



Joint Programming Conference
Smart Energy Systems
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The Status of Research and Innovation on Heating and Cooling Networks as Smart Energy Systems within Horizon 2020

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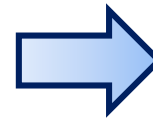
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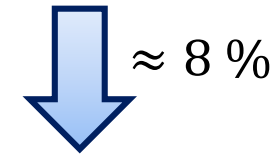


This project has received funding in the framework of the joint programming initiative ERA-Net Smart Energy Systems' focus initiative Integrated, Regional Energy Systems, with support from the European Union's Horizon 2020 research and innovation programme under grant agreement No 775970.

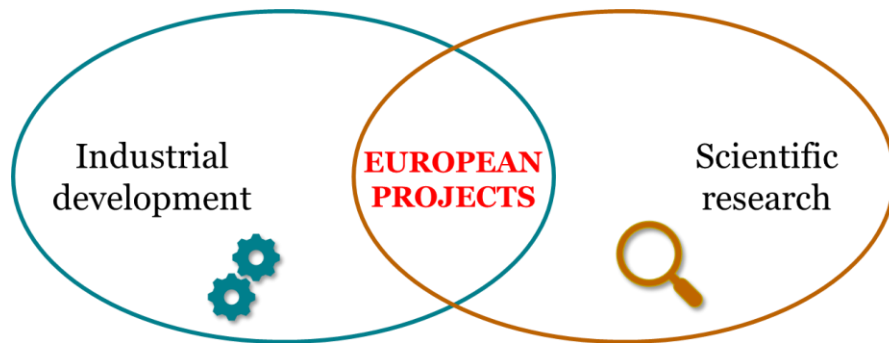
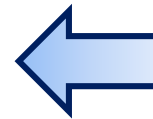
The European Union is greatly supporting **research and innovation** in the energy sector



