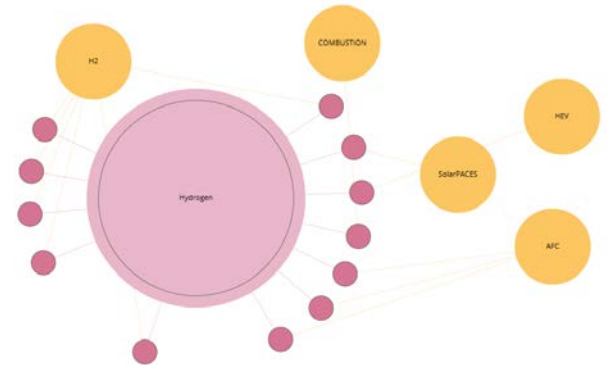


# Visualisation of IEA's Technology Cooperation Program

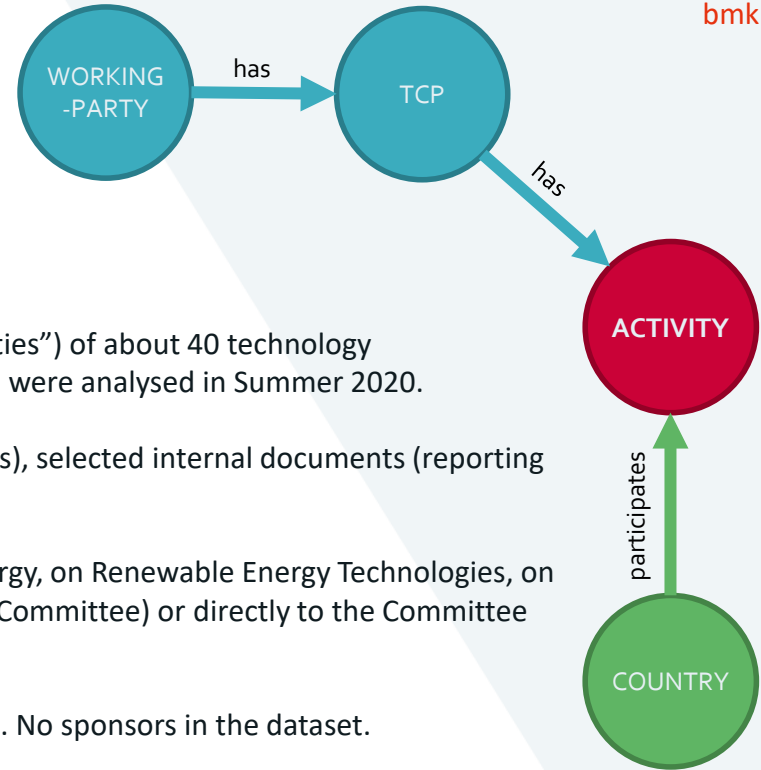
Update of the graph-based data structure, Web-Interfaces and more

Andreas Indinger | Lukas Eggler | Lukas Zwieb  
Austrian Energy Agency  
Vienna, April 2021



## Project background

- First mapping exercise finished in 2018. Linking tasks and annexes of all TCPs to (energy-) topics and the applied work methods allowed new insights. This helped to identify gaps and overlaps in an otherwise complex-to-overlook environment of worldwide technology collaboration in almost every energy sector.
- BUT: The raw dataset required some basic knowledge of graph databases in order to get the most out of it.
- Besides updating the dataset in 2020, the data was also made more accessible by providing new, dynamic web visualisations for some of the most interesting questions.
- The work was carried out by the Austrian Energy Agency and WIENFLUSS information.design.solutions KG on behalf of the Austrian Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK).



## Structure of TCPs in the data-set

- For the visualisation, all ongoing tasks/annexes (here called “activities”) of about 40 technology collaborations (TCPs) in IEA’s Technology Collaboration Programme were analysed in Summer 2020.
- Sources: publicly available information (website TCP, annual reports), selected internal documents (reporting of the TCP to the Working Parties).
- Each TCP is assigned to one of the 4 Working Parties (on Fossil Energy, on Renewable Energy Technologies, on Energy End-Use Technologies and the Fusion Power Co-ordinating Committee) or directly to the Committee on Energy Research and Technology (CERT).
- States can participate in activities (after joining the respective TCP). No sponsors in the dataset.
- Simplified structure: Joint tasks (tasks that run under several TCPs) were linked to only one TCP (The one that appeared more obvious).

