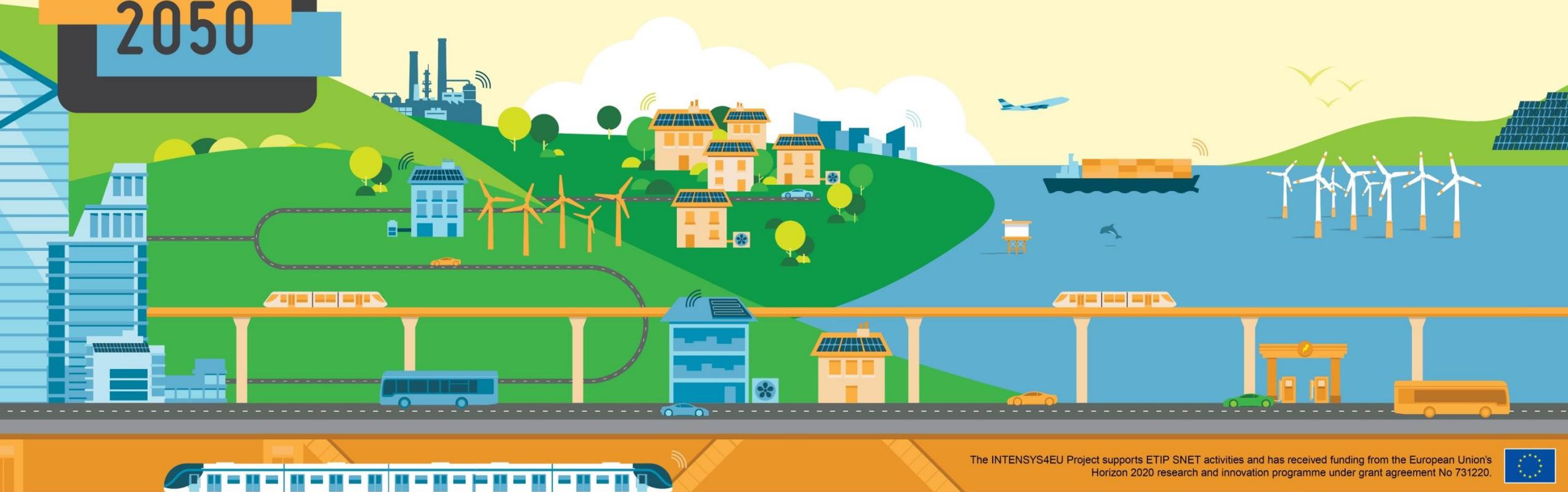




ETIP SNET

VISION
2050

Nikos Hatziargyriou, ETIP SNET Chairman
Konstantin Staschus, ETIP SNET Vice-chair
Thierry Le Boucher, ETIP SNET Vice-chair



The INTENSYS4EU Project supports ETIP SNET activities and has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731220.



From a fragmented EU advisory to an integrated framework



A new focus on
innovation /
implementation and
on sector coupling

2016



Main objective is to address the innovation challenges in **energy system** and **market evolution** necessary for achieving climate protection and **renewables integration** with affordability and security of supply ... beyond smart electricity grids (whole energy system)

ETIP SNET's mission



- ▶ **Set-out a vision for RD&I for Smart Networks for Energy Transition** and engage stakeholders in this vision.
- ▶ **Prepare and update the Strategic Research and Innovation Roadmap.**
- ▶ Report on the **implementation of RD&I activities at European, national/regional and industrial levels.**
- ▶ Provide **input to the SET Plan action 4** which addresses the technical challenges raised by the transformation of the energy system.
- ▶ **Identify innovation barriers**, notably related to regulation and financing.
- ▶ Develop enhanced knowledge-sharing mechanisms that **help bring RD&I results to deployment.**
- ▶ Prepare **consolidated stakeholder views** on Research and Innovation to European Energy Policy initiatives.



ETIP SNET's stakeholders



Transmission System
Operators (TSOs)



Distribution System
Operators (DSOs)



National
Representatives



Research
& Academia



Storage
(technology and services
providers)



Consumers
(aggregated and
not aggregated)



Thermal Generation
(flexible)



Renewable Energy
Sources Generation



ICT, Network and Software
providers



Equipment
manufacturers
and suppliers (non-ICT)

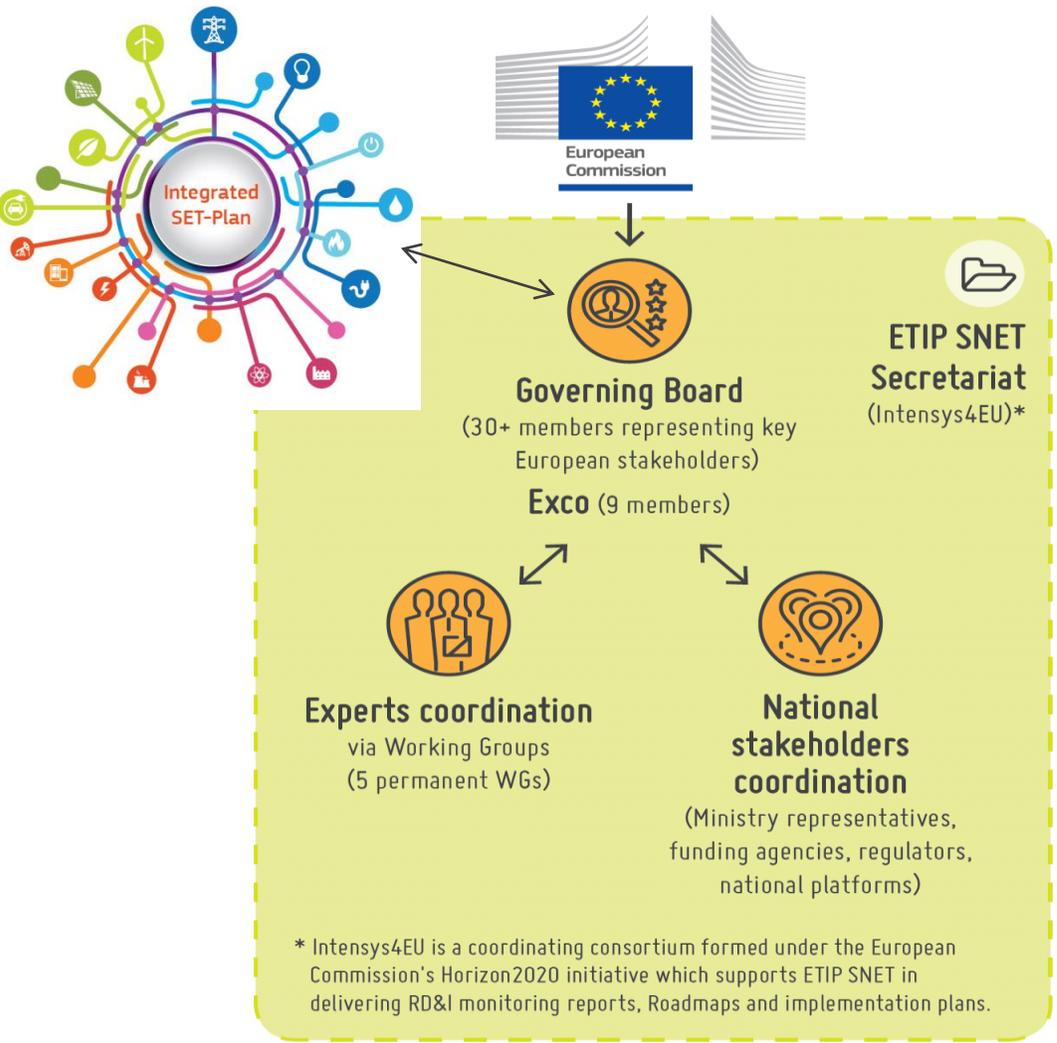


Interface to Other
Energy Carriers
(Heat, Transport, Gas, ...)



Regulators

ETIP SNET's organisation



* Intensys4EU is a coordinating consortium formed under the European Commission's Horizon2020 initiative which supports ETIP SNET in delivering RD&I monitoring reports, Roadmaps and implementation plans.



