Energy Technology RD&D Budgets

October 2023 Edition

Database documentation

International Energy Agency

INTERNATIONAL ENERGY AGENCY

The IEA examines the full spectrum of energy issues including oil, gas and coal supply and demand, renewable energy technologies, electricity markets, energy efficiency, access to energy, demand side management and much more. Through its work, the IEA advocates policies that will enhance the reliability, affordability and sustainability of energy in its 31 member countries, 11 association countries and beyond.

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Egypt
India
Indonesia
Kenya
Morocco
Senegal
Singapore
South Africa
Thailand
Ukraine

This document provides information regarding the 2023 edition of the IEA *Energy Technology RD&D Budgets* database. The data files and documentation are available at: https://www.iea.org/data-and-statistics/data-product/energy-technology-rd-and-d-budget-database-2

For visualization of country-level data through interactive menus, please visit: https://www.iea.org/data-and-statistics/data-tools/energy-technology-rdd-budgets-data-explorer

Please address your comments and inquiries to RDD@iea.org.

Please note that all IEA data are subject to the following terms and conditions found on the IEA website: www.iea.org/terms/.

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Database structure

The database *Energy Technology RD&D Budgets* includes annual data for:

Countries: 31 IEA countries; 4 IEA regions; the European Union; Brazil; Chile. For availability of data by country, see section 4: *Geographical coverage and country notes*.

Years: 1974-2023 unless otherwise specified. 2022 and 2023 are provisional and subject to change in future editions.

The database includes an Excel file with selected data, for fast access to the database (**IEA_Energy_RDD_selected_data.xlsx)**

And the following files, all available in three different formats (ivt, txt and csv):

RDD_Country_Budgets

Detailed country RD&D budgets: 34 countries (33 individual countries + European Union), 8 products and 184 flows

RDD_Country_Budgets_ Summary

Summary country RD&D budgets: 34 countries (33 individual countries + European Union), 8 products and 11 flows (8 summary groups of energy technologies + Total + Memos: Low-carbon and Non-low-carbon).

RDD_Region_Budget

Estimated RD&D budgets by region: 4 regions, 3 products and 11 flows.

RDD_Indicators

RD&D indicators: 34 countries (33 individual countries + European Union) and 4 indicators.

RDD_Per_GDP

RD&D budgets per GDP: 33 countries and 1 indicator.

RDD_Private_Sector

RD&D spendings in the private sector by country: 4 countries, 5 products and 11 flows (8 summary groups of energy technologies + Total + Memos: Low-carbon and Non-low-carbon).

Flow definitions

The *IEA Guide to Reporting Energy RD&D Budget/Expenditure Statistics*, which includes the detailed definitions, can be found in the same folder as this document and is also available for download here.

The following tables shows the complete set of technologies covered in the questionnaire. The different countries submit at various levels of disaggregation depending on availability at national level.

Flow

Long name	Short name
GROUP 1: ENERGY EFFICIENCY	EFFICIENCY
11 Industry	11EFFIND
111 Industrial techniques and processes	111INDTE
112 Industrial equipment and systems	112INDEQ
113 Other industry	113INDOT
119 Unallocated industry	119INDUN
12 Residential and commercial buildings, appliances and equipment	12EFFRCO
121 Building design and envelope	121BUDEE
1211 Building envelope technologies	1211ENVE
1212 Building design	1212DESI
1219 Unallocated building design and envelope	1219BUUN
122 Building operation and efficient building equipment	122OPERA
1221 Building management systems (including smart meters) and efficient internet and communication technologies	1221EMAN
1222 Lighting technologies and control systems	1222LTEC
1223 Heating, cooling and ventilation technologies	1223HEAT
1224 Other building operations and efficient building equipment	1224OTHE
1229 Unallocated building operations and equipment	1229OPUN
123 Appliances and other residential/commercial	123APPLI
1231 Appliances	1231APPL

Long name	Short name
1232 Batteries for portable devices	1232BATT
1233 Other residential/commercial	1233ORCO
1239 Unallocated appliances and other residential/commercial	1239APUN
129 Unallocated residential/commercial buildings, appliances and equipment	129EFFRUN
13 Transport	13TRANSP
131 On-road vehicles	131ORVEH
1311 Vehicle batteries/storage technologies	1311VBAT
1312 Advanced power electronics, motors, EV/HEV/FCV systems	1312ADVA
1313 Advanced combustion engines	1313ENGI
1314 Electric vehicle infrastructure (including smart chargers and grid communications)	1314INFR
1315 Fuel for on-road vehicles (excluding hydrogen)	1315UFUE
1316 Materials for on-road vehicles	1316MATE
1317 Other on-road transport	1317OTHE
1319 Unallocated on-road vehicles	1319ORUN
132 Off-road transport and transport systems	132OFFRO
133 Other transport	133OTRAN
139 Unallocated transport	139TRANUN
14 Other energy efficiency	14OEFFIC
141 Waste heat recovery and utilisation	141WASTE
142 Communities	142COMMU
143 Agriculture and forestry	143AGRIF
144 Heat pumps and chillers	144HEATP
145 Other energy efficiency	145OENEF
149 Unallocated other energy efficiency	149OEFUN
19 Unallocated energy efficiency	19EFFUN
GROUP 2: FOSSIL FUELS: OIL, GAS and COAL	FOSSILFUEL
21 Oil and gas	21OILGAS
211 Enhanced oil and gas production	211ENHAN
212 Refining, transport, storage of oil and gas	212REFIN
213 Non-conventional oil and gas production	213NONCO

Long name	Short name
214 Oil and gas combustion	214COMBU
215 Oil and gas conversion	215CONVE
216 Other oil and gas	216OTOIL
219 Unallocated oil and gas	219OGUN
22 Coal	22COAL
221 Coal production, preparation and transport	221CPROD
222 Coal combustion (including IGCC)	222CCOMB
223 Coal conversion (excluding IGCC)	223CCONV
224 Other coal	224OCOAL
229 Unallocated coal	229COALUN
23 CO2 capture and storage	23CO2CS
231 CO2 capture/separation	231CAPSE
232 CO2 transport	232CTRAN
233 CO2 storage	233CSTOR
239 Unallocated CO2 capture and storage	239CO2CSUN
29 Unallocated fossil fuels	29FOSFUN
GROUP 3: RENEWABLE ENERGY SOURCES	RENEWABLE
31 Solar energy	31SOLAR
311 Solar heating and cooling	311SHEAT
312 Photovoltaics	312PHOTOV
313 Solar thermal power and high-temp. applications	313THERMA
319 Unallocated solar energy	319SOLUN
32 Wind energy	32WIND
321 Onshore wind technologies	321WONSH
322 Offshore wind technologies (excluding low wind speed)	322WOFFS
323 Wind energy systems and other technologies	323WSYST
329 Unallocated wind energy	329WINDUN
33 Ocean energy	33OCEAN
331 Tidal energy	331TIDAL
332 Wave energy	332WAVE

Long name	Short name
333 Salinity gradient power	333SALIN
334 Other ocean energy	334OOTHE
339 Unallocated ocean energy	339OCEUN
34 Biofuels (including liquid biofuels, solid biofuels and biogases)	34BIOFUE
341 Production of liquid biofuels	341LPROD
3411 Gasoline substitutes (including ethanol)	3411GAS
3412 Diesel, kerosene and jet fuel substitutes	3412DIES
3413 Algal biofuels	3413ALG
3414 Other liquid fuel substitutes	3414LOTH
3419 Unallocated production of liquid biofuels	3419LPUN
342 Production of solid biofuels	342SPROD
343 Production of biogases	343GPROD
3431 Thermochemical	3431GTHE
3432 Biochemical (including anaerobic digestion)	3432GBIO
3433 Other biogases	3433GOTH
3439 Unallocated production of biogases	3439GPUN
344 Applications for heat and electricity	344BAPPL
345 Other biofuels	345BOTHE
349 Unallocated biofuels	349BIOUN
35 Geothermal energy	35GEOTHE
351 Geothermal energy from hydrothermal resources	351GEOHY
352 Geothermal energy from hot dry rock (HDR) resources	352GEHDR
353 Advanced drilling and exploration	353DRILL
354 Other geothermal energy (including low-temp. resources)	354GOTHE
359 Unallocated geothermal energy	359GEOUN
36 Hydroelectricity	36HYDROE
361 Large hydroelectricity (capacity of 10 MW and above)	361HLARG
362 Small hydroelectricity (capacity less than 10 MW)	362HSMAL
369 Unallocated hydroelectricity	369HYDRUN
37 Other renewable energy sources	37OTHREN

Long name	Short name
39 Unallocated renewable energy sources	39RENUN
GROUP 4: NUCLEAR	NUCLEAR
41 Nuclear fission	41FISSON
411 Light water reactors (LWRs)	411LWRS
412 Other converter reactors	412OTHNU
4121 Heavy water reactors (HWRs)	4121HWRS
4122 Other converter reactors	4122OTHE
4129 Unallocated other converter reactors	4129OTNUN
413 Fuel cycle	413FUCYC
4131 Fissile material recycling/reprocessing	4131RECY
4132 Nuclear waste management	4132WAST
4133 Other fuel cycle	4133OTCY
4139 Unallocated fuel cycle	4139FUCUN
414 Nuclear supporting technologies	414SUPTE
4141 Plant safety and integrity	4141SAFE
4142 Environmental protection	4142PROT
4143 Decommissioning	4143DECO
4144 Other nuclear supporting technologies	4144ONUC
4149 Unallocated nuclear supporting technologies	4149ONUN
415 Nuclear breeder	415BREED
416 Other nuclear fission	416OFISS
419 Unallocated nuclear fission	419FISUN
42 Nuclear fusion	42FUSION
421 Magnetic confinement	421MACON
422 Inertial confinement	422INCON
423 Other nuclear fusion	423OFUSI
429 Unallocated nuclear fusion	429FUSUN
49 Unallocated nuclear	49NUCUN
GROUP 5: HYDROGEN AND FUEL CELLS	HGENCELL
51 Hydrogen	51HYDROG