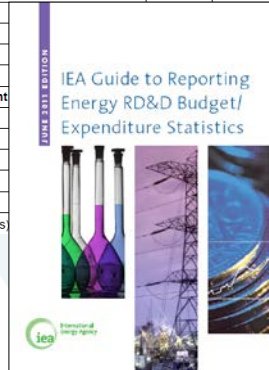
# R&D Budgets and Topic Topology

- Every activity was assigned to up to three topics.
- The topology corresponds to the IEA structure for energy RD&D budgets (4 hierarchical levels with 140 different categories).
- All IEA member countries send their RD&D budget data to IEA, which eventually will be assessed and published.

<https://www.iea.org/subscribe-to-data-services/energy-technology-rdd>

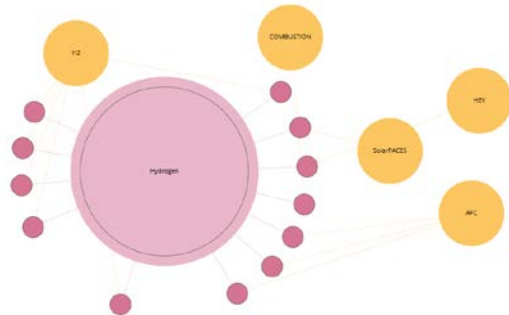
**Table 4**  
**Information on Government Energy RD&D Budgets (A)**  
 Millions, national currency

Years requested: 2014, 2015 estimated and 2016 estimated <small>One sheet to be filled out for RD&amp;D (excluding state-owned enterprises) and one sheet for state-owned enterprises.</small>	Year	
	R&D	Demonstration
BUDGETARY STAGE (see instructions on reporting issues)		
FISCAL YEAR STARTING		
<b>1 ENERGY EFFICIENCY (sum of rows 11 to 19)</b>		
<b>11 Industry</b>		
111 Industrial techniques and processes		
112 Industrial equipment and systems		
113 Other industry		
119 Unallocated industry		
<b>12 Residential and commercial buildings, appliances and equipment</b>		
121 Building design and envelope		
1211 Building envelope technologies		
1212 Building design		
1219 Unallocated building design and envelope		
122 Building operations and efficient building equipment		
1221 Building energy management systems (incl. smart meters)		



## Data and Visualisations

- Visualisations based on a graph database show the extensive activities of the TCPs.
- Interactive web interfaces were developed for five specific use cases, that enable a quick analysis of the most frequent questions without any pre-existing graph knowledge.



TCP Visualisation

- The overall dataset is available for own analysis. This dataset also contains further information on the internal structure of the technology program (allocation to various IEA Working Parties), the research expenditures of the participating IEA member countries and a classification of the type of activities.
- This data was supplemented by some multilateral initiatives in the fields of hydrogen, fuel cells and bioenergy.

# Austrias Worldwide Cooperations (German only)

- The interactive, zoomable world map shows the cooperation of Austria or Austrian organisations in the TCPs with almost 50 countries worldwide.
- The cooperations can be filtered by selecting a topic.
- By clicking on an actively displayed country, the number of joint activities (task participations) is shown. If a topic has been selected, the respective TCPs in which these cooperations take place are also listed.
- The country in the center (Austria) can't be changed in this interface, but the full dataset is freely available for custom analyses.



Wählen Sie ein Thema...

