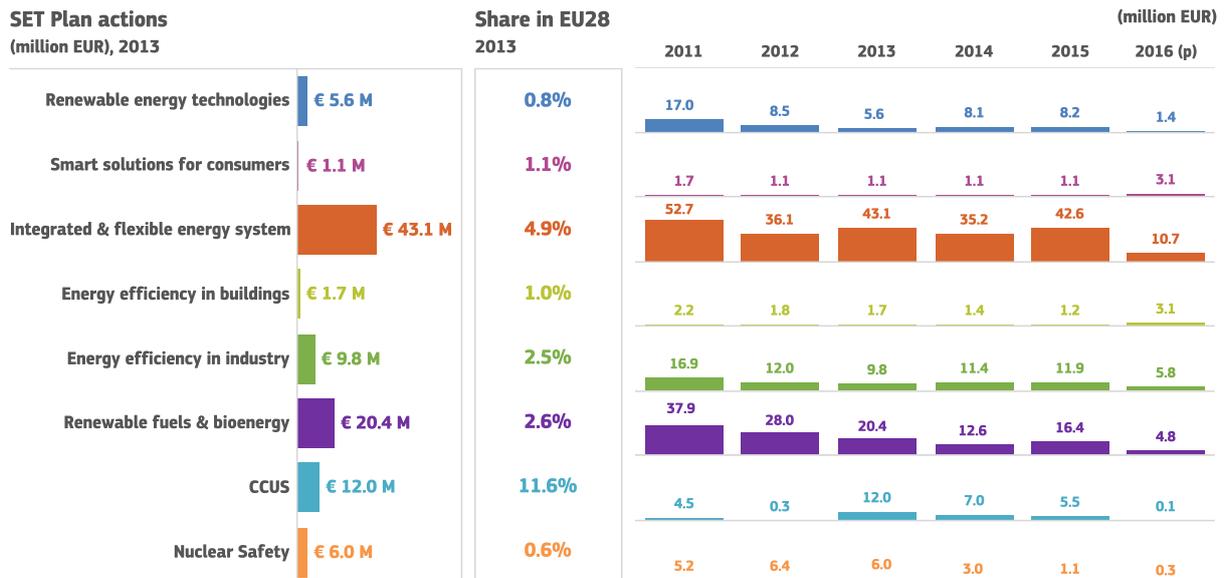


Totals (million EUR), 2013 (most recent year for which data for all indicators are available)

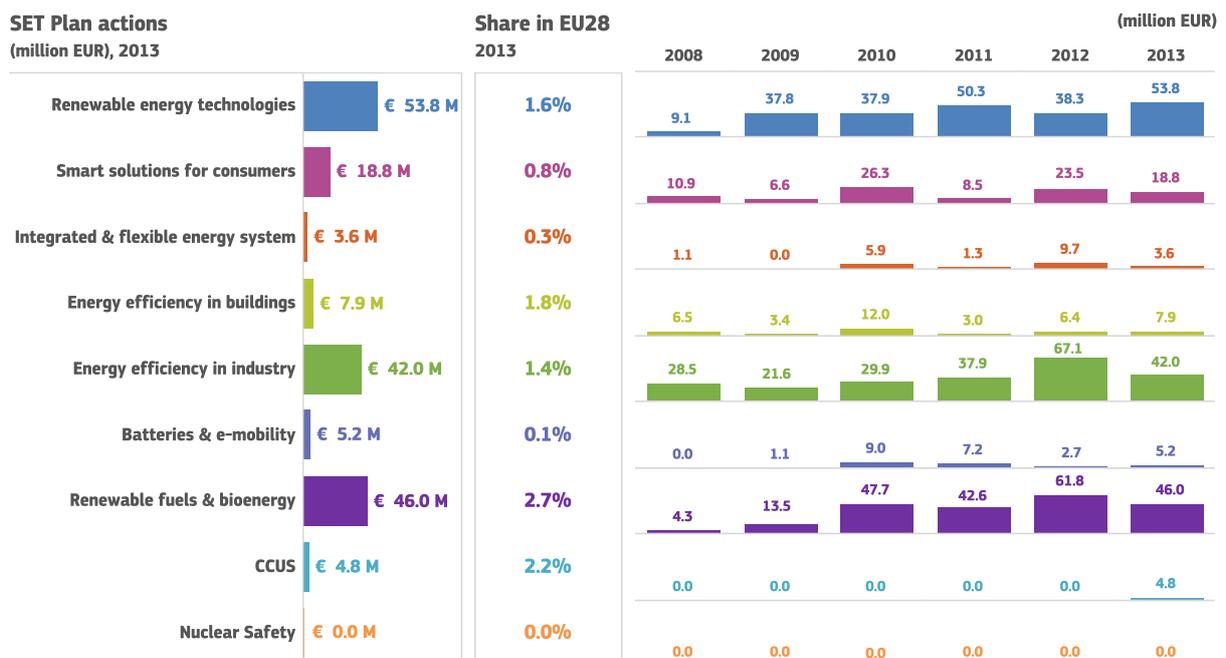
R&I Private investment | 182

R&I Public investment | 100

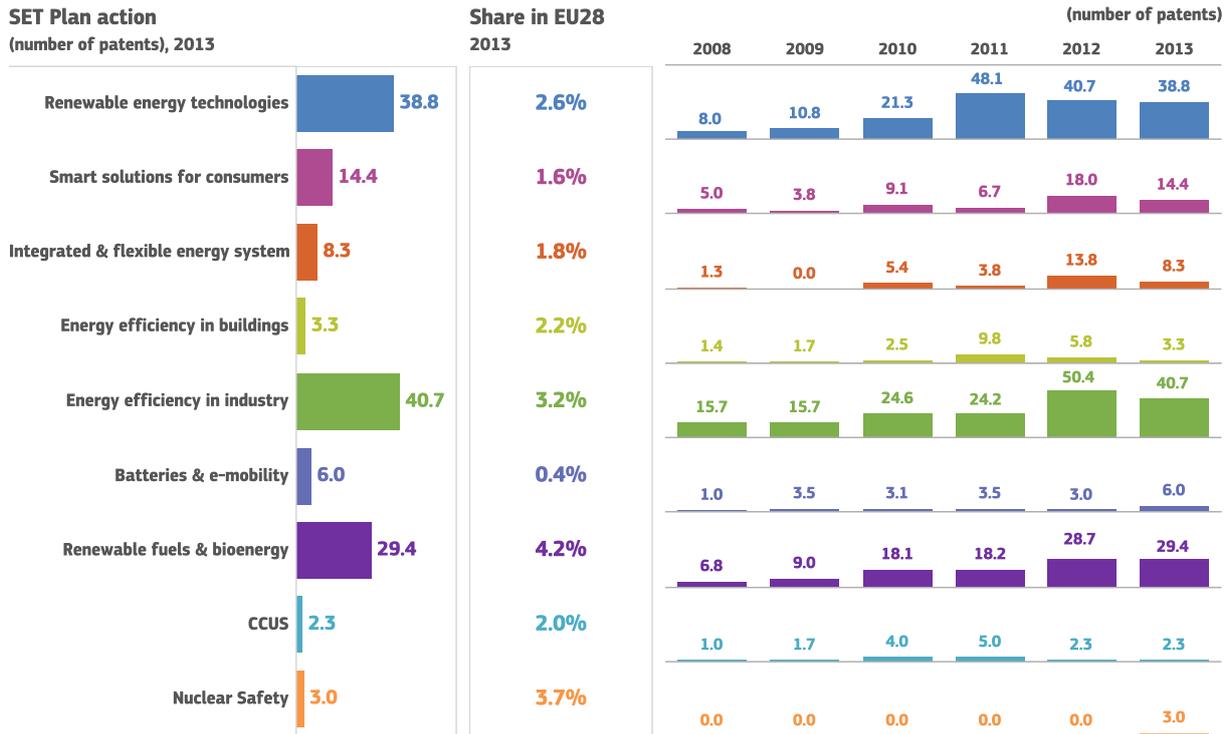
Public R&I investment



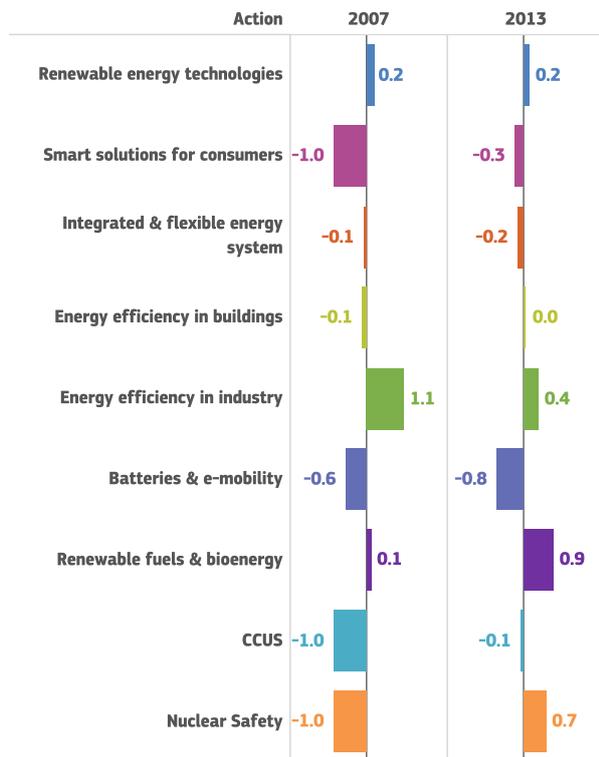
Private R&I investment



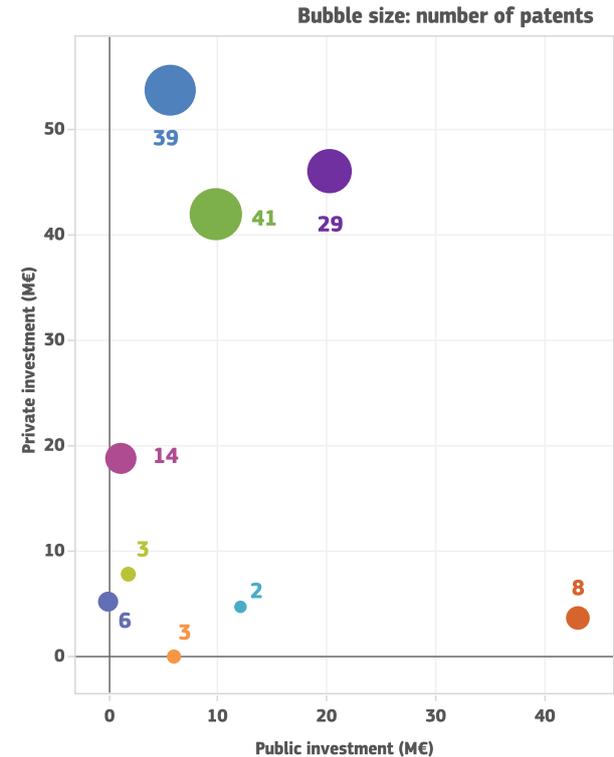
Trends in Patents



Specialisation Index. EU benchmark



R&I summary (2013)



- Renewable energy technologies
- Smart solutions for consumers
- Integrated & flexible energy system
- Energy efficiency in buildings
- Energy efficiency in industry
- Batteries & e-mobility
- Renewable fuels & bioenergy
- CCUS
- Nuclear Safety

Note

The public R&I investment data for 2016 are provisional (p) and amount to EUR 29 million in total; the respective figure for 2015 was EUR 88 million, 10% higher than 2014.