Long name	Short name
511 Hydrogen production	511HYPRO
512 Hydrogen storage	512HYSTO
513 Hydrogen transport and distribution	513HYTRA
514 Other infrastructure and systems	514HYINF
515 Hydrogen end-uses (including combustion; excluding fuel cells and vehicles)	515HYEND
519 Unallocated hydrogen	519HYDUN
52 Fuel cells	52FUELCE
521 Stationary applications	521FUSTA
522 Mobile applications	522FUMOB
523 Other applications	523FUOTH
529 Unallocated fuel cells	529FUELUN
59 Unallocated hydrogen and fuel cells	59HYFUUN
GROUP 6: OTHER POWER AND STORAGE TECHNOLOGIES	OTHERPANDS
61 Electric power generation	61POWCON
611 Power generation technologies	611GETEC
612 Power generation supporting technologies	612GESUP
613 Other electricity power generation	613GEOTH
619 Unallocated electric power generation	619POWUN
62 Electricity transmission and distribution	62TRADIS
621 Transmission and distribution technologies	621TDTEC
6211 Cables and conductors (superconducting, conventional, composite core)	6211CABL
6212 AC/DC conversion	6212ACDC
6213 Other transmission and distribution techs.	6213OTHE
6219 Unallocated transmission and distribution	6219TDTUN
622 Grid communication, control systems and integration	622GRIDC
6221 Load management (including renewable integration)	6221LOAD
6222 Control systems and monitoring	6222CONT
6223 Standards, interoperability and grid cyber security	6223STAN
6229 Unallocated grid communication, control systems and integration	6229GRIDUN
629 Unallocated electricity transmission and distribution	629TRANUN

Long name	Short name
63 Energy storage (non-transport applications)	63ENSTOR
631 Electrical storage	631ELSTO
6311 Batteries and other electrochemical storage (excluding vehicles and general public portable devices)	6311BATT
6312 Electromagnetic storage	6312ELMA
6313 Mechanical storage	6313MECH
6314 Other storage (excluding fuel cells)	6314OSTO
6319 Unallocated electrical storage	6319ELSUN
632 Thermal energy storage	632THEST
639 Unallocated energy storage	639ENSTUN
69 Unallocated other power and storage technologies	69OPOWUN
GROUP 7: OTHER CROSS-CUTTING TECHNOLOGIES AND RESEARCH	OTHERTECH
71 Energy system analysis	71SYSANA
72 Basic energy research that cannot be allocated to a specific category	72BASICUN
73 Other	73OTHER
GROUP 8: UNALLOCATED	UNALLOC
TOTAL BUDGET	TOTAL

Long name	Short name	Definition
Memo: Low-carbon	MEMOLC	Includes: energy efficiency, carbon capture and storage (CCS), renewable energy sources, nuclear, hydrogen and fuel cells, other power and storage, and other cross-cutting technologies and research. =EFFICIENCY+23CO2CS+RENEWABLE+ NUCLEAR+HGENCELL+OTHERPANDS+OTHERTECH+UNA LLOC
Memo: Non-low-carbon	MEMONLC	Includes: coal, gas, oil and other fossil fuel RD&D with the exception of CCS. =21OILGAS+22COAL+29FOSFUN

Product definitions

Products

Long name	Short name	Definition
Total RD&D in million USD (2022 prices and exchange rates)	RDDUSD	Total public RD&D expenditure data, converted from current prices in national currencies to US dollars in constant 2022 prices using GDP deflators and 2022 exchange rates.
Total RD&D in million USD (2022 prices and PPPs)	RDDUSDPPP	Total public RD&D expenditure data, converted from current prices in national currencies to US dollar PPPs in constant 2022 prices using GDP deflators and 2022 PPPs. Purchasing power parities (PPPs) are the rates of currency conversion that eliminate the differences in price levels between countries. For more information on PPP methodology, see www.oecd.org/std/prices-ppp.
Total RD&D in million EUR (2022 prices and exchange rates)	RDDEURO	Total public RD&D expenditure data, converted from current prices in national currencies to euros in constant 2022 prices using GDP deflators and 2022 exchange rates.
Total RD&D in million national currencies (2022 prices)	RDDNCREAL	Total public RD&D expenditure data in national currencies, deflated using country-specific GDP deflators.
Total RD&D in million national currencies (nominal)	RDDNC	Total public RD&D expenditure data, expressed in national currencies at current prices.
Government R&D in million national currencies (nominal)	GOVTRD	Government R&D expenditure data, expressed in national currencies at current prices.
Government Demonstration in million national currencies (nominal)	GOVTDEMO	Government Demonstration expenditure data, expressed in national currencies at current prices.
State-owned R&D in million national currencies (nominal)	STATERD	State-owned R&D expenditure data, expressed in national currencies at current prices.
State-owned Demonstration in million national currencies (nominal)	STATEDEMO	State-owned Demonstration expenditure data, expressed in national currencies at current prices.
Private sector RD&D in million national currencies (nominal)	PRIVATERDD	Private sector RD&D expenditure data, expressed in national currencies at current prices
Private sector RD&D in million national currencies (2022 prices)	PRDDNCREAL	Private sector RD&D expenditure data in national currencies deflated using country-specific GDP deflators.
Private sector RD&D in million USD (2022 prices and exchange rates)	PRDDUSD	Private sector RD&D expenditure data, converted from current prices in national currencies to US dollars in constant 2022 prices using GDP deflators and 2022 exchange rates.

Private sector RD&D in million USD (2022 prices and PPPs)	PRDDUSDPPP	Private sector RD&D expenditure data, converted from current prices in national currencies to US dollar PPPs in constant 2022 prices using GDP deflators and 2022 PPPs. Purchasing power parities (PPPs) are the rates of currency conversion that eliminate the differences in price levels between countries. For more information on PPP methodology, see www.oecd.org/std/prices-ppp.
Private sector RD&D in million EUR (2022 prices and exchange rates)	PRDDEURO	Private sector RD&D expenditure data, converted from current prices in national currencies to euros in constant 2022 prices using GDP deflators and 2022 exchange rates.

Energy RD&D Budgets per thousand units of GDP

Long name	Short name	Definition
RD&D per thousand units of GDP	RDD1000GDP	Total RD&D in nominal national currencies divided by GDP in nominal national currencies at market prices and volumes, expressed in thousand units of GDP.

RD&D Economic Indicators

Long name	Short name	Definition
U.S. dollar exchange rate	USEXRMEI	Source: OECD Main Economic Indicators for OECD Countries and European Union and IMF International Financial Statistics for Brazil.
Purchasing power parity (PPP)	PPP	Source: IMF World Economic Outlook[1], with gaps in data completed with World Bank World Development Indicators[2].
Nominal GDP in national currency (Millions)	GDPNC	Source: IMF World Economic Outlook, with gaps in data completed with World Bank World Development Indicators.
GDP deflator	GDPDEF	Source: IMF World Economic Outlook, with gaps in data completed with World Bank World Development Indicators.

Currency conversion

$$RDDNCREAL_{Y,C} = RDDNC_{Y,C} \times \frac{GDPDEF_{2022,C}}{GDPDEF_{Y,C}}$$

1 - *International Monetary Fund. 2023. World Economic Outlook, April 2023: A Rocky Recovery. Washington, DC. (IMF WEO)*

2 - *World Development Indicators. 2023. Washington, D.C. :The World Bank*. (WB WDI)

$$RDDUSD_{Y,C} = \frac{RDDNC_{Y,C}}{USERXMEI_{2021,C}} \times \frac{GDPDEF_{2022,C}}{GDPDEF_{Y,C}}$$

$$RDDUSDPPP_{Y,C} = \frac{RDDNC_{Y,C}}{PPP_{2022,C}} \times \frac{GDPDEF_{2022,C}}{GDPDEF_{Y,C}}$$

$$RDDEURO_{Y,C} = RDDUSD_{Y,C} \times USERXMEI_{2022,France}$$

Where:
C is the country
Y is the year

Geographical coverage and country notes

Geographical coverage: countries

Long name	Short name
Australia	AUSTRALI
Austria	AUSTRIA
Belgium	BELGIUM
Brazil	BRAZIL
Canada	CANADA
Czech Republic	CZECH
Chile	CHILE
Denmark	DENMARK
Estonia	ESTONIA
Finland	FINLAND
France	FRANCE
Germany	GERMANY
Greece	GREECE
Hungary	HUNGARY
Ireland	IRELAND
Italy	ITALY
Japan	JAPAN
Korea	KOREA
Lithuania	LITHUANIA
Luxembourg	LUXEMBOU
Mexico	MEXICO
Netherlands	NETHLAND
New Zealand	NZ
Norway	NORWAY

Poland	POLAND
Portugal	PORTUGAL
Slovak Republic	SLOVAKIA
Spain	SPAIN
Sweden	SWEDEN
Switzerland	SWITLAND
Republic of Türkiye	TURKEY
United Kingdom	UK
United States	USA
European Union	EU

Geographical coverage: regions

IEA	**Short name:** IEATOT
Definition	Includes Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Lithuania, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, the Republic of Türkiye, the United Kingdom and the United States.
IEA Americas	**Short name:** IEAAM
Definition	Includes Canada, Mexico and the United States.
IEA Europe	**Short name:** IEAEUR
Definition	Includes Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, the Netherlands, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, the Republic of Türkiye and the United Kingdom.
IEA Asia Oceania	**Short name:** IEAAO
Definition	Includes Australia, Japan, Korea and New Zealand.