80 billion € between 2014 and 2020



Secure, Clean and Efficient Energy



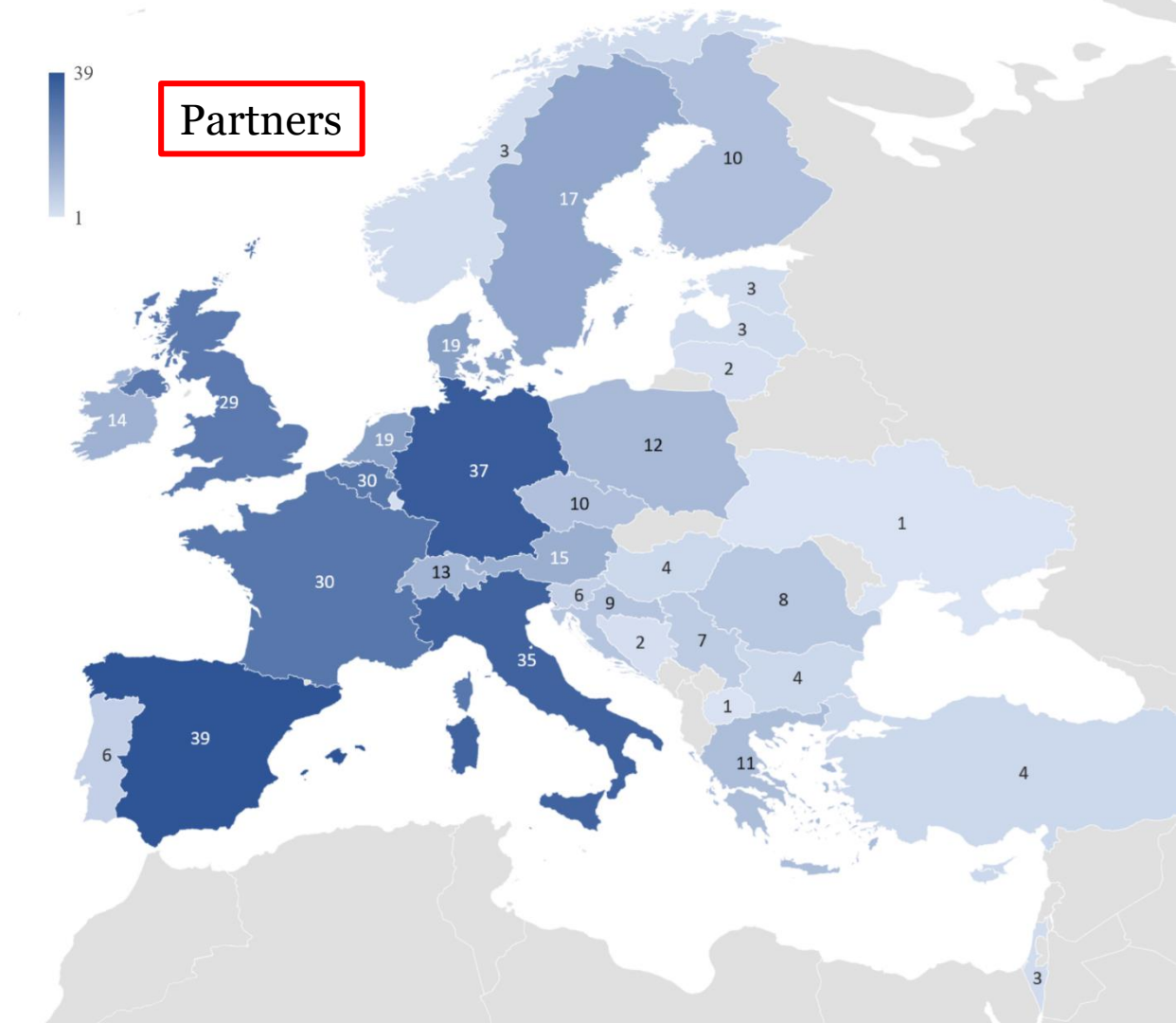
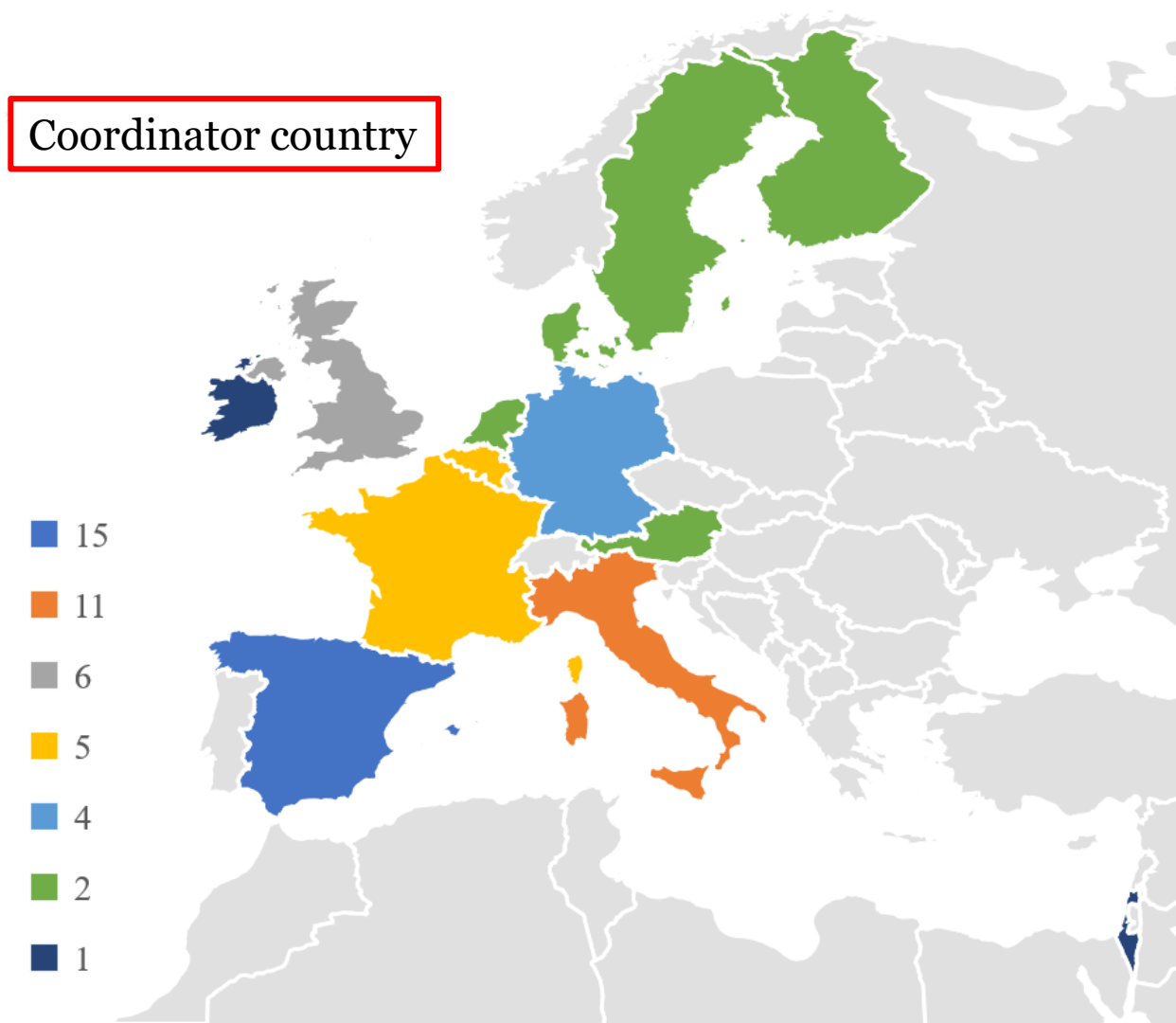
This work presents a map of **Horizon 2020** projects on **smart** heating and cooling systems



