Coupling of Heat/Cooling and Electricity Sectors in a Renewable Energy Driven Europe

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February 17th, 2023

IEWT 2023 Vienna

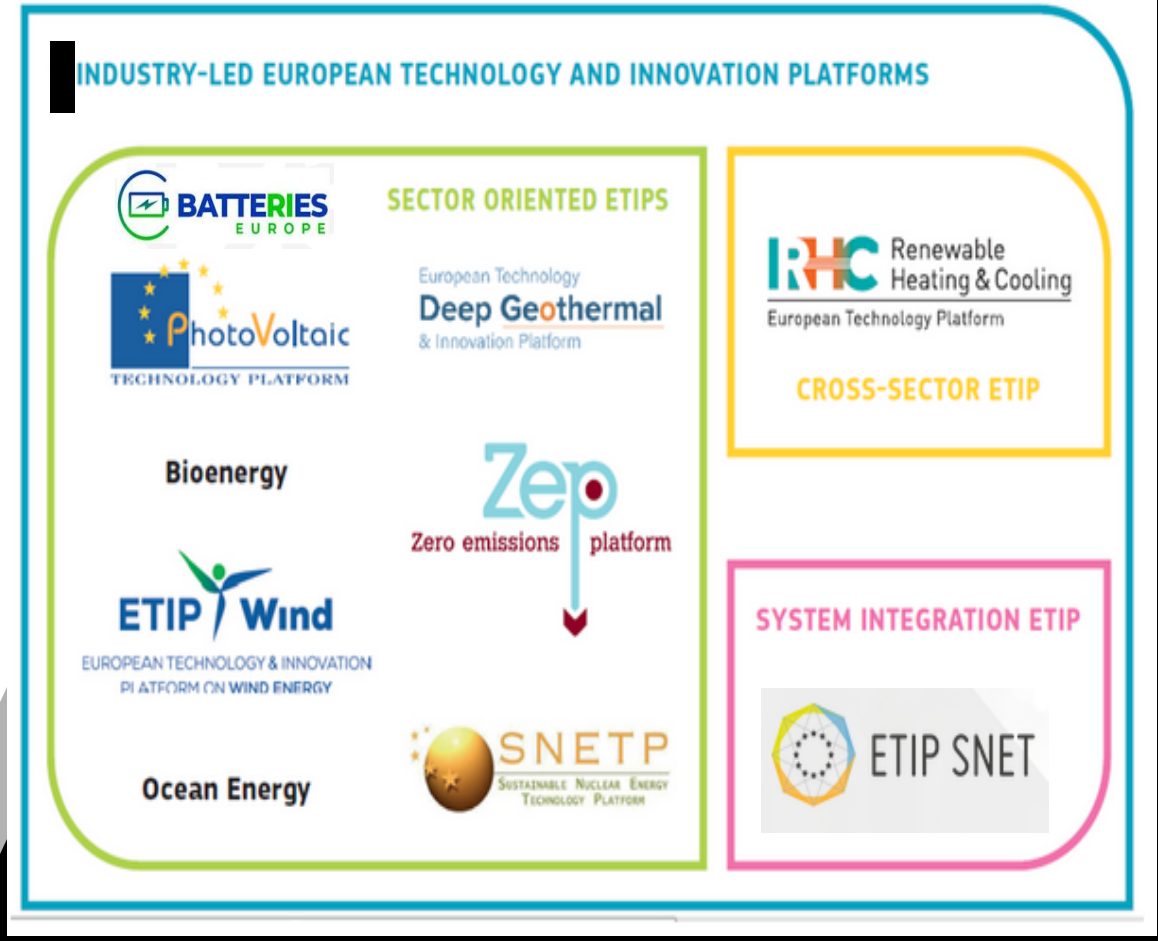
"The Future of Energy MARKETS in Europe against the Background of new geopolitical imbalances"

European Technology and Innovation Platforms

- The two main implementation mechanisms of the SET Plan are the European Technology and Innovation Platforms (ETIPs) and the European Energy Research Alliance (EERA), which together with the SET Plan Steering Group shape the core actors of the SET Plan core community.

