

# Public RD&D budget data collection: IEA's perspective

Domenico Lattanzio, International Energy Agency

Energy Big Push Workshop, 30 October 2019, Brasilia

- **1.** Capacity building. Work with countries to collect better data, including non-IEA.
- 2. Network. Gather different stakeholders to share expertise.
- **3.** Benchmark. Refer to a common and solid methodology for coherent analysis.
- **4. Data-policy integration**. Ensure the connection between policies and data

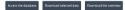
# Better data quality $\rightarrow$ Better policies $\rightarrow$ Better lives

# IEA work on energy technology RD&D

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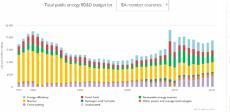
Energy Technology RD&D Tracking trends in spending on research, development and demonstration

The IEA's Energy Technology RD&D Budget Database allows users to track trends in spending by energy technology in IEA countries back to 1977. Data is collected from central or federal government budgets, as well as the budgets of state-owned companies, for spending on a range of sectors including energy efficiency, renewables, nuclear power, fossil fuels, hydrogen and fuel cells, and more. All figures refer to total public energy RD&D expenditure data, converted from current prices in national currencies to US dollar PPPs in constant 2018 prices, using GDP deflators and 2018 PPPs



#### Recent trends in RD&D spending

in 2018, the estimated total public energy research, development and demonstration (RDBD) budget for IFA member governments reached to \$18.9 billion (in purchasing power parity, or PPP, terms). After four years of decreases through to 2016, total public energy RD&D budget of IEA member countries increased in 2017 by 2% and again in 2018 by 4%, reaching a level 22% higher than in 2008 but still 8% lower than in 2012, and much lower than the peak reached in 2009. The 2018 increase was mostly other by higher budgets allocated to low-carbon energy technologies.



In PPP terms, the United States and Japan spent the most on energy RD&D among IEA member countries, followed by France, Germany, the United Kingdom, Canada, Korea, Italy and Mexico and for most of these countries, total public energy RD&D expenditure

The energy RD&D budget of the European Union, under the Horizon 2020 programme is now larger than countries: the USA and Japan. If the EU budget were added to IEA European



Belle 216 Korea: 4% Constanting of the United Kingdom: Shi

> Dancer 76 European Union 9%



A better understanding of the risks faced by investors requires timely and a shoritative data and This year's report finds that global energy investment stabilised in 2018, eneing three consecutive years of decline, as capital spenning on all, gas and coal supply bounced back while investment

Download report Read press release

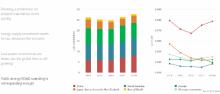
Home Overview Energy end-use and efficiency. Power sector: Fuel supply Einancing and funding trends RD&D and new technologies Data and Methodology

#### Key findings

Public energy RD&D spending is not expanding enough

While public energy RD&D spending rose modestly in 2018, led by the United States and China, most countries are not spending more of their economic output on energy research.

Spending on energy RD&D by national governments, and as a share of GDP



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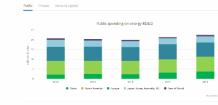
#### Overview

Innovation is a critical driver of clean energy transitions. Through research, investments and collaboration, breakthroughs are happening is a wide variety of energy technology fields, including solar PA, electric vehicles, but over and battery storate - being drive down costs, increasing efficiencies and boost of performent.

But much more needs to be done. The PA has developed this central innovation repository to provide research, exclosion and demonstration (SDNI) to analytic and private investment trade. from detailed technology roadmaps to timely commentaties; and from identifying "monosition gaps" to our

#### Investment in innovation

Global public investment in low-carbon energy technology research and development (R&D) grew again in 2018, by 5%, to \$23 billion. As a share of GDP, public energy R&D funding of the major economies is not growing, yet more innovation in clean energy technologies is needed. Corporate low-carbon energy R&D spanding also graw by 5% in 2018. Measuble, clean energy VC investment reached its birbest ever level at nearly \$7 billion, led by a sharp rise in investment in early-stage clean transport companies



Tracking global investment in clean energy Detailed data on energy technology RD&D innovation spending

EAs most rigorous and timely innovation analysis ever covers The IEA maintains a comprenensive database of trends in RD&D global #D&D spending by governments, coprorate clean energy spending in IEA countries on a range of sectors including energy investments and venture capital investments in clean energy efficiency, renewables, nuclear power, fossil fuels, hydrogen and technologies. fuel cells, and more.