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

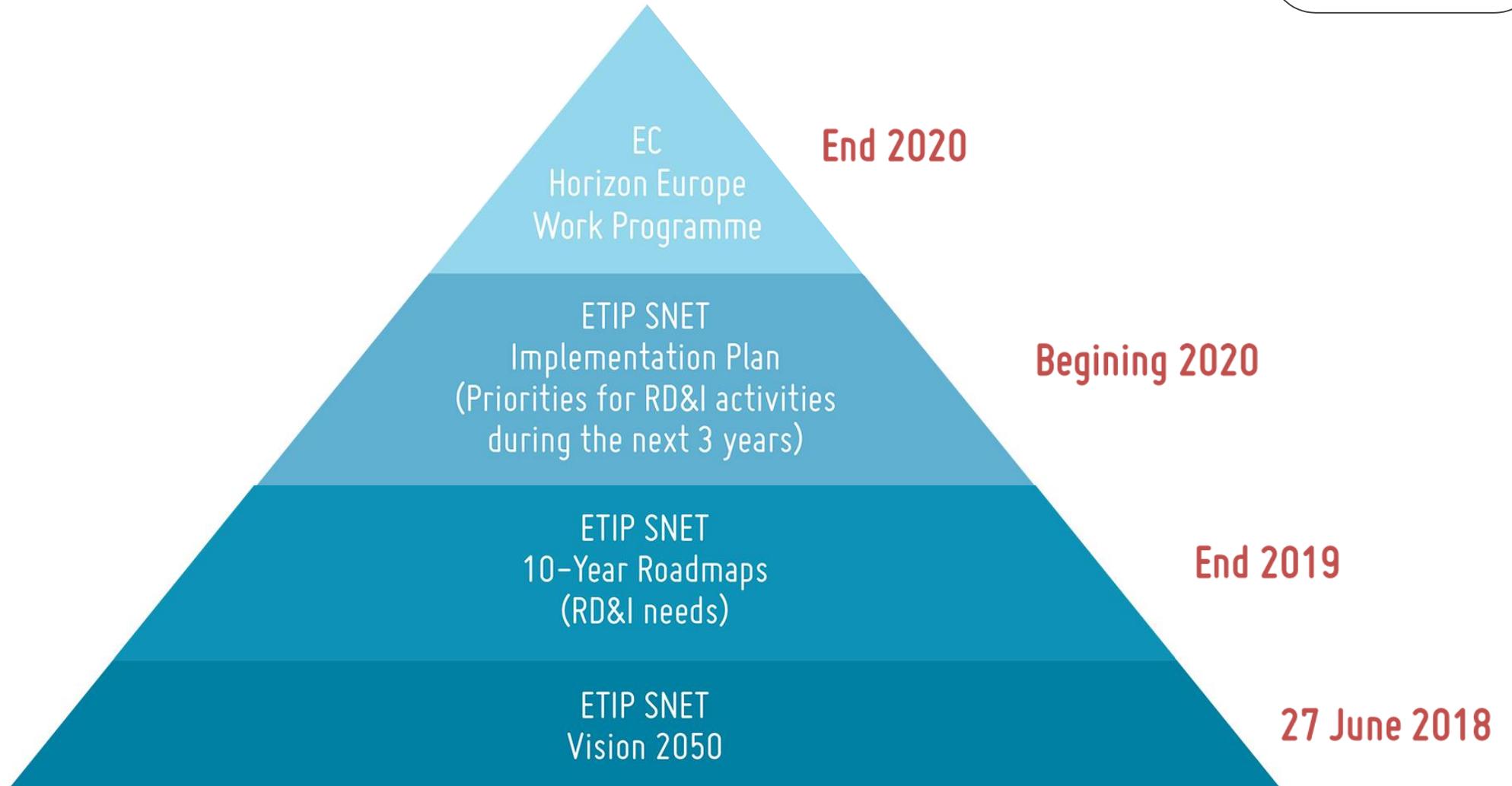


WG5
Innovation implementation in the business environment



NSCG
National Stakeholders Coordination Group

ETIP SNET PROCESS



THREE GOALS OF EU ENERGY POLICY



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Affordable
and market-
based energy
services

Affordable & market-based energy services

- Market integration
- Long-term investment signals
- Prosumers at the centre

Secure, resilient, reliable supply

- Systems integration
- Reduce imports dependence
- Resilience & reliability

Secure, resilient,
reliable supply

Protected
environment

Protected environment

Protected environment

- Climate change mitigation
- Pollution reduction
- Circular economy

2010

2050



Little
Renewable
energy sources



ENERGY SYSTEMS

Inefficient
conversion and use

- Fossil fuels
- Raw materials

- High CO₂ emissions
- High waste generation

Renewable
energy sources



**INTEGRATED,
DIGITALIZED ENERGY
SYSTEMS**

Efficient conversion
and use

- Little waste
generation
- Little CO₂
emissions

Vision 2050

Integrating Smart Networks for the Energy Transition:

Serving Society and Protecting the Environment



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2050 VISION GOAL



A low-carbon, secure, reliable, resilient, accessible, cost-efficient, and market-based **pan-European integrated energy system**

supplying the whole economy and paving the way for a **fully CO₂-neutral and circular economy by the year 2050,**

while **maintaining and extending global European industrial leadership** in energy systems during the energy transition.

Vision ETP SG 2030

Developed in 2006



VISION 2050

A SYSTEM OF SYSTEMS



NETWORKS

Electricity

Heating & Cooling

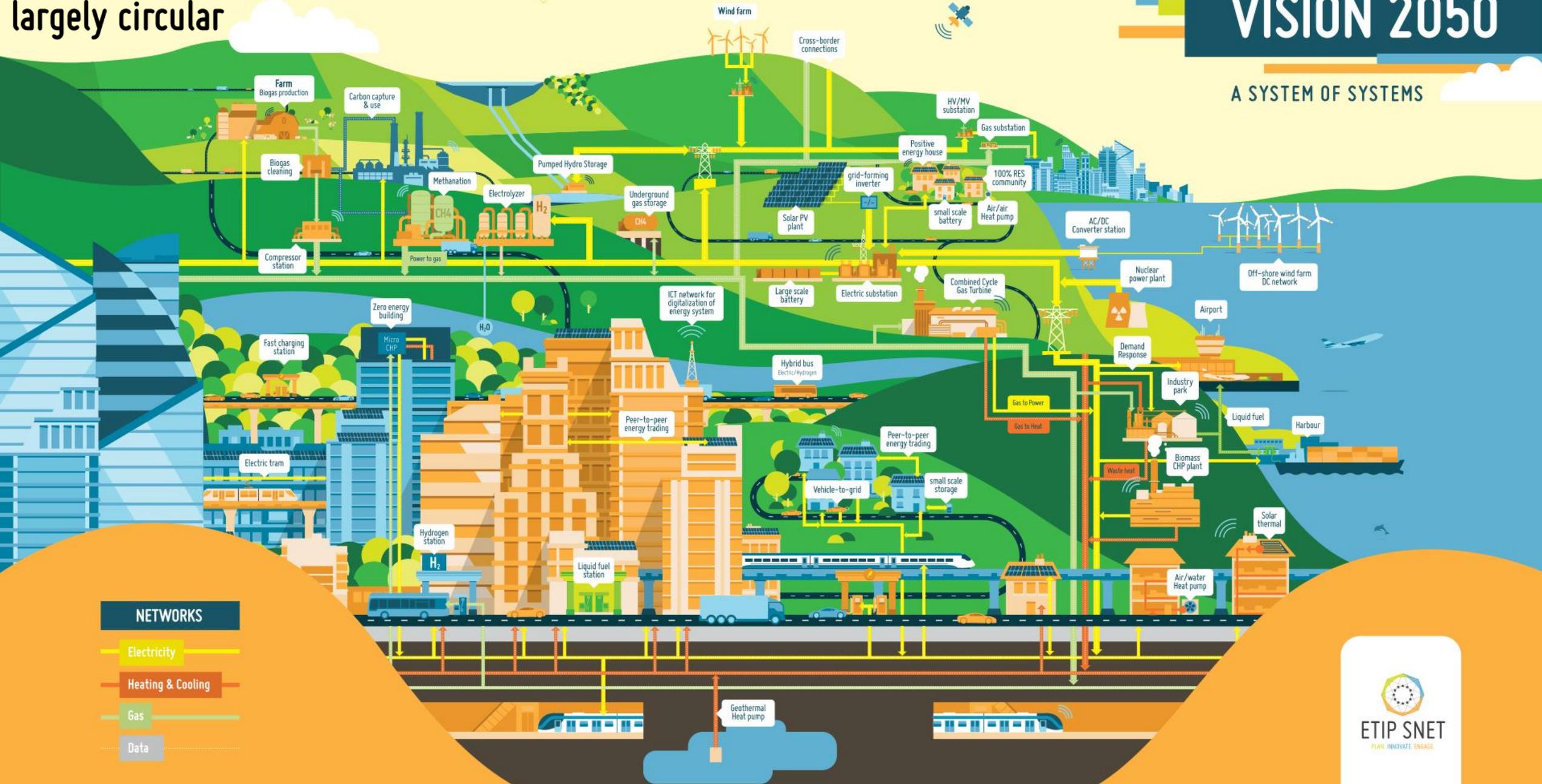
Gas

Data

Variety of generation sources in size, both centralised and decentralised, fully or largely circular

VISION 2050

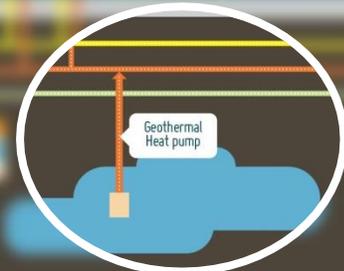
A SYSTEM OF SYSTEMS



Variety of generation sources in size, both centralised and decentralised, fully or largely circular