- The industrial platforms of the initial SET Plan governance structure were simplified in 2016. The 6 European Industrial Initiatives have been merged with the 8 European Technology Platforms to form 10 distinct entities called the European Technology and Innovation Platforms (ETIPs).

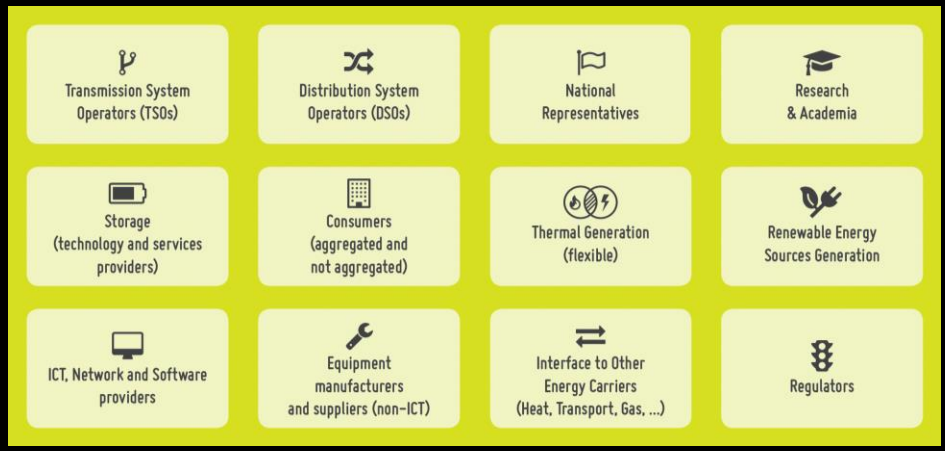
- These ETIPs are recognised as key industry-led communities for the implementation of SET Plan priorities along the innovation chain. They have been directly involved in the 2016 target setting process.



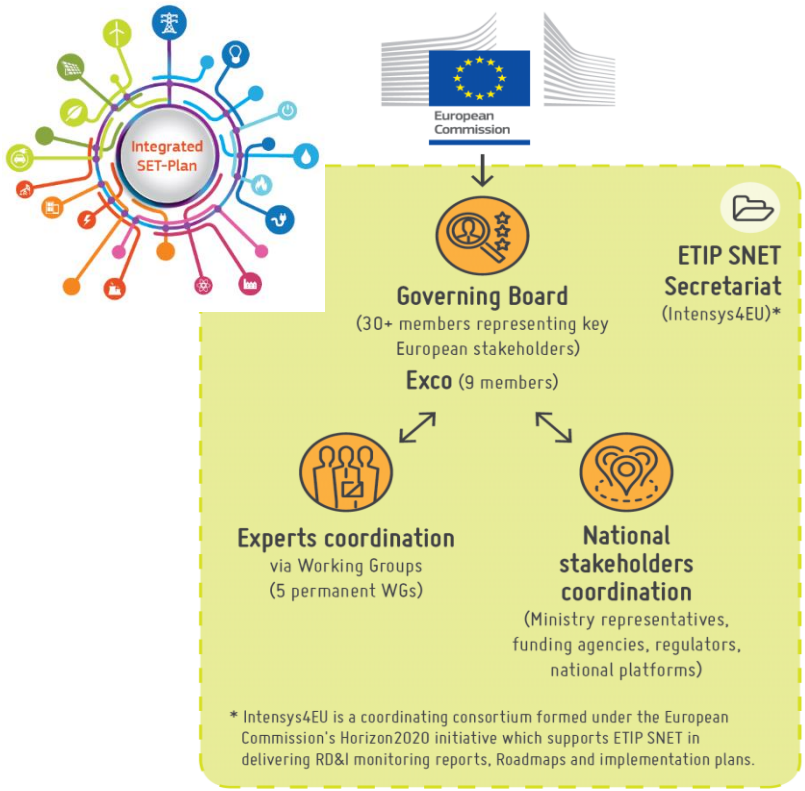
ETIP SNET Mission and Stakeholders

- **Integrated approach among all stakeholders of the energy value chain**
- **Exploit synergies and enhance knowledge-sharing on European RD&I**
- **Prepare consolidated stakeholder views as authoritative input to European Energy Policy initiatives**