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Commentary: Global patent applications for climate change mitigation technologies - a key measure of innovation - are trending down

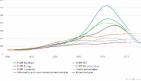
Dr Missel Circleras Rodríguez, Statistican, OCCD/DV/: Ivan Hatteit, Senior Contornist, OCCD/DV/: and



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One of the key measures of innovation in dimate change mitigation is showing worrying trends, according

Use advants added with the fact that is seen appendix give intervention in the method the provided in the period of the period o



What is particularly striking is that there is no evidence of such a drop off in patenting in general, or in

technologies, and thus lower propensity to patent. For example, many of the more recent developments nnovations from previous years. There is some limited support for such a hypothesis with less evidence of capture and storage.

Latest articles





# International work on energy technology RD&D



# The Global Energy Innovation Index: National Contributions to the Global Clean Energy Innovation System

Read Report Download Data

By Colin Cunliff and David M. Hart | August 26, 2019

Since 2015, 24 nations and the EU have joined "Mission Innovation," pledging to double public investments in energy RD&D and collaborate on key innovation challenges. This report seeks to provide accountability for these commitments and lay the foundation for more ambitious measures.



Mission Innovation is a global initiative working to accelerate clean energy innovation. The power of innovation – driven by sustained public investment coupled with business leadership – can make clean energy widely affordable and bring fledgling ideas into the mainstream.

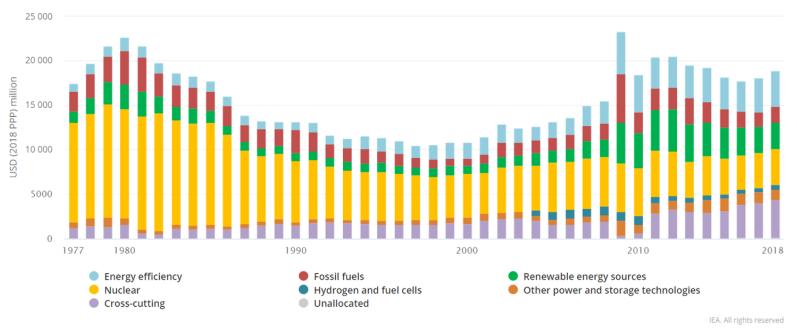


### OUR MEMBERS

ustainable Innovation Mission Innovation (MI) is a global initiative of 24 countries and the European Commission (on behalf of the European orum: facilitating Union). Find out more about our members, including annual progress reports. eater engagement public sector to accelerate clean energy \* 0 October 23, 2019 Austria Brazil Canada Mission Innovation (MI) is pleased to support the Sustainable Innovati.. Chile China European Union MI Secretariat Gathering

# IEA - October 2019 release

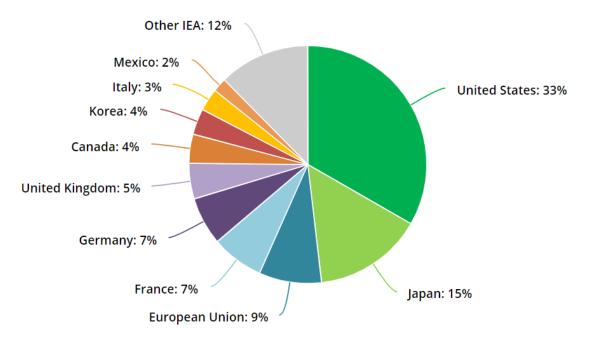
### Total public energy RD&D budget for IEA member countries



Available at https://www.iea.org/statistics/rdd/

In 2018, the estimated total public RD&D budget of IEA member countries reached to **\$ 19.6 billion** (in purchasing power parity, or PPP, terms)

# Total Public Energy RD&D budget shares – IEA Member Countries + EU



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USA and Japan spend the most on energy RD&D among IEA members, followed by France, Germany, UK, Canada, Korea, Italy, Mexico. For most countries, total public energy RD&D expenditure rose in 2018.

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Summary country RD&D budgets (Read-only)							
COUNTRY: Australia PRODUCT: Total RD&D in	Million USD (2018	3 prices and exch	rates)				
TIME	2014	2015	2016	2017	2018		
FLOW					0		
Group 1: Energy efficiency	23.843	23.720	16.684	21.440	24.556		
Group 2: Fossil fuels	124.991	51.876	32.900	51.776	53.174		
Group 3: Renewable energy sources	75.733	121.977	43.670	52.231	49.667		
Group 4: Nuclear	6.323	7.344	13.641	7.640	6.562		
Group 5: Hydrogen and fuel cells	3.271	3.341	3.018	4.483	24.095		
Group 6: Other power and storage technologies	8.609	13.526	14.522	12.938	15.196		
Group 7: Other cross-cutting techs/research	0.176	1.768	1.998	1.960	1.779		
Group 8: Unallocated	6.212	2.099	5.484	2.621	1.981		
Total budget	249.160	225.651	131.916	155.089	177.010		
Memo: Low-carbon	183.009	187.899	119.573	118.850	140.874		
Memo: Non-low-carbon	66.149	37.752	12.344	36.239	36.136		