Portugal

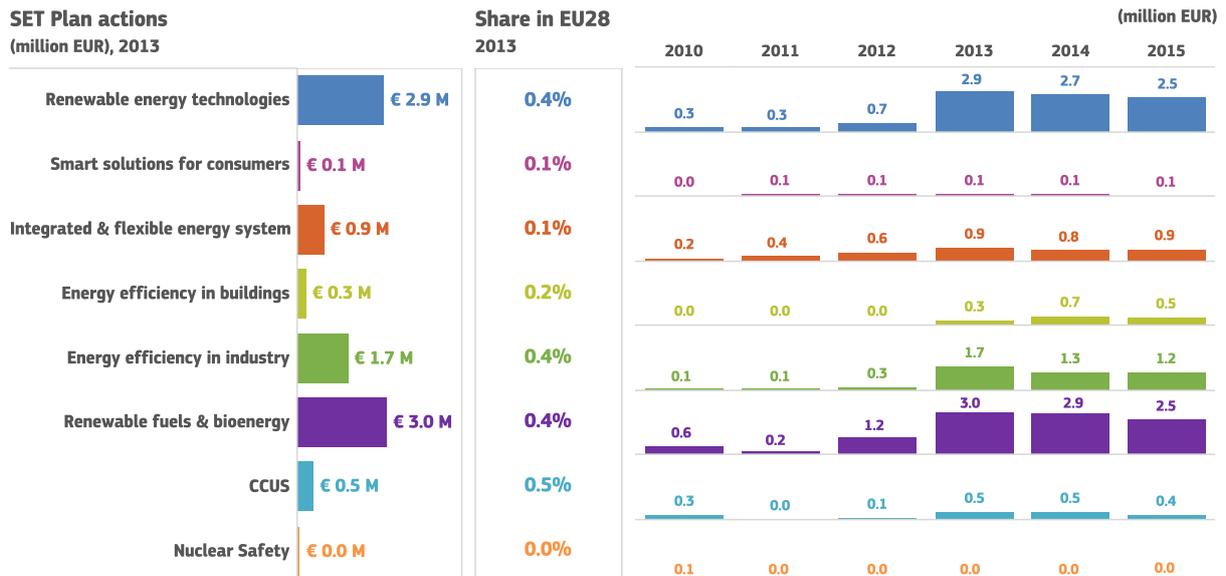


Totals (million EUR), 2013 (most recent year for which data for all indicators are available)

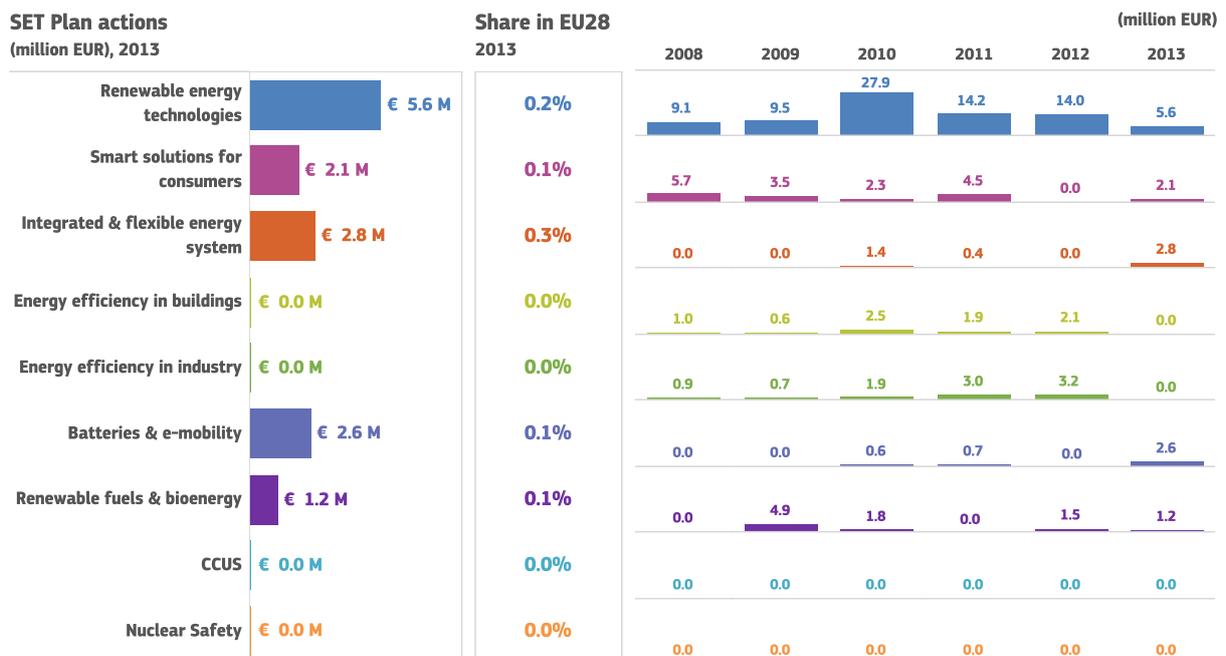
R&I Private investment | 14

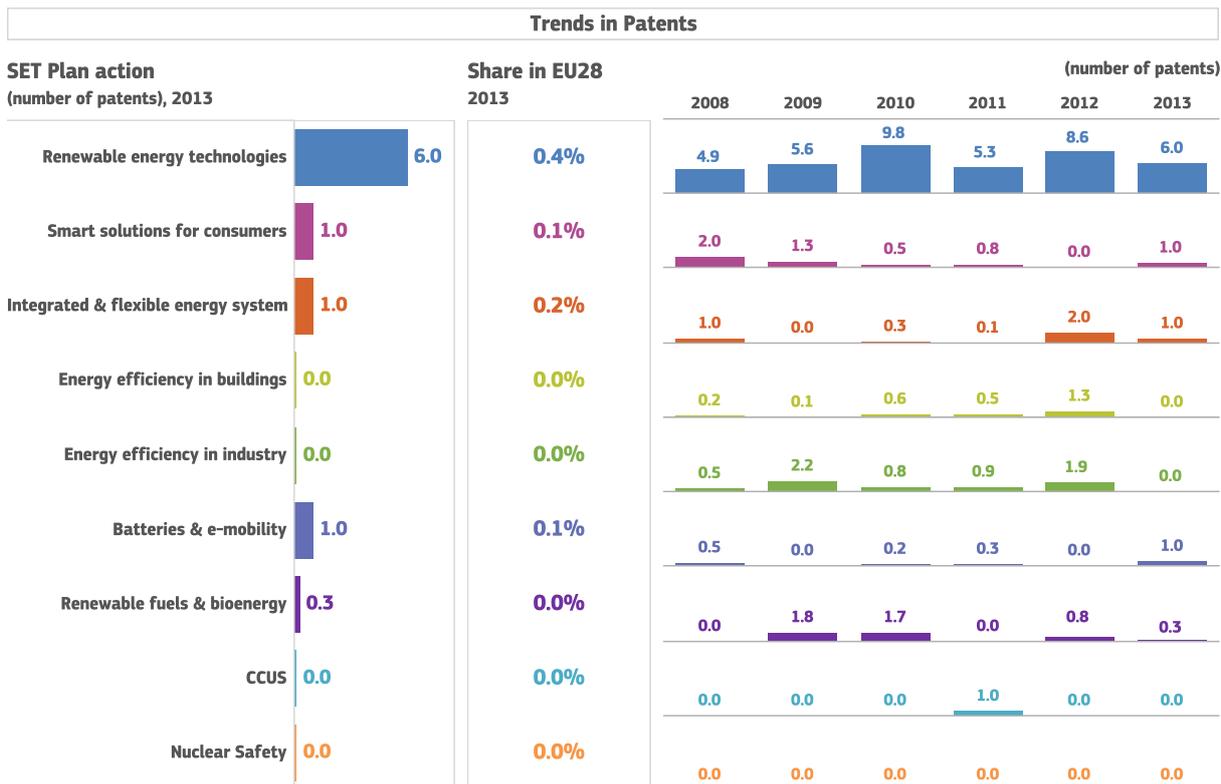
R&I Public investment | 10

Public R&I investment

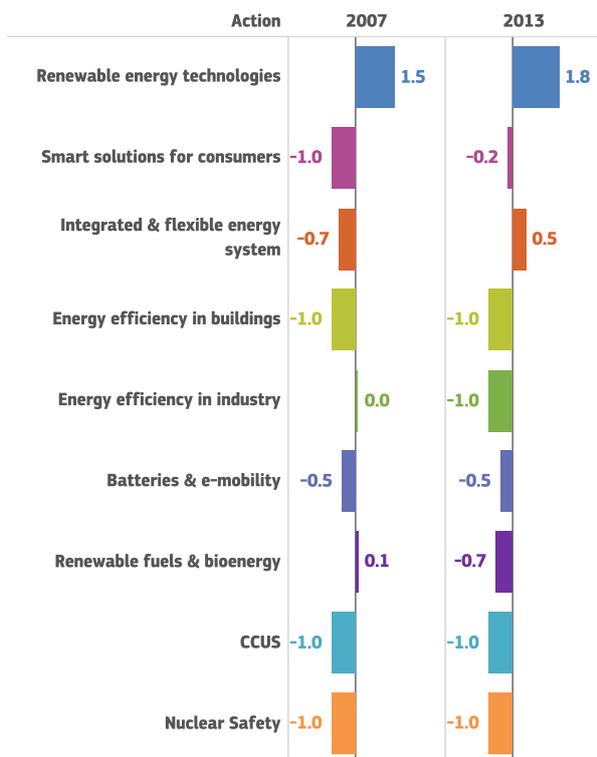


Private R&I investment

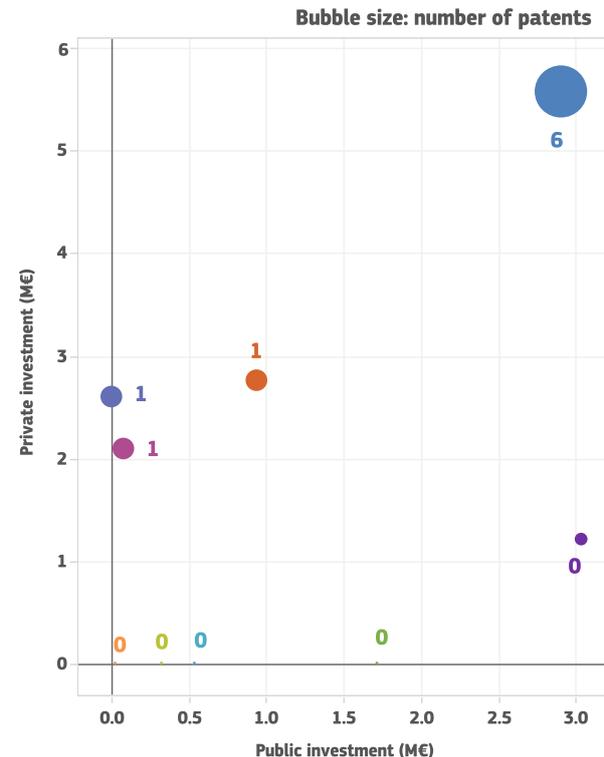




Specialisation Index. EU benchmark



R&I summary (2013)



Note

From 2013 onwards, the reported figures for public R&I investment are three times higher than previous years, in part due to a change in methodology by the Member State.

Romania



Totals (million EUR), 2013 (most recent year for which data for all indicators are available)

R&I Private investment | 26

R&I Public investment | 7

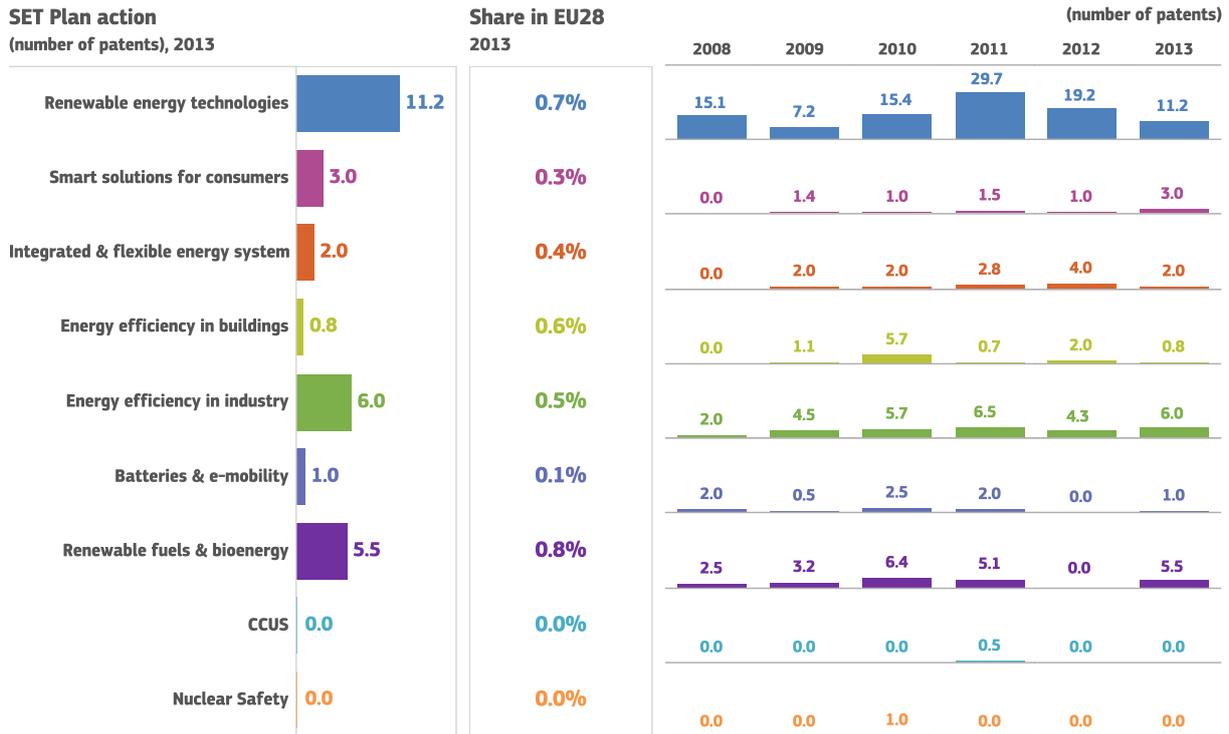
Public R&I investment *

SET Plan actions (million EUR), 2013	Share in EU28 2013	Share in EU28 (million EUR)					
		2009	2010	2011	2012	2013	2014
Renewable energy technologies	0.3%	n.a.	0.9	0.9	2.1	2.4	3.1
Smart solutions for consumers	0.3%	n.a.	0.0	0.0	0.2	0.3	0.7
Integrated & flexible energy system	0.1%	n.a.	0.0	0.0	1.0	1.2	1.6
Energy efficiency in buildings	0.2%	n.a.	0.0	0.0	0.2	0.3	0.7
Energy efficiency in industry	0.0%	n.a.	0.0	0.0	0.0	0.0	0.0
Renewable fuels & bioenergy	0.2%	n.a.	0.8	0.8	1.3	1.5	2.5
CCUS	0.2%	n.a.	0.0	0.0	0.2	0.2	0.2
Nuclear Safety	0.1%	n.a.	0.2	0.2	1.5	1.5	1.6