ETIP SNET



ETIP SNET Organisation



WG1
Reliable, economic and efficient smart grid system

WG2
Storage technologies and sector interfaces

WG3
Flexible Generation

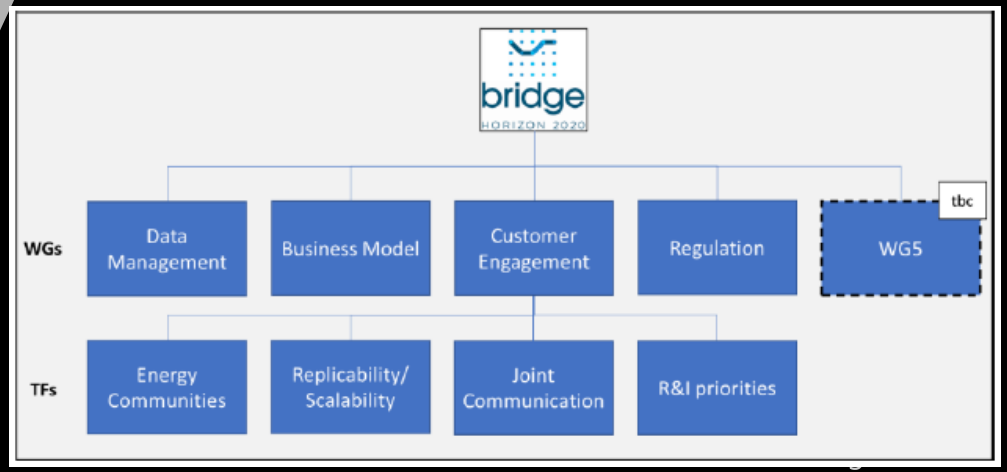
WG4
Digitisation of the electricity system and customer participation

WG5
Innovation implementation in the business environment

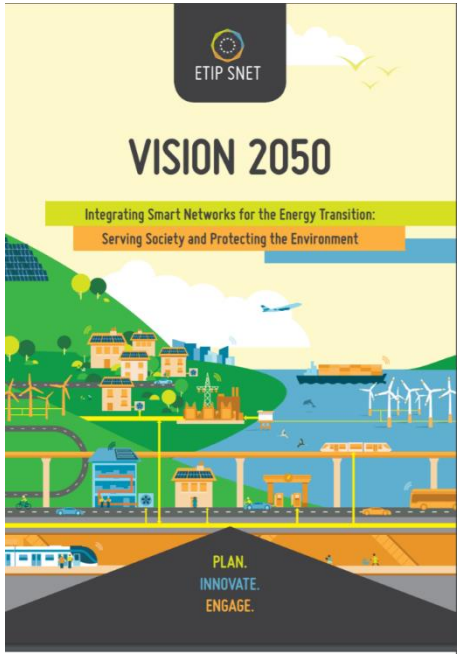
NSCG
National Stakeholders Coordination Group

BRIDGE H2020

- **European Commission initiative which unites H2020 Smart Grid, Energy Storage, Islands, and Digitalisation Projects**
- **Create a structured view of cross-cutting issues which are encountered in the demonstration projects and may constitute an obstacle to innovation**
- **Foster continuous knowledge sharing amongst projects**