VISION 2050

A SYSTEM OF SYSTEMS



In 2050 the Customer is fully engaged

VISION 2050

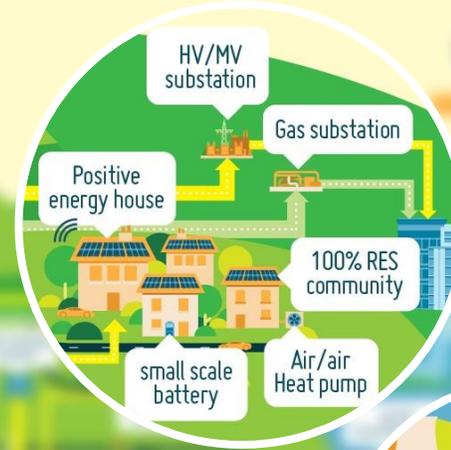
A SYSTEM OF SYSTEMS



In 2050 the Customer is fully engaged

VISION 2050

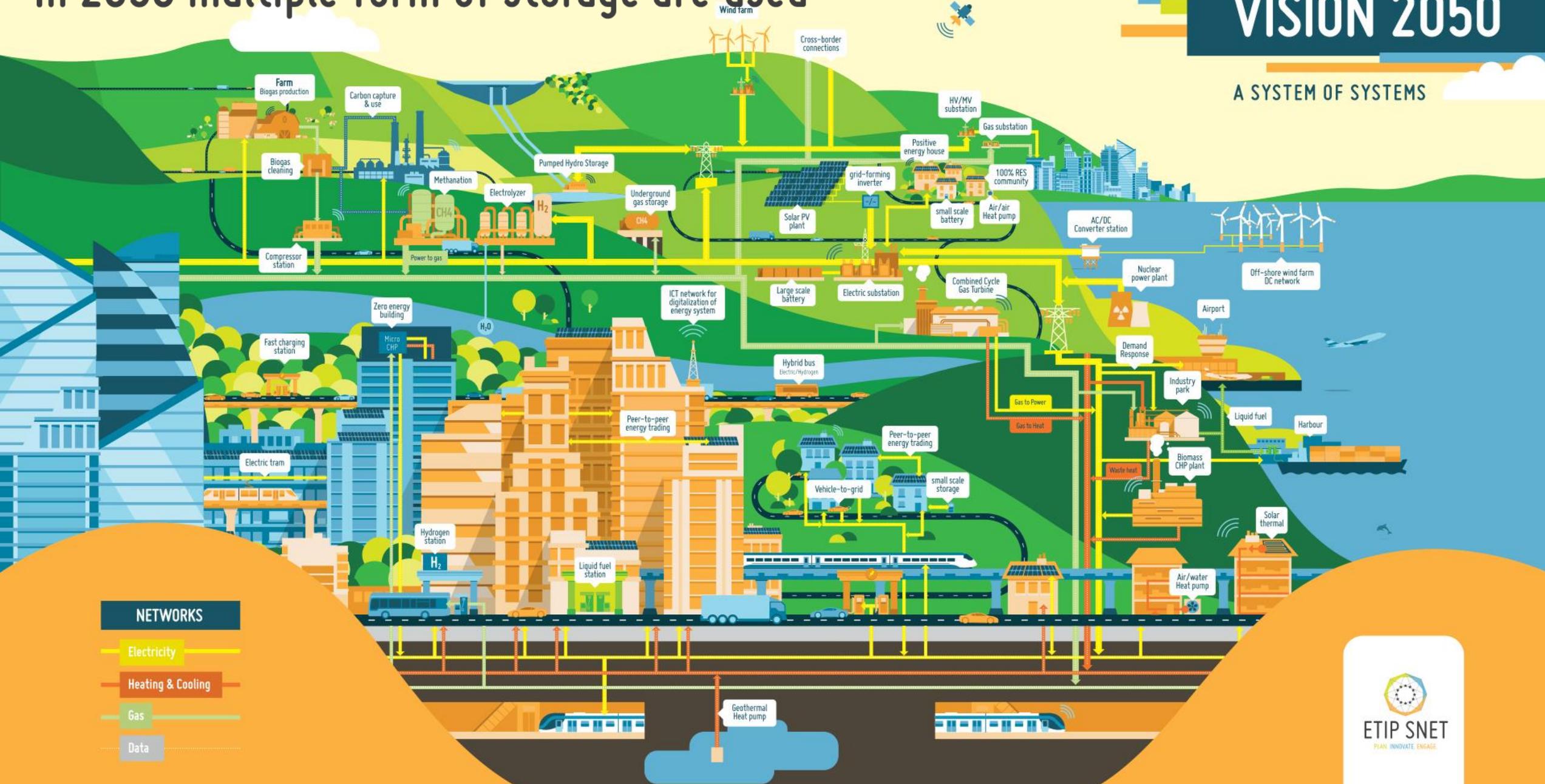
A SYSTEM OF SYSTEMS



In 2050 multiple form of storage are used

VISION 2050

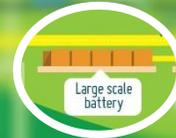
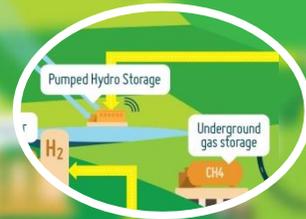
A SYSTEM OF SYSTEMS



