



celsius



Celsius Talk: Integrated Energy Systems

Friday, June 3, 2022





Integrated Energy Systems



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Moderator



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DG Energy

European Commission



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Optit

project PlaMES



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Ennatuurlijk

The Netherlands



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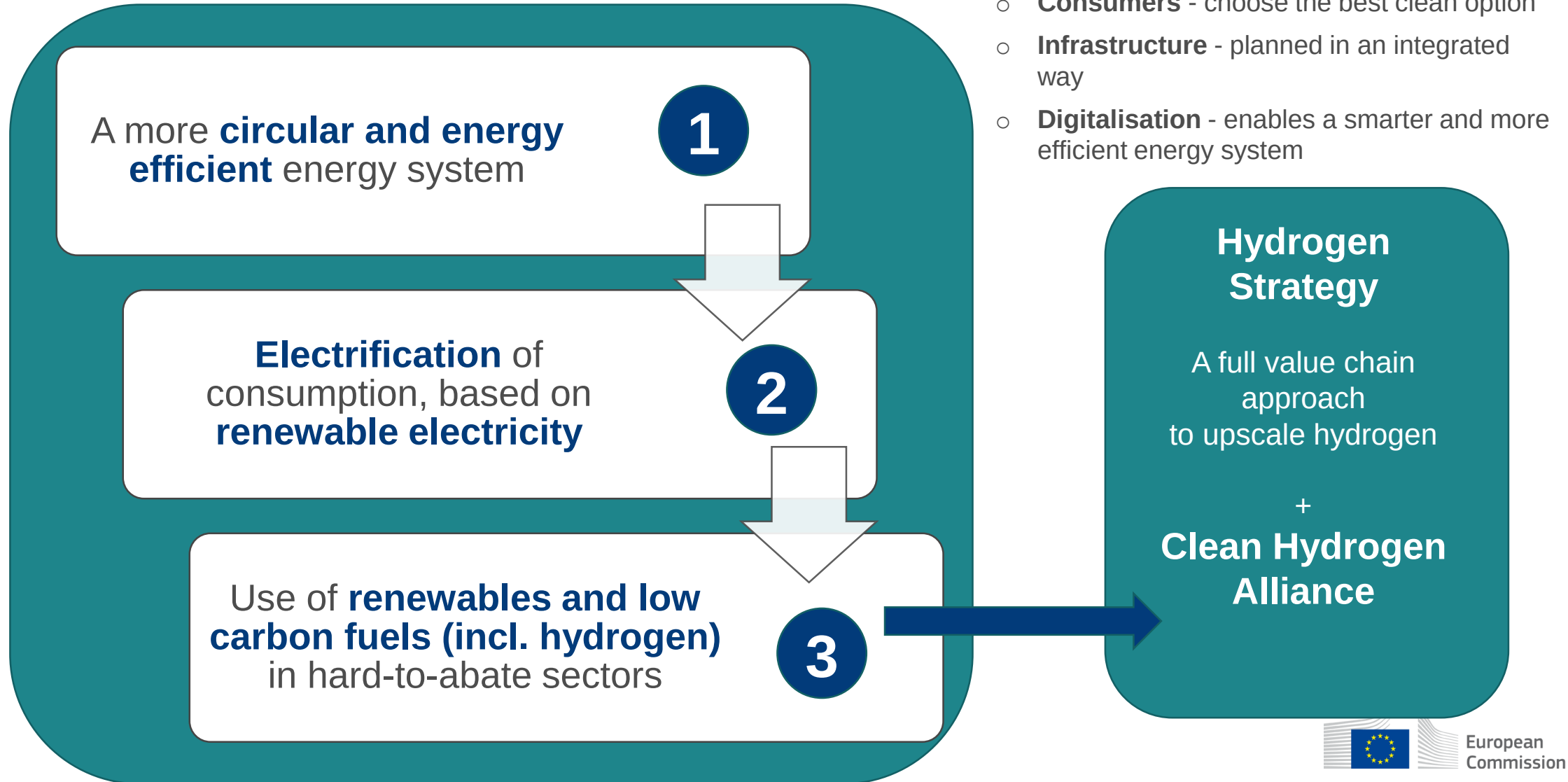


Energy Sector Integration: Delivering the European Green Deal

Celsius Webinar, Brussels, 3 June 2022

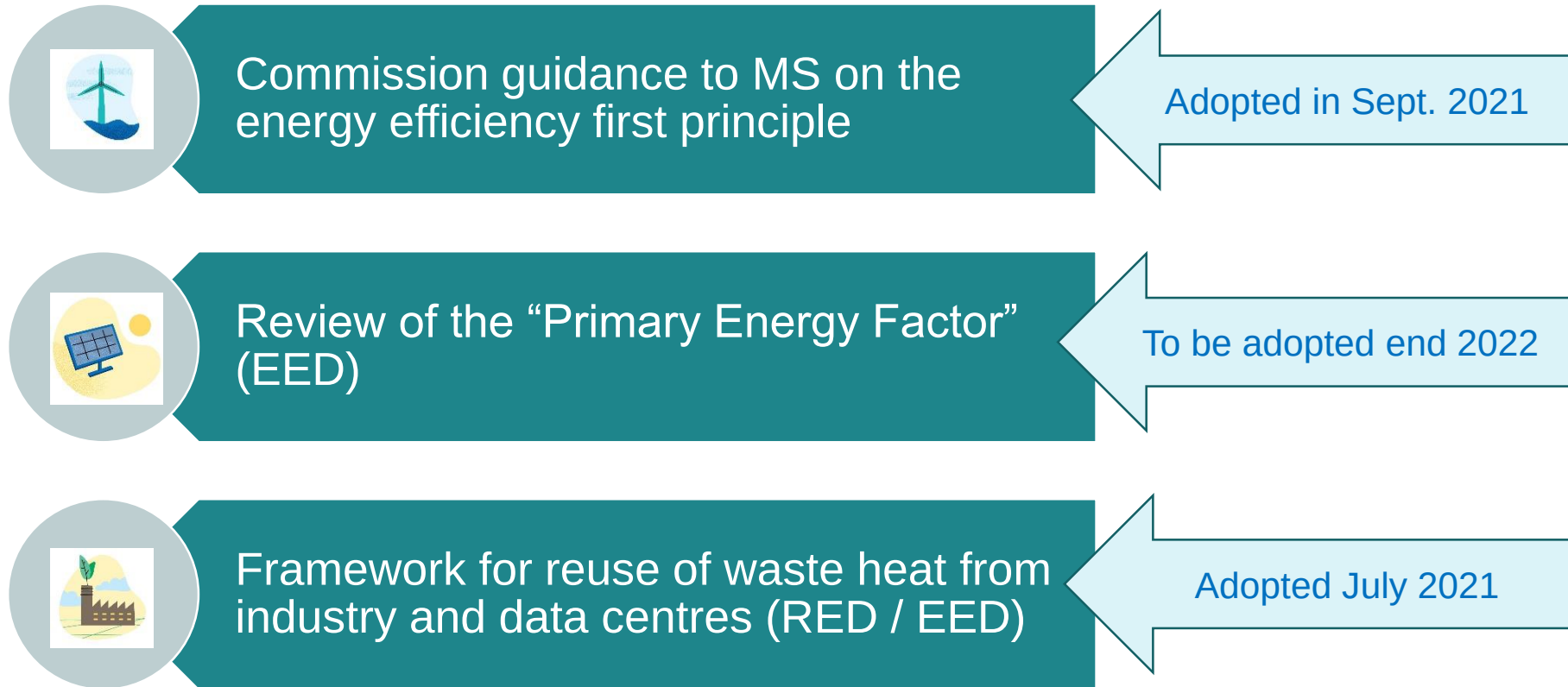
Lelde Kiela Vilumsone
Renewables & Energy System Integration Policies
Directorate-General for Energy