ETIP SNET Main achievement for R&I priorities



Published 2018

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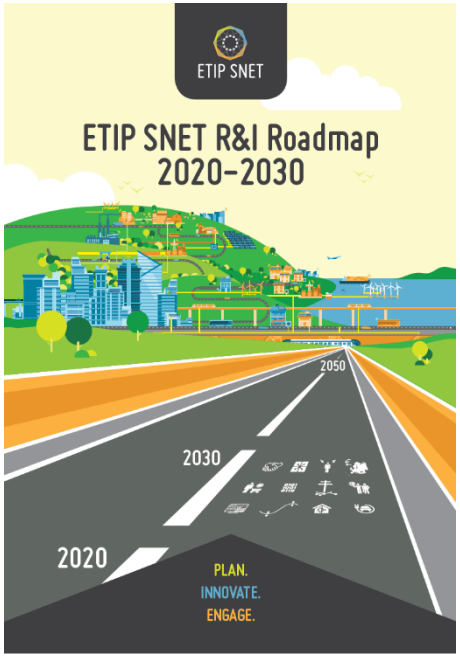

Published Feb 2020
Updated June 2020

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Published May 2020

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ETIP SNET / RHC White Paper

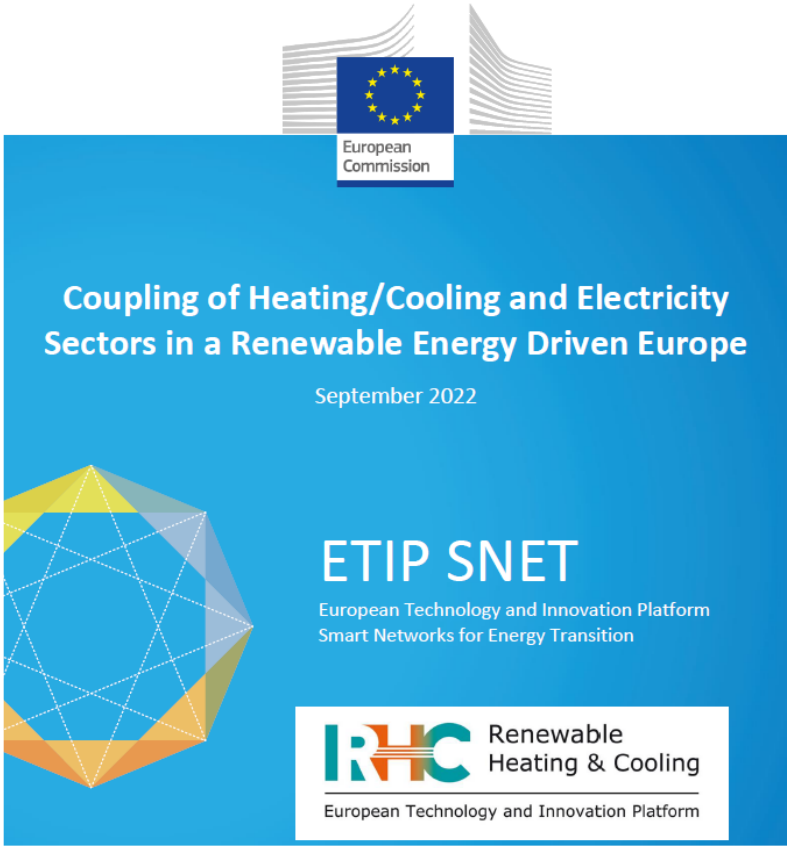
The White Paper

“Coupling of Heat/Cooling and Electricity Sectors in a Renewable Energy Driven Europe”

is a joint publication by the

ETIP – SNET and ETIP – RHC

Its focus is on the decarbonisation of the important sectors heating/cooling and electricity generation



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Scope of the paper

Scope if the paper in a nutshell:

- coupling of the electricity and heating/cooling sectors is key factor towards whole electrification of all sectors by renewable energy sources
- to work out the most promising energy sources and carriers
- to evaluate sector coupling components and technologies and their readiness to achieve decarbonisation within the timelines set by the EU in “Fit-for-55” and “REPowerEU” - packages
- to highlight the importance of energy storage aligned with the extension of vRES
- to work out R&I requirements forming the basis of new business models
- to create public awareness for accepting cost intensive efforts and investments to achieve the goals
- to highlight the importance of education and new skills