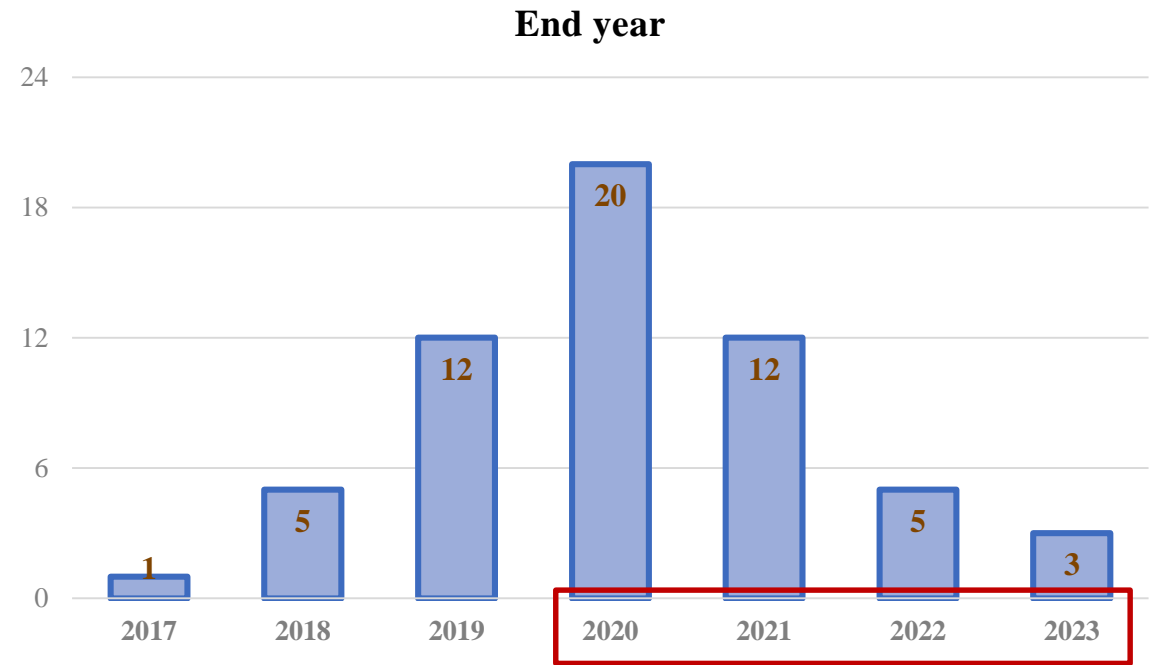
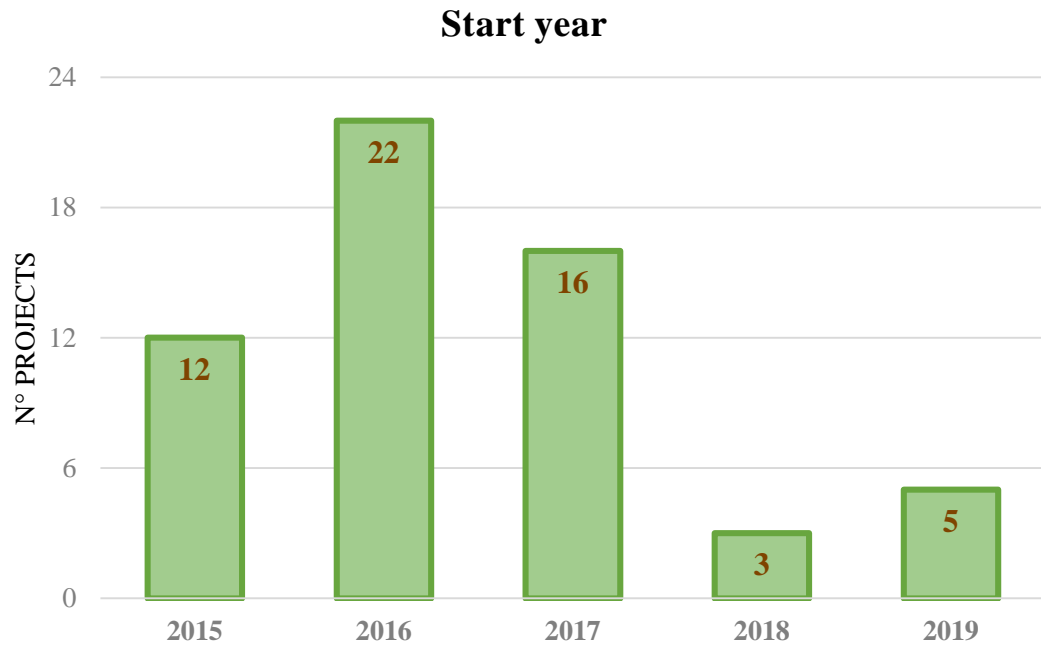
Project	Title	Grant Agreement	Funding Scheme	Funding [€]	Coordinator Country	Start Date	End Date
4RinEU	Robust and Reliable technology concepts and business models for triggering deep Renovation of Residential buildings in EU	723829	IA	4 627 954	Italy	01/10/2016	20/09/2020
CHESS-SETUP	Combined Heat System by using Solar Energy and heat pumps	680556	IA	3 703 706	Spain	01/06/2016	31/05/2019
Cool DH	Cool ways of using low grade Heat Sources from Cooling and Surplus Heat for heating of Energy Efficient Buildings with new Low Temperature District Heating (LTDH) Solutions	767799	IA	5 291 186	Denmark	01/10/2017	30/09/2021