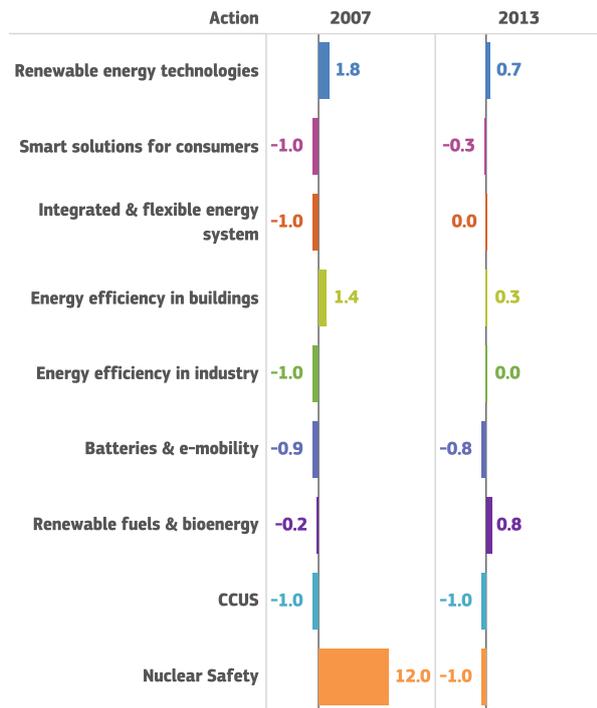
Private R&I investment

SET Plan actions (million EUR), 2013	Share in EU28 2013	Share in EU28 (million EUR)					
		2008	2009	2010	2011	2012	2013
Renewable energy technologies	0.3%	4.0	0.0	6.5	12.6	12.3	11.2
Smart solutions for consumers	0.1%	0.0	2.9	0.0	0.0	2.6	2.1
Integrated & flexible energy system	0.0%	0.0	2.6	3.7	0.2	0.0	0.0
Energy efficiency in buildings	0.0%	0.0	0.0	8.9	0.0	0.8	0.0
Energy efficiency in industry	0.2%	0.0	5.3	5.7	11.9	0.6	7.2
Batteries & e-mobility	0.0%	6.3	1.7	0.0	5.6	0.0	0.0
Renewable fuels & bioenergy	0.3%	7.6	1.2	4.8	3.3	0.0	5.5
CCUS	0.0%	0.0	0.0	0.0	0.0	0.0	0.0
Nuclear Safety	0.0%	0.0	0.0	0.0	0.0	0.0	0.0

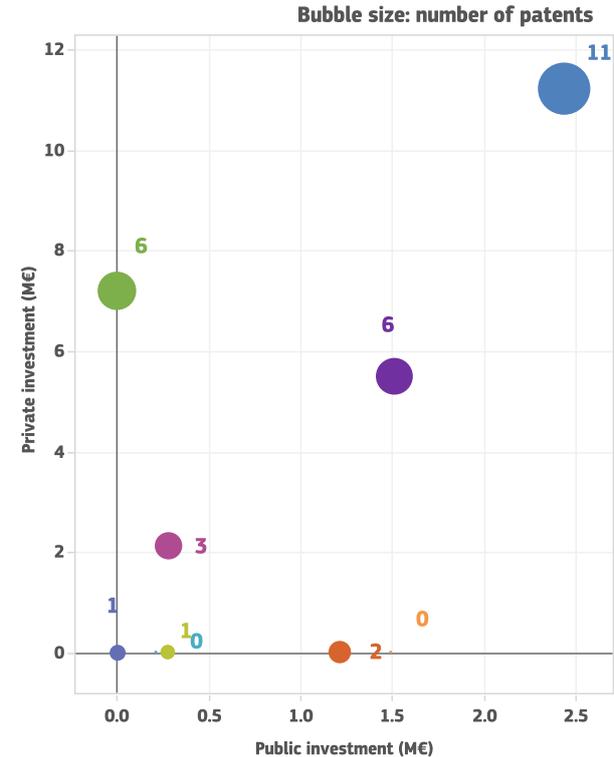
Trends in Patents



Specialisation Index. EU benchmark



R&I summary (2013)



Note

* Romania is not a member of the IEA; data as collected by SETIS based on Projects funded by the Romanian Executive Agency for Higher education, Research, Development and Innovation Funding between 2011 and 2013 (UEFISCDI)

Slovakia

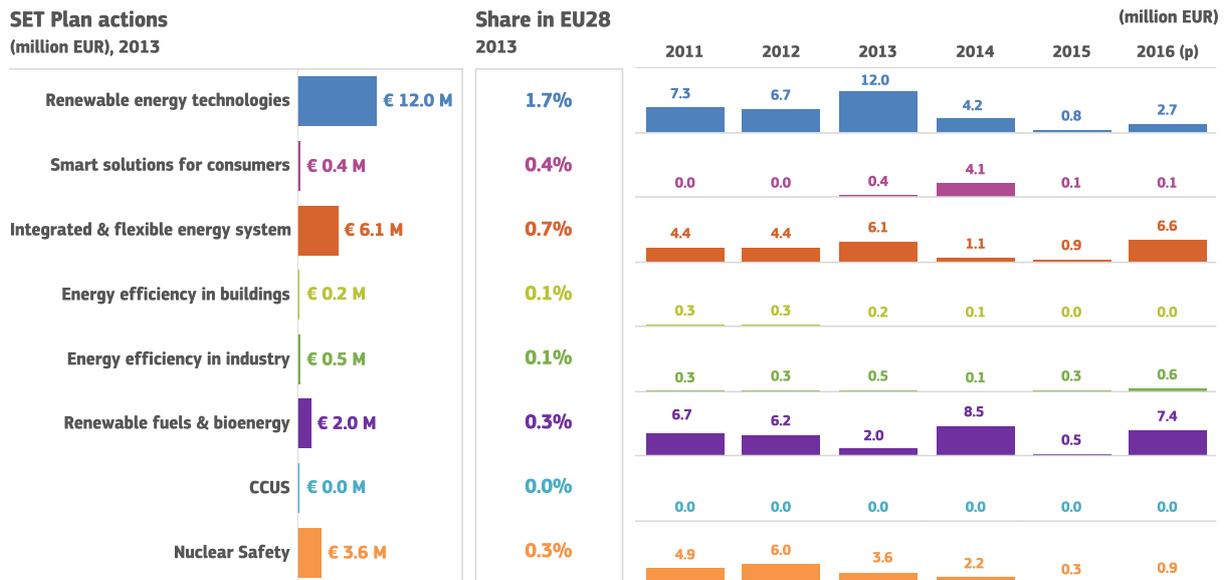


Totals (million EUR), 2013 (most recent year for which data for all indicators are available)