Country notes

Australia	Short name: AUSTRALI
Definition	**Source**: Department of the Environment and Energy **Latest submission:** 2022/2023 **Latest available data:** 2023 **Funding institutions/programmes included in the submission** • Department of Industry, Science, Energy and Resources (DISER) • Department of Agriculture, Water and Environment (DAWE) • Australian Nuclear Science and Technology Organisation (ANSTO) • Australian Renewable Energy Agency (ARENA) • Australian Research Council (ARC) • Commonwealth Science and Industrial Research Organisation (CSIRO) • Cooperative Research Centres (CRCs) • Bureau of Meteorology (BoM) The submission also includes RD&D funding by some State Governments. Coverage across states and territories is not comprehensive. 2022 (fiscal year July 2021 to June 2022) data do not include budgetary outlays for the Australian Renewable Energy Agency (ARENA). **Budgetary stage information** All data refer to the financial year; for example, 2022 refers to 1 July 2021 to 30 June 2022. Expenditure by individual institution can vary greatly from year to year, and an agency's proportion of total spending will also vary (e.g. completion or termination of projects, etc.). The budgetary stages would change over the years, considering the completion of various long-term funded projects. Thus, depending on the funding institution, the budgetary stage may be final budget appropriation or obligations. **Data coverage** Excludes overseas territories. The submission does not include the Australian Government's direct funding for universities, administered through its research training and support programs, due to limitations in data reporting. Indirect funding for the higher-education sector through agencies such as the ARC, CRC, ARENA etc. is captured in the submission. Data at the 3 and 4-digit levels are not available for all projects. **State-owned enterprises coverage** State-owned enterprises data is included starting from 2018. The coverage for state-owned enterprises does not include all states and territories. **Private sector coverage** No data available **Time series changes** For cycle 2021/2022, the data starting from 2018 has been updated to increase the coverage to state/territory and state-owned enterprises. From 1999 to 2003, only aggregate figures are available for nuclear fission/fusion.

Australia Definition (continued)	Data for 2009, 2010 and 2011 have been estimated by the Australian administration, causing breaks in series between 2008 and 2009. In 1993, figures for nuclear fuel cycle include nuclear supporting technology data. Prior to 1997, biofuels includes geothermal and other renewable energy not elsewhere classified. **Other information** N/A

Austria	**Short name: AUSTRIA**

Definition

Source: Austrian Energy Agency on behalf of the Austrian Federal Ministry of Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK)

Latest submission: 2022/2023

Latest available data: 2022

Funding institutions/programmes included in the submission

- Federal Ministry of Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK)
  - City of Tomorrow
  - IEA Research Cooperation
  - Smart Energy Systems
  - JPI Urban Europe Smart
  - Mobility of Tomorrow
  - Important Projects of Common European Interest (IPCEI)
- Climate and Energy Fund
  - Energy Research Programme
  - Flagship Region Energy
  - Zero Emission Mobility & Implementation
  - Lighthouses for Resilient Cities 2040
- European and international cooperationsAustrian Research Promotion Agency
- General programme

Budgetary stage information

The government data are based on obligation (vi). The private sector data are based on actual outlays (vii).

Data coverage

Government RD&D data cover federal and state units.

Financial flows from European programmes (Horizon 2020, Research Fund for Coal and Steel…) are excluded, national contributions on project level are included. Austrian contributions to the European Union budget are excluded. IEA TCPs (including common funds) are included.

Data are collected from a performer perspective as expenditures by using voluntary surveys for equity capital used by research organizations and universities and identifying contracted funding with data provided by funding agencies.

Details on methodology and sample coverage are available at:

https://nachhaltigwirtschaften.at/resources/iea_pdf/events/20200708_webinar-energiewende/webinar-energiewende-energieforschung-indinger-katzenschlager-2020-07-08_en.pdf.

Estimated share of the sample of the total expenditure covered:

Austria Definition (continued)	• Government: >95% • Higher education: >80%

State-owned enterprises coverage

In Austria, state owned companies are covered in the R&D-surveys for the private sector. They are intentionally not covered in the detailed survey for IEA.

Private sector coverage

For every second year (2015, 2017, 2019, 2021) Austria provides a total annual sum for energy R&D for the whole private sector (including state owned) in the IEA questionnaire. Due to confidentiality and data protection, no individual technology figure is disclosed by the federal statistics authority.

Time series changes

N/A

Other information

N/A

Belgium	**Short name: BELGIUM**

Definition	**Source**: Belgium Federal Government
	Latest submission: 2022/2023
	Latest available data: 2023
	
	Funding institutions/programmes included in the submission
	
	Federal (nuclear)
	• Federal Public Service Economy (https://economie.fgov.be/en)
	  ○ NIRAS/ONDRAF
	  ○ IRE
	  ○ SCK CEN
	  ○ Waste treatment and dismantling techniques for decommissioning of legacy facilities
	  ○ BELSPO
	  ○ Royal Military School
	  ○ Energy Transition Fund grants
	Contributions to CERN are not included.
	Brussels-capital region
	• Bruxelles–Environnement (https://environnement.brussels/)
	• Innoviris (https://innoviris.brussels/) – until 2019
	Flemish region
	• Research Foundation Flanders (FWO) (https://www.fwo.be/en/).
	• Flanders Innovation & Entrepreneurship (VLAIO) (https://www.vlaio.be/nl/andere-doelgroepen/flanders-innovation-entrepreneurship)
	• Interuniveristy Micro-electronics Centre (Imec) (https://www.imec-int.com/en/home)
	• Flanders Make (https://www.flandersmake.be/en)
	• Flemish Institute for Technological Research (VITO) (https://vito.be/en)
	“VLAIO” and “Research Foundation – Flanders” are funding agencies for research. IMEC, VITO, Flanders Make are strategic research centres who yearly receive a public funding amount (dotation) from the Flemish government.

Belgium

Definition (continued)

Walloon region

- Walloon Public Service Energy https://energie.wallonie.be/fr/recherche-et-developpement-en-energie.html?IDC=8180
- Walloon Public Service Research https://recherche.wallonie.be/home.html

Budgetary stage information

Data provided are based on obligations (budgetary stage vi).

Data coverage

Government RD&D data cover federal and regional units.

For 2023 estimates, only data for nuclear budgets are available.

Federal (nuclear)

Data are collected with a hybrid methodology by using voluntary surveys at the federal level.

Estimated share of the sample of the total expenditure covered:

- Government: 100%
    - Information obtained from SCK CEN, IRE, NIRAS/ONDRAF, BELSPO and the Royal Military School
- Higher education: 0%
- Business sector: 0%

Brussels-capital region

For the Brussels region, data provided are based on the individual analysis of the projects themselves. The data include all the projects in which there is a regional co-funding involved.

Flemish region

Data are collected from a funder perspective as budgets. The data are derived from the budget.

The figures are composed from the survey of the funding agencies (VLAIO and FWO) and some public institutions which are financed by the government for the research activities.

Flemish data rely on the individual analysis of budgets of approved project proposals in the energy technology field, and only includes Flemish public RD&D expenditures (no European / international / private co-funding budget is included).

Walloon region

Data are collected from a funder perspective as budgets. The data are derived from the budget and on the individual analysis of the projects themselves. Only the national/regional public funding has been considered for projects which are co-financed by Europe.

State-owned enterprises coverage

There are no state-owned companies.

Private sector coverage

No data available

Time series changes

N/A

Other information

N/A

Brazil	Short name: BRAZIL

Definition

Source: Ministry of Mines and Energy
Latest submission: 2021/2022
Latest available data: 2020

Funding institutions/programmes included in the submission

- Financiadora de Estudos e Projetos (FINEP)
- Agência Nacional do Petróleo, Gás Natural e Biocombustíveis (ANP)
- Agência Nacional de Energia Elétrica (ANEEL)
- Banco Nacional do Desenvolvimento (BNDES)
- Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq)
- Comissão Nacional de Energia Nuclear (CNEN)
- Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP)

Budgetary stage information

Data are based on final budget appropriations.

Data coverage

The demonstration budgets are included in the R&D section.

State-owned enterprises coverage

No data available

Private sector coverage

No data available

Time series changes

N/A

Other information

The dataset is the result of a project called Energy Big Push (EBP) that gathered the all the relevant actors active in the energy innovation scenario of Brazil, including the Brazilian Ministry of Mines and Energy and the Ministry of Science, Technology and Innovation.

EBP project analysed the RD&D spending data of the relevant federal institutions listed above and the state of São Paulo.

It is important to note that significant amounts of resources are associated with contractual investment obligations, being considered public-oriented in this project. This is the case of all investments under regulated programs of the Brazilian National Agency of Petroleum, Natural Gas and Biofuels (ANP), and Brazilian Electricity Regulatory Agency (ANEEL).

The database of Brazilian National Agency of Petroleum, Natural Gas and Biofuels (ANP) was not available at project level. In that case it was necessary to adopt the premise that almost all investment is made in oil and gas industry. This was a necessary simplification to report the data, but it is recognized that part of these resources may be invested in renewable energy.

For values associated with Brazilian National Development Bank (BNDES) the database contains the financing granted by the institution in energy RD&D area, considering BNDES loans and non-reimbursable funding.