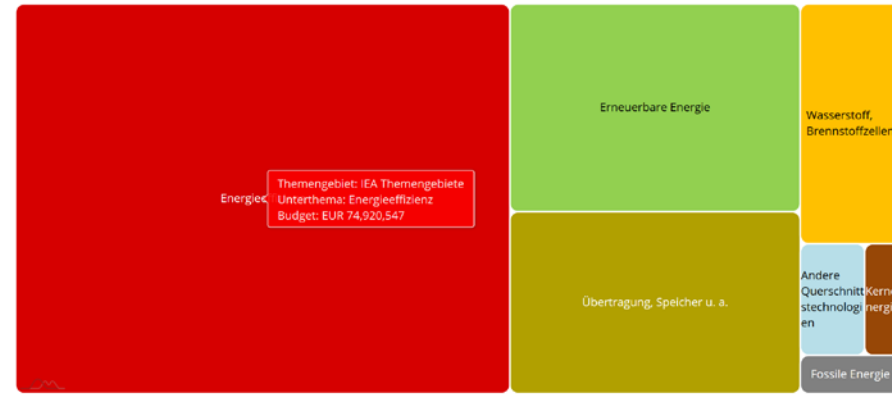
Alle Themen	Erneuerbare Energie (alle)
Energieeffizienz	Sonnenenergie
Fossile Energie	Windenergie
Erneuerbare Energie >	Bioenergie
Wasserstoff, Brennstoffzellen	Nicht-wardenbar-Erneuerbare
Übertragung, Speicher u. a.	
Andere Querschnittstechnologien	

**Mexiko (MX)**  
Anzahl der gemeinsamen Aktivitäten: 8  
In den Technologieprogrammen:

- Konzentrierende Solarenergie
- Fotovoltaik

# Austrias focus in RD&D-spendings and TCP Participation (German only)

- The treemap chart shows the public-sector investments in energy research in Austria for the most current year available (2019) and has a zoom-in function for subtopic-levels.
- Area size is proportional to RD&D spendings on the corresponding topic. The priorities, respectively money spent, decrease from the left (top) to the right (bottom).
- This interface provides further information on investments in subtopics and also dedicated links to a database with all Austrian participations in TCPs (publications, events, experts...).

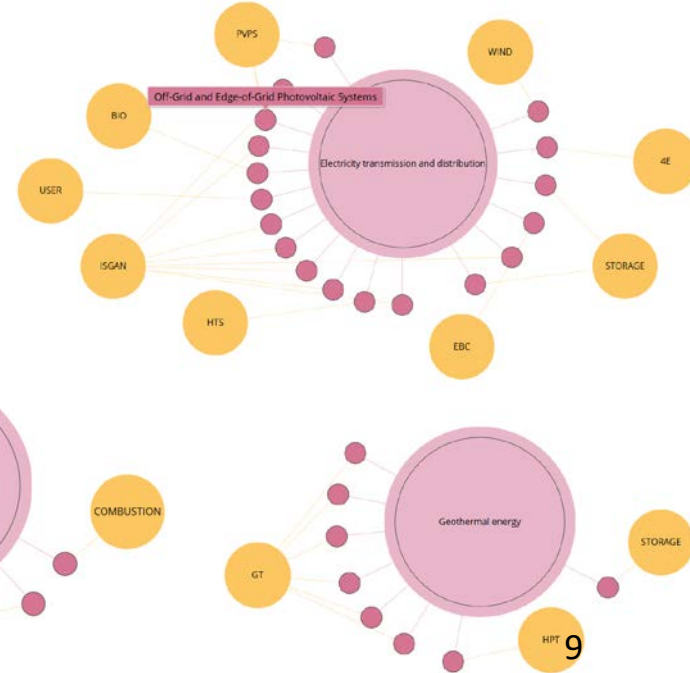
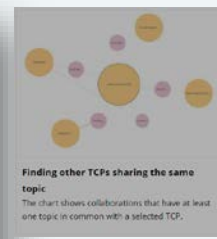