Strategy for Energy System Integration

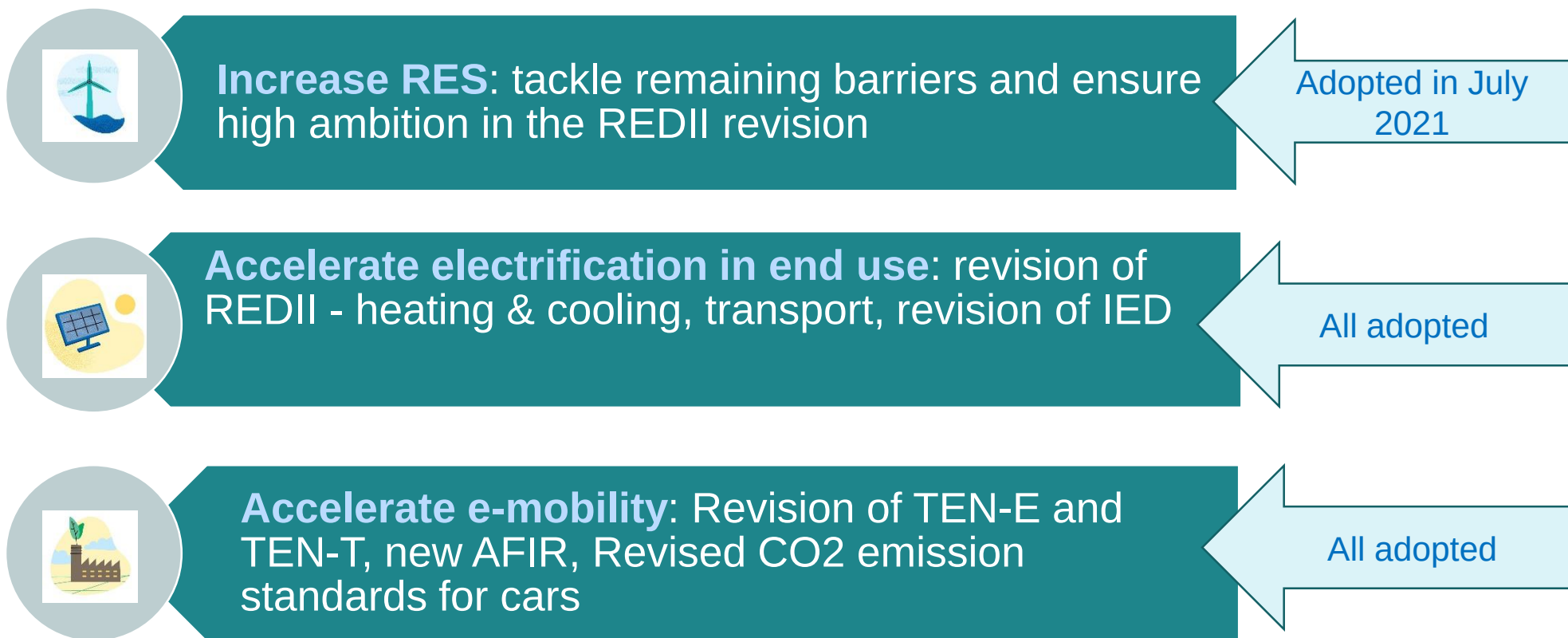


Update on key actions

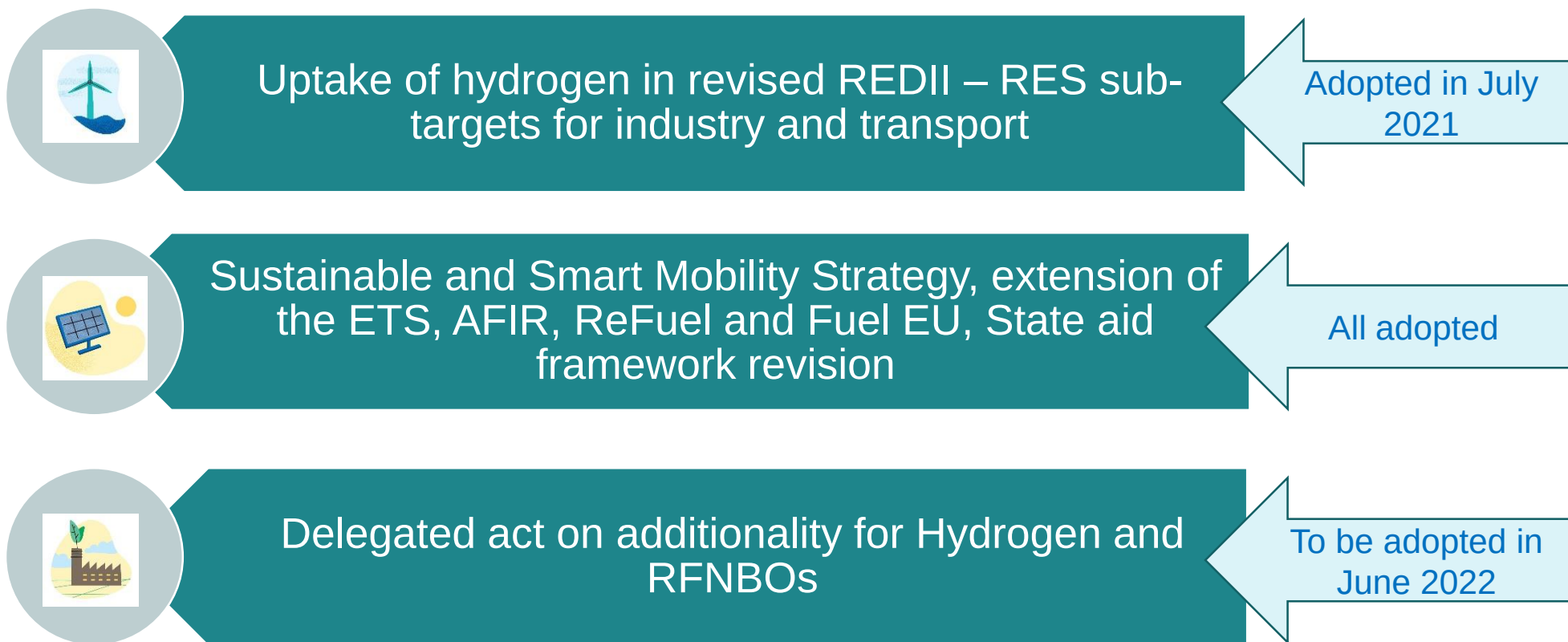
1. More efficient and circular energy system



2. Electrification based on renewables



3. Hydrogen and hydrogen derived fuels

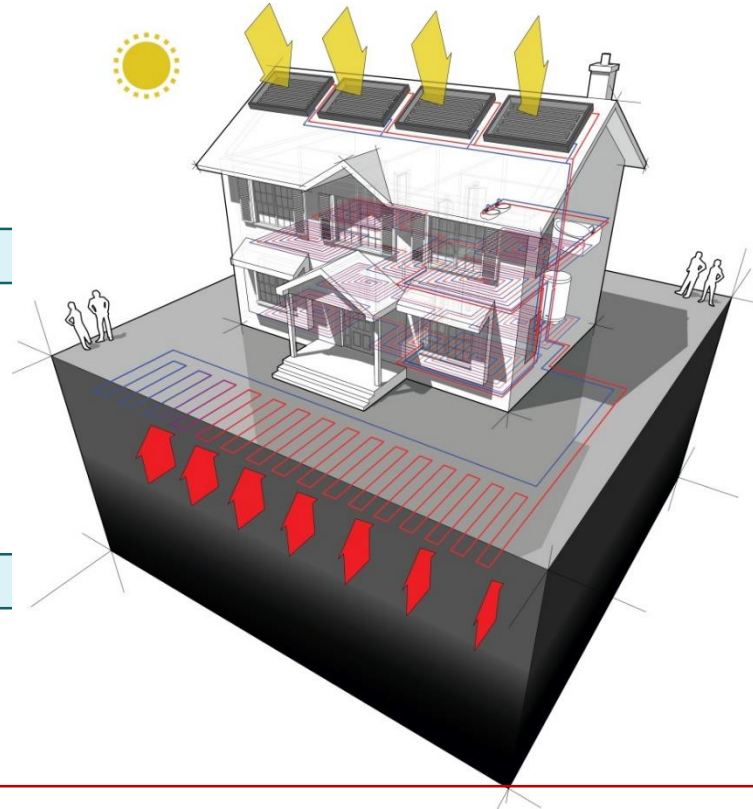


Importance of developing the hydrogen infrastructure and market through regulatory and non-regulatory actions, incentives, cross-border cooperation

Proposal REDII review – Shifting to modern, consumer based DHC & Buildings

District Heating and Cooling:

- Increased indicative target to **2.1 percentage point**
- Stronger **consumer information** and network access requirements