### **B2020 - Database**

Raise the exposure of the energy technology RD&D data in different format to be able to reach all users

Available at https://www.iea.org/statistics/rdd/

Raise the profile of Energy RD&D data by enhancing accessibility

# October 2019 release – main features

	A	В	С	AR	AS	AT	AU	AV
1	Total RD&D spending in Million	Source: IEA All rights reserved ( http://www	v.iea.org/t&c/termsandconditions/ )					
2	Country	Currency	Economic Indicators	2014	2015	2016	2017	2018 Estimated
138	Canada	National currency (nominal)	Energy efficiency	139.179	144.22	103.171	175.915	271.876
139	Canada	National currency (nominal)	Fossil fuels	365.088	319.618	170.653	230.758	366.841
140	Canada	National currency (nominal)	Renewables	113.327	137.708	116.814	121.734	113.243
141	Canada	National currency (nominal)	Nuclear	124.559	169.26	147.449	133.295	149.183
142	Canada	National currency (nominal)	Hydrogen and fuel cells	13.444	12.584	21.193	21.66	23.075
143	Canada	National currency (nominal)	Other power and storage technologies	141.339	105.875	92.808	94.818	115.157
144	Canada	National currency (nominal)	Other cross-cutting technologies/research	39.318	5.253	8.851	20.326	22.42
145	Canada	National currency (nominal)	Unallocated	0	0	0	0	0
146	Canada	National currency (nominal)	Total Budget	936.254	894.518	660.938	798.505	1061.795
147	Canada	National Currency (2018 prices)	Energy efficiency	144.828	151.471	107.557	178.768	271.876
148	Canada	National Currency (2018 prices)	Fossil fuels	379.907	335.688	177.908	234.5	366.841
149	Canada	National Currency (2018 prices)	Renewables	117.927	144.632	121.78	123.708	113.243
150	Canada	National Currency (2018 prices)	Nuclear	129.615	177.77	153.718	135.457	149.183
151	Canada	National Currency (2018 prices)	Hydrogen and fuel cells	13.99	13.217	22.094	22.011	23.075
152	Canada	National Currency (2018 prices)	Other power and storage technologies	147.076	111.198	96.754	96.356	115.157
153	Canada	National Currency (2018 prices)	Other cross-cutting technologies/research	40.914	5.517	9.227	20.656	22.42
154	Canada	National Currency (2018 prices)	Unallocated	0	0	0	0	0
155	Canada	National Currency (2018 prices)	Total Budget	974.257	939.494	689.037	811.454	1061.795
156	Canada	USD (2018 prices and exchange rates)	Energy efficiency	111.75	116.876	82.992	137.938	209.781
157	Canada	USD (2018 prices and exchange rates)	Fossil fuels	293.138	259.019	137.275	180.941	283.056
158	Canada	USD (2018 prices and exchange rates)	Renewables	90.993	111.599	93.966	95.454	87.379
159	Canada	USD (2018 prices and exchange rates)	Nuclear	100.012	137.168	118.61	104.519	115.11
160	Canada	USD (2018 prices and exchange rates)	Hydrogen and fuel cells	10.795	10.198	17.048	16.984	17.805
161	Canada	USD (2018 prices and exchange rates)	Other power and storage technologies	113.485	85.801	74.656	74.349	88.856
162	Canada	USD (2018 prices and exchange rates)	Other cross-cutting technologies/research	31.569	4.257	7.12	15.938	17.299
163	Canada	USD (2018 prices and exchange rates)	Unallocated	0	0	0	0	0
164	Canada	USD (2018 prices and exchange rates)	Total Budget	751.742	724.918	531.664	626.122	819.286
165	Canada	USD (2018 prices and PPP)	Energy efficiency	115.955	121.274	86.114	143.129	217.675
166	Canada	USD (2018 prices and PPP)	Fossil fuels	304.169	268.765	142.44	187.75	293.708
167	Canada	USD (2018 prices and PPP)	Renewables	94.417	115.798	97.502	99.046	90.667
168	Canada	USD (2018 prices and PPP)	Nuclear	103.775	142.33	123.073	108.452	119.442
169	Canada	USD (2018 prices and PPP)	Hydrogen and fuel cells	11.201	10.582	17.689	17.623	18.475
170	Canada	USD (2018 prices and PPP)	Other power and storage technologies	117.755	89.03	77.465	77.147	92.199
171	Canada	USD (2018 prices and PPP)	Other cross-cutting technologies/research	32.757	4.417	7.388	16.538	17.95