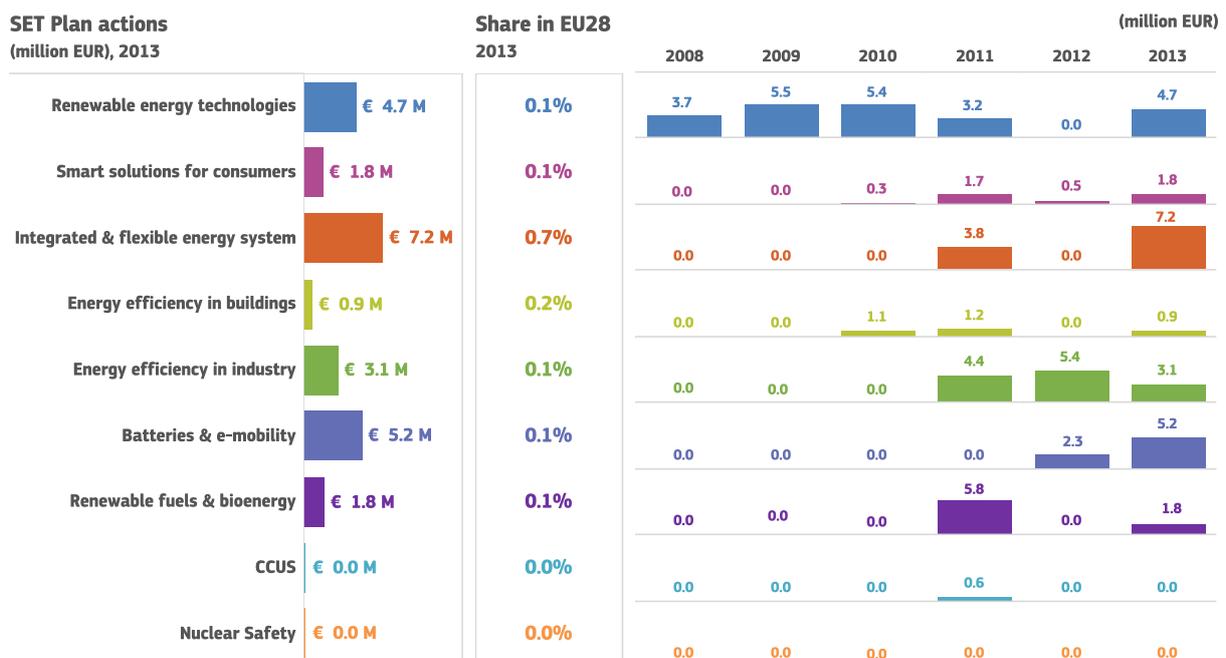
R&I Private investment | 25

R&I Public investment | 25

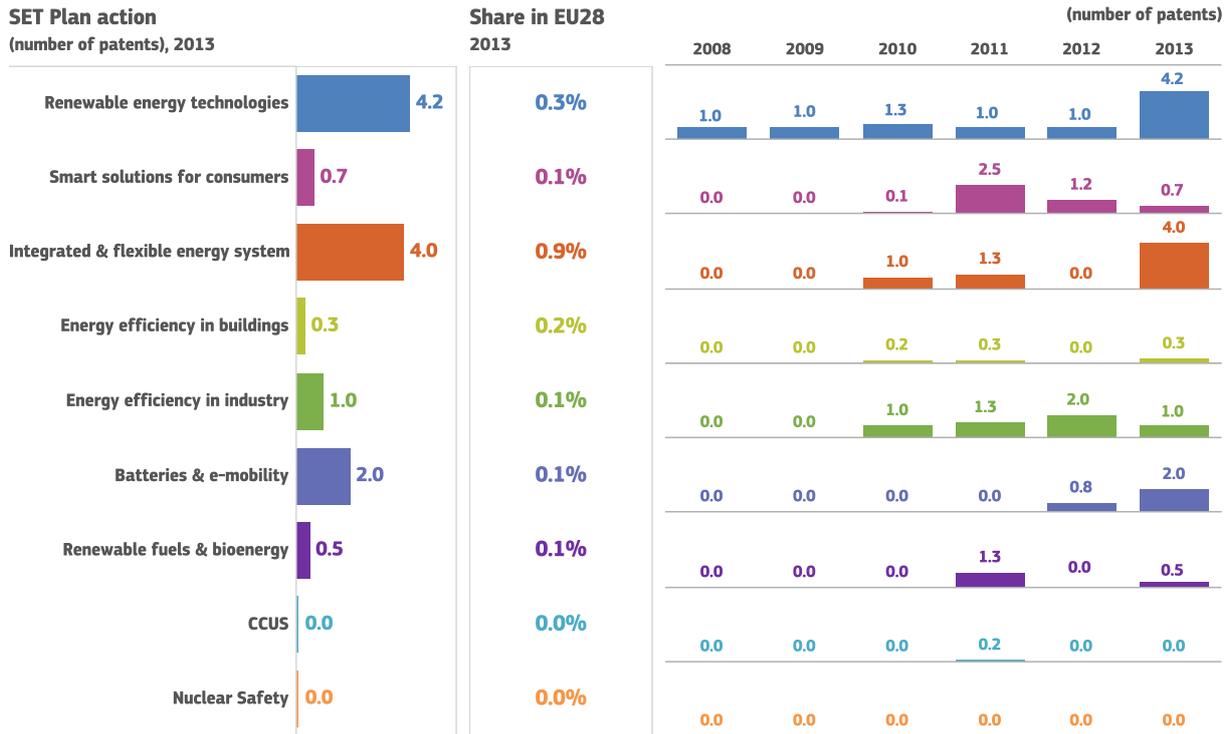
Public R&I investment



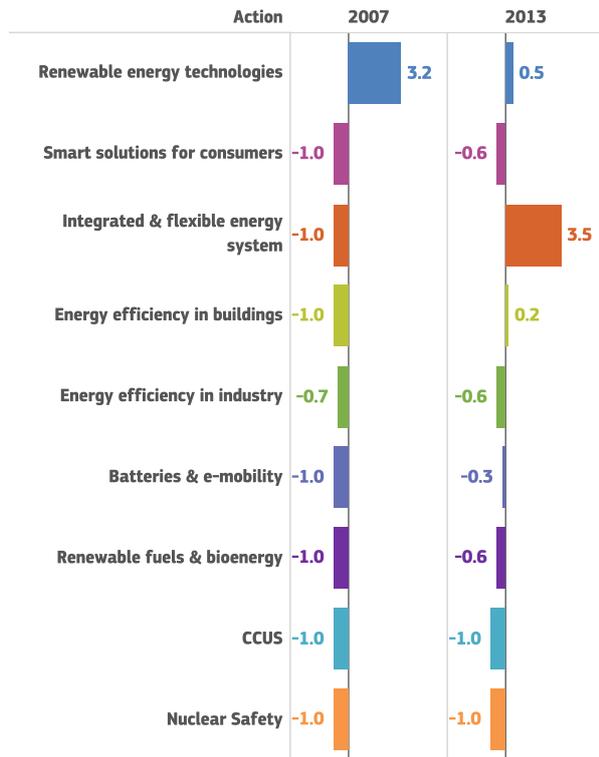
Private R&I investment



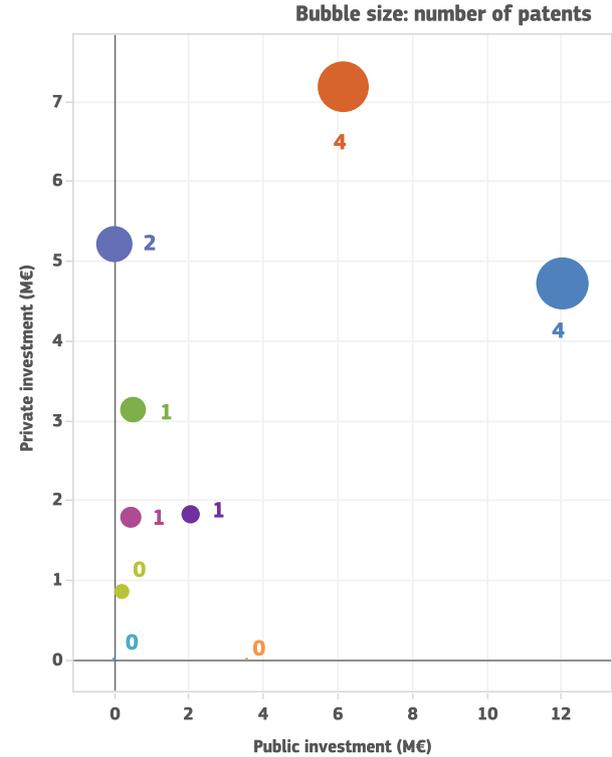
Trends in Patents



Specialisation Index. EU benchmark



R&I summary (2013)



Note

The public R&I investment data for 2016 are provisional (p) and amount to EUR 18 million, six times the amount reported in 2015 but in line with reports for previous years e.g. EUR 20 million in 2014 and EUR 25 million in 2013.

Slovenia



Total (million EUR), 2013 (most recent year for which data for all indicators are available) *

R&I Private investment | 49.2

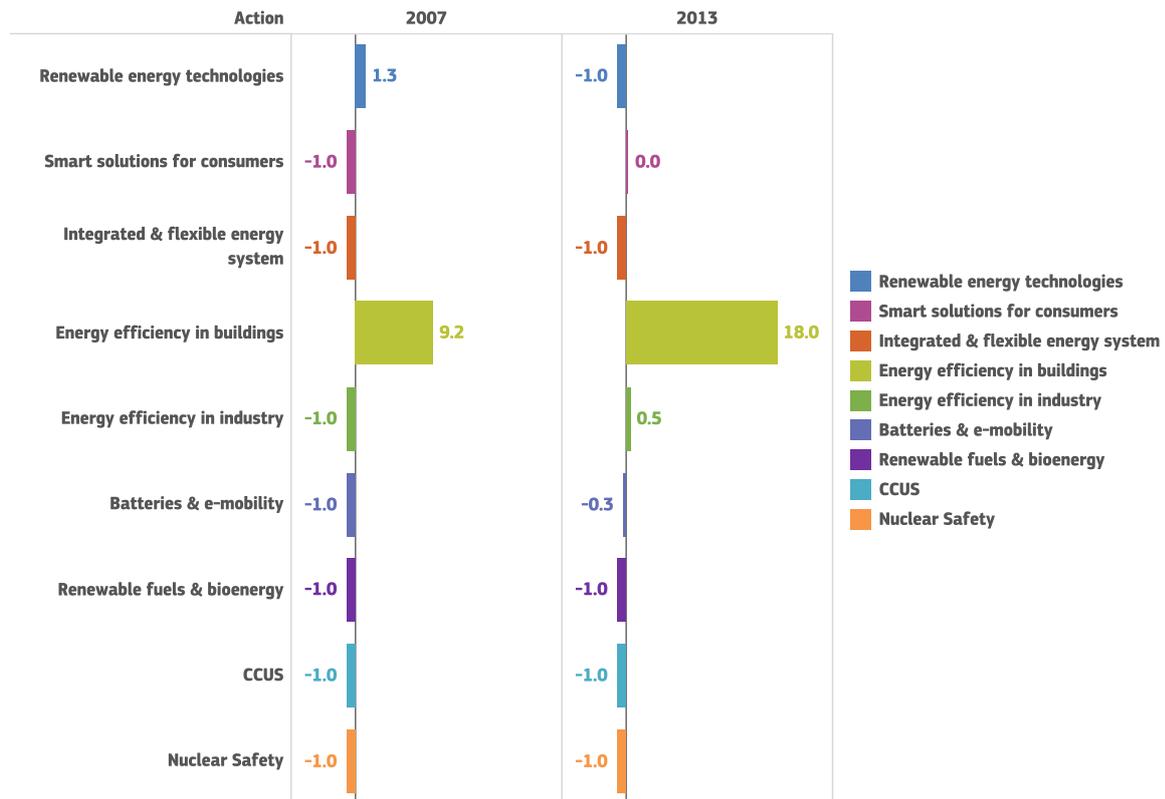
Private R&I investment

SET Plan actions (million EUR), 2013		Share in EU28 2013	2008 2009 2010 2011 2012 2013					
			(million EUR)					
Renewable energy technologies	€ 0.0 M	0.0%	3.9	8.6	10.1	8.0	4.7	0.0
Smart solutions for consumers	€ 0.0 M	0.0%	0.0	0.0	9.6	0.0	1.3	0.0
Integrated & flexible energy system	€ 0.0 M	0.0%	0.0	0.0	2.0	0.0	0.0	0.0
Energy efficiency in buildings	€ 10.2 M	2.4%	0.0	7.0	3.6	0.0	1.4	10.2
Energy efficiency in industry	€ 36.4 M	1.2%	0.0	0.0	0.0	1.9	1.4	36.4
Batteries & e-mobility	€ 2.6 M	0.1%	0.0	0.0	0.0	0.0	2.7	2.6
Renewable fuels & bioenergy	€ 0.0 M	0.0%	0.3	0.0	0.0	3.9	0.0	0.0
CCUS	€ 0.0 M	0.0%	0.0	0.0	0.0	0.0	0.0	0.0
Nuclear Safety	€ 0.0 M	0.0%	0.0	0.0	0.0	0.0	0.0	0.0

Trends in patents

SET Plan action (number of patents), 2013		Share in EU28 2013	2008 2009 2010 2011 2012 2013					
			(number of patents)					
Renewable energy technologies	0.0	0.0%	1.0	2.0	2.3	2.3	3.2	0.0
Smart solutions for consumers	1.0	0.1%	0.0	0.0	2.8	0.0	1.0	1.0
Integrated & flexible energy system	0.0	0.0%	0.0	0.0	0.5	0.0	0.0	0.0
Energy efficiency in buildings	3.0	2.0%	0.0	1.0	0.8	0.0	0.5	3.0
Energy efficiency in industry	2.0	0.2%	0.0	0.2	0.0	0.7	0.5	2.0
Batteries & e-mobility	1.0	0.1%	0.0	0.0	0.0	0.0	1.0	1.0
Renewable fuels & bioenergy	0.0	0.0%	0.1	0.0	0.0	1.4	0.0	0.0
CCUS	0.0	0.0%	0.0	0.0	0.0	0.0	0.0	0.0
Nuclear Safety	0.0	0.0%	0.0	0.0	0.0	0.0	0.0	0.0

Specialisation Index. EU benchmark



Note

* Slovenia is not a member of the IEA; data on public R&I expenditure are not available.

Spain



Totals (million EUR), 2013 (most recent year for which data for all indicators are available)

R&I Private investment **456**

R&I Public investment **72**

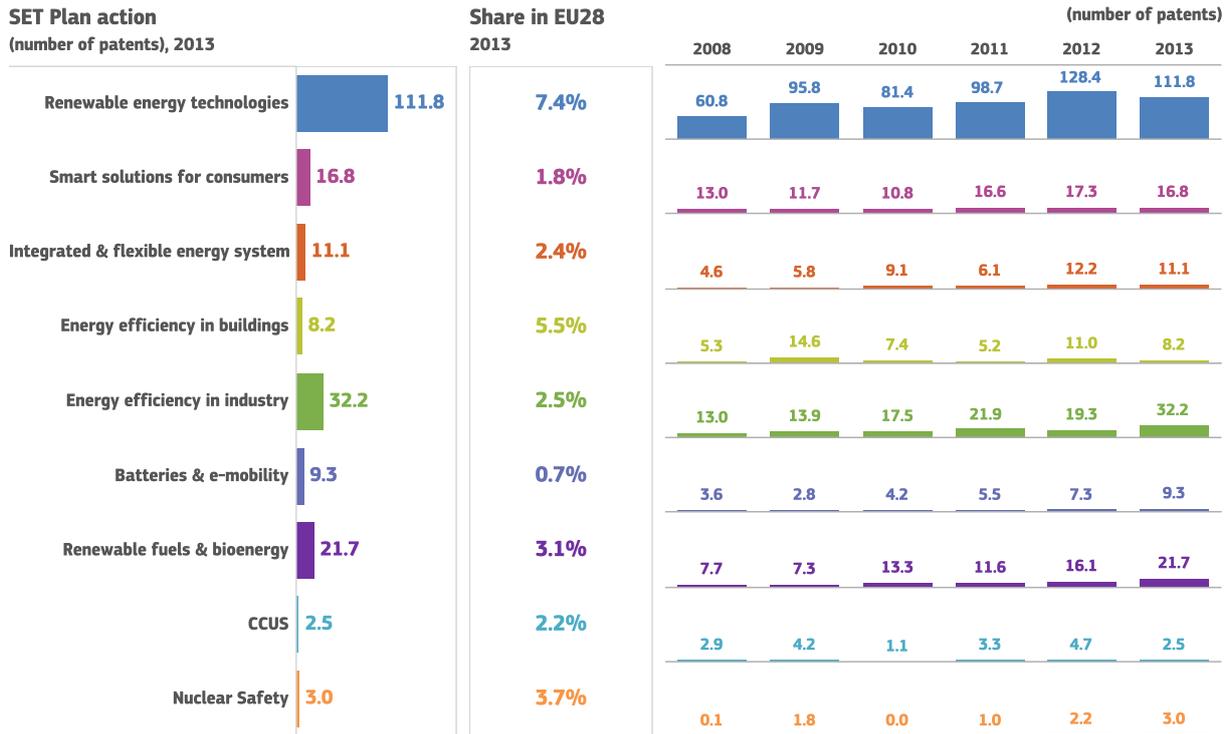
Public R&I investment

SET Plan actions (million EUR), 2013	Share in EU28 2013	Share in EU28 2013 (million EUR)					
		2010	2011	2012	2013	2014	2015
Renewable energy technologies € 29.3 M	4.0%	57.9	114.6	59.7	29.3	46.0	43.2
Smart solutions for consumers € 0.4 M	0.4%	0.0	6.9	0.1	0.4	0.0	0.0
Integrated & flexible energy system € 4.2 M	0.5%	25.7	74.3	18.6	4.2	14.4	27.5
Energy efficiency in buildings € 0.8 M	0.5%	12.8	21.8	15.1	0.8	8.6	4.9
Energy efficiency in industry € 5.7 M	1.5%	12.8	16.7	16.7	5.7	8.6	4.9
Renewable fuels & bioenergy € 10.0 M	1.2%	36.5	39.5	24.6	10.0	14.1	15.9
CCUS € 0.0 M	0.0%	0.0	0.0	2.2	0.0	2.0	6.6
Nuclear Safety € 22.0 M	2.0%	0.0	1.0	25.3	22.0	1.9	2.6