- Stronger coordination with other energy networks to **facilitate system integration**
- Coordination framework to **harness the potential sources of waste heat and cold**



Buildings:

- 49% renewable energy benchmark to monitor efforts and progress
- Training and skills
- Complementary to EED and EPBD

Enabling framework for waste heat and ESI

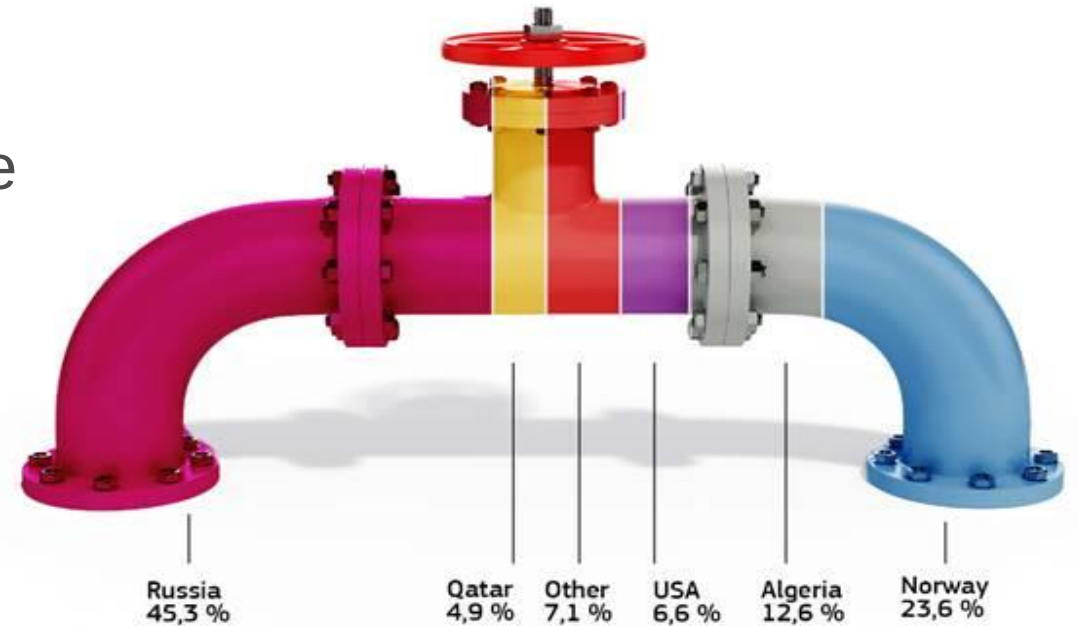
Strengthening and enabling DHC role in Energy System Integration by requirements to establish national frameworks:

- for waste heat/cold utilisation (paragraph 6 of Article 24);
- for cooperation with electricity, gas and other energy grids (paragraph 8 of Article 24).