### Database in Excel format now available!

Raise the exposure of the energy technology RD&D data in different format to be able to reach all users

Available at https://www.iea.org/statistics/rdd/

### Raise the profile of Energy RD&D data by enhancing accessibility

## Enhanced country information to increase transparency

	Co	untries and Reg	ions								
Country	Short name	Definition		Countries and Regions							
BELGIUM		Source: Belgium Federa Latest submission: 2013		Short name	Definition						
	Latest available data: 2017 Funding institutions included in the su Flemish region: The list of included institutions in the fig • Flanders Innovation & Entrepreneu- https://www.vlano.be/nl/ander=adoo innovation-entrepreneurship): • Innee (https://www.flandersnake.be/en):		Auded in the submission:           utions in the figures for Flanders:           1.& Entrepreneurship (VLAIO)( ent/andere-doelgroepen/flanders- neurship); imsec-int.com/ent/ome), Flanders Make	FRANCE	Source: Direction de la Recherche et de l'Innovation, Ministère d' l'Ecologie, du Développement Durable et de l'Energie Latest submission: 2018/2019 Latest available data: 2017 Funding institutions included in the submission: 14 publi scientific and technical institutions, industrial and commerci- institutions, public interest groups or public funding programs.						
		Cou	Intries and Regions		Country note: Includes Monaco, and excludes the following overseas department						
	Country	Short name	Definition		and territories (Guadeloupe, Guyana, Martinique, New Caledonia						
	Canada	CANADA	Source: Natural Resources Canada (NR Canada Latest submission: 2018/2019 Latest available data: 2018 Funding institutions included in the su based on data from 30 Federal Departments all Provincial and Territorial and Territorial energy RD&D related activities with municipalities. Country note: All data refer to the fiscal year, for examp 1st 2017 to March 31st 2018. Government figures include combined Departments and Agencies and all of Provin Data up to and including 2017 refer to achur 2017 are considered estimates based on thime of reporting. Each year, the data coi October and ends in March. Data include contributions to the followir programme/organizations: International Atomic Energy Agency (Ed.) O CECD Nuclear Energy Agency (Ed.) O CECD Nuclear Energy Advancement Immoviation (CEATI) 2012-2013 fiscal year was the first year C state-owned entities separately.	abmission: Figures are and Agencies as well as The Canadian process al organizations funding h the exception of e. 2017 refers to April i data from Federal eas and Territories. al outlays. Data beyond he available data at the lection period starts in ag international RD&D IAEA) ) through Technological	French Polynesia, Reunion, and Saint-Pierre and Miquelon). In 2010 the French Administration revised the RD&D budgets bac to 2002. This results in a break in series between 2001 and 2002. Estimates are not available even for 2016, mostly because R&D an demonstration data are real zeros. The French data submission is mostly based on actual budge outlays (budgetary stage vii), with a few French institution reporting on obligations. It covers a combination of basic research/ applied researcl experimental development programmes. The French submission does not include EU or international RD& programmes (e.g. ITER), nor contributions to these programmes.						

#### • The IEA database is published ection de la Recherche et de l'Innovation, Ministère de along with a country specific analysis which includes all the stitutions included in the submission: 14 public nd technical institutions, industrial and commercial public interest groups or public funding programs. assumptions/methodology onaco, and excludes the following overseas departments used for reporting the data. ies (Guadeloupe, Guyana, Martinique, New Caledonia, nesia, Reunion, and Saint-Pierre and Miquelon). French Administration revised the RD&D budgets back is results in a break in series between 2001 and 2002. re not available even for 2016, mostly because R&D and on data are based on projects. All zeros in R&D and

### Sources

- Funding institutions included in the submission
- Assumptions used
- Exclusions