... 58 RELEVANT PROJECTS

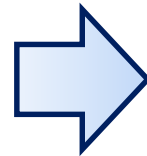
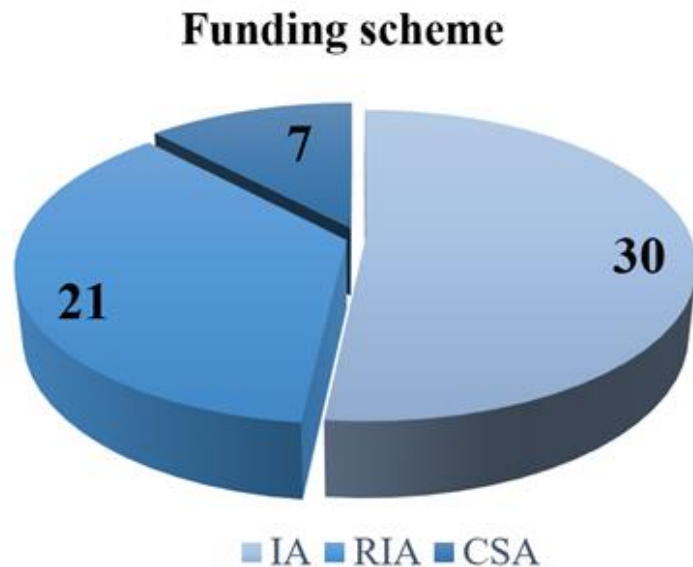
The map collects **general information** about the work actions



Many projects are still **ongoing**, thus noteworthy results are expected in the upcoming years



Available funding is mostly dedicated to **application** and **demonstration** of technologies in operational environment



RIA: Research and Innovation Action
TRL 1–5



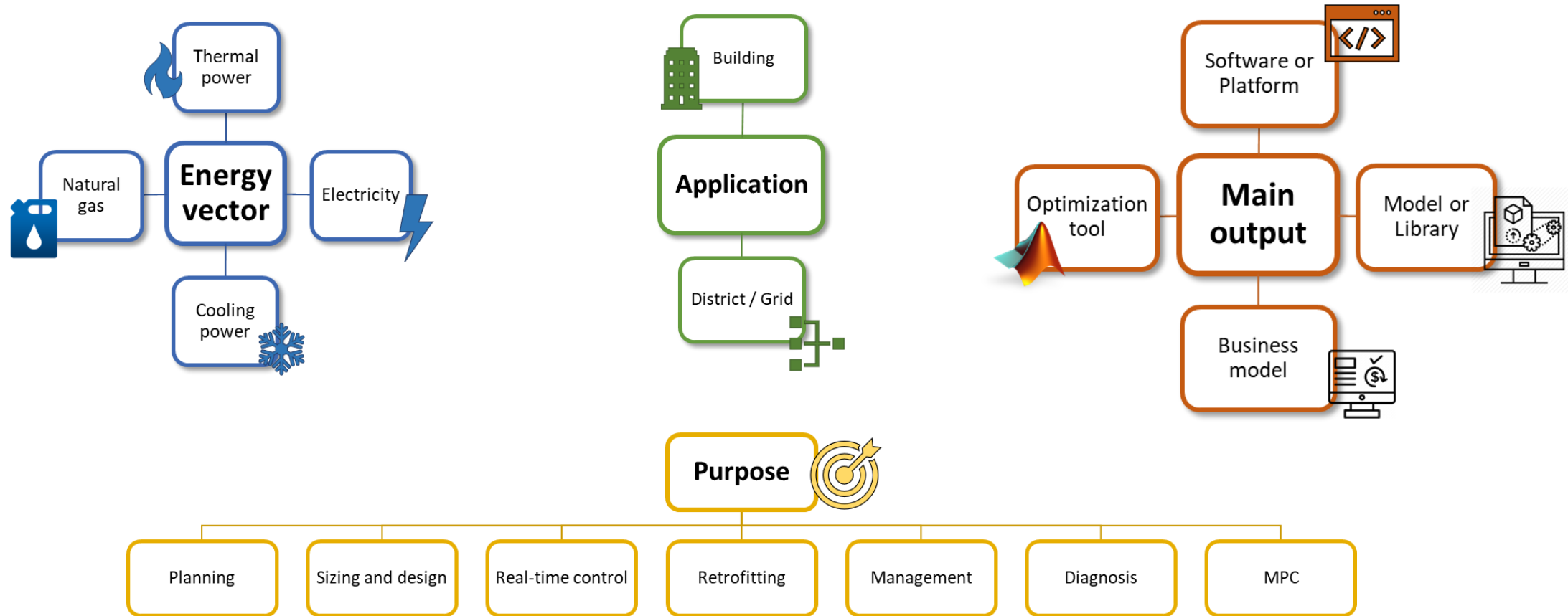
IA: Innovation Action
TRL 6–9



CSA: Coordination and Support Action



The projects are classified according to **relevant features** concerning different topics