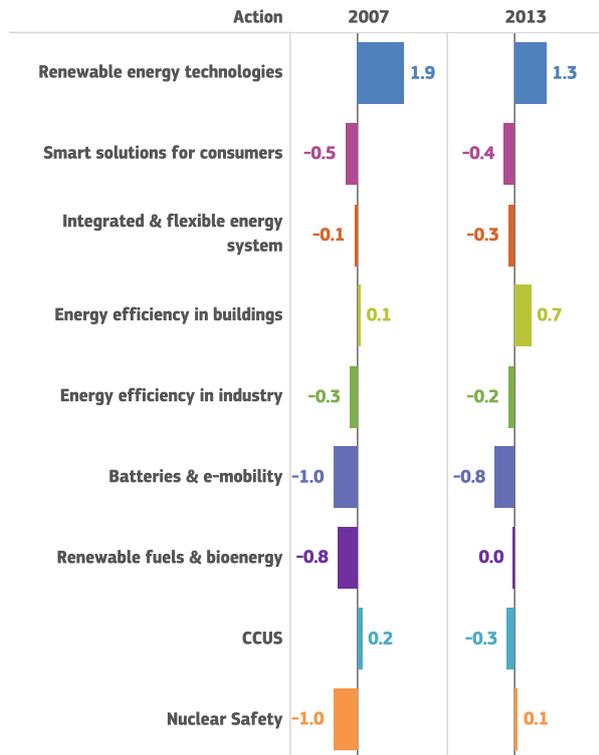
Private R&I investment

SET Plan actions (million EUR), 2013	Share in EU28 2013	Share in EU28 2013 (million EUR)					
		2008	2009	2010	2011	2012	2013
Renewable energy technologies € 227.5 M	6.9%	169.4	328.1	260.3	265.1	249.5	227.5
Smart solutions for consumers € 35.3 M	1.6%	41.2	31.0	34.4	36.2	43.2	35.3
Integrated & flexible energy system € 23.4 M	2.2%	10.1	13.0	45.9	17.1	14.2	23.4
Energy efficiency in buildings € 22.4 M	5.2%	18.2	78.1	31.4	14.3	20.6	22.4
Energy efficiency in industry € 67.2 M	2.2%	32.7	36.1	39.8	37.8	46.5	67.2
Batteries & e-mobility € 18.5 M	0.5%	6.7	8.3	12.6	11.3	16.6	18.5
Renewable fuels & bioenergy € 50.9 M	3.0%	41.2	6.0	104.8	21.4	30.2	50.9
CCUS € 4.0 M	1.8%	7.4	6.7	2.2	9.6	13.2	4.0
Nuclear Safety € 6.6 M	1.7%	1.3	9.8	0.0	12.8	8.7	6.6

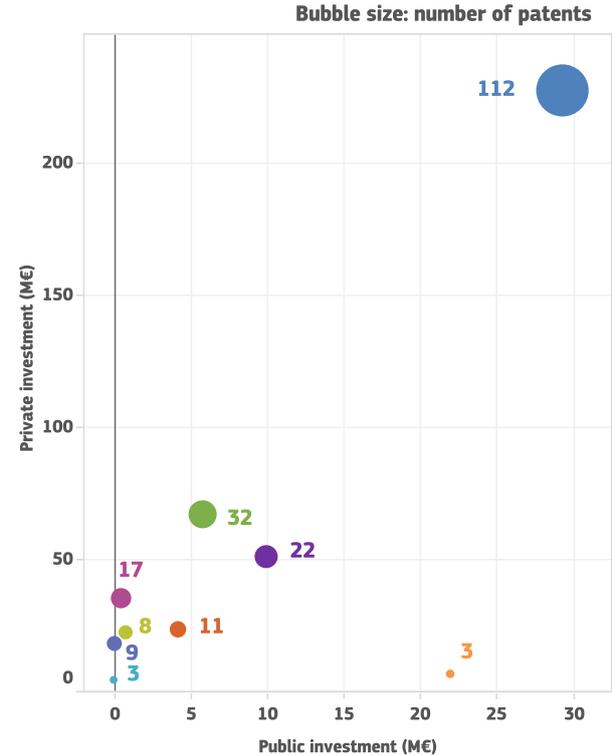
Trends in Patents



Specialisation Index. EU benchmark



R&I summary (2013)



- Renewable energy technologies
- Energy efficiency in buildings
- Renewable fuels & bioenergy
- Smart solutions for consumers
- Energy efficiency in industry
- Batteries & e-mobility
- CCUS
- Integrated & flexible energy system
- Nuclear Safety

Sweden

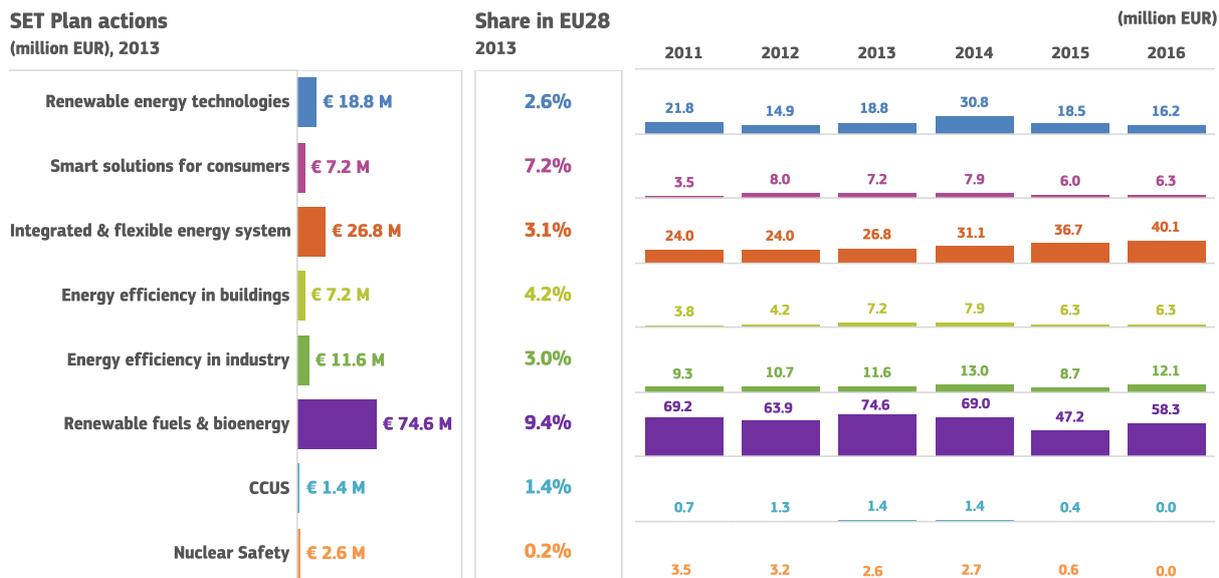


Totals (million EUR), 2013 (most recent year for which data for all indicators are available)