RepowerEU context

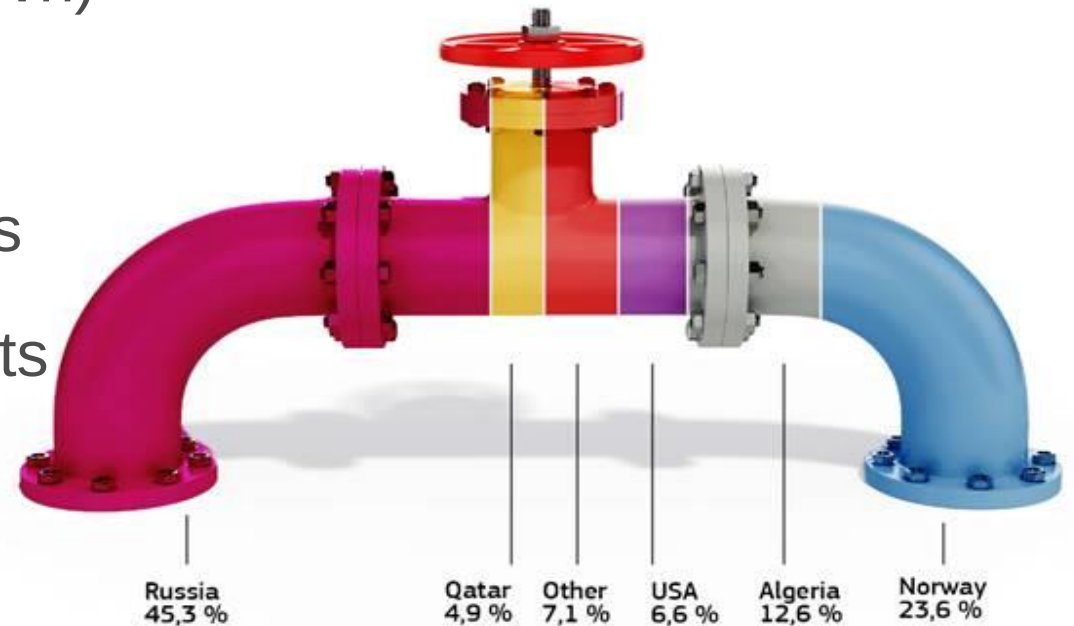
RepowerEU: Double HP deployment rate & develop district heating to replace fossil fuels

- 30 million newly installed heat pumps in 2030, 10 million units in the next 5 years
- **Develop, modernise district heating systems**, which can replace fossil fuels in individual heating, especially in densely populated areas and cities, to **accelerate the deployment and integration of**: 1) **large-scale heat pumps**, 2) **geothermal** and 3) **solar thermal energy**
- Develop clean communal heating
- Exploit industrial heat whenever available.



RepowerEU: The Hydrogen Accelerator

- **EU production:** 10 million tonnes (333 TWh)
- Identify main offtake sectors
- Infrastructure, storage, terminals and ports
- Prioritisation state aid for hydrogen projects
- **Imports:** 10 million tonnes
 - Green Hydrogen Partnerships
 - Global European Hydrogen Facility



RepowerEU - EU Solar Energy Strategy

Objectives:

- To increase the EU share of renewables and to reach more demand sectors
- To reduce dependence on fossil fuels imports from Russia

The strategy proposes a comprehensive approach, identifies barriers and measures



European Solar Rooftops Initiative to promote massive decentralised PV deployment in our buildings - significant unexploited potential



RepowerEU -

Accelerating permitting processes for renewable energy projects

The Permitting package:

- Recommendation
- Guidance
- Legislative proposal

Thank you!



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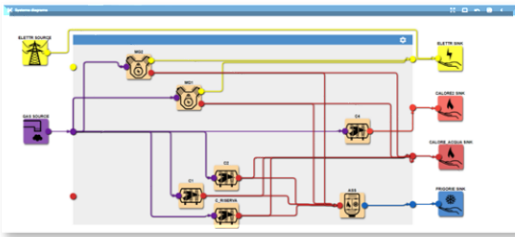
OPTIT
optimal solutions

Integrated Energy Systems

PlaMES: multi-energy system planning tool

Celsius Talk - Matteo Pozzi
Zoom meeting 3rd June 2022

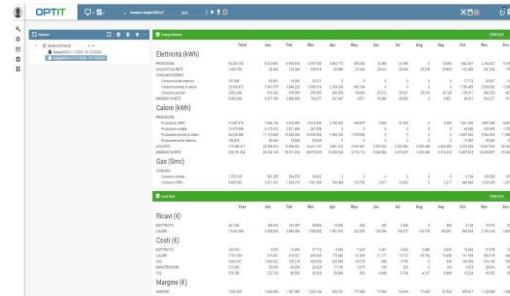
PLANT CONFIGURATION



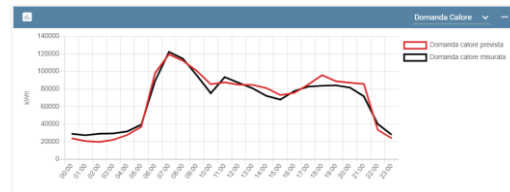
SYSTEM INTEGRATION

- Field data
- Market data
- Price estimates
- Economics
- Weather forecasts

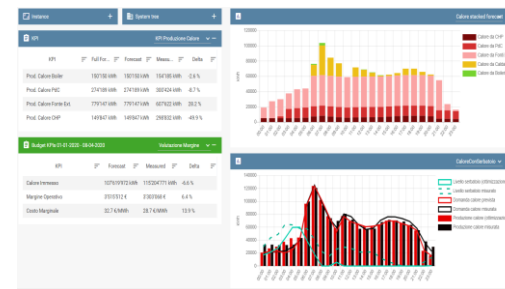
LONG TERM (YEAR)