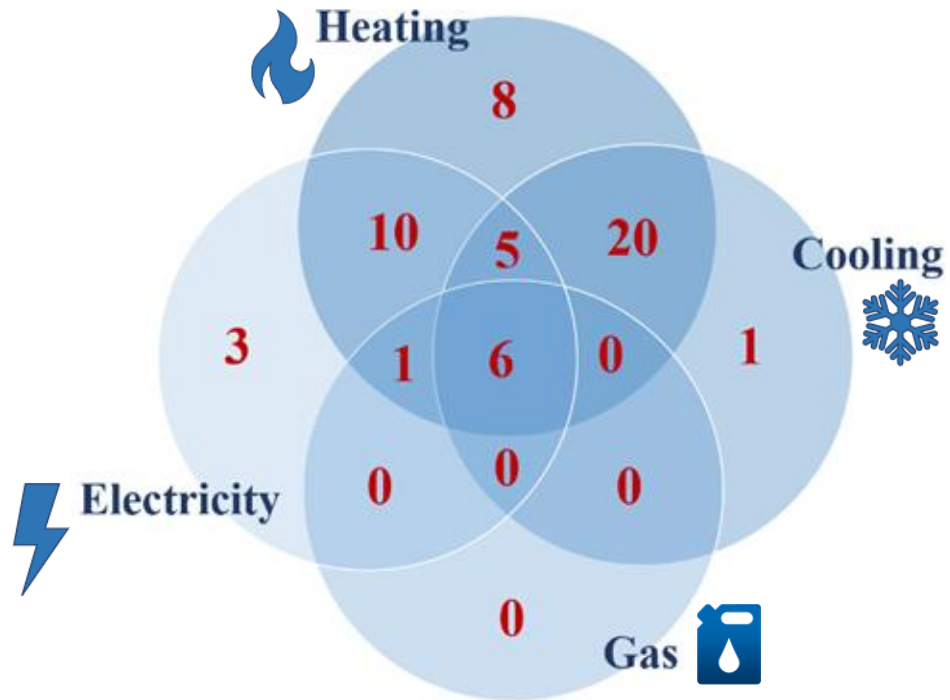


A **complete table** summarizes the results and leads to a fast project comparison

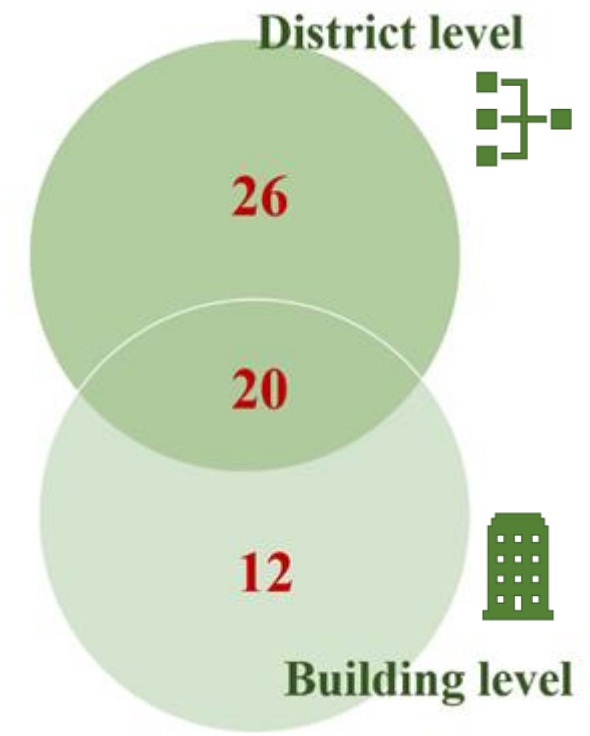
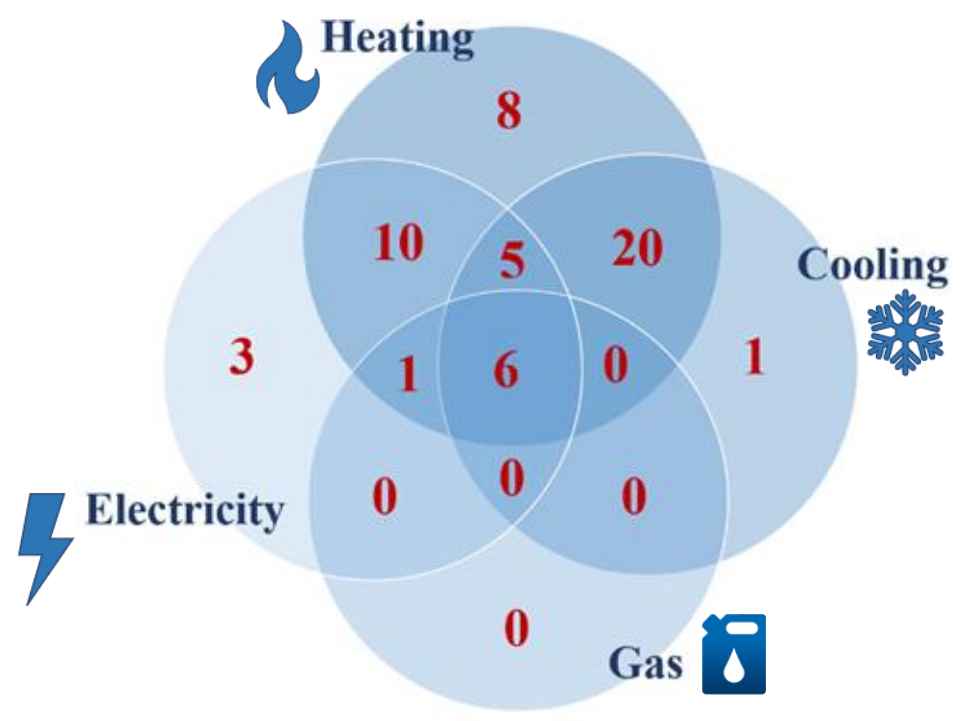
Project	Energy Vector				Application		Main Outcome			Purpose					Other Features									
	Heating	Cooling	Electricity	Gas	Grid/District	Building	Software/Platform	Model/Library	Optimization Tool	Business Model	Planning	Sizing/Design	Retrofitting	Real Time Control	Monitor/Management	Diagnosis	MPC	Machine Learning	Forecasting	LCA/LCC	Demand Response	Peak Shaving	Storage	RES
4RinEU	✓	✓				✓	✓		✓			✓	✓											✓
CHES-SETUP	✓	✓	✓		✓	✓	✓	✓	✓			✓	✓	✓									✓	✓
Cool DH	✓	✓			✓	✓			✓			✓	✓										✓	✓
CoolHeating	✓	✓			✓				✓														✓	✓
Create	✓					✓																	✓	✓
DR-BOB			✓			✓	✓	✓	✓				✓	✓							✓		✓	✓
DRivE			✓		✓		✓	✓	✓				✓	✓					✓		✓		✓	✓
E2District	✓	✓			✓	✓	✓	✓	✓				✓	✓	✓			✓	✓	✓			✓	✓
EnergyMatching	✓		✓		✓	✓		✓	✓					✓	✓	✓		✓					✓	✓
ExcEED					✓	✓	✓		✓					✓	✓			✓					✓	✓
...																								