Available at https://www.iea.org/statistics/rdd/

## Plans to further enhance data quality

#### PART I: DATA COVERAGE

	PART II: DATA CO	OLLECTION METHODOLOGY						
	🗌 [ (Please choose the methodology that you are using and fill the related questions under that methodology)							
	A. Measuri	ng Public Energy RD&D Budget	B. Measuring Public Energy RD&D Expenditure					
	Yes		□ Yes					
We will	🗆 No	PART III: DATA INTERPRETATION						
any pro	1. For which yea	1. Please describe any important polic	y initiatives related to energy RD&D in general and/or for any sub-technology level.					
Please : A. Gove	2. Please specify	2. Please clarify any significant change	es in time series by explaining the underlying reason with specific examples (if any).					
A. Gove a	<ol> <li>How do you n</li> <li>by official of</li> </ol>	types of projects covered.	ic energy research that cannot be allocated to a specific category", please provide an example of the					
c	by collectin	4. If you assign any spending to "Unall	ocated" energy research that cannot be allocated to a specific category, please provide an example of					
B. State	4. Are you able t □ Yes	<ol><li>What are your main difficulties in re</li></ol>	eporting public energy RD&D data?					
a t	No, pl     are not in		n existing reference document published or a link in your country, on which public energy RD&D data is					
c	5. Please add na with a few wo	7. How do you use the public energy F	D&D budgets data for policy and decision-making at the national level, with examples if possible?					
-	a. X b. Y c	8. According to your data sources, do	you think is it possible to separate energy RD&D budget/expenditure for international collaboration? If to separate the budget for international collaboration for each country?					
	<sup>1</sup> Forecasts, budget	describe the methodology, sample of	currently in place in your country focusing on private sector energy RD&D expenditures? If yes, please coverage and technology level coverage in details. Also, please share any questionnaire, metadata or any					
	- Forecasts, budget		u have an agenda to collect private sector energy RD&D expenditures? &D and innovation data or indicators are available in your country?					
		11. What kind of additional energy RD8	2D and innovation data or indicators would be useful for you?					
		12. If your country is a member of Missi fill the MI guestionnaire?	ion Innovation (MI) initiative, could you explain how you are using your IEA public energy RD&D data to					

Metadata are crucial to increase data quality.

In order to increase data quality of the current data collection, IEA will soon launch an **enhanced metadata collection** 

### The questionnaire includes 3 Sections:

- Coverage
- Collection methodology
- Interpretation

### IEA report cards – enhancing data quality with data providers

1- Submission process	Genera	d i
1.1 Submission in this cycle		
2- Timeliness and punctuality	Genera	ıl
2- Timeliness and punctuality 2.1 Timeliness of submissions	Genera	il

	Gove	Government		ed Companies
3 - Relevance	R&D	Demonstration	R&D	Demonstration
3.1 Data submitted (sector completeness)				
3.2 Data years submitted (time completeness)				
3.3 Level of disaggregation (technology completeness)				
3.4 Budgetary stage information				

### 4 - Comparability and coherence

4.1 Data representativeness & coverage				
4.2 Revisions between current and previous data cycles				

### 5 - Accuracy and reliability

5.1 Internal consistency of first submission			

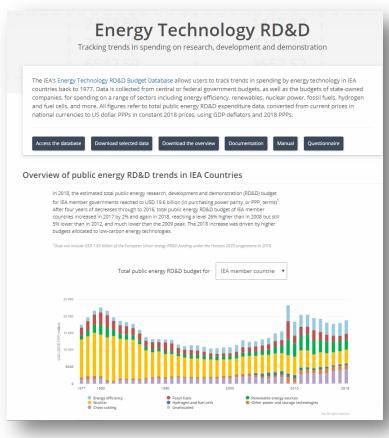
### 6 - Accessibility and clarity

6.1 Metadata survey answers quality and completeness

### 7 - Private sector data

7.1 Voluntary private sector data submission No data provided No data provided

# Dissemination: RD&D statistics website



### Raising the exposure of Energy Technology RD&D

- Database
- Interactive graphs
- Overview
- Excel file

## Manual



# IEA – Methodology review

### It covers national budgets & expenditures on:

- "Basic research" when clearly for development of energy-related technologies
- "Applied research" & "experimental development"
- "**Demonstration**" (large-scale but not on a commercial basis)

•and excludes:

- "Deployment"
- "Education and training" (partially excluded)
- "Administration and other supporting activities"

### 2 Reference publications

□ IEA guide to reporting energy RD&D budget/expenditure statistics

□ Frascati Manual , guidelines for definitions & surveys of R&D



IEA quide available at:

# What technologies do we cover?

Energy Efficiency	<ul> <li>Industry, residential, transport,</li> <li></li> </ul>
Fossil Fuels	• Oil, gas, coal, CCS,
Renewable Energy	• Solar, wind, biofuels,
Nuclear	• Fission, fusion
Hydrogen & Fuel Cells	Hydrogen, fuel cells
Other Power and Storage Technologies	<ul> <li>Power generation, T&amp;D, storage</li> </ul>
Other Cross-Cutting Technologies	<ul> <li>Cross-cutting and others, basic research</li> </ul>

7 Groups of energy related RD&D, 2-digit, 3-digit & 4-digit breakdowns available