## Finding TCPs focussing on a topic

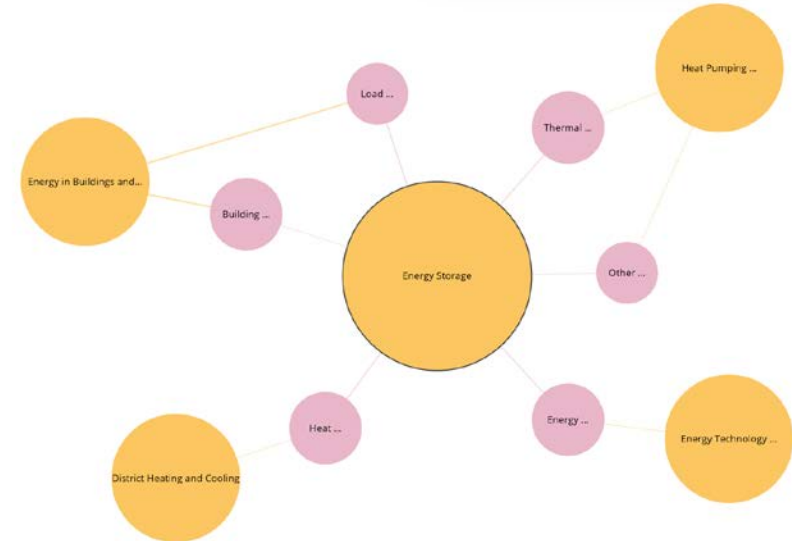
- After selecting a topic, this graph shows all tasks (activities) focussing on the selected topic. The topics are structured according to the IEA energy RD&D budget/expenditure statistics topology.
- Yellow nodes represent the related Technology Collaboration Programmes (TCPs).
- Energy experts are enabled to find relevant TCPs and Tasks, Governments will be supported in selecting and prioritising their funding and participation....
- Results cover ongoing activities (as of Summer 2020) from all IEA-TCPs
- Re-arrange the different bubbles to better meet the needs of your analysis. Use “mouse-over” to see additional information.
- If a TCP consists of more than one task (activity), it also contains one entry in the database labelled “ExCo-Activities”.







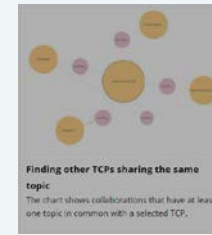
## Finding other TCPs sharing the same topic

- After selecting a Technology Collaboration Programme (TCP), this graph shows all other TCPs sharing at least one common topic.
- The topics are structured according to the IEA energy RD&D budget/expenditure statistics topology.
- This makes it easy to spot thematic overlaps between TCPs, so:
  - Working Parties can use this information to provide support for coordination
  - TCPs can explore future cooperation with other TCPs currently not „on the radar“.