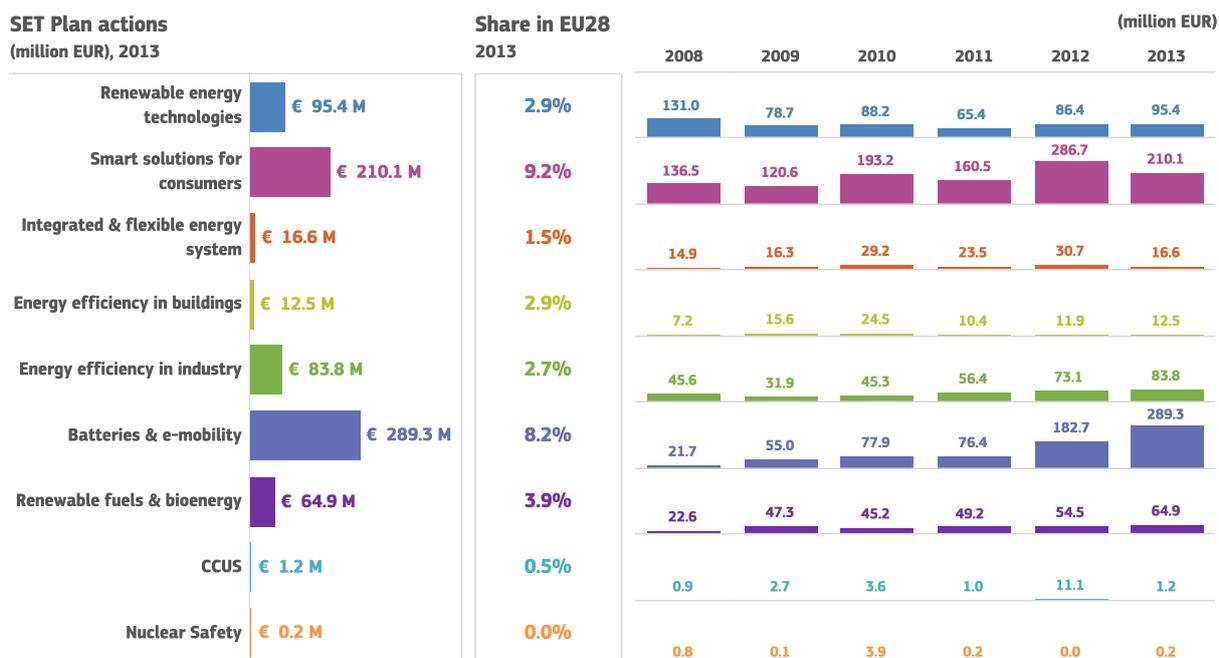
R&I Private investment **774**

R&I Public investment **150**

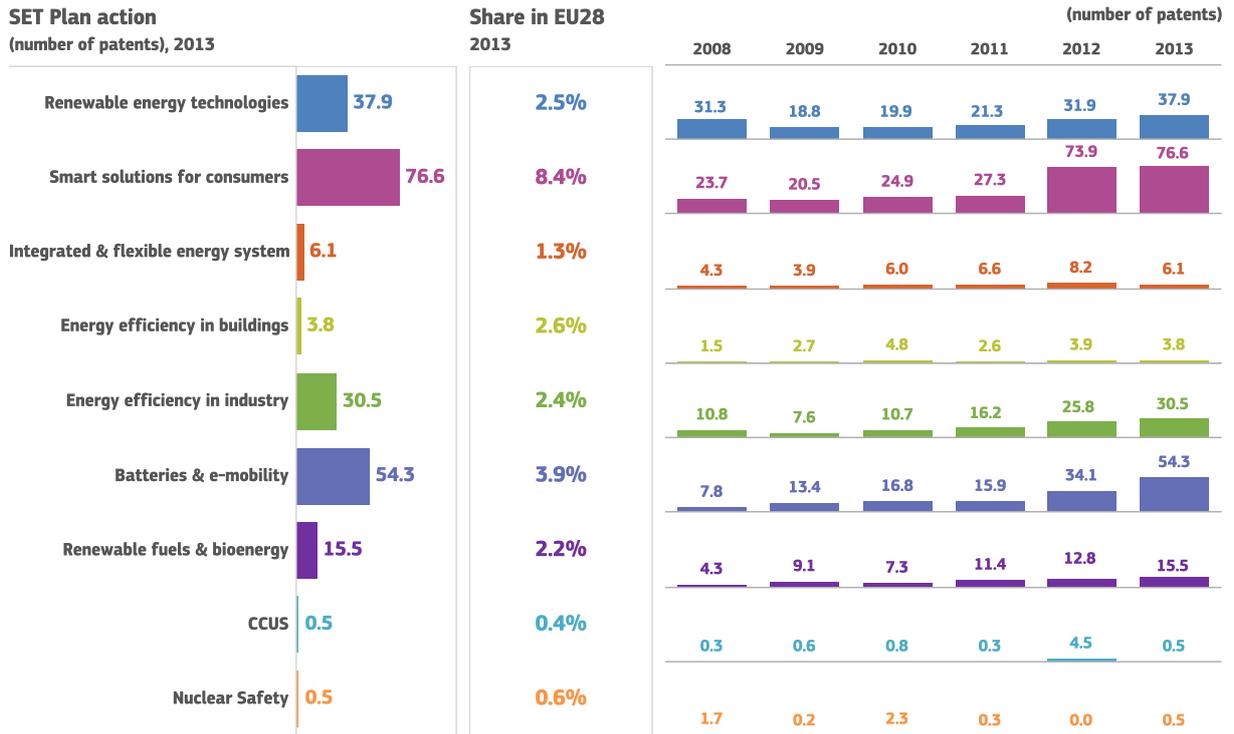
Public R&I investment



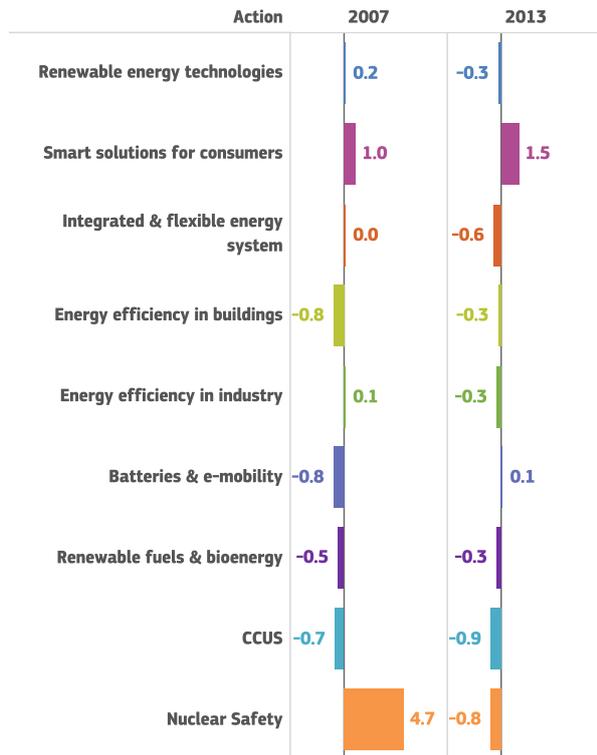
Private R&I investment



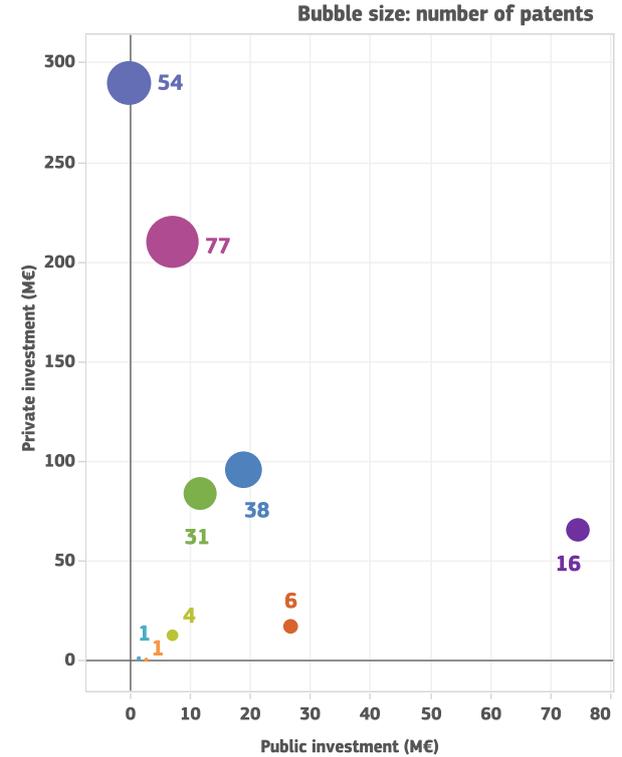
Trends in Patents



Specialisation Index. EU benchmark



R&I summary (2013)



United Kingdom

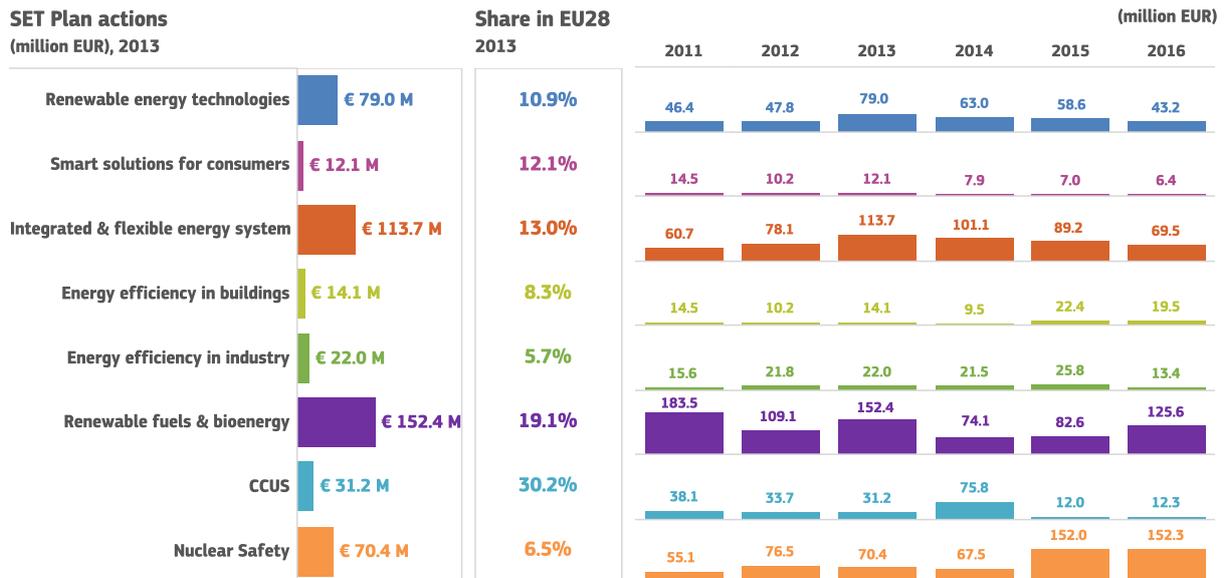


Totals (million EUR), 2013 (most recent year for which data for all indicators are available)