In 2050 multiple form of storage are used

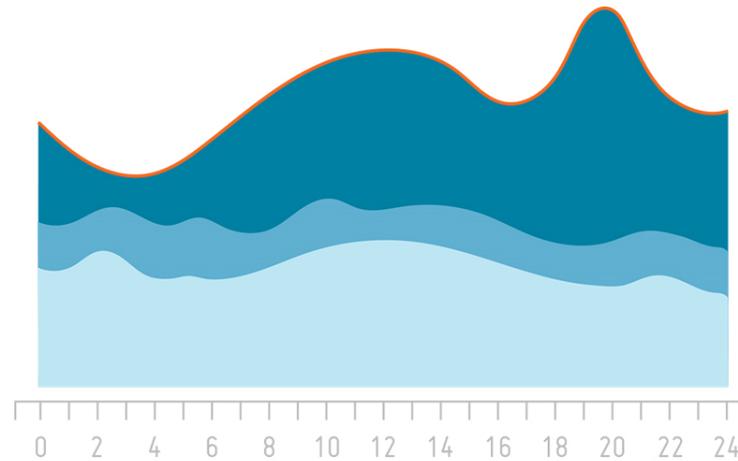
VISION 2050

A SYSTEM OF SYSTEMS

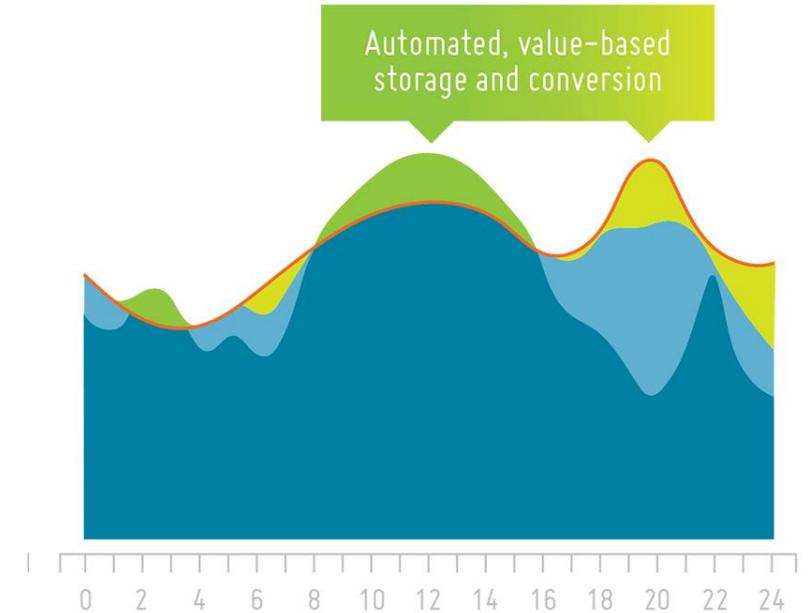


Outcomes of the daily electricity market

A day in the past



A day in the future



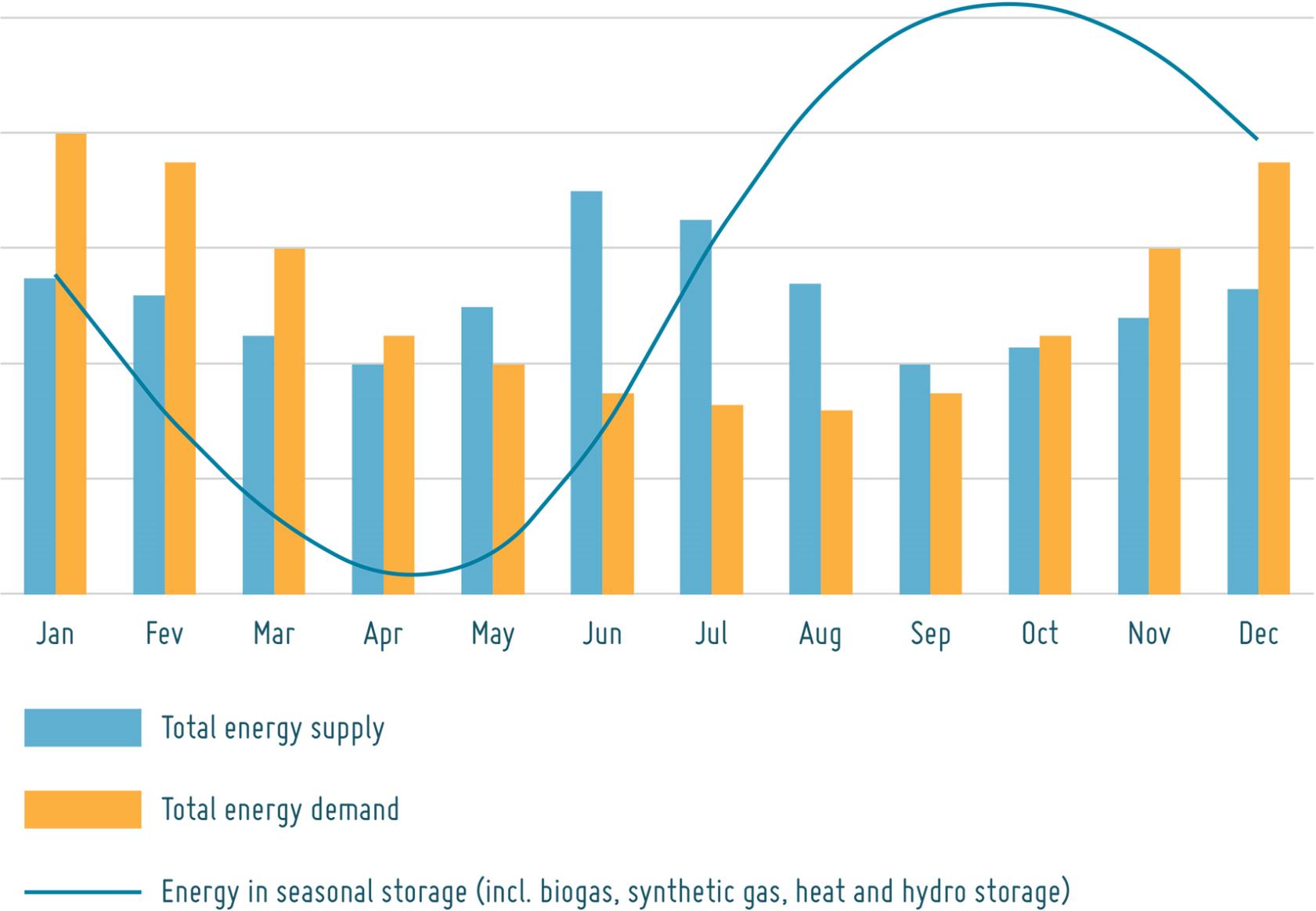
- Dispatchable non-renewable (nuclear, coal, gas, oil-fired power plants)
- Dispatchable renewable (biomass, hydro dams...)
- Variable renewables (wind, solar, hydro run of river...)
- Demand

This figure is provided for illustration purposes only: ratios between the different types of energy source not necessarily corresponding to the EU case; the demand profile should also be different in the future because of demand response measures that should be broadly implemented and possibly the massive roll-out of electric vehicles (EVs).



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Outcomes of integrated energy markets across multiple energy carriers



This figure is provided for illustration of the principles of seasonal storage only, not based on real data or modelling.

Conversion technologies are widely needed

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A SYSTEM OF SYSTEMS



Conversion technologies are widely needed

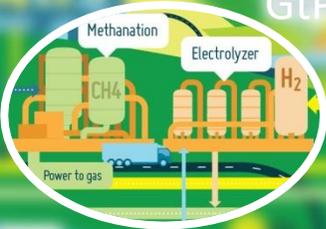
VISION 2050

A SYSTEM OF SYSTEMS

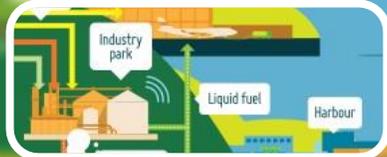
PtG



GtP&H



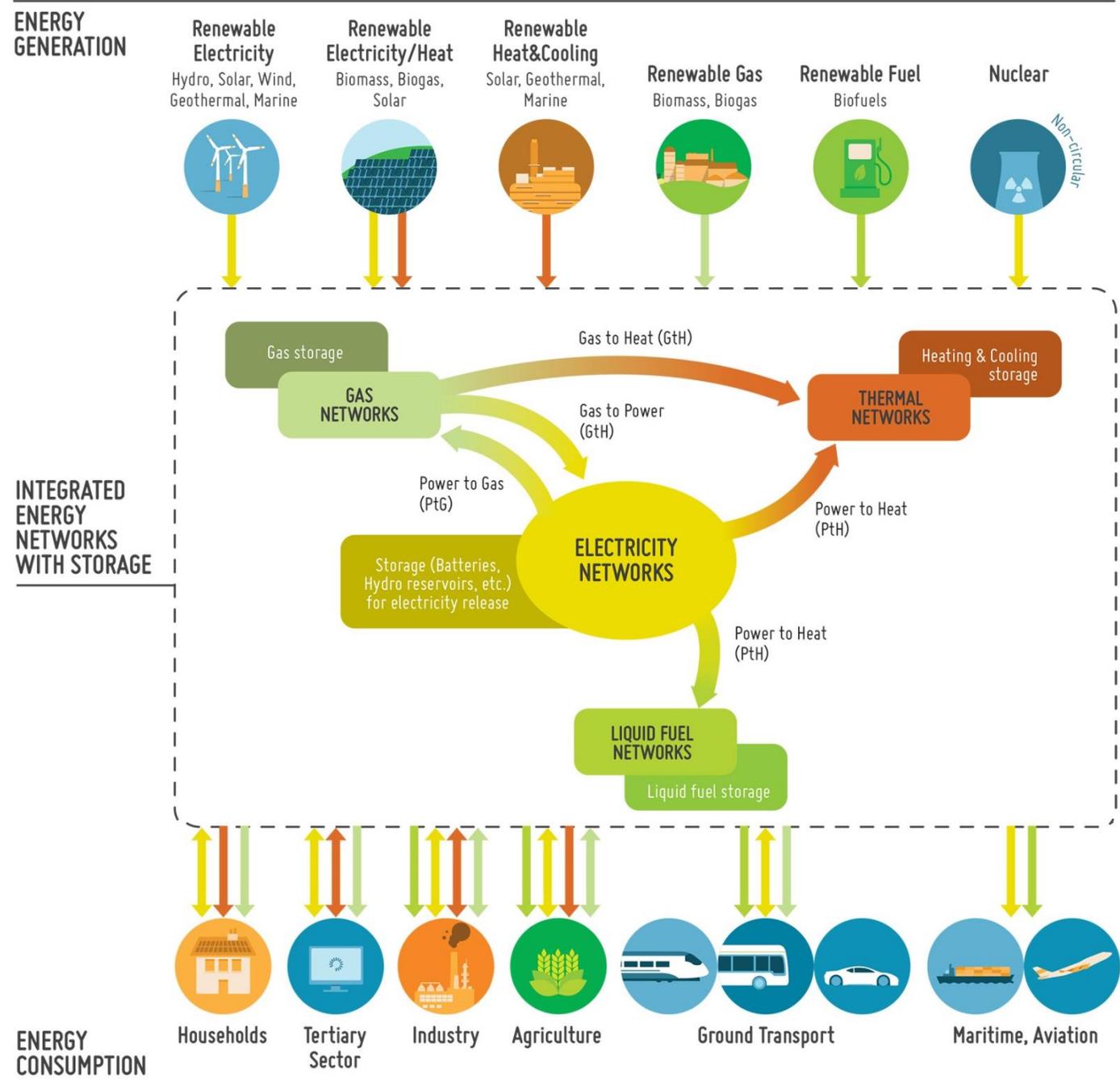
PtL



PtH



The future integrated energy systems with conversion and storage devices



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In 2050 Networks are fully integrated