Canada	Short name: CANADA

Definition

Source: Natural Resources Canada (NRCan, Government of Canada
Latest submission: 2022/2023
Latest available data: 2023

Funding institutions/programmes included in the submission

Figures are based on data from approximately 30 federal departments and agencies as well as all provincial and territorial governments. The Canadian process surveys all federal, provincial and territorial organizations funding energy RD&D related activities with the exception of municipalities. Government figures include combined data from federal departments and agencies and all of provinces and territories.

- Natural Resources Canada (NRCan)
  - Program of Energy Research & Development (PERD)
  - Energy Innovation Program (EIP) (all streams including Canadian Emissions Reduction Innovation Network (CERIN), Breakthrough Energy Solutions Canada (BESC))
  - Impact Canada Cleantech Challenges
  - Clean Growth Program (CGP)
  - Green Infrastructure (GI) – Smart Grid Program, Energy-Efficient Buildings RD&D, Electric Vehicles Infrastructure Demonstrations, Clean Energy for Rural & Remote Communities
  - Emission Reduction Fund (ERF) Offshore Research, Development and Demonstration Stream
  - Greener Neighbourhoods Pilot Program (GNPP)
  - Reducing Diesel in Indigenous, Rural and Remote Communities
  - Oil Spill Response Challenge (OSRC)
  - Critical Minerals RD&D Program
- Natural Resources Canada (NRCan) – Atomic Energy of Canada Limited (AECL)
  - Revitalization of the Chalk River Laboratories
  - Federal Nuclear Science and Technology Work Plan
- Innovation, Science and Economic Development Canada (ISED)
- Global Innovation Clusters (GIC)
- Innovative Solutions Canada (ISC)
- Strategic Innovation Fund (SIF)
- Innovation, Science and Economic Development Canada (ISED) – Sustainable Development Technology Canada (SDTC)
  - SD Tech Fund
- Innovation, Science and Economic Development Canada (ISED) – National Research Council Canada (NRC)
  - R&D programs
  - Industrial Research Assistance Program (IRAP)
- Innovation, Science and Economic Development Canada (ISED) – Natural Sciences and Engineering Research Council of Canada (NSERC)
  - Discovery Research
  - Research Training and Talent Development
  - Research Partnerships

Of approx. 30 federal departments/agencies, six federal organizations are identified as major spenders. Federal organisations are not listed in any particular order (i.e., ranked by spending). Provincial and territorial governments were also surveyed but the details of their major programs are not provided here.

Note that some program names change over time as the programs are renewed and/or combined with other programs.

Canada Definition (continued)	**Budgetary stage information** All data refer to the fiscal year, for example, 2021 refers to April 1st, 2021, to March 31st, 2022. Data up to and including 2021 refer to actual outlays. Data beyond 2021 are considered estimates based on the available data at the time of reporting. **Data coverage** The data cover national projects, national contributions to international RD&D programmes or organizations such as the International Atomic Energy Agency (IAEA) and OECD Nuclear Energy Agency (NEA) and international RD&D efforts under the IEA Technology Collaboration Programmes. **State-owned enterprises coverage** For Canada, State-Owned Enterprises (SOEs) are reported only from provincial and territorial governments. SOEs are considered Provincial or Territorial Crown Corporations, such as electric or gas utilities. Not all provincial and territorial governments reported relevant spending from SOEs. 2012-2013 fiscal year was the first year Canada started reporting SOEs separately. **Private sector coverage** Data on the private sector are available here: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2710034701. **Time series changes** N/A **Other information** The data are collected with a hybrid methodology by using voluntary surveys Canada uses both funder and performer perspectives to collect energy RD&D data, as the investment flows externally outside the government (i.e. to private sector) and also internally within the government (i.e. national laboratories). NRCan, as a coordinator of the data, works with both performers and funders within the Government of Canada (GOC) to check and verify the data submitted. This particular process puts enhanced measures to ensure the accuracy of the data received including budgeted and estimated expenditures. GOC's internal performers do not often provide budgeted/estimated expenditures. In those cases, budgeted/estimated figures are provided by the program administrators. For provinces and territories, each provincial/territorial government has its own coordinating ministry that is responsible for collecting the data, on behalf of its provincial/territorial government.

Chile	**Short name: CHILE**
Definition	**Source**: Ministry of Energy **Latest submission:** 2022/2023 **Latest available data:** 2022
	Funding institutions/programmes included in the submission No information available

Budgetary stage information

No data available

Data coverage

The demonstration budgets are included in the R&D section.

State-owned enterprises coverage

No data available

Private sector coverage

No data available

Time series changes

N/A

Other information

The data for Chile have been submitted through the joint questionnaire between Mission Innovation and the IEA.

Czech Republic	Short name: CZECH

Definition

Source: Ministry of Industry and Trade of the Czech Republic
Latest submission: 2022/2023
Latest available data: 2023

Funding institutions/programmes included in the submission

No information available.

Budgetary stage information

No details available.

Data coverage

No details available.

State-owned enterprises coverage

No details available.

Private sector coverage

No details available.

Time series changes

N/A

Czech Republic	**Other information**
Definition (continued)	Publicly funded R&D projects can be searched through public databases and portals. These are mainly the ISVAV (https://www.rvvi.cz/) and the STARFOS portal (https://starfos.tacr.cz/cs). Based on individual code and project name, basic information can be found. These are mainly: the amount of eligible costs and the amount of public support (not for every year but only total amount), basic information about an institution carrying the research, project solution time, program of a concrete project, public tender number, R&D categories field, etc. Each specific project has an individual code that serves as a unique identifier. R&D projects data are collected by the Technology Agency of the Czech Republic (TA CR). The above-mentioned public databases are managed by the Technology Agency of the Czech Republic (STARFOS), respectively by the Research, Development and Innovation Council (ISVAV). The Ministry of Industry and Trade with the help of the Technology Agency of the Czech Republic (TA CR), which has direct access to background data, such as eligible costs and public support for each individual year, searched specific energy projects in the Czech Republic within the STARFOS database. These projects were supplemented by already searched projects, as the search was carried out in 2015 while preparing one of the previous questionnaires. These projects were subsequently exported, including the key information necessary to complete the questionnaire.

Denmark	**Short name: DENMARK**
Definition	**Source**: Danish Energy Agency, Ministry of Energy, Utilities and Climate, Ministry of Higher Education and Science **Latest submission:** 2022/2023 **Latest available data:** 2022 **Funding institutions/programmes included in the submission** • Ministry of Higher Education and Science • Danish Innovation Fund • Ministry of Climate, Energy and Utilities • Energy Technology Development and Demonstration Program • ELFORSK **Budgetary stage information** Data are based on obligations for 2021 and 2022 (budgetary stage vi). **Data coverage** Excludes Greenland and the Faroe Islands. Figures included in the Danish submission consist exclusively of funding of project proposals directed towards Danish RD&D programs. Contributions to international organisations and programmes are not included. **State-owned enterprises coverage** Does not include data from state-owned companies in Denmark. **Private sector coverage** No data available

Denmark Definition (continued)	**Time series changes** N/A **Other information** N/A

Estonia	**Short name: ESTONIA**

Definition	**Source**: Ministry of Economic Affairs and Communications
	Latest submission: 2022/2023
	Latest available data: 2022
	
	Funding institutions/programmes included in the submission
	
	• Estonian Research Council (https://www.etag.ee/en/funding/programmes/)
	  ○ RITA, grant, personal funding
	• Ministry of Economic Affairs and Communications
	  ○ R&D programme for the National Development Plan of the Energy Sector until 2030
	• Research programmes are described here: https://www.hm.ee/en/activities/research-and-development/research-programmes
	
	Budgetary stage information
	
	No details available
	
	Data coverage
	
	Data are collected from a performer perspective as expenditures.
	All projects and other RD&D related activities by the evaluated institutions listed at: https://www.etis.ee/Portal/Institutions/Index?lang=ENG are registered at the Estonian Research Information System.
	
	State-owned enterprises coverage
	
	Data include state-owned energy companies belonging to the Republic of Estonia:
	• Eesti Energia (https://www.energia.ee/en/ettevottest)
	• Elering (https://elering.ee/en/about-company)
	
	Private sector coverage
	
	No details available
	
	Time series changes
	
	Data prior to 2011 are not available.
	
	Other information
	
	Data reported under the name of Coal actually correspond to oil shale.

Finland	Short name: FINLAND
Definition	**Source**: Statistics Finland on behalf of the Energy Department, Ministry of Economic Affairs and Employment **Latest submission:** 2022/2023 **Latest available data:** 2021 **Funding institutions/programmes included in the submission** • Ministry of Economic Affairs and Employment • The Finnish State Nuclear Management Fund • Tekes - Finnish Funding Agency for Innovation / Business Finland • VTT Technical Research Centre of Finland • Geological Survey of Finland • The Finnish Academy • Ministry of the Environment • Finnvera • Nordic Investment Bank • Ministry of Agriculture and Forestry **Budgetary stage information** No details available **Data coverage** R&D also includes demonstration budgets. **State-owned enterprises coverage** No data available **Private sector coverage** No data available **Time series information** From 2021 data, the classification used to collect the data has been updated. Not all institutions are able to submit at the most disaggregated level yet. Among the changes regarding the classification are the following: addition of hydrogen and fuel cells, split between electric and thermal storage, addition of geothermal energy, unallocated coal now includes coal (combustion & conversion) and peat research. **Other** N/A

France	Short name: FRANCE

Definition

Source: Service de la Donnée et des Etudes Statistiques, Ministère de la Transition Ecologique et Solidaire

Latest submission: 2022/2023

Latest available data: 2022

Funding institutions/programmes included in the submission

13 public scientific and technical institutions, industrial and commercial institutions, public interest groups or public funding programmes:

- Agence de l'environnement et de la maitrise de l'énergie (ADEME)
- Agence nationale pour la gestion des déchets radioactifs (ANDRA)
- Agence nationale de la recherche (ANR)
- Banque publique d'investissement (BPI)
- Bureau de Recherches Géologiques et Minières (BRGM)
- Centre national de la recherche scientifique (CNRS)
- Centre Scientifique et Technique du Bâtiment (CSTB)
- Commissariat à l'énergie atomique et aux énergies alternatives (CEA)
    - ITER, Jules Horowitz reactor project
- Institut français pétrole énergies nouvelles (IFPEN)
- Institut de radioprotection et de sûreté nucléaire (IRSN)
- Institut français de recherche pour l'exploitation de la mer (IFREMER)
- Institut national de la recherche agronomique (INRA)
- Institut français des sciences et technologies des transports, de l'aménagement et des réseaux (IFSTTAR)

Budgetary stage information

The French data submission is mostly based on actual budget outlays (budgetary stage vii), with a few French institutions reporting on obligations.