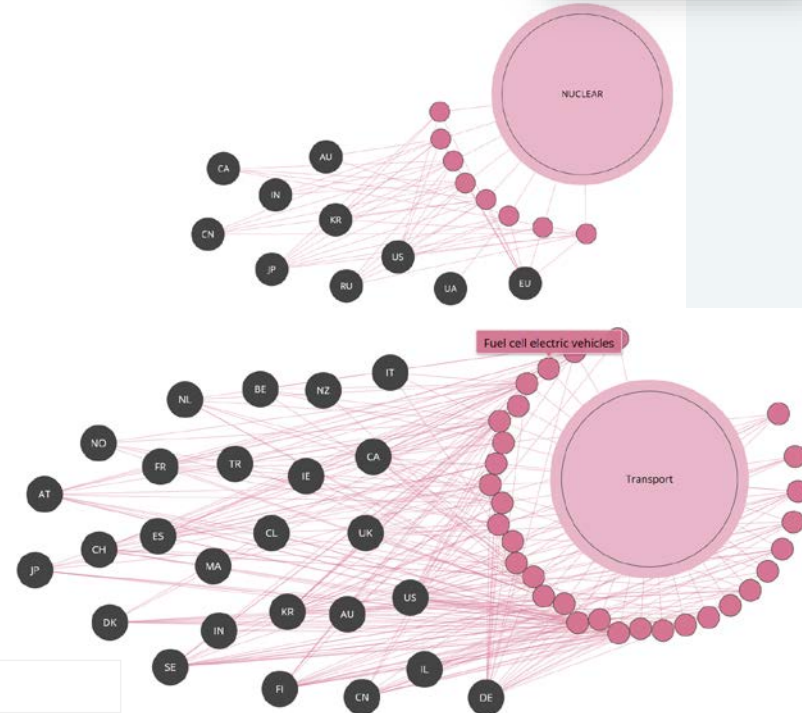
 Topic  Technology Programme

Edge-width: The more activities, the stronger the edges



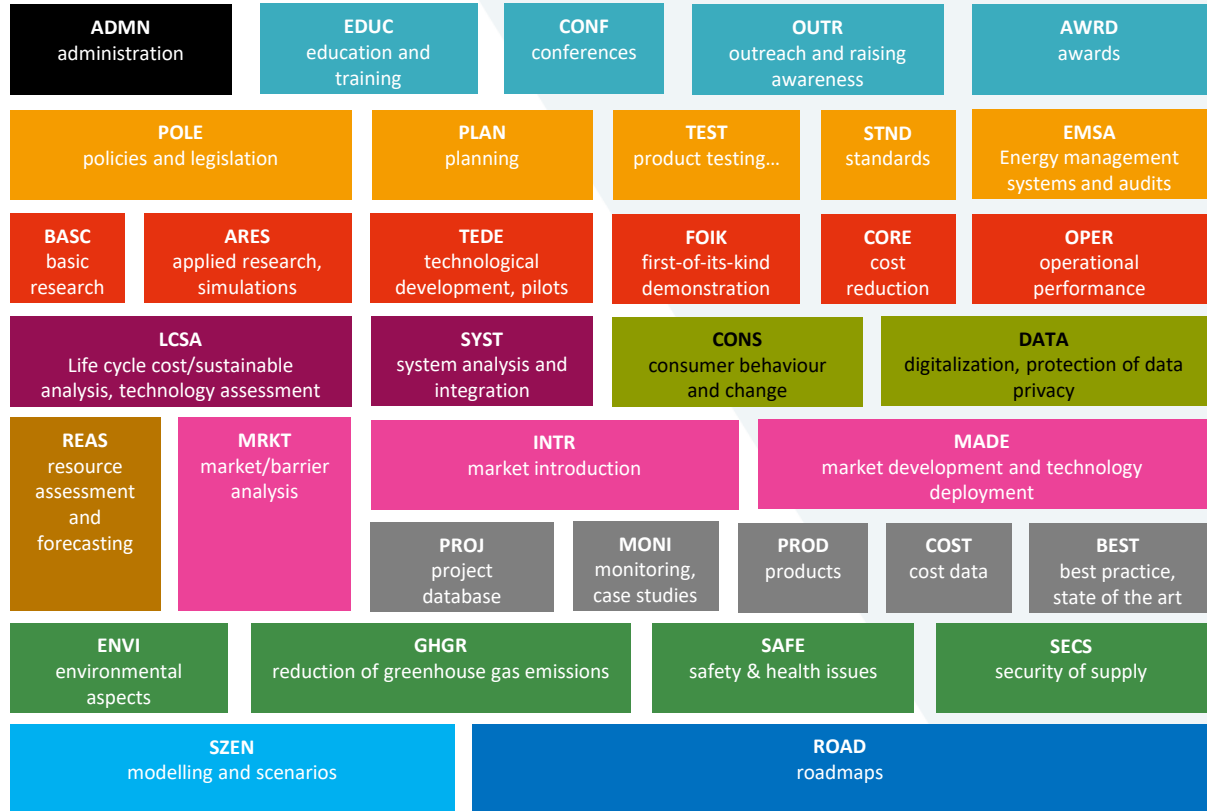
## Finding all countries engaged in a certain topic

- After selecting a topic, this graph shows all tasks (activities) having a focus in that particular topic.
- Countries participating in these tasks are displayed with their ISO code (AU, AT,...).
- Selecting one country (mouse-over), all participations in the selected topic are displayed (with the name of the TCP as additional information).
- Re-arrange the different bubbles to better meet the needs of your analysis.