FORECASTING



SHORT TERM (NEXT DAYS)



TRADING (SAME DAY)



STRATEGIC DECISIONS

- Investments
- Sensitivity (what-if)
- Budgeting

OPS DECISIONS

- Unit commitment
- Margin optimisation
- Automatization

TRADING DECISIONS

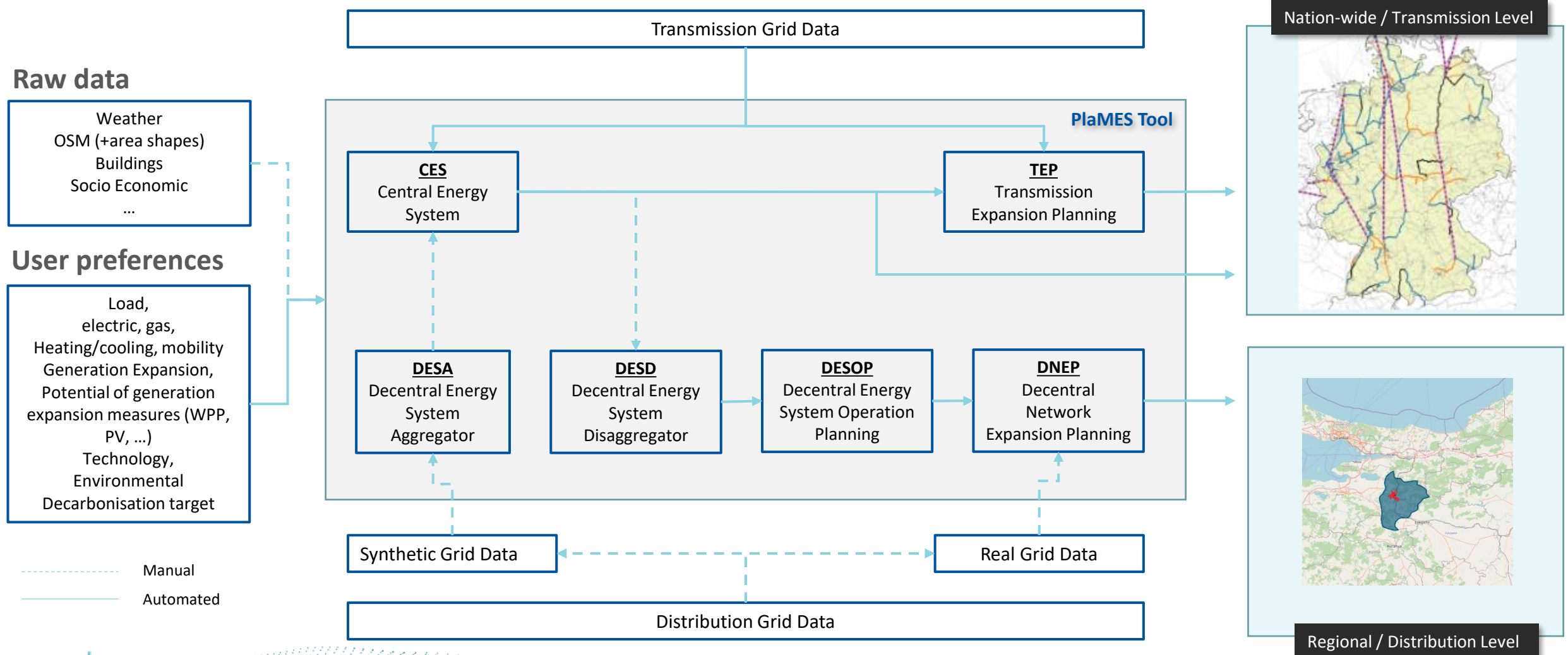
- DA/SD adj. Trading
- Capacity markets
- XBID

INTEGRATED PLANNING OF MULTI-ENERGY SYSTEMS

- Design of efficient transition paths for **future energy systems**, regarding both generation and infrastructure
- Achieve **synergies and flexibilities** between the electricity, heat, gas and mobility sectors
- **Support** system planners, regulators, national authorities, technology companies TSOs and DSOs