Energies 2020, 13(11), 2835; <https://doi.org/10.3390/en13112835>

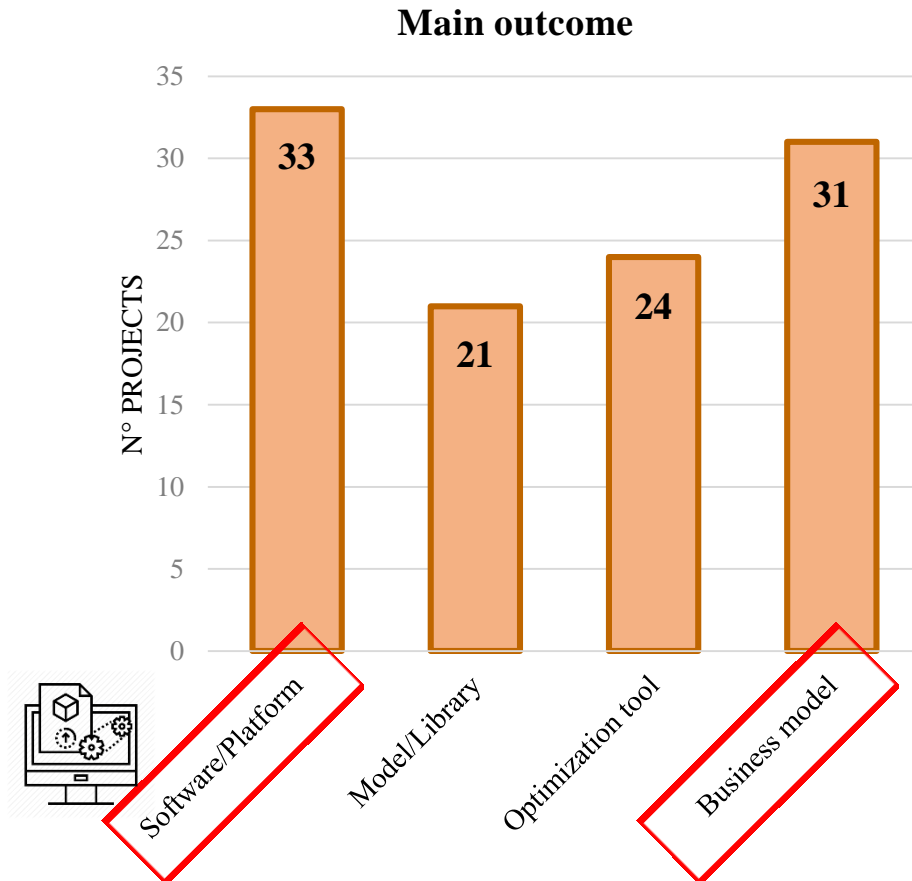
Integration of all **energy carriers** is gaining relevance...