Data coverage

Government RD&D data cover central government units only.

It covers a combination of basic research/ applied research/ experimental development programmes as well as both energy related and fundamental research programmes.

French data include ITER contributions and exclude other EU or other international RD&D programmes and contributions to these programmes. Indirect funding related to the ITER project, via Euratom, is excluded from the submission.

Data are collected from a funder perspective as budget.

Includes Monaco and excludes the following overseas departments and territories: Guadeloupe, Guyana, Martinique, New Caledonia, French Polynesia, Reunion, and Saint-Pierre and Miquelon.

State-owned enterprises coverage

SOEs are not included in the submission due to the business secrecy rules applicable in France.

Private sector coverage

No data available.

France Definition (continued)	**Time series changes** In 2010 the French Administration revised the RD&D budgets back to 2002. This results in a break in series between 2001 and 2002. In 2018, International Thermonuclear Experimental Reactor (ITER) funding (via the Commissariat à l'énergie atomique et aux énergies alternatives -CEA-, GOVT R&D budgets) was added ("Other nuclear fusion" item) with also data from 2002 to 2017. In 2017, a new structure (specialized in nuclear waste management) was added with data since 2002. No incidence on GOVT demonstration budgets: only GOVT R&D budgets was updated. In 2021, the data transmitted by the CNRS (Centre national de la recherche scientifique) have been revised from 2002 to improve the coverage. The revision leads to an increase in the total RD&D expenditure by 21% on average over the period 2002-2019 (from a minimum of 15% in 2019 to a maximum of 28% in 2009). In 2022, the amount allocated to hydrogen demonstration projects has increased significantly. This mainly concerns the implementation of projects such as France 2030, which aims to accelerate innovation in certain sectors. One of the objectives is to decarbonize industry, of which hydrogen is a major component. Thus, 10 French hydrogen-related projects among the IPCEIs (Important Projects of Common European Interest) are to receive 2.1 billion in public funding by 2030. In addition, the collection method has been improved for 2022 to take better account of expenditure on demonstrators. **Other information** N/A

Germany	**Short name: GERMANY**
Definition	**Source**: Federal Ministry for Economic Affairs and Energy **Latest submission:** 2022/2023 **Latest available data:** 2023 **Funding institutions/programmes included in the submission** • 7th Energy Research Programme of the Federal Government • Federal Ministry for Economic Affairs and Energy • Federal Ministry of Education and Research • Federal Ministry of Food and Agriculture **Budgetary stage information** 2021 estimated data are based on actual outlays (budgetary stage vii). **Data coverage** Government RD&D data cover federal and state units. Data include basic research and applied research projects. Data cover national projects and national contributions to international RD&D efforts under the IEA TCPs. Figures on international or European programmes are not included. **State-owned enterprises coverage** No data available.

Germany Definition (continued)	**Private sector coverage** No data available. **Time series changes** With the transition to the 7th Energy Research Programme, the data for 2019 onwards are based on a new categorization of energy research funding. Data do not include the new Laender of Germany prior to 1992. From 2003 onwards, the institutionally financed R&D activities of the Helmholtz centers are included. From 2018 onwards, the institutional funding for non-nuclear energy research is mainly allocated to category 8, “Unallocated”. **Other information** All government energy RD&D expenditures for project funding are managed with the electronic accounting system profile. The Federal Ministry for Economic Affairs and Energy uses a fine-grained categorisation system to match project expenditures to the categories of national and IEA energy RD&D reporting. The other ministries use similar systems. The sample coverage is 100%.

Greece	**Short name: GREECE**
Definition	**Source**: General Secretariat for Research and Technology **Latest submission:** 2010/2011 **Latest available data:** 2011 **Funding institutions/programmes included in the submission** No details available **Budgetary stage information** No details available **Data coverage** No details available **State-owned enterprises coverage** No data available **Private sector coverage** No data available **Time series changes** From 2000 onwards, Greece has provided only aggregated data until 2007. **Other information** N/A

Hungary	Short name: HUNGARY
Definition	**Source**: National Research, Development and Innovation Office (NRDI) **Latest submission:** 2022/2023 **Latest available data:** 2022 **Funding institutions/programmes included in the submission** • National Research, Development and Innovation Office **Budgetary stage information** Data are based on obligations. **Data coverage** Data refer to projects supported by Hungarian budgetary funds (National research, development and Innovation Fund) and the projects co-financed by European Structural and Investment Funds (ESIF represented 75% of the total RD&D budget in 2017 and 80% in 2018). **State-owned enterprises coverage** No data available **Private sector coverage** No data available **Time series changes** Data for 1995, 1996, 1998 and 1999 are not complete. New data were received for the period 2013-2016 in cycle 2016/17, explaining the break in time series between 2012 and 2013. **Other information** In most of the cases in Hungary, RD&D funds are not allocated to a specific field of science but are assigned to different projects through tenders; thus, energy obligations may vary from year to year. Further details about Hungarian RD&D budget are available on the NRDI website.

Ireland	Short name: IRELAND

Definition

Source: Sustainable Energy Authority of Ireland
Latest submission: 2022/2023
Latest available data: 2022

Funding institutions/programmes included in the submission

- Sustainable Energy Authority of Ireland (SEAI)
- National Research Funding Programme
- Ocean Energy Prototype Development Fund
- Department of Agriculture, Food and the Marine (DAFM)
- Competitive Research Funding Programme
- Department of Transport
- National funding through departmental vote
- Green Public Transport Fund
- Environmental Protection Agency (EPA)
- EPA Climate Call
- EPA Strategic Partnership Award
- Enterprise Ireland
- Commercialisation Fund
- Geological Survey Ireland (GSI)
- Geothermica/GSI Research Programme
- Marine Institute
- Marine Institute's Marine Research Programme
- Marine Research Programme – Industry-led Awards
- Science Foundation Ireland (SFI)
- SFI Future Innovator Prize
- SFI Industry Fellowship
- SFI Research Infrastructure
- SFI Frontiers for the Future Programme
- Strategic Partnerships Programme
- Irish Research Council (IRC)
- Employment Based Postgraduate Programme
- EPS Postgraduate Application
- EPS Postdoctoral Application
- Ulysses
- Advanced Laureate Awards
- Government of Ireland Postgraduate Award
- Government of Ireland Postdoctoral Award

Budgetary stage information

Data from 2016 are based on awarded budgets (budgetary stage vi). The financial year runs from 1 January to 31 December.

Data coverage

For transnational projects (e.g., ERANET), only the financial contribution from the Irish agencies was included (when this information was made available to SEAI). For such projects, in-kind contribution from Irish agencies was not accounted for in the reporting (when this information was made available to SEAI); Irish funder's contribution had to be estimated in some cases. The value of funding provided by International/European organisations (e.g., European Commission etc.) is not included in the data.

Transnational projects in which Irish public funding agencies are participating as a partner or a lead were not included (e.g., Interreg projects).

Ireland Definition (continued)	**State-owned enterprises coverage** Ireland does not have any state-owned enterprises. **Private sector coverage** No data available **Time series information** Data prior to 2015 consist of funding of project proposals directed towards Irish energy RD&D programs and are based on reported “actual expenditures”. Data include deployment prior to 2010. Data from 2016 onwards refer to a new data methodology based on a data collection run by SEAI with the main organisations, listed above, which disburse public funding. **Other** Further information relating to energy RD&D projects funded in Ireland is available at the SEAI National Energy Database.

Italy	**Short name: ITALY**
Definition	**Source**: Department of Energy, Ministry of Environment and Energy Security **Latest submission:** 2022/2023 **Latest available data:** 2020
	Funding institutions/programmes included in the submission No details available
	Budgetary information No details available
	Data coverage The Italian GOV R&D survey is census-based. The target population includes all the institutions in the public sector (ESA 2010) known or assumed to perform R&D in the reference year, integrated with the Public Administration Register (with the exclusion of those units included in the Higher education sector -HES). In 2020, the target population comprised 387 public institutions. Government sector coverage: 99 % of the units (response rate for the reference year 2020). A list of potential R&D performing units is based on: • a list of known R&D institutes performing or funding research activities on a regular basis (ISTAT) • institutions reporting R&D in previous R&D surveys (ISTAT) • institutions receiving grants for R&D • institutions that applied to participate in the allocation of 5 per 1 000 of personal income tax (IRPEF) for scientific and university research and for health research (Italian Revenue Agency) **State-owned enterprises coverage** No data available

Italy

Definition (continued)

Private sector coverage

The Italian BES R&D survey is census-based, considering that the target population comprises all the active enterprises that potentially perform R&D, according to the information received from other statistical or administrative sources. In 2020, the target population comprised over 15 000 enterprises active in R&D.