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Geographical filters

Model Management
and run process

Scenario
Management

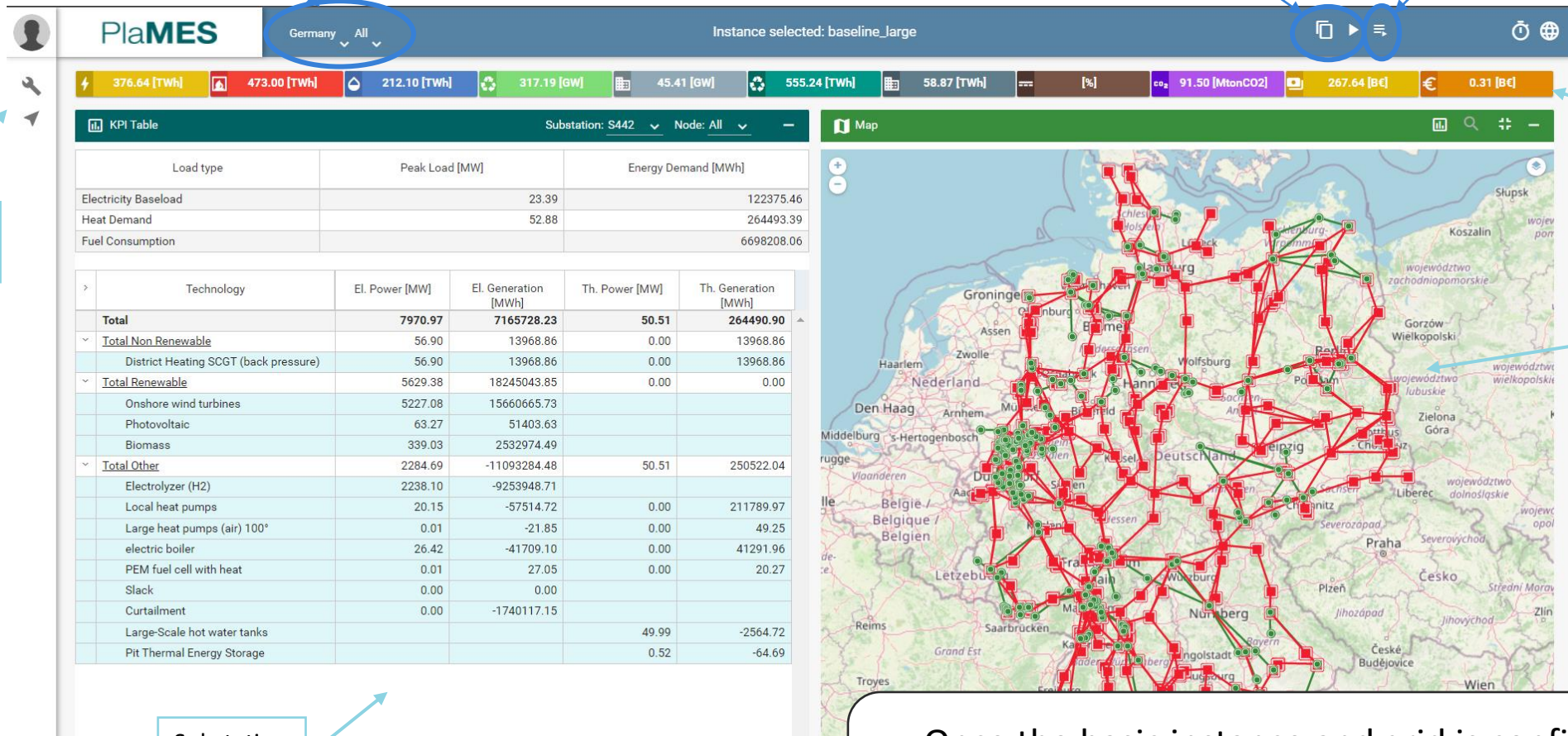
Tool
settings

Global scenario
results

Grid map for an
easier navigation

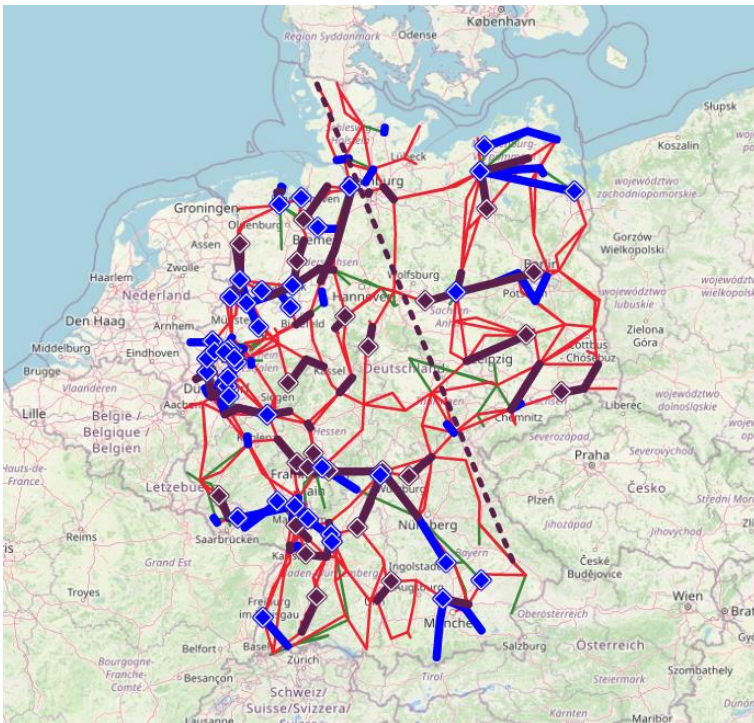
Substation
KPI Panel

Once the basic instance and grid is configured, the PlaMES tool allows scenario setup, launch of models, navigation of solutions in a few clicks



The ultimate tool to design the long term decarbonisation strategy

Long term and large-scale scenarios of supply and transmission/distribution investment plans to meet **decarbonization** targets with minimum costs