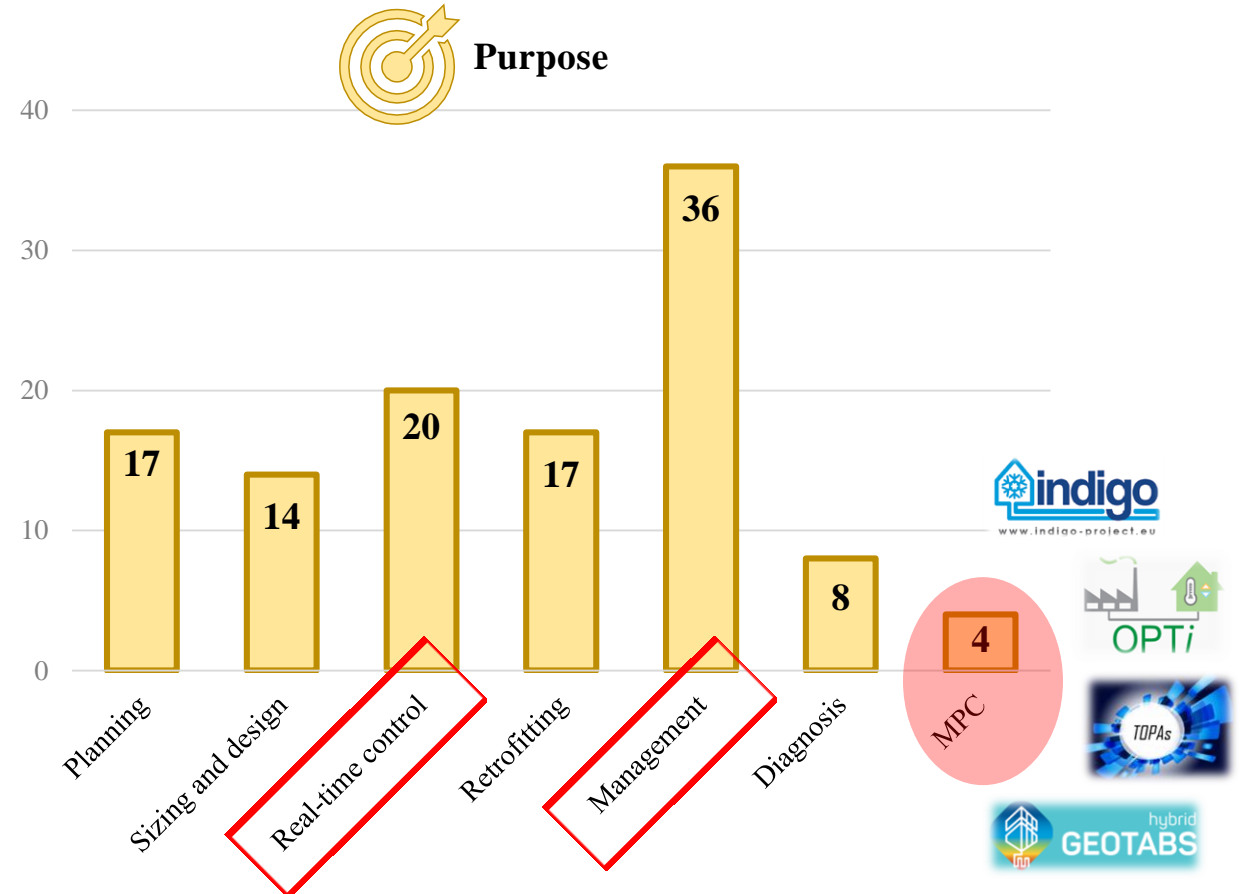
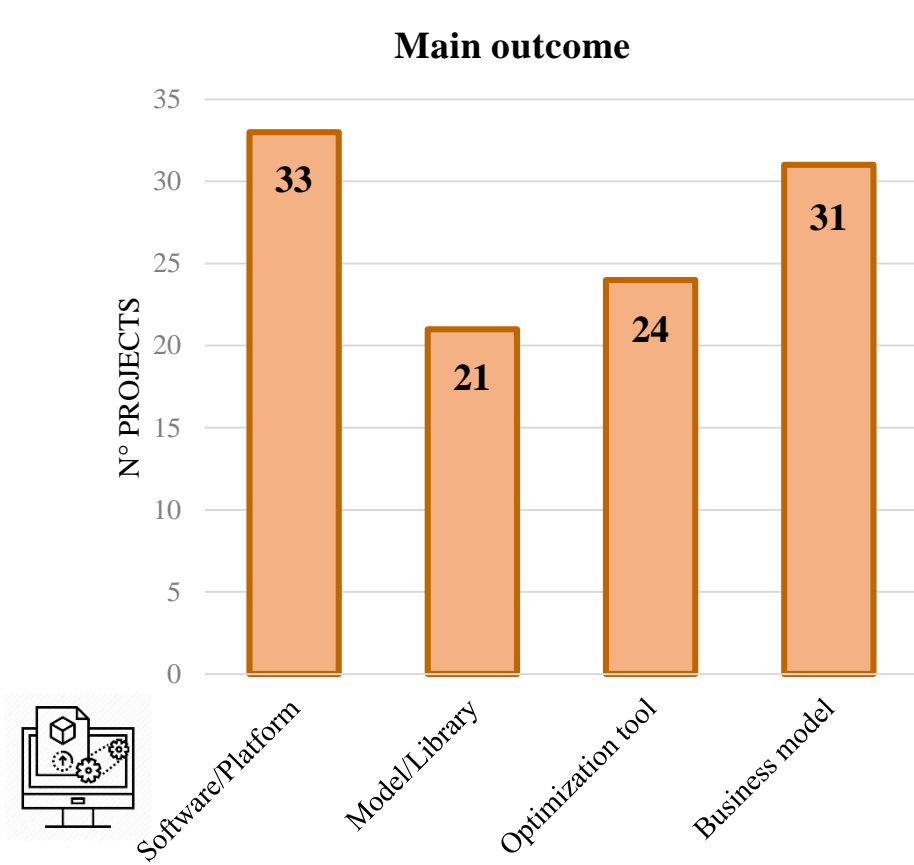
... as well as tackling the entire system (both **network** and **buildings**)