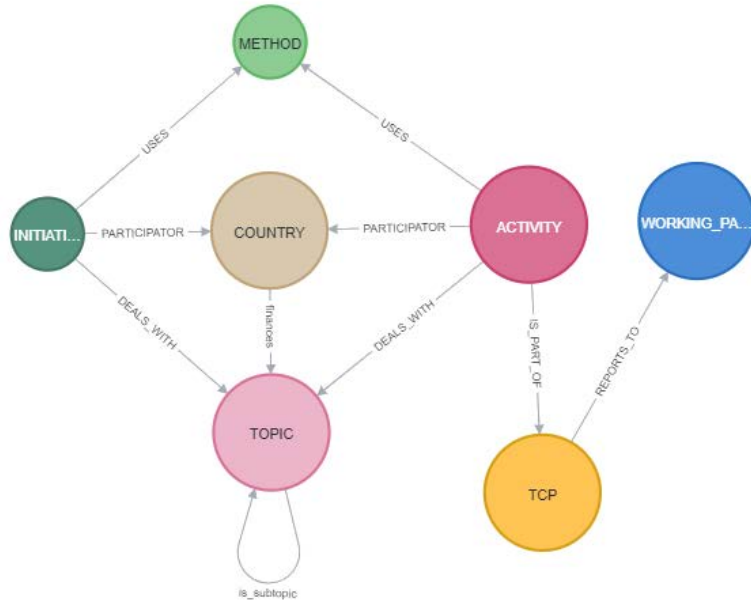


# Activities: Methods

- “What’s the task actually doing?”
- 35 “methods”, developed by AEA, as a classification of the type of activities.
- Each activity linked to up to three methods (mainly based on an assessment of work programmes presented on TCPs websites).



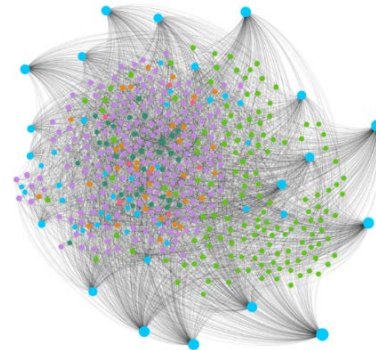
## Full dataset available for download



Graph-based data structure consisting of 600 nodes and 11.000 edges.

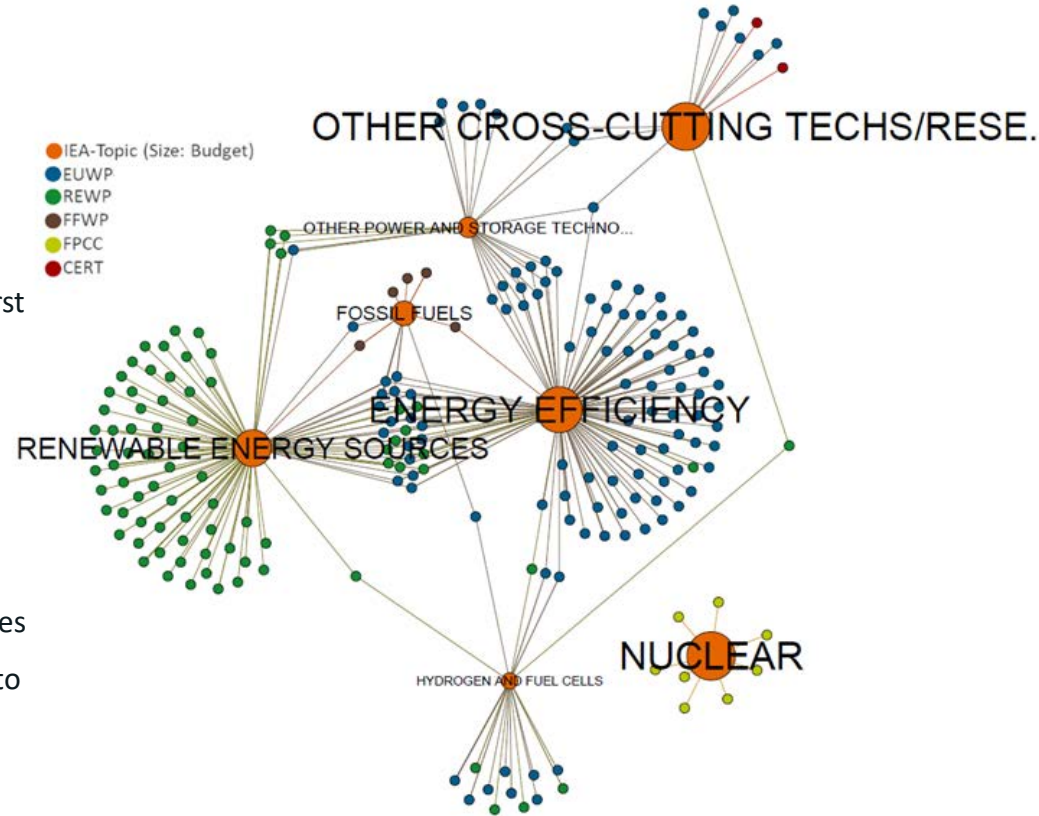
Dataset available for download along with updated handbook at [nachhaltigwirtschaften.at/iea-visualisations](https://nachhaltigwirtschaften.at/iea-visualisations)

Customized queries for individual analysis possible – see examples on the next slides and the handbook.