Business sector coverage: 74% of the performers (response rate for the A reference year 2020)

The main statistical source used for defining the target population of R&D performers is the most updated release of the official Italian business Register, Asia 2018.

Other sources of information were:

- the inventory of the enterprises claiming tax relief for R&D activities and projects (Dichiarazione Unico from the Italian Agency for fiscal revenues of the Ministry of Economy)
- the list of the enterprises reporting R&D activities in the two previous R&D surveys
- the list of the enterprises reporting intramural R&D activities in the previous CIS
- the register of the innovative start-ups included in the Business Register of the Italian Ministry of Economic Development
- the register of the contributors to international research programs
- the list of the enterprises operating in one of the Italian Scientific and Technological Parks

Since 2016, ISTAT has implemented an imputation method to consider the non-response units. This action solves the issue of "under-estimations" of Italian business R&D expenditures and personnel, and it improves the quality of the results. It is a partial imputation of the non-response units because only the units in the previous two surveys that gave preliminary R&D data were considered in the imputation process. Specifically, in this process – based on a predictive regression imputation, applied to the two key variables (R&D expenditure and R&D personnel in FTE) – 3 631 non-response units were involved in the 2020 edition of the Italian BES R&D survey.

Time series information

N/A

Other

The Italian BES R&D survey is a web survey. The data collection made use of the ISTAT Business Statistical Portal, a single entry point for ISTAT web-based data collection from enterprises. ISTAT Business Statistical Portal implements a new approach for the organisation and management of data collection processes.

The Italian GOV R&D survey is a web survey, the technique used for data collection is the self-compilation of a web questionnaire, which can be accessed from the ISTAT website dedicated to the survey.

Japan — Short name: JAPAN

Definition

Source: Ministry of Economy, Trade and Industry
Latest submission: 2022/2023
Latest available data: 2022

Funding institutions/programmes included in the submission

- Ministry of Economy, Trade and Industry (METI)
- Ministry of Environment (MOE), from 2018 onwards
- Ministry of Education, Culture, Sports, Science and Technology (MEXT)

Japan Definition (continued)	**Budgetary stage information** Data provided are based on final budget appropriations (budgetary stage v). **Data coverage** Data provided do not include budgets related to international RD&D programmes. **State-owned enterprises coverage** No data available **Private sector coverage** No data available **Time series information** The items included in Conservation were expanded in 1994. Earlier budgetary data are not comparable. Data for Japan cover budgets allocated by METI for all years and include the spending of MOE for the first time in 2018. In 2018 MOE represented 13% of the total national budget, which explains the break in time series between 2017 and 2018. This also affects the aggregates “IEA Total” and “IEA Asia Oceania”. **Other** N/A

Korea	**Short name: KOREA**
Definition	**Source**: Ministry of Trade, Industry, and Energy (MOTIE), Korea Institute of Energy Technology Evaluation and Planning (KETEP) **Latest submission:** 2022/2023 **Latest available data:** 2022 **Funding institutions/programmes included in the submission** • Korea Institute of Energy Technology Evaluation and Planning (KETEP) **Budgetary information** Data are based on actual outlays. **Data coverage** Data include RD&D budgets based on the technology development and international cooperation reflected in the Energy R&D Program of the MOTIE. **State-owned enterprises coverage** No data available

Korea Definition (continued)	**Private sector coverage** No data available **Time series information** N/A **Other** N/A

Lithuania	**Short name: LITHUANIA**

Definition

Source: Ministry of Energy of the Republic of Lithuania
Latest submission: 2022/2023
Latest available data: 2023

Funding institutions/programmes included in the submission

- Ministry of Economy and Innovation of the Republic of Lithuania
- Ministry of Environment of the Republic of Lithuania
- Ministry of Transport of the Republic of Lithuania
- Ministry of Education, Science and Sports of the Republic of Lithuania
- Lithuanian Science Council
- Public Institution Innovation Agency
- State Research Institute Center of Physical and Technological Sciences
- Lithuanian Energy Institute
- UAB Ignitis
- AB Amber Grid
- LITGRID AB
- AB ESO
- Joint-stock company Klaipėdos nafta
- Vilnius Gediminas Technical University
- Kaunas University of Technology
- Vilnius University
- Klaipėda University
- Vytautas the Great University
- Association of Scientific Research and Technology Organizations

Budgetary information

Figures for the year 2022 are actual outlays and figures for the year 2023 are obligations.

Data coverage

N/A

State-owned enterprises coverage

State-owned utilities data are submitted separately in the SOE section and cover UAB "Ignitis", AB Amber Grid, LITGRID AB, UAB EPSO-G and AB ESO.

Lithuania Definition (continued)	**Private sector coverage** No data available **Time series information** Data prior to 2019 are not available. **Other** N/A

Luxembourg	**Short name: LUXEMBOU**
Definition	**Source**: Ministère de l'Economie, Direction générale Recherche, propriété intellectuelle et nouvelles technologies **Latest submission:** 2013/2014 **Latest available data:** 2012 **Funding institutions/programmes included in the submission** • Luxembourg Government, conventions are double signed by both the Minister of Economy and Minister of Finance. **Budgetary stage information** Data provided are based on obligations (budgetary stage vi). **Data coverage** The figures provided do not show the split between R&D and Demonstration since the split is not available within current reporting scheme. **State-owned enterprises coverage** No data available **Private sector coverage** No data available **Time series information** Luxembourg has provided just partial information for 1991 to 2000. **Other** N/A

Mexico	Short name: MEXICO

Definition

Source: Secretaría de Energía – Dirección General de Investigación, Desarrollo Tecnológico y Formación de Recursos Humanos

Latest submission: 2022/2023

Latest available data: 2023

Funding institutions/programmes included in the submission

- SENER – CONACYT
- Fondo Sectorial de Hidrocarbos
    - Fonda Sectorial de Sustentabilidad Energética

Budgetary information

No details available

Data coverage

The data cover national projects, national contributions to international RD&D efforts under the IEA Technology Collaboration Programmes. It includes contribution committed by the Energy Sustainability Fund for a project in collaboration with the European Commission.

State-owned enterprises coverage

There are two SOEs in Mexico:

- Petróleos Mexicanos (PEMEX)
- Comisión Federal de Electricidad (CFE)

They are not included in the submission.

Private sector coverage

No data available

Time series information

Data for Mexico are available starting in 2013.

Other

N/A

Netherlands	Short name: NETHLAND
Definition	**Source**: Netherlands Enterprise Agency (RVO.nl), Ministry of Economic Affairs and Climate Policy **Latest submission:** 2022/2023 **Latest available data:** 2022 **Funding institutions/programmes included in the submission** • Netherlands Enterprise Agency (RVO) • DIE+ – Demonstratie Energie- en Klimaatinnovatie • MOOI – Missiegedreven Onderzoek, Ontwikkeling en Innovatie • TSE Industrie studies • TSE Industrie Onderzoek & Ontwikkeling • HER – Hernieuwbare Energietransitie (2022 not complete yet) • PPS toeslag Onderzoek en Innovatie • TSE Systeemintegratie • Dutch Research Council (NWO) • Netherlands Organisation for applied scientific research (TNO) • Nuclear Research and Consulting Group (NRG) **Budgetary stage information** Data submitted are based on obligations (budgetary stage vi). **Data coverage** The data cover grants funded before 1 May 2023. RD&D budgets and expenditures of universities, as well as funding from local governments programs, are not included in the submitted data. Excludes the former Netherlands Antilles. The Netherlands submission does not include EU or international RD&D programmes, nor the Dutch contributions to IAEA, ITER or CERN. **State-owned enterprises coverage** No data available **Private sector coverage** No data available **Time series information** N/A **Other** The data are also published in the publication IEA Publiek gefinancierd energie onderzoek.

New Zealand	Short name: NZ

Definition

Source: Ministry of Business, Innovation and Employment
Latest submission: 2022/2023
Latest available data: 2021

Funding institutions/programmes included in the submission

- Ministry of Business, Innovation and Employment
  - Endeavour Fund
  - Strategic Science Investment Fund Programmes
  - National Science Challenges and Partnerships
  - Provincial Development Unit
- Callaghan Innovation

Budgetary stage information

The data provided are based on actual expenditures.
The data refer to the financial year; for example, 2021 refers to 1 July 2021 to 30 June 2022**,** except the Unallocated data which refer to the calendar year.

Data coverage

Government RD&D data cover central and state units.
Only national projects are covered in public energy RD&D.

State-owned enterprises coverage

There is one SOE, Transpower New Zealand Limited, for which no RD&D spendings have been identified.

Private sector coverage

No data available

Time series information

For cycle 2022/2023, the reallocation of projects to accommodate for the update of the ANZSRC research classification has been finalised. At the disaggregated level, this leads to time series breaks and improvement of the detail availability in a few cases.
there was a reallocation of codes, as the ANZSRC codes used to classify research have been revised. This may have a small impact on categorisation for fiscal year 20/21. Previous years have not been revised.
Callaghan Innovation have reviewed their history of allocating grant funds to energy-related projects. The timeseries has been revised from 2018 in the Unallocated category.

Other information

The value for 2021 GOVT R&D in Unallocated corresponds to the spendings of one government agency which didn't provide updated data for the current cycle.