PlAMES

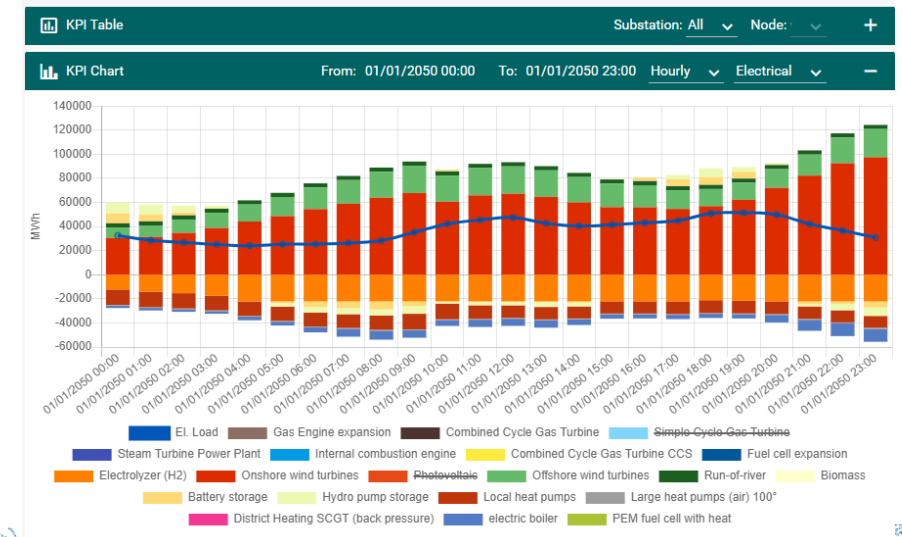
Instances comparison

Target version: ehighways_2050_v3 Network Category: Electrical

KPI	ehighways_2050_v3	Germany_2019_v3	Δ	baseline_large	Δ
Loads					
Electricity Baseload [TWh]	414.14	578.24	39.63% ▲	376.64	-6.05% ▼
Fuel Consumption [TWh]	305.78	709.73	132.10% ▲	212.10	-30.64% ▼
Generations [TWh]					
Total	412.50	605.44	46.77% ▲	375.00	-9.09% ▼
Total Non Renewable	85.25	289.78	239.92% ▲	40.92	-52.00% ▼
Gas Engine expansion	3.23	81.03	2408.61% ▲	12.84	297.43% ▲
Combined Cycle Gas Turbine	46.13	148.63	222.21% ▲	9.72	-78.93% ▼
Simple Cycle Gas Turbine	0.76	1.21	57.66% ▲	0.03	-96.47% ▼
Steam Turbine Power Plant	0.78	16.78	2041.92% ▲	0.27	-65.63% ▼
Internal combustion engine	0.01	8.46	65649.94% ▲	0.01	-11.43% ▼
Combined Cycle Gas Turbine CCS	0.11	0.11	-0.16% ▼	0.11	-0.16% ▼
District Heating SCGT (back pressure)	34.22	33.68	-1.59% ▼	17.95	-47.55% ▼
Total Renewable	533.49	309.77	-41.94% ▼	555.24	4.05% ▲
Onshore wind turbines	147.68	147.68	-90.03% ▼	300.66	1.04% ▲
Photovoltaic	64.54	50.77	-21.33% ▼	134.30	108.10% ▲
Offshore wind turbines	30.80	30.80	-46.84% ▼	44.66	-51.93% ▼
Run-of-river	30.00	29.97	-0.10% ▼	28.00	-6.67% ▼
Biomass	50.54	50.54	-0.00% ▼	47.61	-5.79% ▼
Total Other	-206.24	5.89	102.85% ▲	-221.16	-7.23% ▼
CO2 Emissions [MtonCO2]	88.90	161.55	81.72% ▲	82.73	-6.94% ▼
Capex [B€]	253.66	244.43	3.77% ▲	266.66	5.09% ▲
Opex [B€]					

Detailed (hourly) optimized **energy production mix** for each scenario

Transmission / distribution infrastructure requirements based on expected **future supply/demand structure**, that takes into account interaction between electricity, heat, electric mobility and gas loads



OPTIT

optimal solutions

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Celsius talk: Integrated energy systems



Hengelo: The most **innovative** district heating network in NL

ennatuurlijk

Doorpakkers
in lokale energie



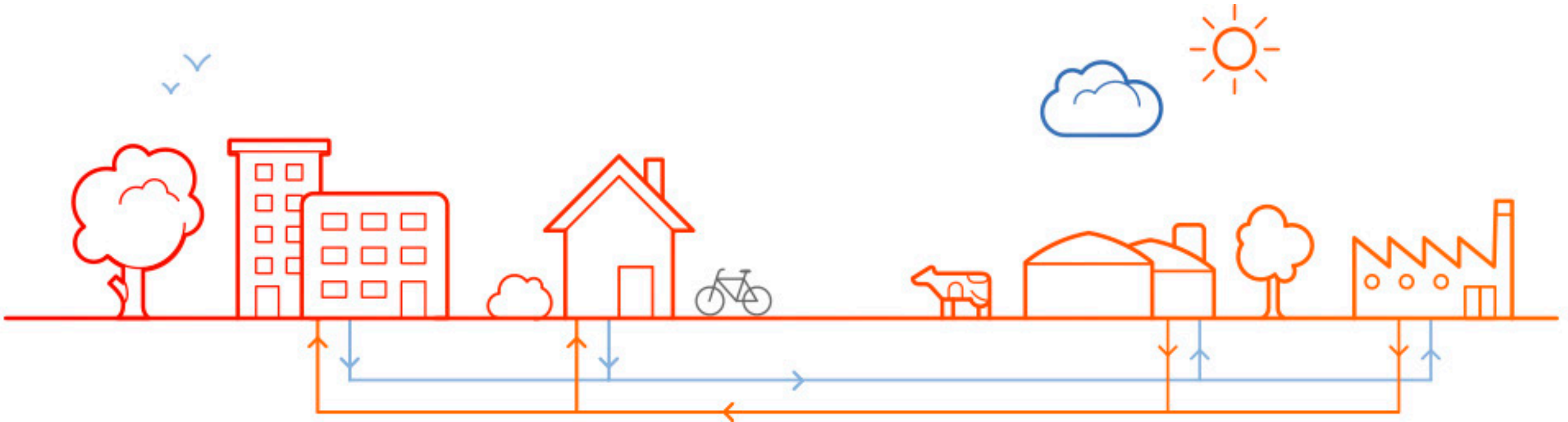
Agenda

1. About Ennatuurlijk
2. Our objectives
3. The Hengelo network
4. Innovations and developments
5. Questions?

About Ennatuurlijk

ennatuurlijk

Ennatuurlijk supplies **heat** and **cold** to approx. 85.000 residential and 1.200 commercial customers in the Netherlands. Our strengths lie in heating projects that are **local** and **sustainable**.



Some of our bigger projects

- Enschede Industrial waste heat (Most sustainable of NL)
- Hengelo Industrial waste heat
- Leeuwarden Geothermal energy in development
- Den Bosch Ground-coupled heat exchanger and aquathermal energy
- Apeldoorn Biogas waste heat
- MW Brabant Industrial waste heat -> Geothermal energy in development
- Eindhoven Biomass
- Helmond Gas-CCGT -> Aquathermal energy in development
- Maastricht Industrial waste heat
- Sittard Biomass -> Industrial waste heat in development