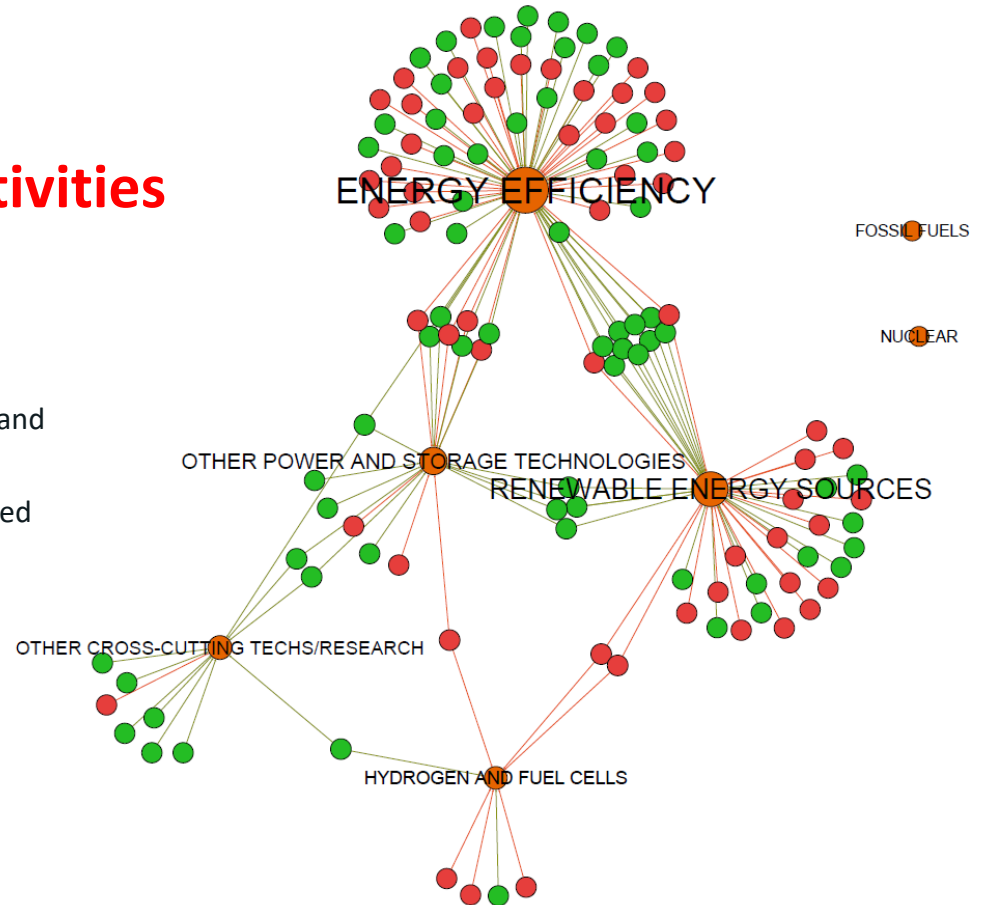
## Customized query: Mapping

- The topics are structured according to the IEA energy RD&D budget/expenditure statistics topology on the first hierarchy level (“IEA-Topic”, orange).
- Colour of small bubbles (activities, tasks) show the relationship of the TCP of this activity to one of the Working Parties.
- For example: many tasks which address both renewables AND efficiency topics, some attached to REWP, others to EUWP.



## Customized query: New Activities

- New analysis became available because of the data update (two survey dates).
- Many new tasks (green) between energy efficiency and renewables.
- Hydrogen-Hype? More tasks closed (red) than opened during the last two years ....
- Etc.









The work was carried out by the Austrian Energy Agency and WIENFLUSS information.design.solutions KG on behalf of the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK).

IEA FORSCHUNGS  
KOOPERATION

Andreas Indinger | Lukas Eggler | Lukas Zwieb  
Austrian Energy Agency  
[andreas.indinger@energyagency.at](mailto:andreas.indinger@energyagency.at)