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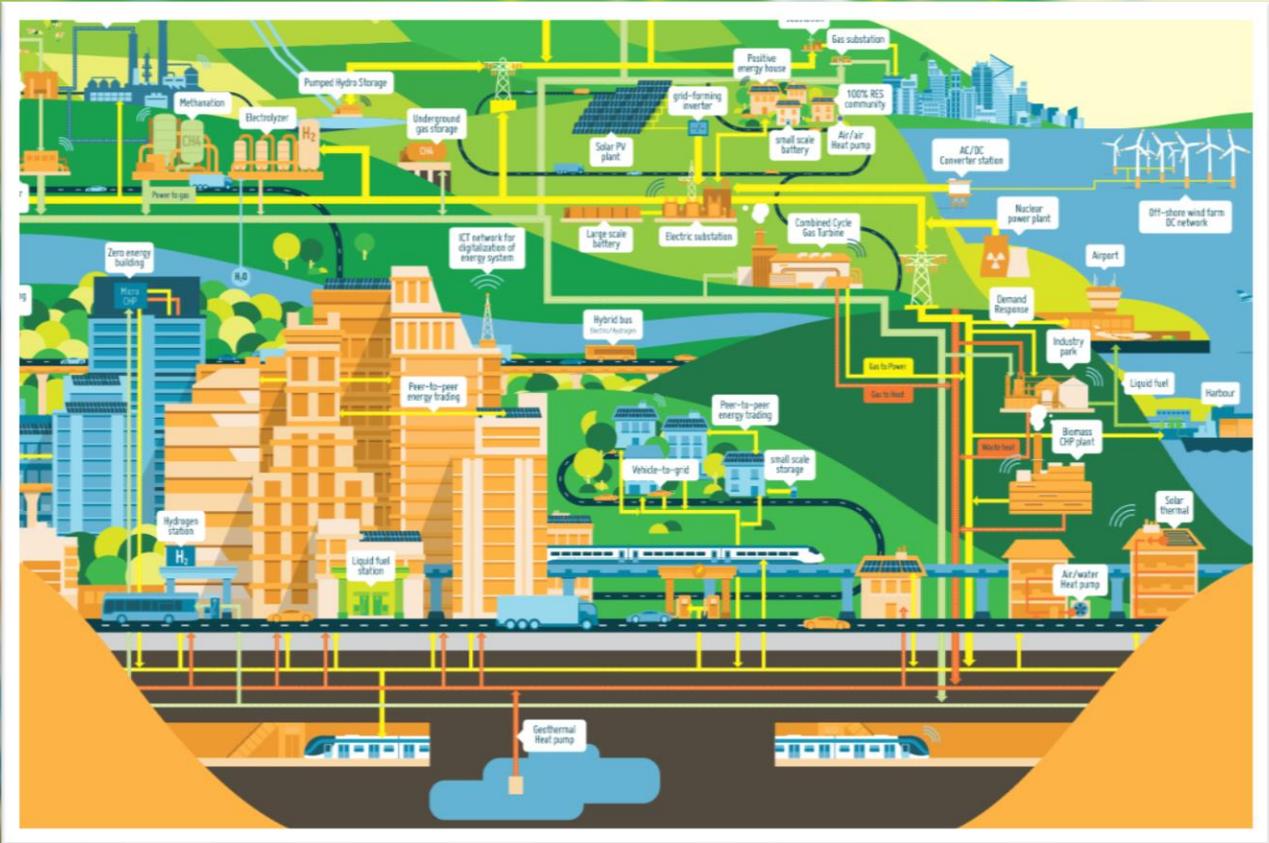
A SYSTEM OF SYSTEMS



In 2050 Networks are fully integrated

VISION 2050

A SYSTEM OF SYSTEMS



NETWORKS

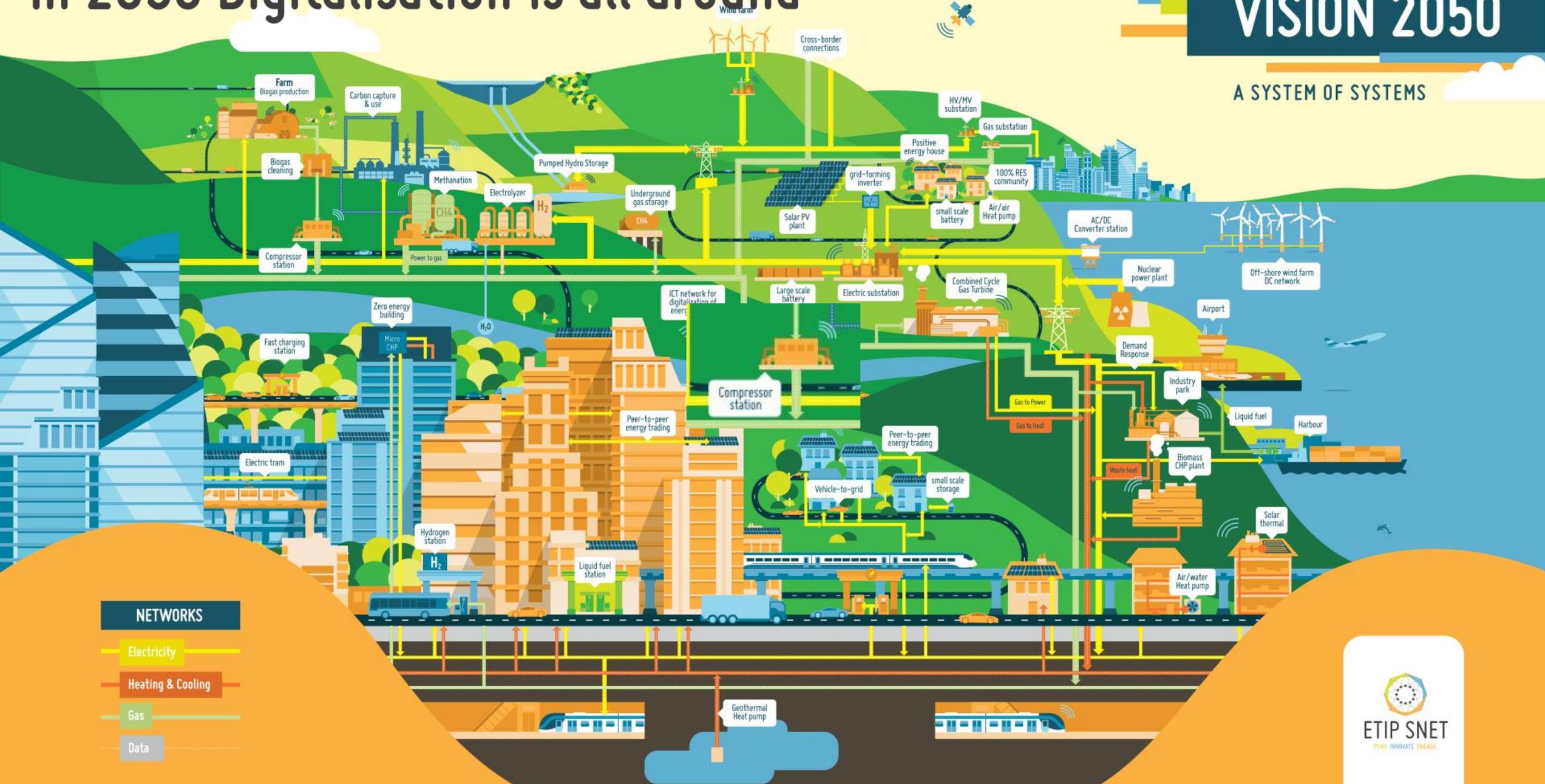
- Electricity
- Heating & Cooling
- Gas
- Data



In 2050 Digitalisation is all around

VISION 2050

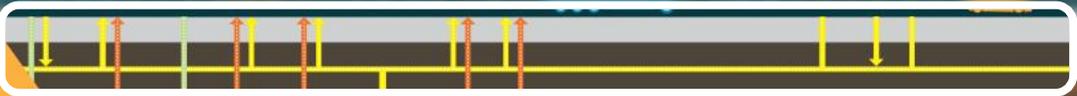
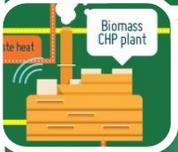
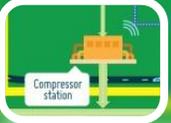
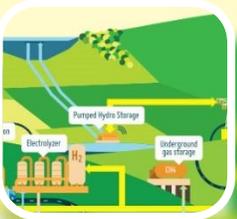
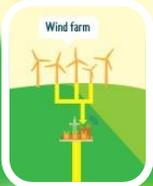
A SYSTEM OF SYSTEMS