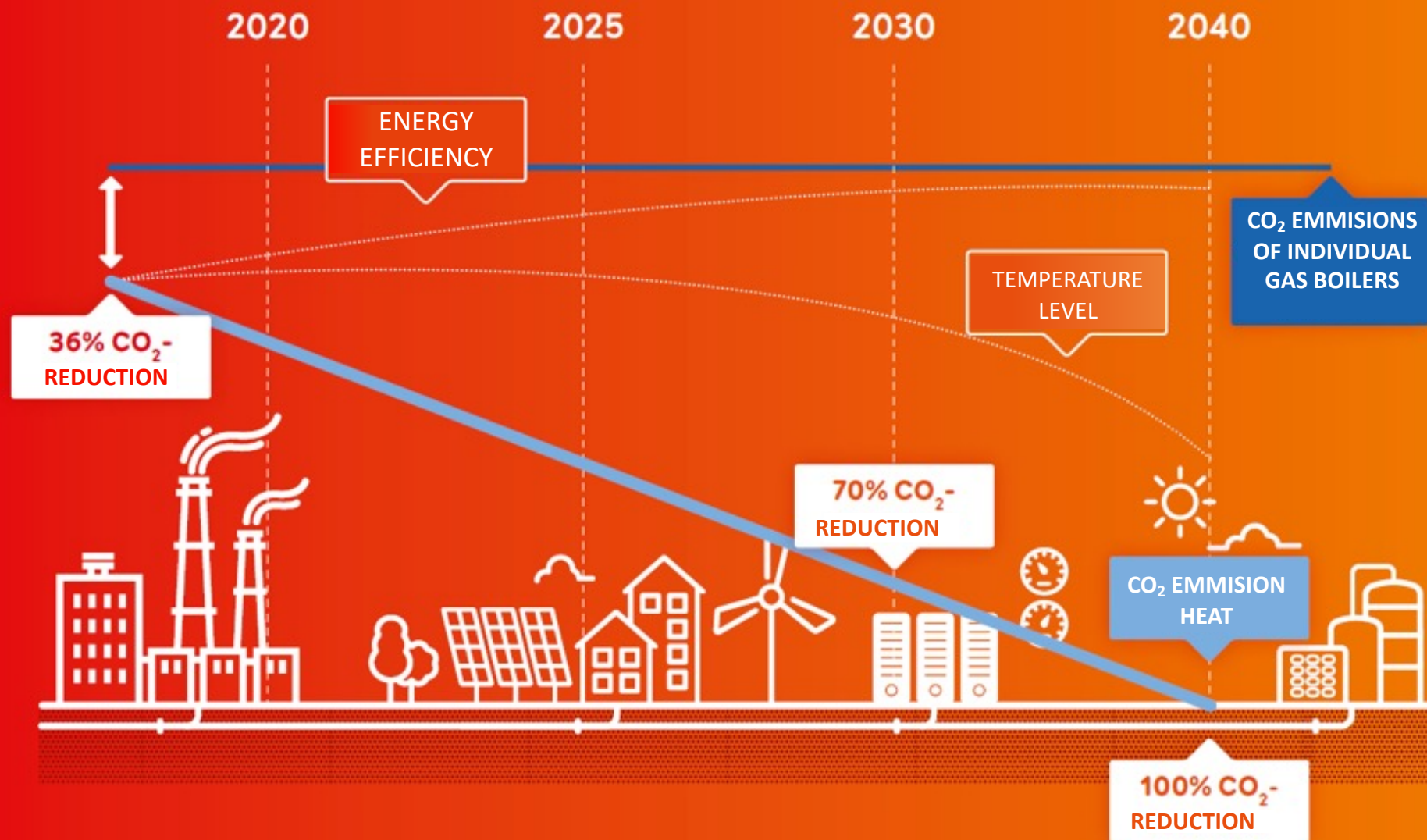


Objectives

- 20% CO2 reduction 2030
- 200.000 end-customers in 2030
- 30% cost reduction in 2030

Outlook in the future

ennatuurlijk

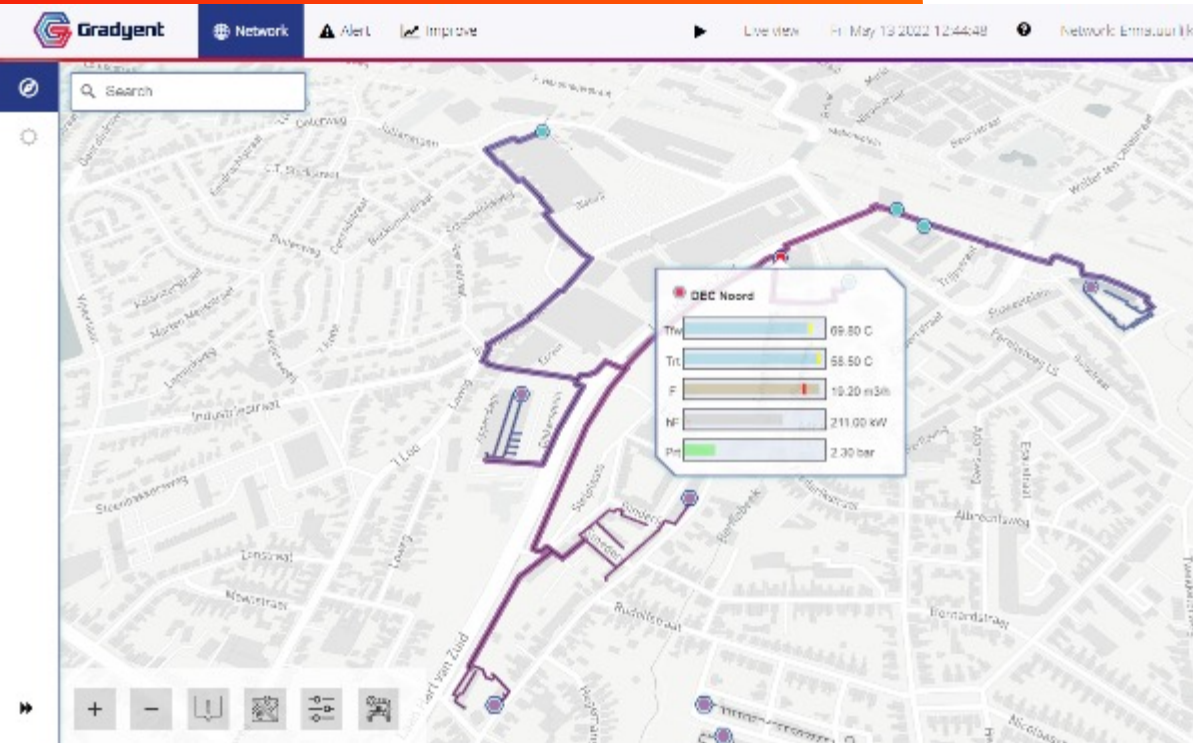


The Hengelo network:

- High temperature heat from waste incineration (1) used by salt production (2)
- Low temperature heat from salt production to locations from Ennatuurlijk (A, B)
- Heat is upgraded to mid temperature with heat pumps
- Heat pumps use electricity from the solar park from Twence



Exploring a 5th generation network:



- Digital twin from Gradyent
 - TCO optimization
- Buffer studies
- Demand side response
- Collective and individual cold
- P2H & P2P combined concept

Questions?



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Doorpakkers
in lokale energie