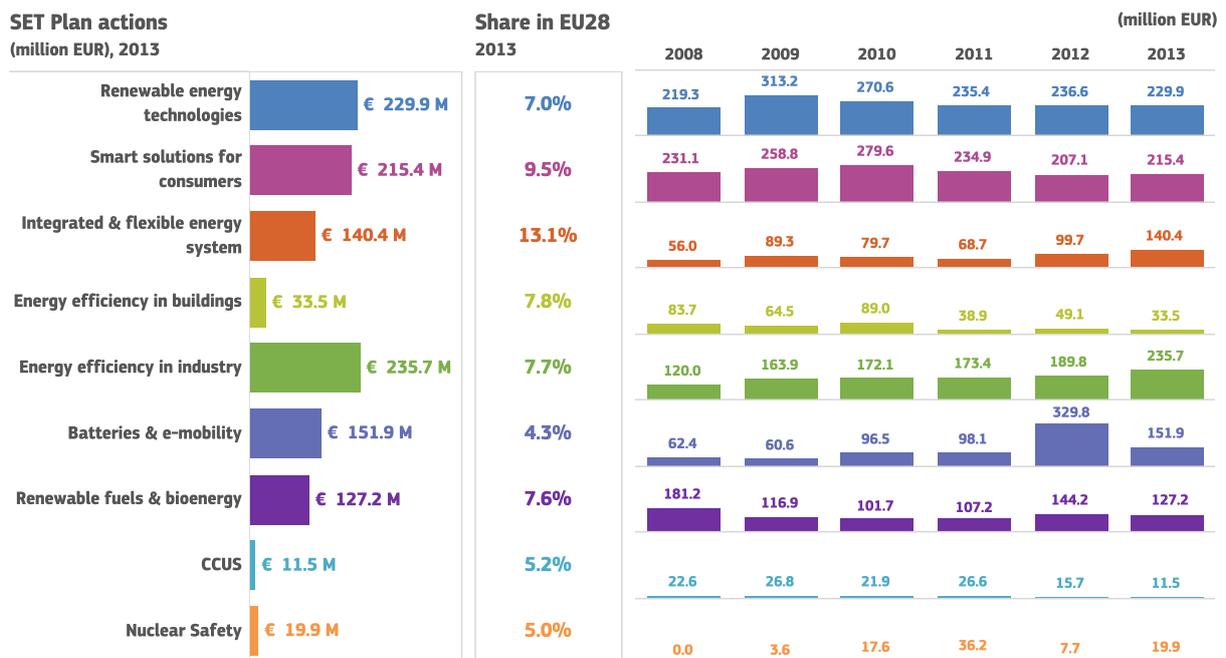
R&I Private investment **1,165**

R&I Public investment **495**

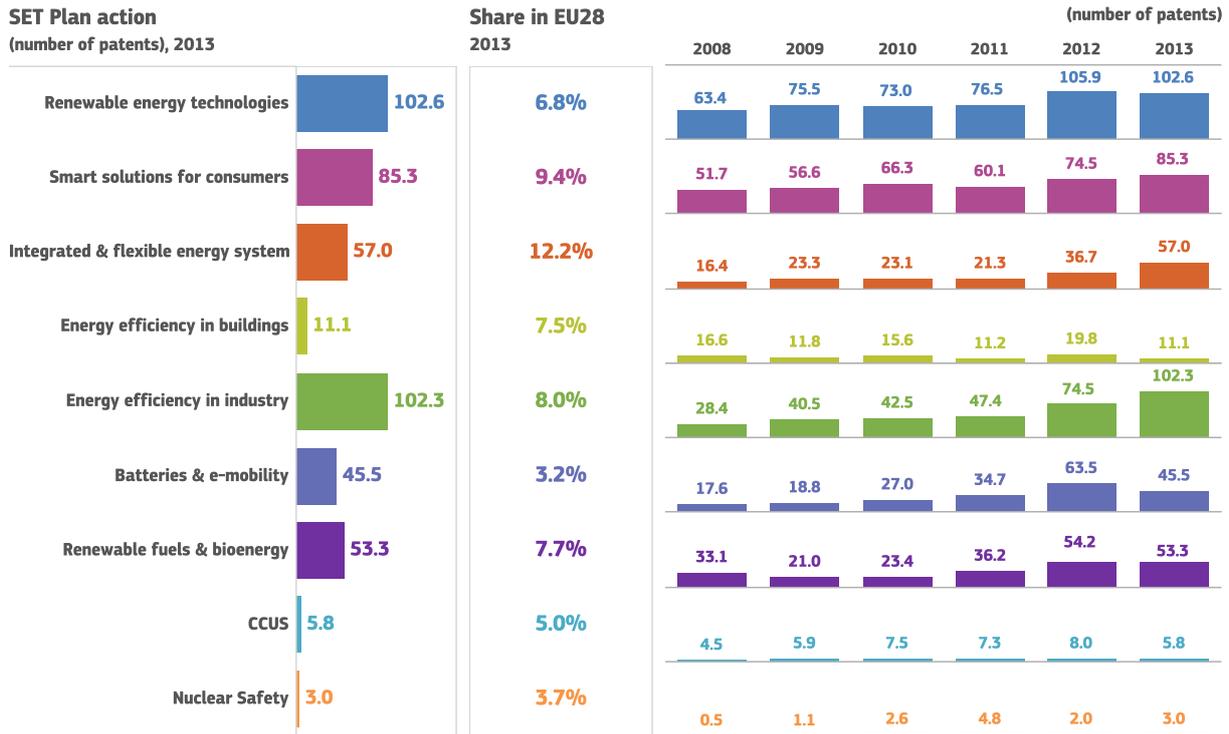
Public R&I investment



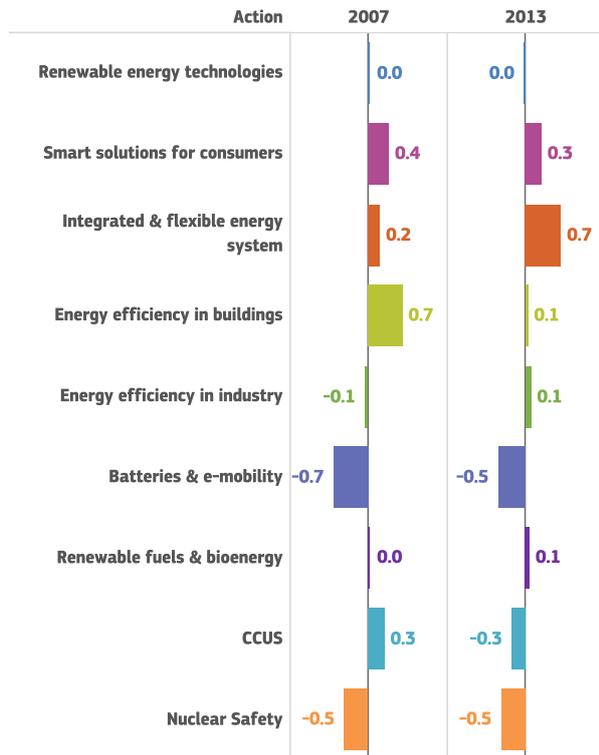
Private R&I investment



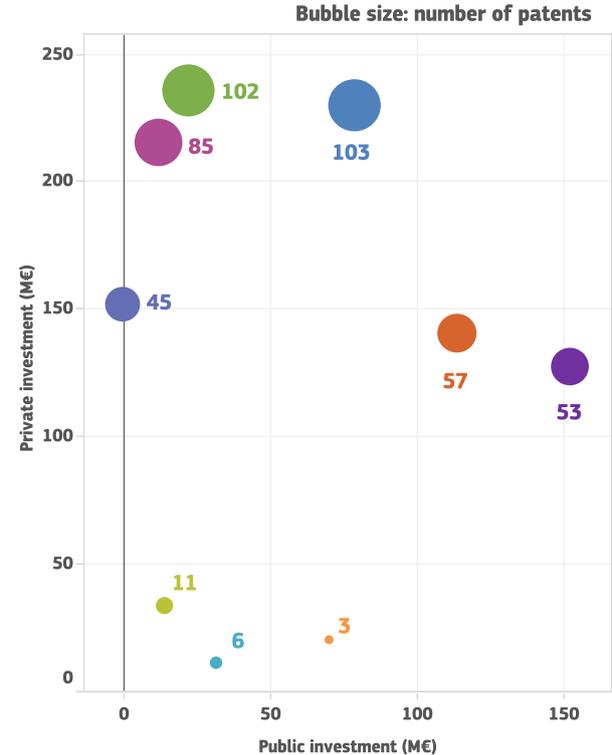
Trends in Patents



Specialisation Index. EU benchmark



R&I summary (2013)



- Renewable energy technologies
- Energy efficiency in buildings
- Renewable fuels & bioenergy
- Smart solutions for consumers
- Energy efficiency in industry
- Batteries & e-mobility
- CCUS
- Integrated & flexible energy system
- Nuclear Safety

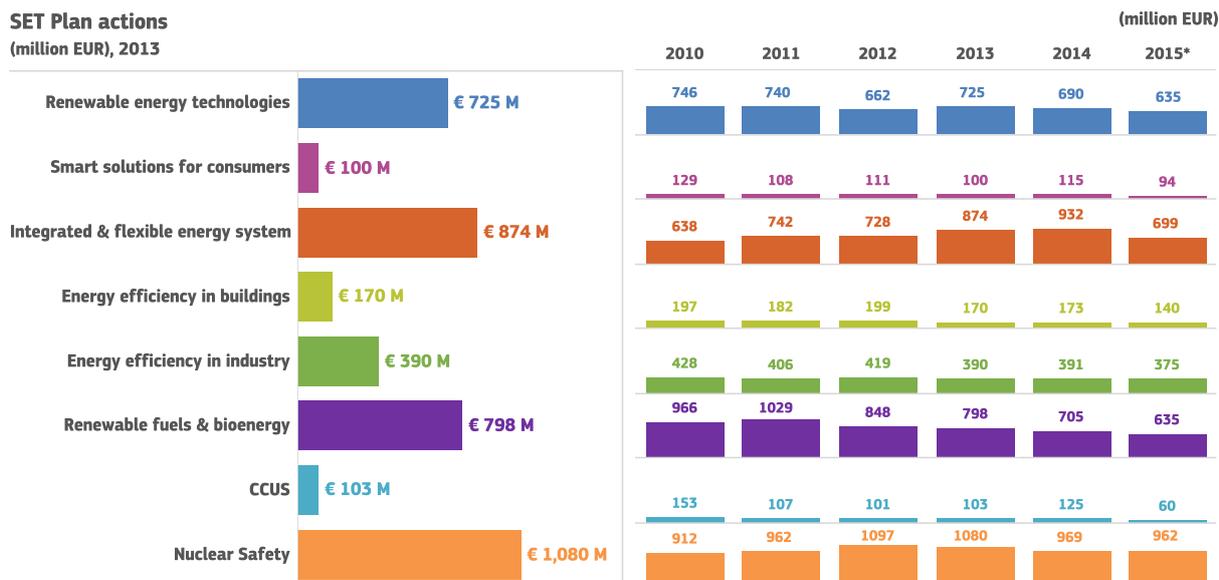
European Union



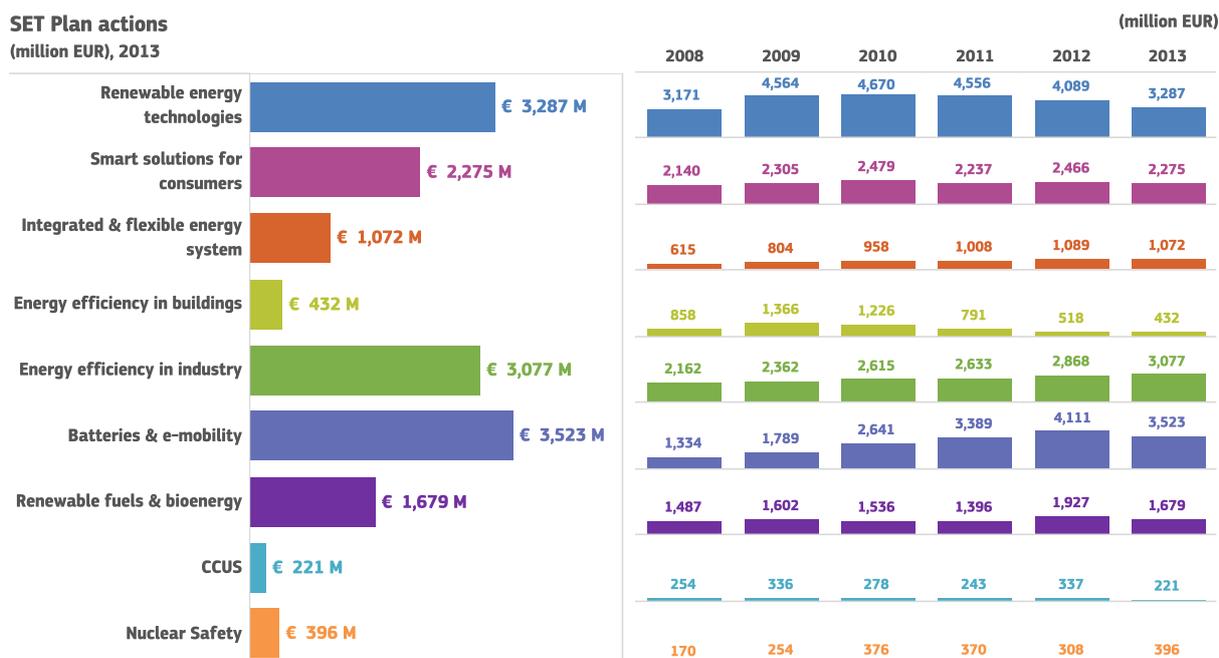
Totals (million EUR), 2013 (most recent year for which data for all indicators are available)



Public R&I investment

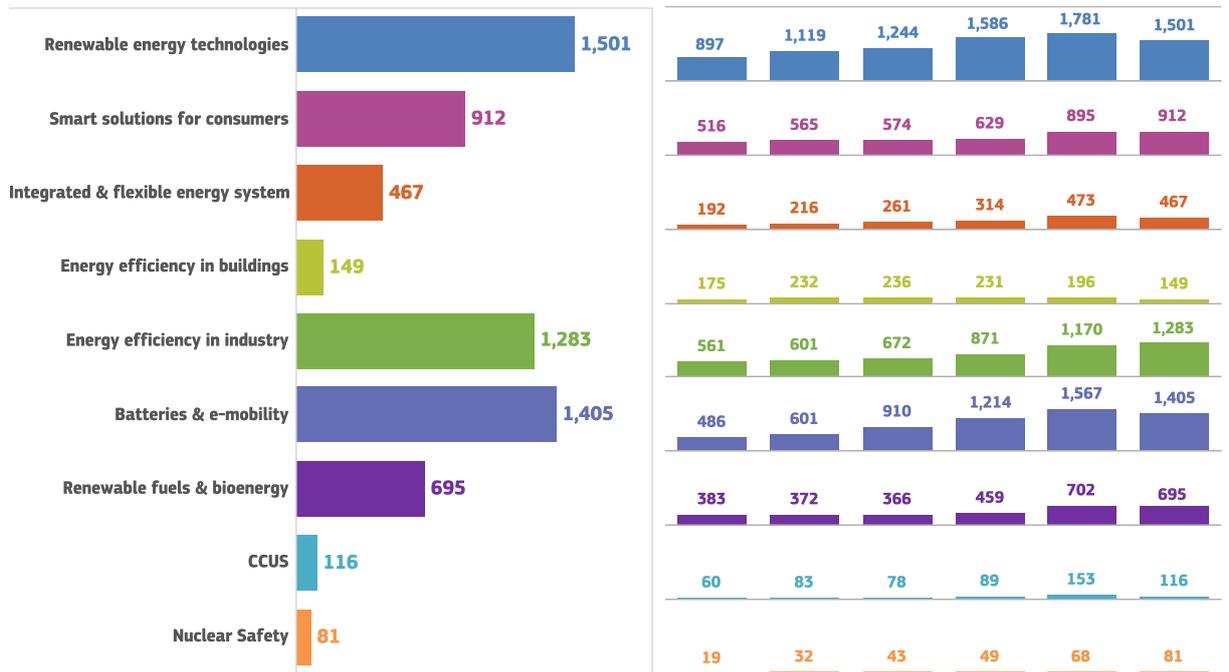


Private R&I investment

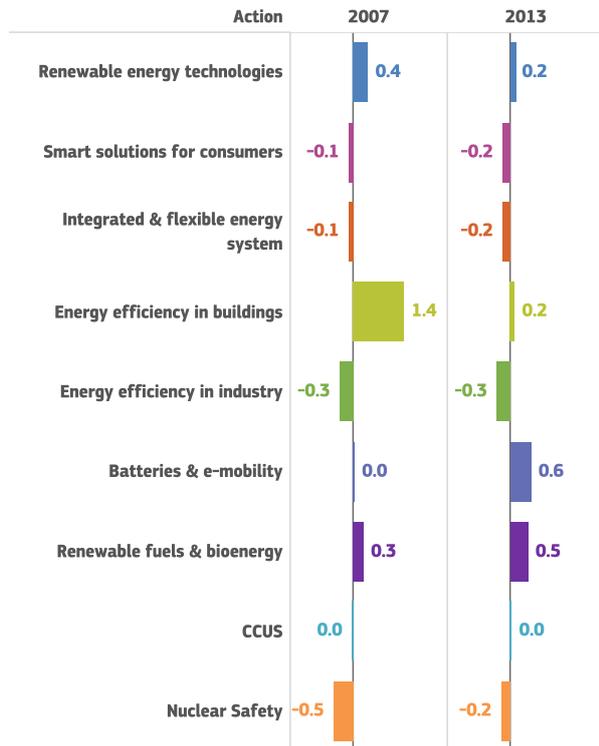


Trends in Patents

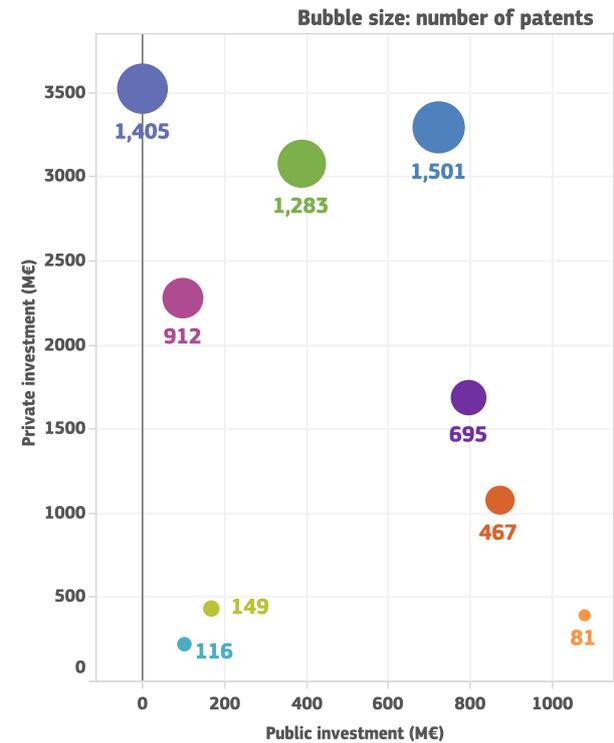
SET Plan action
(number of patents), 2013



Specialisation Index. World benchmark



R&I summary (2013)



- Renewable energy technologies
- Smart solutions for consumers
- Integrated & flexible energy system
- Energy efficiency in buildings
- Energy efficiency in industry
- Batteries & e-mobility
- Renewable fuels & bioenergy
- CCUS
- Nuclear Safety

Note

* As shown in Table 1, data for some Member States are not yet available for 2015; this includes one of the major investors, Italy which in previous years has contributed total investments of the order of half a billion euro in R&I in the area of the SET Plan actions.