Software platforms and new business models are the most common project outputs



Energy management and real-time control are main purpose of most studies

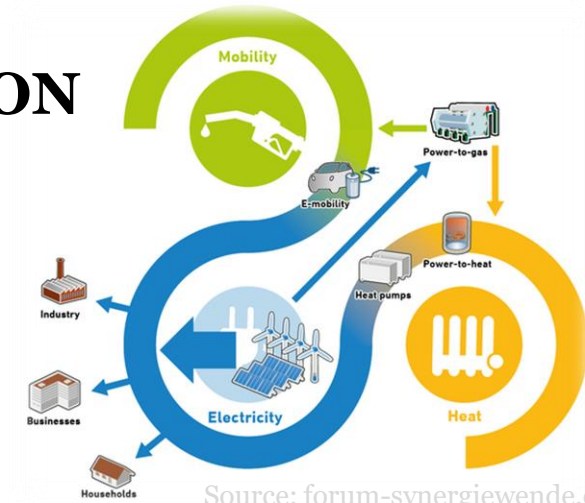


This overview highlights four key drivers for future innovation in H&C

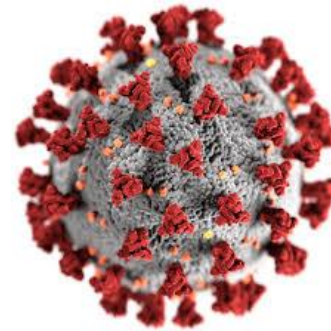
➤ DIGITALIZATION



➤ INTEGRATION

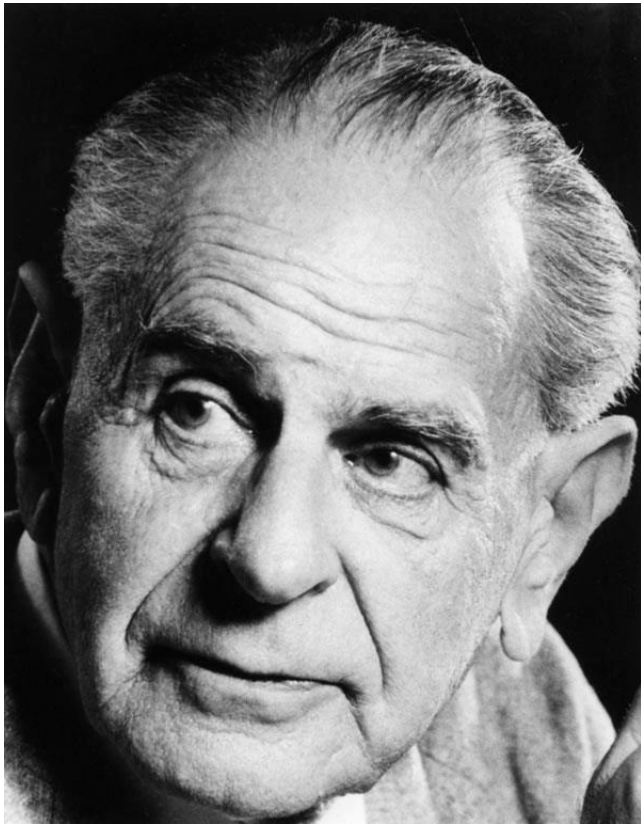


➤ DECARBONIZATION



➤ RESILIENCE

Big data are surely a big opportunity, but we have a strong physical knowledge about our systems and we must not put it apart and forget it



“

*Twenty-five years ago I tried to bring home the same point to a group of physics students in Vienna by beginning a lecture with the following instructions: “Take pencil and paper; carefully observe, and write down what you have observed!” They asked, of course, **what I wanted them to observe. Clearly the instruction, “Observe!” is absurd.***

”

Conjectures and Refutations: The Growth of Scientific Knowledge
by Karl Popper



Thank you for your attention!

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