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The Status Quo

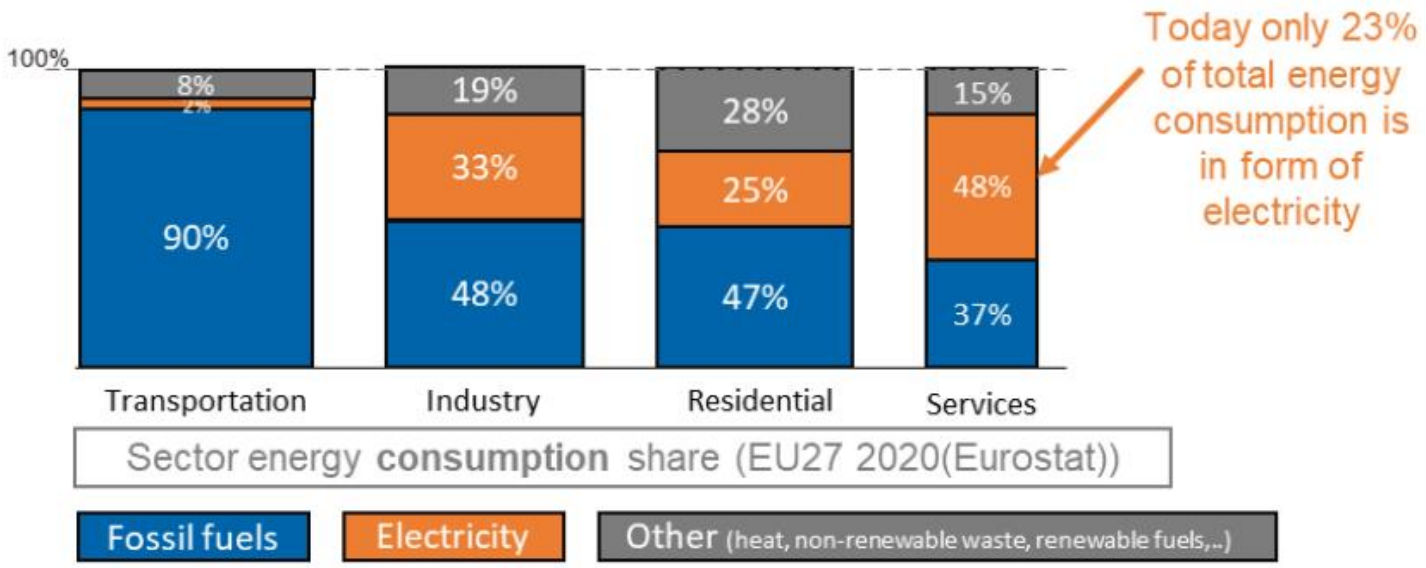

Figure 2: Share of renewables in different sectors[4]

- **Electrification of all sectors is key to decarbonise Europe**
- **Heat related sectors as Industry and Residential are still far behind**

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Sector Coupling Technologies

Which renewable generation and conversion technologies are relevant for the coupling of Electricity and H/C- Sectors?

- Sources for both electricity and heating/cooling
  - Solar, geothermal, biomass driven
- Direct conversion of renewable electricity into heating/cooling
  - Any other kind of renewable energy source

Which technologies are available at which TRL?

- Technologies should be at least proven at pilot scale
- Assessment of scaling effects to make technologies economically viable
- Heat pump technologies: development status

Role of traditional connection of heat and power: CHP, Co-Generation and poly-generation plants

- Exploitation of high CHP- efficiencies with natural gas
- Replacement of natural gas by green gas (hydrogen; ammonia)

System integration of heat and power demand/generation of energy-intensive industries