Key Messages

- Public investment in R&I in the SET Plan actions increased from EUR 2.6 billion in 2007 to EUR 4.2 billion in 2010; it has remained around that level for the period 2010-2015 (most recent year for which information is available).
- Public investments in four Member States, France, Germany, Italy and the UK account for approximately 70% of the total EU R&I investment. France is the largest public investor in R&I, followed by Germany; they account for near a quarter and a fifth of the EU total, respectively.
- Private investment in R&I in the SET Plan actions increased from EUR 11 billion in 2007 to EUR 16 billion in 2013 (most recent year for which data is available).
- Throughout the period 2007-2013, private investment has consistently accounted for around 80% of the total R&I expenditure in SET Plan actions.
- The German private sector is the largest contributor to R&I activities in SET Plan actions. Investment in 2013 reached EUR 7 billion, equal to 46% of all private investment at EU level. France ranked second with a share of 16%.
- In the period 2007-2013, the number of patents in topics relevant to the SET Plan actions increased by an average 15% annually.
- The specialisation index, based on the patenting intensity in each SET Plan action reveals that in the reference period 2007-2013 the EU has increased specialisation in renewable fuels and bioenergy, as well as batteries and e-mobility compared to the rest of the world; it has also retained a specialisation advantage in renewables and energy efficiency in buildings, although this has been reducing over time.

Key messages for the SET Plan actions:

- Renewable energy technologies
 - Public investment increased from EUR 0.3 billion in 2007 to EUR 0.75 billion in 2010; it has subsequently fallen slightly, to just under EUR 0.7 billion. The leading investor is Germany, which accounts for almost a third of EU wide public R&I investment in renewables.
 - Private investment increased from EUR 1.7 billion in 2007 to EUR 4.7 billion in 2010; it has also declined since to an estimated EUR 3.3 billion in 2013. The leading investor is the German private sector, which accounts for almost half of EU wide private R&I investment in renewables.
 - Renewable energy technologies have the highest number of patents among all SET Plan actions. Over the reference period 2007-2013 the EU has retained a (shrinking) specialisation advantage over the rest of the world. Germany also leads in patents in renewables.
- Smart solutions for consumers
 - This action attracts a small part of the public R&I investment, around 2% or EUR 0.1 billion per year. France is the Member State which invests the most in smart solutions for consumers from public funds, followed by Germany and Finland.
 - In contrast private R&I investment is significant, ranging between EUR 2.3 billion and EUR 2.5 billion for the period 2010 to 2015, around 15% of the private R&I investment at EU level. The private sector in Germany is consistently the largest R&I investor in smart solutions for consumers.
 - Patents in smart solutions for consumers have been increasing, accounting for 7% of the total in all actions in 2013. Nonetheless, patenting intensity in this action in the EU is lower than the rest of the world.

— Integrated and flexible energy system

- Public investment in integrated and flexible energy systems has been increasing and, at a level exceeding EUR 0.9 billion for 2014, is comparable with the contribution from the private sector. Italy is the Member State leading in public R&I investment, followed by Germany and France.
- Private investment in R&I in the area of system integration and flexibility has increased from EUR 0.6 billion to just over EUR 1 billion in the reference period. The German and French private sectors are the major contributors of private R&I funds.
- Patents have been increasing but the EU is still behind the rest of the world in patenting intensity in the area of integrated and flexible energy systems.

— Energy efficiency in buildings

- Public investment in R&I for energy efficiency in buildings accounts for approximately 4% of the total public R&I investment at EU level. Germany, Italy and the UK are the major investors.
- After an initial increase up to EUR 1.3 billion in 2009-2010, private investment in R&I for energy efficiency in buildings has dropped dramatically to just EUR 0.5 billion in 2014. The private sectors in Germany and France maintain the highest levels of investment.
- Patents technologies addressing energy efficiency in buildings have not been increasing at the same rate as for the other SET Plan actions. As a result the comparatively large specialisation advantage held by the EU in 2007 appeared much reduced by 2013.

— Energy efficiency in industry

- There has been a slight drop in public investment in R&I in energy efficiency in industry; it accounted for 9.5% of the public investment in all SET Plan actions at EU level in 2014. Germany and Finland are the major investors.
- In contrast, private investment has increased by 42% in the reference period to EUR 3 billion in 2013; the German private sector accounts for 44% of this R&I investment.
- Despite the fact that patents in energy efficiency in industry in the EU more than doubled in the reference period, the EU did not gain in specialisation and is still lagging behind the rest of the world in this area.

— Batteries and e-mobility

- The structure and level of detail of public R&I investment data in the IEA database is not conducive to reporting on batteries and e-mobility.
- Private investment in batteries and e-mobility in 2013 (most recent data available) was EUR 3.5 billion or just over a fifth of private investment in all SET Plan actions. EUR 2.2 billion came from the German private sector and an additional EUR 0.6 billion from France.
- Patent numbers in the area of batteries and e-mobility have increased significantly. This action is the second highest in number of patents after renewables, with approximately 22% of the total in all SET Plan actions in recent years. Over the period 2007 – 2013 the EU has gained a specialisation advantage in these technologies over the rest of the world.

— Renewable fuels and bioenergy

- Public investment in renewable fuels and bioenergy makes up approximately 15% of the public R&I investment in all SET Plan actions, but has been in decline over the past few years from near EUR 1 billion in 2010-2011 to EUR 0.7 billion in 2014. France is the lead contributor of public R&I funds.
- Private investment in R&I has been fluctuating between EUR 1.4 billion and EUR 1.9 billion in the reference period. The major contributors are the private sectors in Germany and France.
- The increase in patents in renewable fuels and bioenergy has increased the specialisation advantage of the EU against the world during the reference period.

— Carbon Capture, Utilisation and Storage (CCUS)

- CCUS attracts a small part of the public R&I investment, on average just over EUR 0.1 billion per year or 2% of the total investment in SET Plan actions at EU level. France and the UK are major investors, contributing over half of the funding at EU level, although the level of investment can vary significantly from year to year.
- Private R&I investment is also modest compared to other SET Plan actions, on average 2% of the total at EU level.
- As with all SET Plan actions, patents in CCUS have also increased; the EU specialisation remains on par with the rest of the world.

— Nuclear Safety

- Nuclear safety receives the largest amount of public R&I investment among all SET Plan actions, in the order of EUR 1 billion per year. France is the major investor in nuclear safety R&I, contributing almost half of all public investment at EU level.
- In contrast, contributions to R&I from the private sector are limited, just under EUR 0.4 billion in recent years. The majority of private R&I investment comes from the French private sector.
- Patent numbers have been increasing but still only make up a small fraction (~1%) of the total in all SET Plan actions; the EU is less specialised in nuclear safety than the rest of the world.

List of figures

Figure 1 The Integrated SET Plan Structure, representing the links between the Energy Union R&I and Competitiveness priorities, the SET Plan Integrated Roadmap and the 10 SET Plan actions. 5

Figure 2 Country dashboard layout: (a) total public & private R&I investment, (b) public R&I investment per SET Plan action, (c) private R&I investment per SET Plan action, (d) patent families per SET Plan action , (e) specialisation index and (f) combined chart..... 6

Figure 3 Public R&I investment detail; from left to right: investment per SET plan action for the reference year (2013); share of the Member State in the EU for the same year; and time series. 7

Figure 4 Combined chart contrasting public and private R&I investment and number of patents for the reference year 2013..... 8

References

European Commission. A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy. Vol. COM(2015) 80 final; 2015a.

European Commission. Towards an Integrated Strategic Energy Technology (SET) Plan: Accelerating the European Energy System Transformation. Vol. COM(2015) 6317 final; 2015b.

European Commission. Commission staff working document "Monitoring progress towards the Energy Union objectives - Concept and first analysis of key indicators", Accompanying the document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions and the European Investment Bank "State of the Energy Union". Vol. SWD(2015) 243 final. Brussels, 18.11.2015; 2015c.

European Commission. Commission staff working document "Monitoring progress towards the Energy Union objectives - key indicators", Accompanying the document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions and the European Investment Bank "Second Report on the State of the Energy Union". Vol. SWD(2017) 32 final. Brussels, 1.2.2017; 2017a.

European Commission. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions and the European Investment Bank "Third Report on the State of the Energy Union" Vol. COM(2017) 688 final and SWD(2017) 384 final to - and including SWD(2017) 413 final. Brussels, 23.11.2017; 2017b.

European Commission. Transforming the European Energy System through INNOVATION. Luxembourg: Publications Office of the European Union 2016. ISBN 978-92-79-63468-0, doi:10.2833/45248.

IEA. Statistics, RD&D Online Data Service. International Energy Agency; cited 2017. Available from: <http://www.iea.org/statistics/RDDonlinedataservice/>

EPO. EPO Worldwide Patent Statistical Database (PATSTAT): European Patent Office; cited 2017. Available from: <https://data.epo.org/expert-services/start.html>

Fiorini, A.; Georgakaki, A.; Pasimeni, F.; Tzimas, E. Monitoring R&I in Low-Carbon Energy Technologies, EUR 28446 EN, Publications Office of the European Union, Luxembourg, 2017, ISBN 978-92-79-65591-3, doi: 10.2760/434051.

Research Council of Lithuania. Annual reports 2011, 2012 and 2013 of the Lithuanian National Science Programs Future Energy (2010-2014).

Available from: <http://www.lmt.lt/lt/nacionalines-mokslo-programos/nmp-ataskaitos/ateities-energetika-20102014/2476>

UEFISCDI. Projects funded by the Romanian Executive Agency for Higher education, Research, Development and Innovation Funding between 2011 and 2013, Available from: <https://uefiscdi.ro/>

GETTING IN TOUCH WITH THE EU

In person

All over the European Union there are hundreds of Europe Direct information centres. You can find the address of the centre nearest you at: <http://europea.eu/contact>

On the phone or by email

Europe Direct is a service that answers your questions about the European Union. You can contact this service:

- by freephone: 00 800 6 7 8 9 10 11 (certain operators may charge for these calls),
- at the following standard number: +32 22999696, or
- by electronic mail via: <http://europa.eu/contact>

FINDING INFORMATION ABOUT THE EU

Online

Information about the European Union in all the official languages of the EU is available on the Europa website at: <http://europa.eu>

EU publications

You can download or order free and priced EU publications from EU Bookshop at: <http://bookshop.europa.eu>. Multiple copies of free publications may be obtained by contacting Europe Direct or your local information centre (see <http://europa.eu/contact>).

JRC Mission

As the science and knowledge service of the European Commission, the Joint Research Centre's mission is to support EU policies with independent evidence throughout the whole policy cycle.



EU Science Hub
ec.europa.eu/jrc



@EU_ScienceHub



EU Science Hub - Joint Research Centre



Joint Research Centre



EU Science Hub