In 2050 Digitalisation is all around

VISION 2050

A SYSTEM OF SYSTEMS



Data



Vision 2050

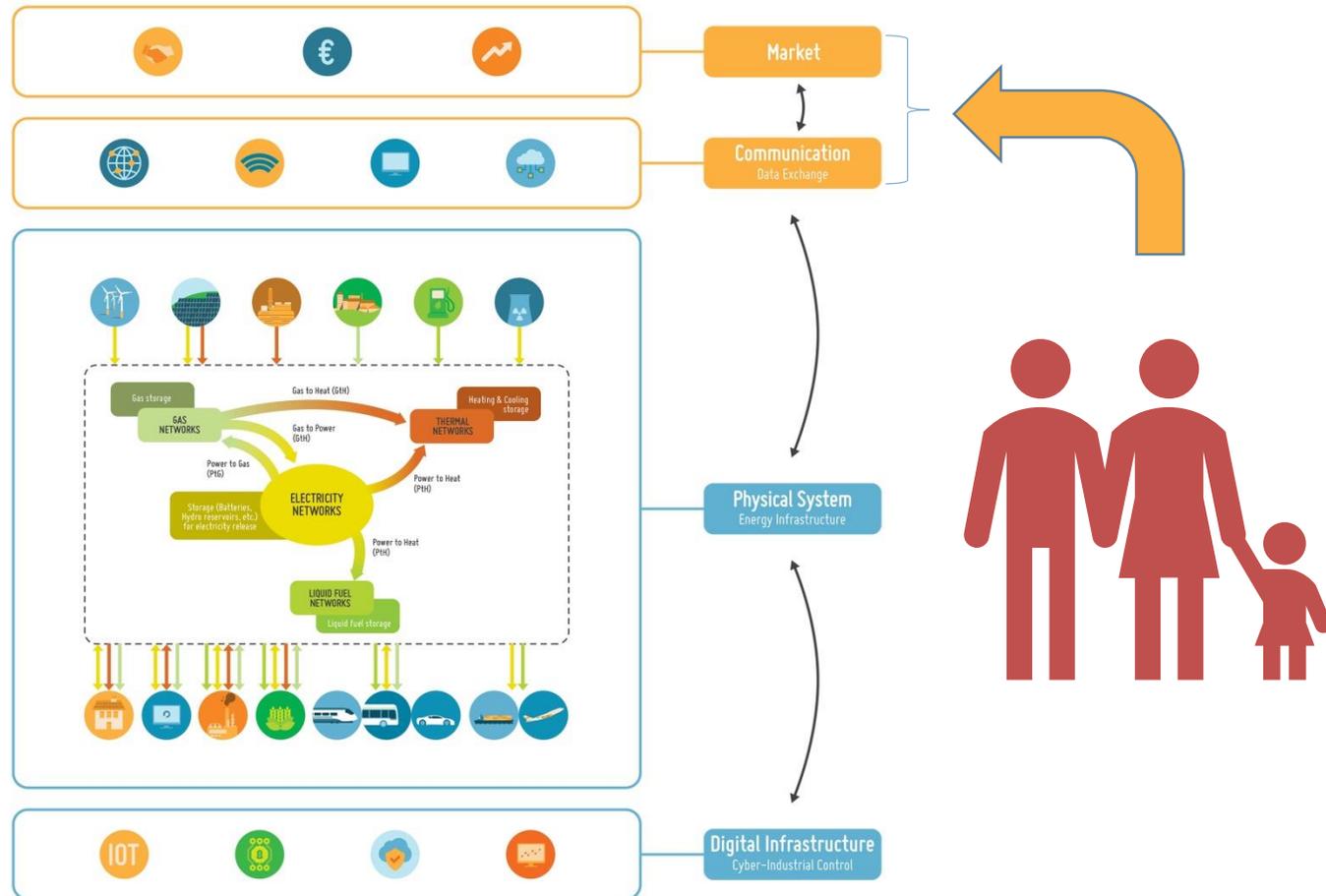
**Building Blocks:
The Ingredients of the Vision**



ETIP SNET

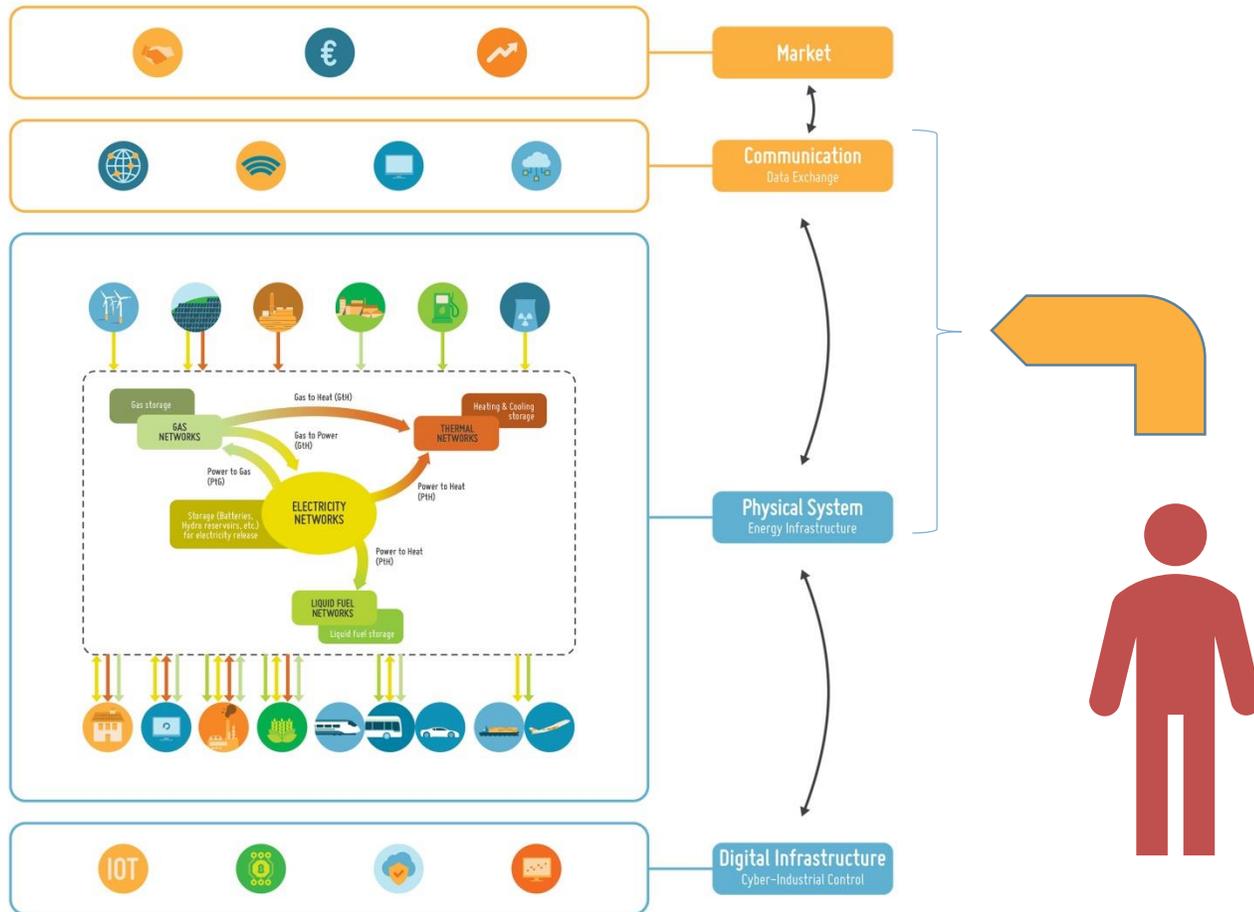
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Customers and Markets ...



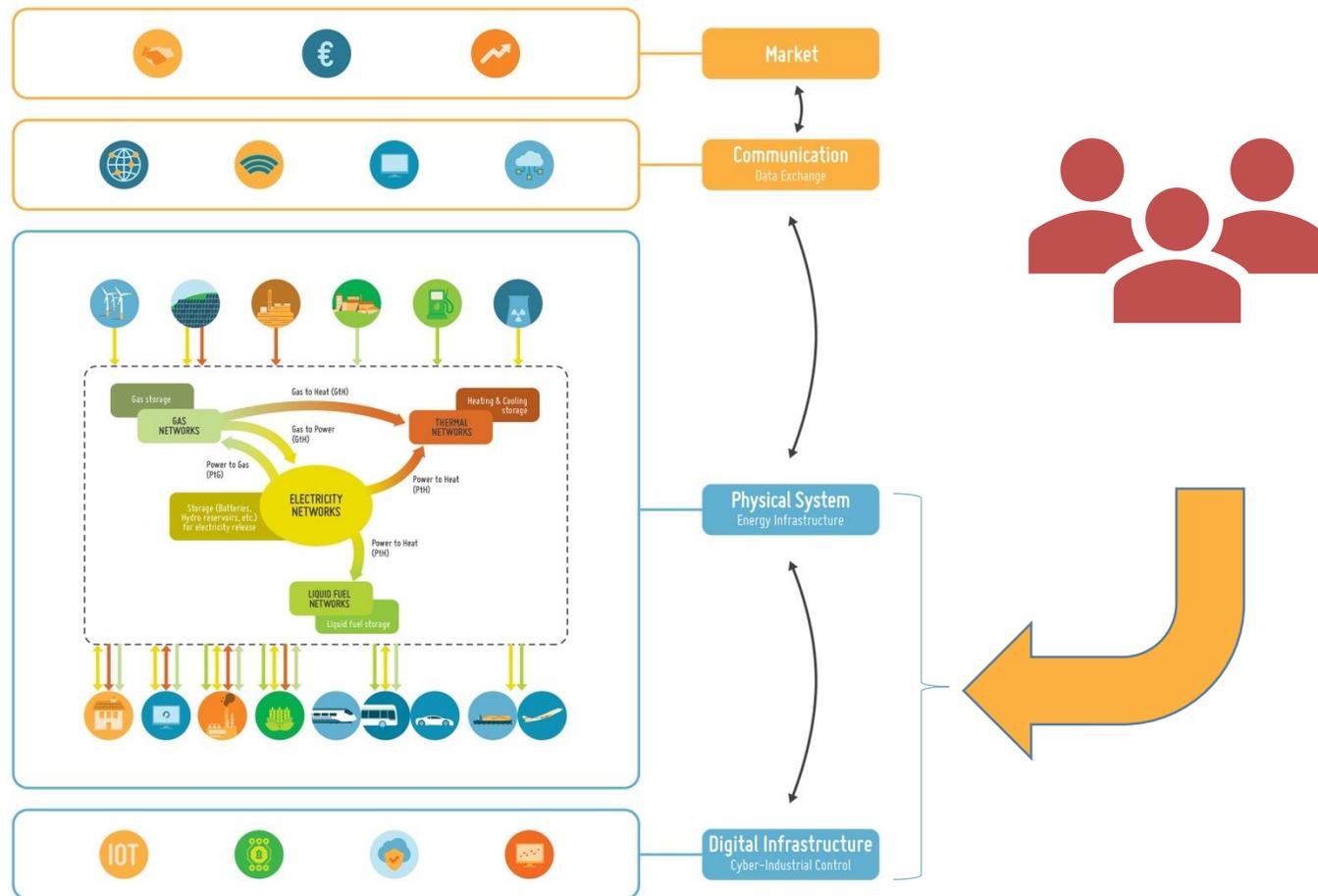
- **enable price-based coordination:** based on wind, sunshine, and cost-reflective customer choices (no subsidies any more)
- **enable diverse use of resources:** optimal use of renewable resources, weather and demand across Europe.
- **enable use of biomass and synthetic gas:** must be integrated efficiently (with hydro, ocean and nuclear energy)
- **enable end-use value:** for industrial processes or for aviation, shipping and long-distance trucking.
- **enable daily or seasonal energy storage:** Value of energy in storage, from seasonal to hourly