- Waste heat recovery technologies

Essential Role of Decentralised solutions and district heating

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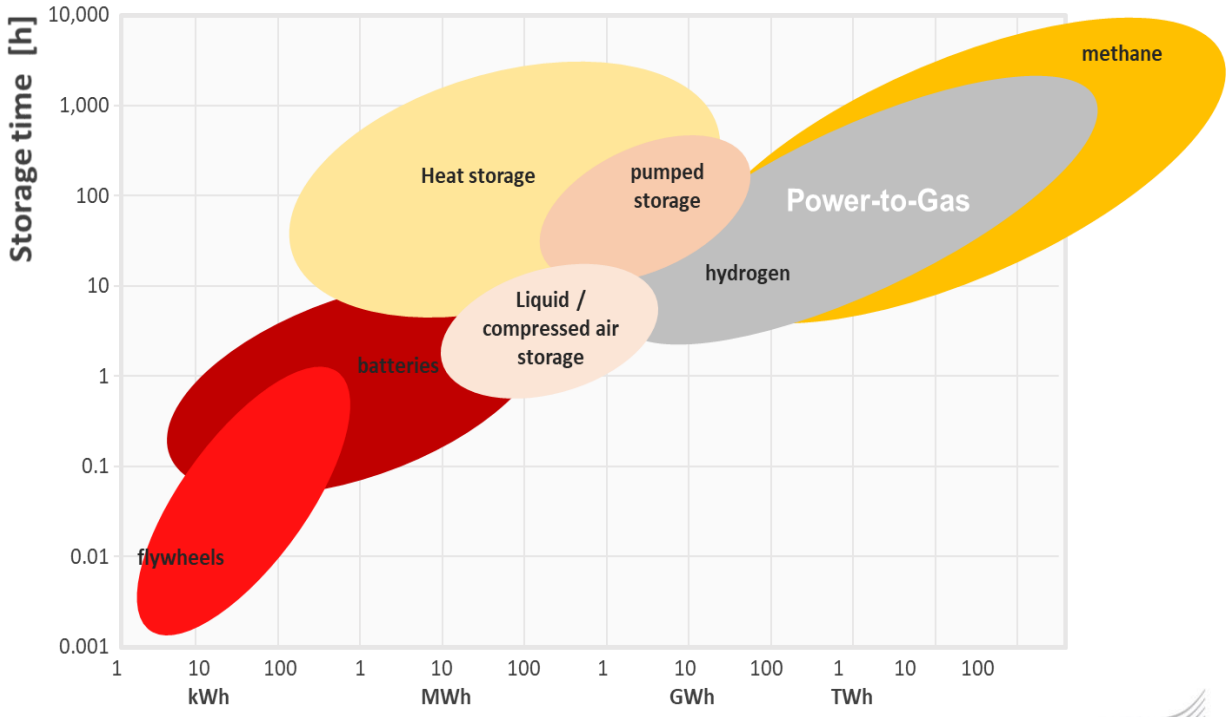
Storage as Sector Coupling Device