Norway	Short name: NORWAY
Definition	**Source**: Climate, Industry and Technology Department, Ministry of Petroleum and Energy **Latest submission:** 2021/2022 **Latest available data:** 2023 **Funding institutions/programmes included in the submission** • The Research Council of Norway • Enova SF • Innovation Norway • The Norwegian Water and Energy Directorate • Gassnova SF. • Statnett • Statkraft **Budgetary stage information** The budgetary stage is different depending on the submitting institution. Some data are based on grants to individual projects while others are based on state budget allocation, depending on which funding scheme the data is collected from. **Data coverage** Includes the Svalbard archipelago (Spitsbergen). Allocations for International R&D programmes are, in general, not included. However, support of Norwegian participation in ERA-NET Cofunds is included. In addition, some national programmes provide financial support to Norwegian actors that participate in international programmes. Such schemes are included in the Norwegian submission of the RD&D questionnaire. **State-owned enterprises coverage** Included: • Statnett • Statkraft Not included: • Equinor (only partially state-owned) **Private sector coverage** No data available **Time series changes** N/A **Other information** The Norwegian schemes for governmental RDD support are, for the most part, technology neutral. The actual allocations each year to various energy fields and technologies are based on the quality of the projects responding to the calls, i.e., competition among researchers and projects proposals, where the best projects are funded within available budgets. Reporting on final budget appropriations is only possible for very broad fields such as petroleum, CCS and energy efficiency/ renewable energy/ energy system/ storage.

Poland	Short name: POLAND

Definition

Source: Department of Innovation and Development, Ministry of Science and Higher Education

Latest submission: 2021/2022

Latest available data: 2022

Funding institutions/programmes included in the submission

- Ministry of Science and Higher Education (MSHE)
- National Centre for Research and Development – agency funding applied research
- National Centre of Science – agency funding basic research)

Budgetary stage information

Data are based on obligations.

Data for 2022 are only initial estimation for ongoing or planned projects. The final data for this period will vary and should be higher.

Data coverage

Other Polish ministries and institutes, which fund demonstration projects and marginally R&D projects (MSHE is the primary funder of R&D projects), are not included.

Only R&D projects are included in the submission. Demonstration projects are not included.

Data reported include R&D projects funded or co-funded from public money. Financial means from EU structural funds are also included (Contributions from international organisations and EC framework programmes like H2020 are not included).

All projects funded from science budget, including “State-owned R&D” and “Government pilot projects”, are included in the submission.

Data reported do not include all funds on energy R&D from MSHE’s budget (may include less than 50%). This is due to the structure of Polish science budget, which is divided into definite financing streams (based on a legislative regulation). Approximately half of the science budget is appropriated on statutory tasks of scientific institutions and other tasks that means that it is not the government (MSHE) that decides the objective of the funds but R&D institutions, including academia. As a result, funds on statutory tasks – as far as division on definite economy sectors is concerned, e.g., renewable energy – is difficult to measure.

State-owned enterprises coverage

No data available

Private sector coverage

No data available

Time series changes

The decrease in energy R&D fundings compared to the 2010-2015 period is caused by the schedule of priorities implementation in the National Research Program. Energy was one of seven main country R&D priorities. The largest R&D projects were launched in 2010 and ended in 2015. In the following years, projects from other priorities were carried out. However, in September 2021, the government launched a new strategic R&D programme in the field of energy (the budget for 2021-2029 is 800 million PLN) and other R&D programmes dedicated to the European Green Deal have been launched and will be financed in the next several years.

Poland	**Other information**
Definition (continued)	In Poland, the Ministry of Science and Higher Education is responsible for financing research (basic and applied research projects, experimental development and research infrastructure), while “sectoral” ministries (e.g. ministry for energy, climate, agriculture, environment, defence etc.) are responsible for the implementation of demonstration projects and for the deployment of new technologies in their respective areas. Data reported are not official statistical data, but only estimations based on analysis carried out by MSHE and its supervised funding agencies. Data provided are based on obligations (Minister’s and its agencies programmes and projects) and on the individual analysis of the projects themselves. The Polish Statistical Office delivers official statistical data for R&D in Poland. From 2013, the Polish Statistical Office presents government budget appropriations or outlays for R&D by socio-economic objectives (NABS), where energy is 1 of 13 objectives (among others are environment, agriculture, health, defence). However, those data are not detailed and divided into sub-areas as RES, fossil fuels, nuclear etc.).

Portugal	Short name: **PORTUGAL**
Definition	**Source**: Direção Geral de Energia e Geologia **Latest submission:** 2022/2023 **Latest available data:** 2022 **Funding institutions/programmes included in the submission** • National Foundation for Science and Technology • MIT Portugal Other institutions are also included in the submission. **Budgetary stage information** The data for 2021 are based on actual outlays The data for 2022 are based on forecast calculated based on the assumption that budgets grow at the same rate as GDP forecast published by the European Commission for Portugal. **Data coverage** Includes the Azores and Madeira Islands. The financing budgets include expenditure on human resources related to the relevant energy projects. Energy-related projects undertaken with the European Union or other countries (bilaterally or multilaterally) are included in the Portuguese energy RD&D data. **State-owned enterprises coverage** No data available **Private sector coverage** The Private-Sector energy R&D budget groups the expenditures of the Business and Enterprise and the PNP sector. **Time series changes** In 2013, the total budget triples because the figures include salaries and EU financing.

Portugal Definition (continued)	From 2016 onwards, data include funding from the Nation Foundation for Science and Technology and other funding agencies. **Other information** Information on the yearly survey are available here: https://www.dgeec.mec.pt/np4/206/ The data for 2021 were sorted based on replies to question 5 (Energy) of the Survey of the National Scientific and Technological Potential (IPCTN) provided by the universities/companies that perform RD&D. In this question, the nomenclature of socio-economic objectives (SEO) is based on the Nomenclature for the Analysis and Comparison of Scientific Programmes and Budgets (NABS 2007). For the 2021 survey, the IPCTN19 questionnaire form disaggregated the Energy objective to comply with the one-digit level of the IEA questionnaire. The IPCTN follows the internationally established guidelines (OECD, Frascati Manual, 2015) with four institutional sectors: Business and Enterprise (Empresas), Government (Estado), Higher Education (Ensino Superior) and Non-profit Private (Instituições privadas sem fins lucrativos).

Slovak Republic	**Short name: SLOVAKIA**
Definition	**Source**: Department of International Energy Relations, Ministry of Economy of The Slovak Republic **Latest submission:** 2022/2023 **Latest available data:** 2023 **Funding institutions/programmes included in the submission** • Ministry of Education, Science, Research and Sport of the Slovak Republic (MESRS SR) http://www.minedu.sk/about-the-ministry/ • Slovak Research and Development Agency – SRDA https://www.apvv.sk/?lang=en • Scientific Grant Agency – VEGA http://www.minedu.sk/vedecka-grantova-agentura-msvvas-sr-a-sav-vega/ • Research Agency – RA http://www.vyskumnaagentura.sk/en/; • Slovak Innovation and Energy Agency – SIEA http://www.siea.sk/. **Budgetary stage information** No details available **Data coverage** Financial means from EU structural funds are included in the indicated amounts. Data concerning specific budgets for demonstration projects or any “seed-capital” budgets for R&D are not available. **State-owned enterprises coverage** No data available **Private sector coverage** No data available **Time series information** N/A

Slovak Republic	**Other**
Definition (continued)	The Ministry of Education, Science, Research and Sport of the Slovak Republic (MESRS SR) is the central body of the state administration of the Slovak Republic for elementary, secondary, and higher education, educational facilities, lifelong learning, and science, and for the state's support for sports. The R&D agenda belongs to competencies of MESRS SR and is supported from the state budget via grant agencies (Slovak Research and Development Agency – SRDA, Scientific Grant Agency – VEGA). The use of structural funds of European Union for research and development are administered by dedicated agency Research agency (RA) or directly via relevant section of MESRS SR - EU Structural Funds Section. Industries and private companies are cooperating with academic institutions, but the funding for these activities is small. Incentives for R&D – support from the state budget in SMEs and their cooperation with academic institutions – is implemented through Law no. 185/2009 Coll. and Commission Regulation (EU) No. 651/2014 (until now, no. 800/2008).

Spain	**Short name: SPAIN**
Definition	**Source**: Subdirección General de Planificación, Seguimiento y Evaluación, Ministerio de Ciencia e Innovación, Subdirección General de Prospectiva, Estrategia y Normativa en Materia de Energía, Ministerio para la Transición Ecológica y el Reto Demográfico **Latest submission:** 2022/2023 **Latest available data:** 2021 **Funding institutions/programmes included in the submission** • Ministry of Science and Innovation • National Research Agency (AEI) • Center for Technological Development and Innovation (CDTI) • Ministry of Ecological Transition and Demographic Challenge • Institute for Energy Diversification and Saving (IDAE) • Center for Energy, Environmental and Technological Research (CIEMAT) • Superior Council of Scientific Research (CSIC) • National Institute for Space Technology (INTA) • Regional departments **Budgetary stage information** Data are based on final budget allocations. **Data coverage** Includes Autonomous Communities. **State-owned enterprises coverage** No data available **Private sector coverage** No data available

Spain Definition (continued)	**Time series changes** From 2021 data, the methodology for collecting the data has changed, resulting in a break in the time series between 2020 and 2021. The coverage has been expanded, including data from state and regional governments in a GBARD basis. **Other information** N/A

Sweden	**Short name: SWEDEN**
Definition	**Source**: Energy Analysis Department, Swedish Energy Agency **Latest submission:** 2022/2023 **Latest available data:** 2023 **Funding institutions/programmes included in the submission** • Swedish Energy Agency • VINNOVA – Sweden´s Innovation Agency • The Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas) • The Swedish Research Council (VR) • Affärsverket svenska kraftnät (SVK) **Budgetary stage** Data are based on actual outlays (budgetary stage vii). **Data coverage** International programmes such as ITER and expenditures to the IEA and the EU are included, but not the contribution for IEA and EU memberships. Data are collected from a funder perspective as budget. **State-owned enterprises coverage** State-owned enterprises exist but are not covered in the data. **Private sector coverage** No data available **Time series change** N/A **Other information** N/A