Customer, Communication, Digitalisation



- **Information:** IoT with smart meters and sensors for real-time monitoring and control
- **Analytics:** Data mining, machine learning, digital twins
- **Connectivity:** Massive data exchange including M2M

Customer, Physical System and Digital infrastructure



- **Enable cooperation:** TSO & DSO, both electricity and gas, from building to pan-european (and heat/cooling district/locally)
- **Enable subsidiarity:** Actions are optimised at the most immediate level. Actions that cannot be handled locally are handled at the next level.
- **Enable automation:** handle the available physical capacities through new, automated services for flexible energy network resources

Efficient energy use in buildings and industry

VISION 2050

A SYSTEM OF SYSTEMS



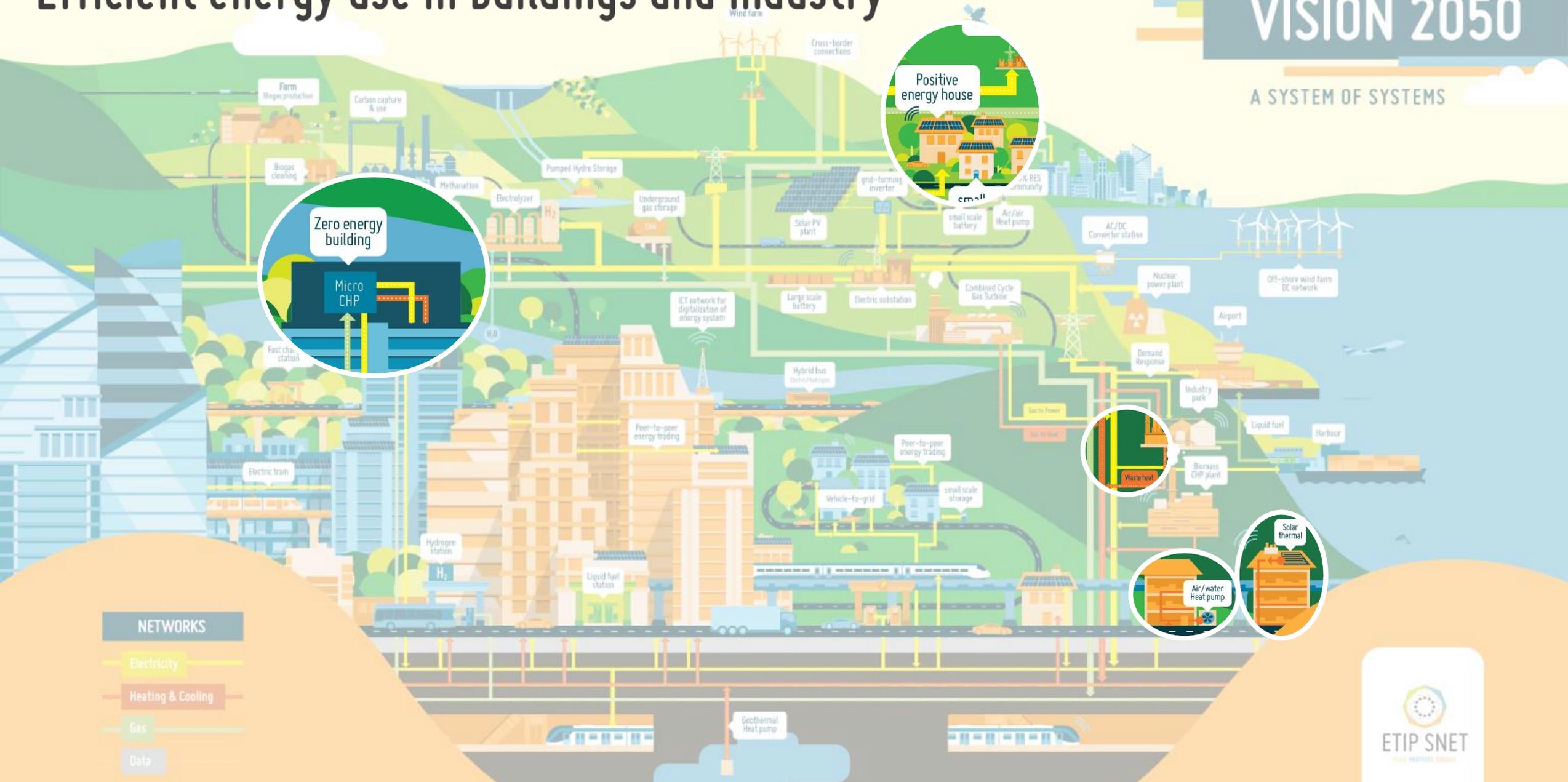
- NETWORKS**
- Electricity
 - Heating & Cooling
 - Gas
 - Data



Efficient energy use in buildings and industry

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Zero energy building

Micro CHP

Positive energy house

Waste heat

Air/water Heat pump

Solar thermal

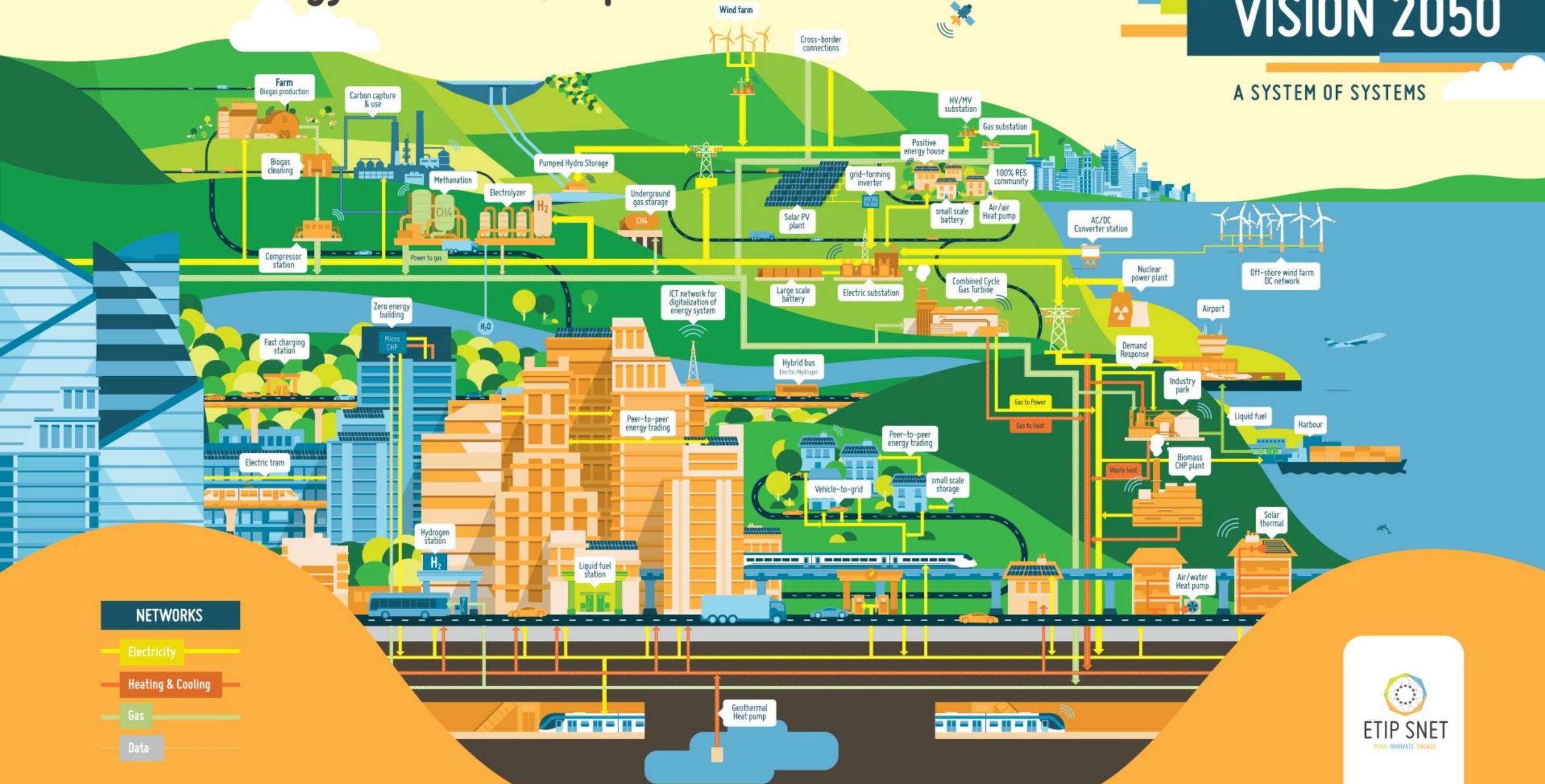
- NETWORKS**
- Electricity
 - Heating & Cooling
 - Gas
 - Data