Energy Storage is most relevant for full decarbonisation

Excessive increase of storage plants are needed with growth of vRES

- Thermal storage as direct link of electricity and heating/cooling sectors



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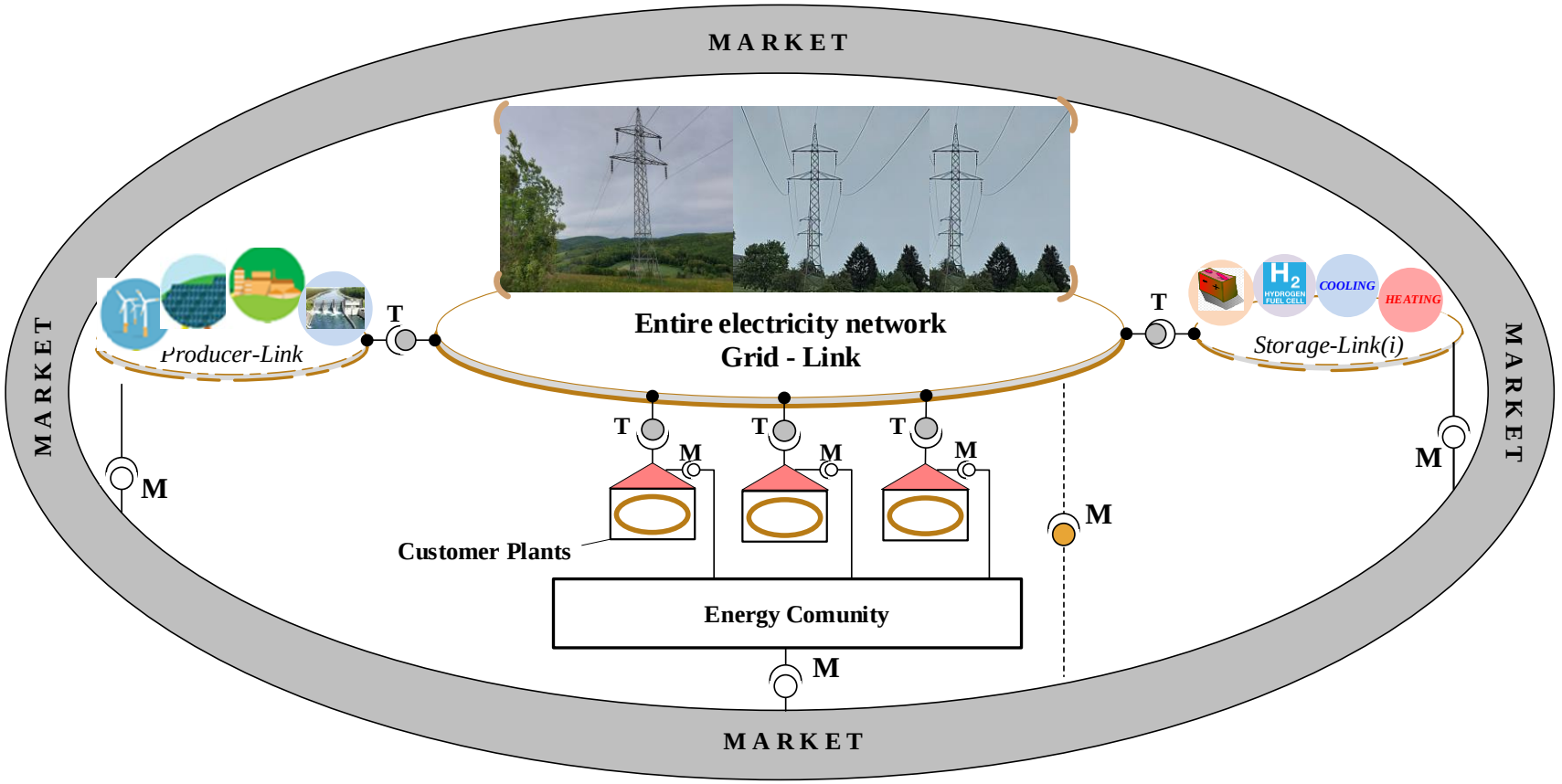
Sector Coupling and Storage on Systems Level



LINK-holistic power system architecture based on *LINK* Paradigm ,derived from "Smart Grids" fractal pattern

Ilo A (2019) Design of the Smart Grid Architecture According to Fractal Principles and the Basics of Corresponding Market Structure. Energies, vol 12, p 4153. doi:10.3390/en12214153