Switzerland	Short name: SWITLAND

Definition

Source: Swiss Federal Office of Energy, Energy Research & Cleantech
Latest submission: 2022/2023
Latest available data: 2022

Funding institutions/programmes included in the submission

- ETH domain
- basic financing and internal competitive programmes of the federal technical universities and research organisations (ETHZ, EPFL, PSI, EMPA, EAWAG, WSL)
- Swiss National Science Foundation (SNSF)
- (Open) project funding (fundamental research)
    - National Research Programmes
- Swiss Innovation Agency (Innosuisse)
- (Open) project funding (applied research)
    - Energy Programme (SCCER)
    - EUREKA
    - COST
- Swiss Federal Office of Energy (SFOE)
- Energy Research Programmes (incl. SWEET/SOUR)
- Pilot and Demonstration Programme
- Swiss Federal Nuclear Safety Inspectorate (ENSI)
- Nuclear Safety and Radioactive Waste Research Programme
- State Secretariat for Education Research and Innovation (SERI)
- Replacement measures for the European Framework Programmes
- Cantons
- basic financing of cantonal universities and universities of applied sciences

Budgetary stage

The numbers up to 2021 correspond to the effective expenditures of R&D institutions. The values for 2022 and 2023 are estimated based on 2021. Since there is no specific budget for energy related R&D in Switzerland that there is a broad variety of national/regional funding bodies, the value is estimated from the year before.

Data coverage

Estimated share of the sample of the total expenditure covered:

- Government: 100%
- All the Swiss federal research organizations receive the survey. All the institutions dealing in energy research do respond and declare their data in a remarkable degree of detail.
- Higher education: 100%
- All the Swiss universities and universities of applied sciences receive the survey. All the institutions dealing in energy research do respond and declare their data in a remarkable degree of detail.

State-owned enterprises coverage

No data available

Private sector coverage

No data available

Switzerland Definition (continued)

Time series change

N/A

Other information

Data are collected with a hybrid methodology by using voluntary surveys.

The Swiss RD&D statistics are based on the real expenditures per project. Data about projects entirely or partially funded by the federal government are available from federal databases. However, federal research organisations, federal and cantonal universities, as well as cantonal universities of applied sciences, also run internal or third-party financed projects (cantonal/private, national/international). Data about these projects are declared by the performers annually on a detailed questionnaire (per project, including several classifications/categories). About 30% of the total expenditures are based on the survey.

Republic of Türkiye — Short name: TURKEY

Definition

Source: The Scientific and Technological Research Council of Turkey (TÜBİTAK) and the Ministry of Energy and Natural Resources

Latest submission: 2022/2023

Latest available data: 2023

Funding institutions/programmes included in the submission

- Scientific and Technological Research Council of Turkey (TÜBİTAK) - Academic R&D Funding Directorate (ARDEB)
- Public Research Grant Committee (KAMAG)
- Technology and Innovation Grant Programs Directorate (TEYDEB)
- TÜBİTAK Marmara Research Center (MAM) Energy Institute, Chemistry Institute and Materials Institute

Budgetary stage

Turkish data are allocated and realised budgets (final budget appropriations, budgetary stage v) for the years 2021 and 2022. Only the budgets for 2023 represent estimated values.

Data coverage

The budget includes the public R&D funds that are provided to academic and private sector researchers, entrepreneurs, and/or research consortiums, including all related actors and public research institutes.

Based on the responsibility area of TÜBİTAK, all national values represent R&D budgets and not demonstration.

State-owned enterprises coverage

No data available

Private sector coverage

No data available

Republic of Türkiye

Definition (continued)

Time series change

Data for 2014-2018 include European R&D project financial resources allocated in the corresponding years. The total values are EUR 3.97 million in 2016 and EUR 8.48 million in 2017 that have been converted to national currency based on the annual average conversion rates.

Other information

N/A

United Kingdom — Short name: UK

Definition

Source: Department for Energy Security and Net Zero
Latest submission: 2022/2023
Latest available data: 2022

Funding institutions/programmes included in the submission

- Department for Energy Security and Net Zero (DESNZ)
- Department for Transport (DfT)
- Department for Business and Trade (DBT)
- Department for Environment Food And Rural Affairs (DEFRA)
- Foreign, Commonwealth and Development Office (FCDO)
- Department for Science, Innovation and Technology (DSIT)
- UK Research and Innovation Councils (UKRI)
- Scottish Government
- Welsh Government
- Nuclear Decommissioning Authority (NDA)
- UK Atomic Energy Authority
- Office for Low Emission Vehicles
- Ofgem

Budgetary stage information

All data refer to the UK financial year; for example, the data year 2021 correspond starts April 1, 2021, and runs until March 31, 2022.
Data for year 2022/23 are estimates based on available information at the time of the submission to the IEA.

Data coverage

Due to data coming from multiple sources in the UK government that provide differing degrees of detail, only certain sub-totals can be shown.
All programmes funded by the UK government, regardless of where they take place are included.

State-owned enterprises coverage

No data available

Private sector coverage

No data available

United Kingdom	**Time series change**
Definition (continued)	N/A
	Other information
	N/A

United States	**Short name: US**
Definition	**Source**: U.S. Department of Energy, for the years 2012 to 2015. IEA estimates from public sources for earlier years. **Latest submission:** 2016/2017 **Latest available data:** 2015
	Funding institutions/programmes included in the submission
	No information available
	Budgetary stage information
	No details available
	Data coverage
	Includes Puerto Rico, Guam and the Virgin Islands and the Hawaiian Free Trade Zone.
	State-owned enterprises coverage
	No data available
	Private sector coverage
	No data available
	Time series change
	There is a large increase in RD&D spending observed in 2009 due to the increased expenditures associated with the American Recovery and Reinvestment Act of 2009 (stimulus) spending. This is a one-year appropriation (although actual expenditures may go into future years), and so 2010 saw a significant decrease.
	Other information
	The item III.1.1 “Solar heating and cooling” is included under the item I.2 “Energy efficiency-residential and commercial” as it cannot be easily separated. The IEA is not able to provide any official information on energy technology RD&D for the United States, for the period 2016 onwards, due to lack of submission from the national administration. The IEA is closely working with the US administration to address this issue and looks forward to re-establishing the continuity of data provision. Please note that in the interim the Secretariat estimates for the years 2016 onwards included in previous editions of this database have been removed, although selected estimated datapoints for the US totals are still used to derive the time series of the IEA aggregate. We look forward to providing data at the country level in future editions.

European Union	Short name: EU

Definition

Source: European Union Directorate-General for Research and Innovation, Directorate for Energy

Latest submission: 2022/2023

Latest available data: 2021

Funding institutions/programmes included in the submission

- Horizon 2020
- Horizon Europe
- Innovation Fund (small-scale projects)

Budgetary stage information

Figures for the Horizon 2020 and Horizon Europe Framework Research Programmes refer to budget commitments, i.e., not yet paid – related to EU contribution to projects - up to year 2021. Budgets have been allocated to the year of the calls for proposals and are not spread across the duration of the project.

Funding figures for the Innovation Fund programme (call for 'Small-Scale Projects' InnovFund-SSC-2020) refer to the total amount of grants approved for selected projects, with 'year' attributed to the year when the award decision was made.

Data coverage

The figures for Horizon2020 and Horizon Europe projects include all relevant projects funded under calls for proposals in the years 2014 -2021.

Only project grants are considered – financial instruments or contributions to other initiatives are not included.

Only projects including an explicit reference to energy R&D objectives have been included.

Projects have been classified according to their contribution to energy-related R&D objectives as either “fully”, “partially” or “not” contributing. The EU contribution to projects fully contributing was considered fully (100%), while for projects partially contributing, only 40% of the EU contribution has been considered in the figures.

Besides the Horizon 2020 Societal Challenge “Clean, secure and efficiency energy”, the following programme parts contribute substantially to energy-related R&D objectives: “Nanotechnologies, Advanced Materials, Biotechnology, and Advanced Manufacturing and Processing (NMBP)”, “Smart, Green and Integrated Transport”, “European Research Council”, “Marie Skłodowska-Curie Actions”, “Information and Communication Technologies”, and “Innovation in SMEs”.

State-owned enterprises coverage

Not applicable

Private sector coverage

Not applicable

Time series change

The European Union revised data back to 2018 with the 2020 submission, to improve the attribution of funding to the specific years and technology categories.

Sectoral break-down of funding figures related to 2021 may shows significant differences versus 2020. This has to do with the fact that a new Framework Research programme (Horizon Europe) was started in 2021.

European Union Definition (continued)	2021 Funding figures under 'GOVT Demonstration' (all related to the Innovation Fund Small-scale projects) were in the previous reported under year 2020. This is a correction made to align with the approach taken for GOVT R&D funding, i.e., only projects for which finalised budget commitments are included. **Other information** The EU provided substantial support to energy harvesting and the “Smart Cities and Communities” initiative. As there is no dedicated category in the current template for “Smart Cities and Communities” (SCC), which is a very substantial spending item for the EU Horizon 2020 programme, SCC is included under item 73 “Other cross-cutting technologies and research – Other” in the current figures. SCC is covering energy efficiency in buildings and transport as well as renewable energy and electricity transmission and distribution.

IEA Publications

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