Efficient energy use in transport sector

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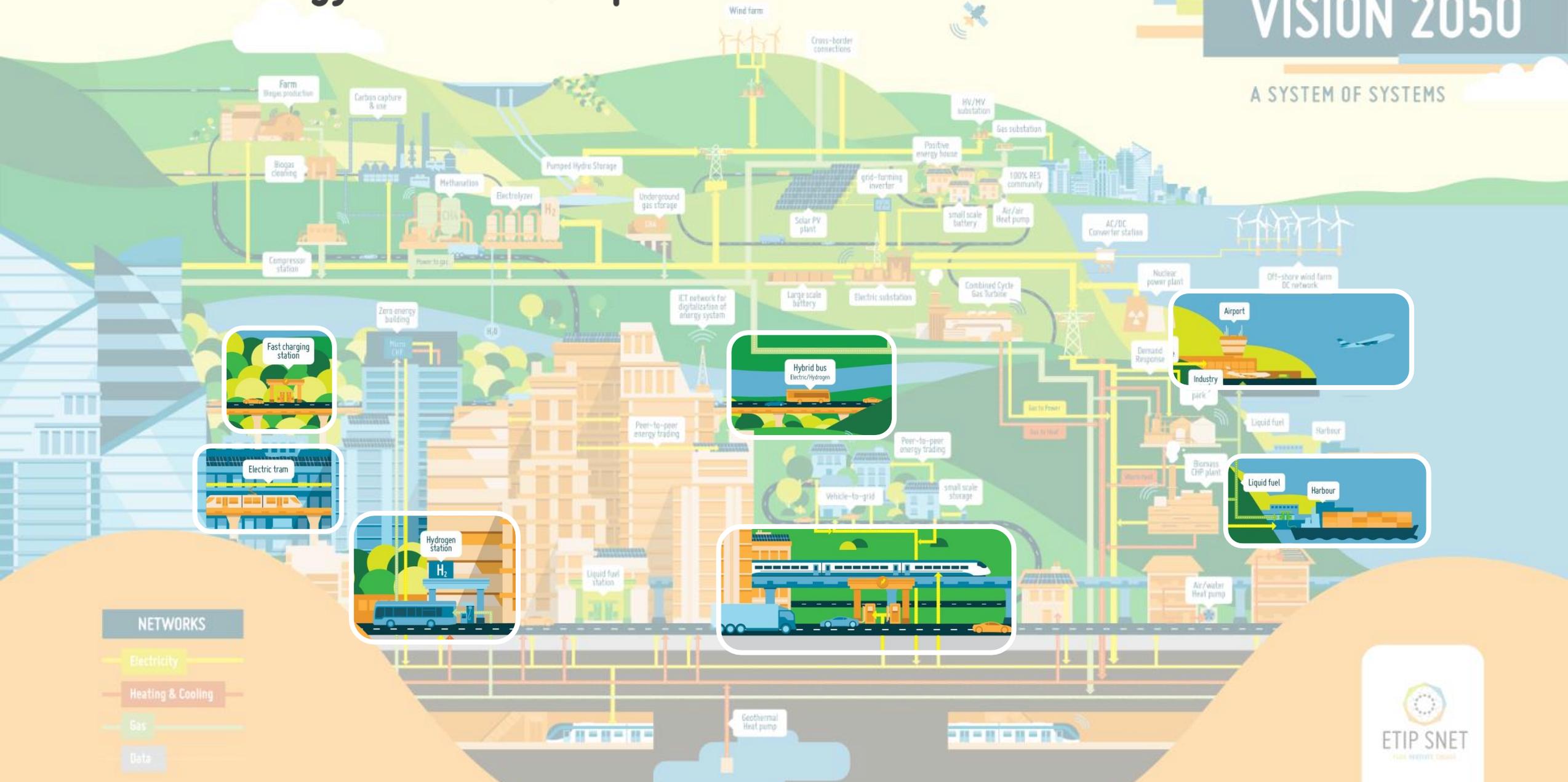
A SYSTEM OF SYSTEMS



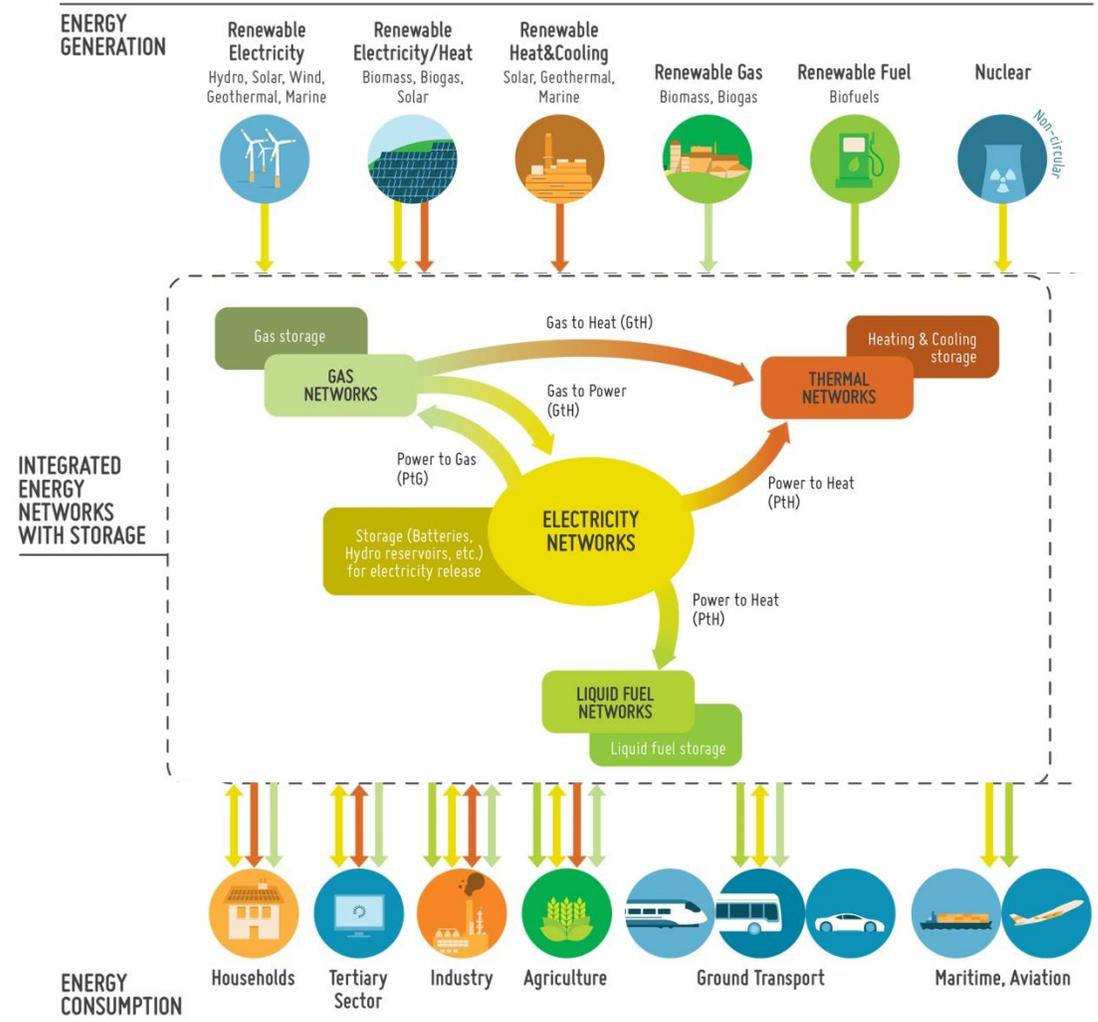
Efficient energy use in transport sector

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Electricity network is the backbone of the integrated energy system



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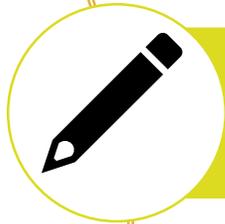
RD&I Environment: The Framework



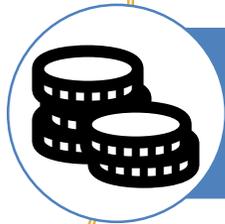
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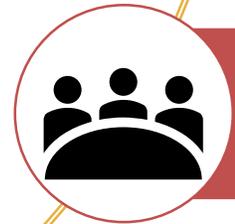
European Leadership in World Economy



Managing economic disruption and job creation



Strategy for RD&I on Governance, Funding, Financing



Act today: Bring stakeholders together, guide paths, link platforms and stakeholders, communicate societal benefits



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#Vision2050