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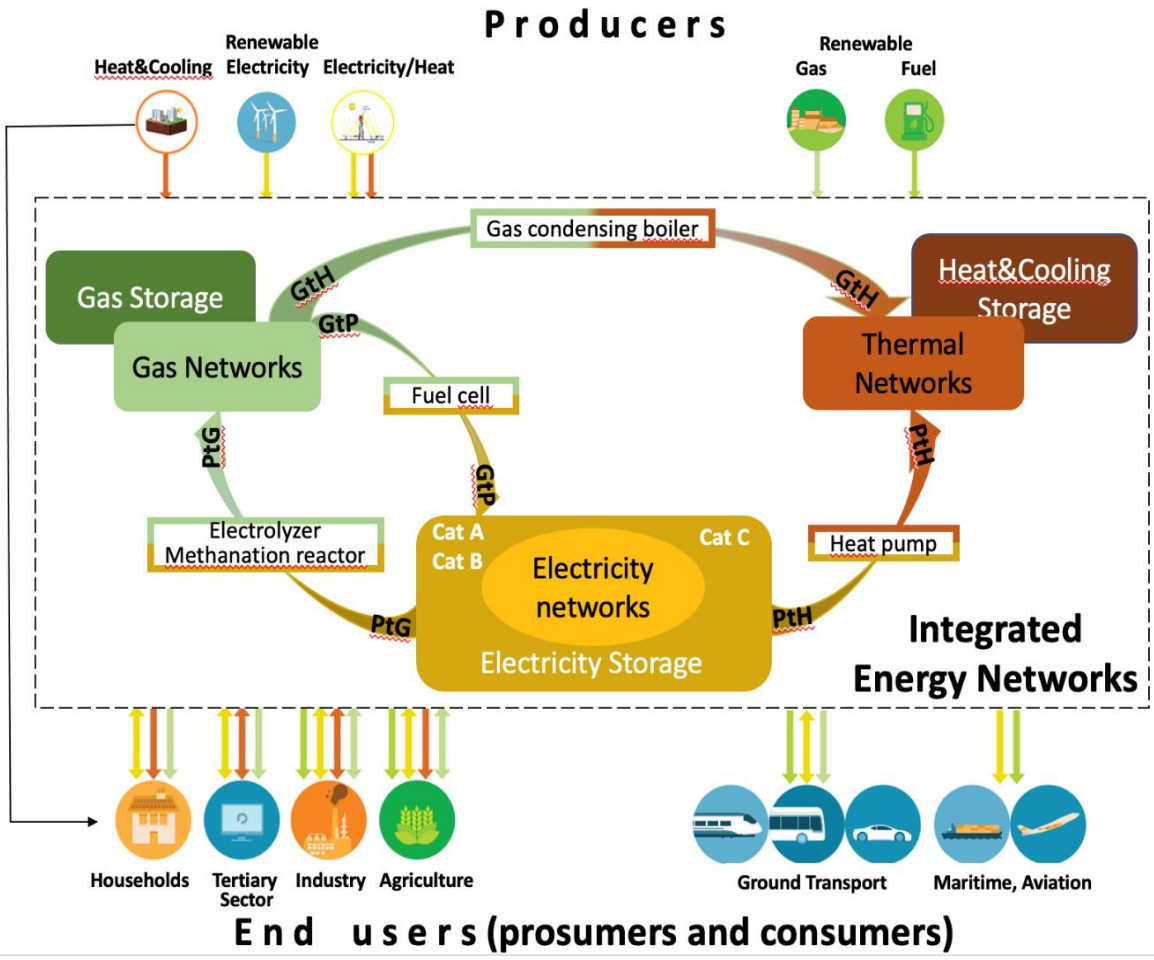
Sector Coupling and Storage on Systems Level

Holistic View on Systems level:



Conversion between electricity, dgas and thermal networks:

Role of PtG, PtT and GtH process to balance production and comsumers‘ demands

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R&I needs and challenges

- Sector coupling components: large heat pumps
- Heat and power demand management: Power-to-X, X-to-Power
- Biomass utilisation
- Large scale thermal storage
- Integration of industrial waste heat in overall heating and cooling networks
- Foster RHC in industries and buildings sectors
- “Smart Networks” and DHC
- Hydrogen as future energy carrier

EU and national funding required to support set up of new business models

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Policies and regulations proposals

- Need incentives to change market framework and political mind set
- To create public awareness
- To create skills and ensure education of trained designers, planners and installers

Decarbonisation of European energy systems will require utmost monetary efforts and extended investment incentives at Pan-European level

European Commission

Thank for your attention

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https://smart-networks-energy-transition.ec.europa.eu/

For the White Paper, use the link:

https://op.europa.eu/en/publication-detail/-/publication/919a8405-6ed7-11ed-9887-01aa75ed71a1/language-en?WT.mc_id=Searchresult&WT.ria_c=37085&WT.ria_f=3608&WT.ria_ev=search&WT.URL=https%3A%2F%2Fenergy.ec.europa.eu%2F