Netbeheer Nederland

Flexibility & System Integration

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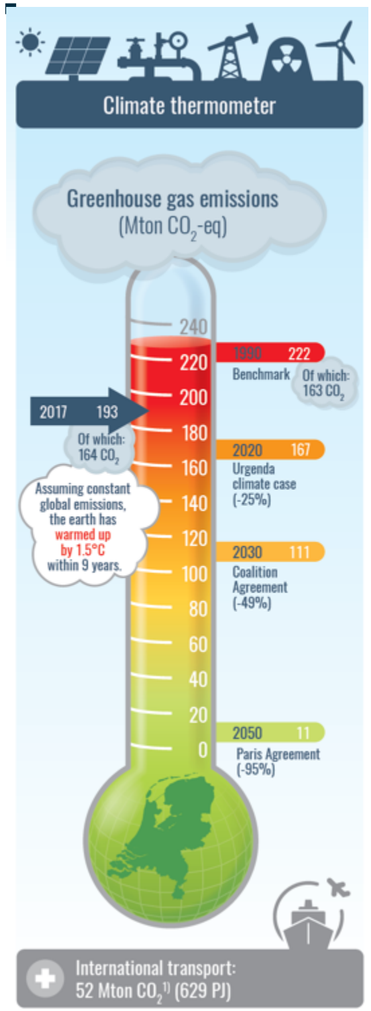
Agenda

1. Introducing Netbeheer Nederland
2. The role of the Dutch Climate Agreement
3. A Best Practise flexibility solution: Gopacs
4. The real solution: System Integration

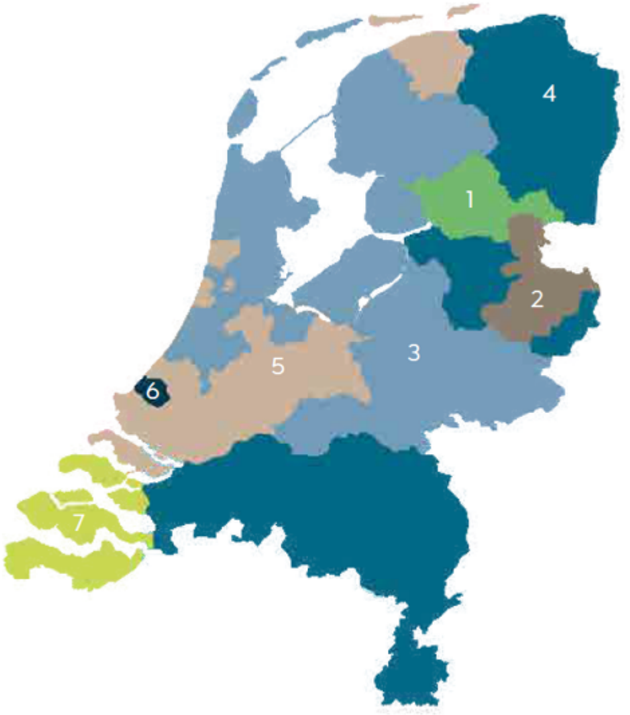
Thinking about Holland…



Introduction Netbeheer Nederland

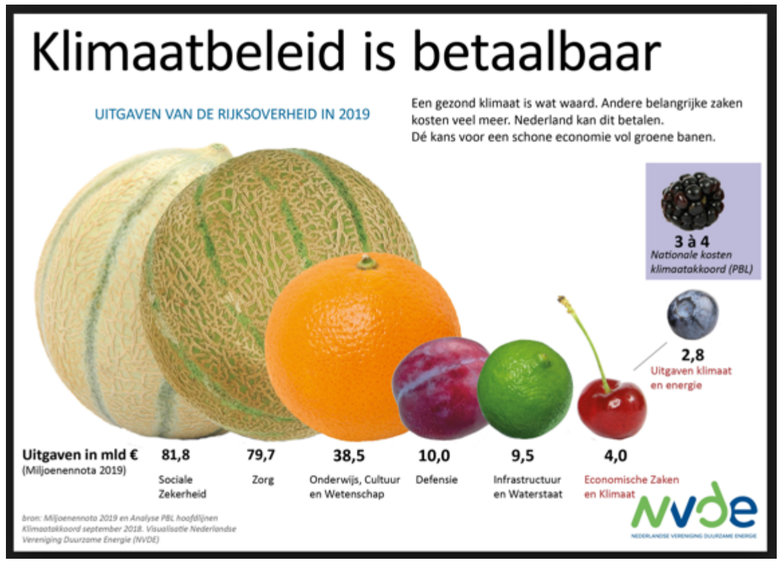
Elektriciteit

Gas



1. RENDO
2. Coteq
3. Liander
4. Enexis
5. Stedin
6. Westland Infra
7. Enduris

Climate Agreement defines energy transition



THE TASK.

More than 100 involved parties will decrease the Dutch CO_2 emissions by 49% compared to 1990 via the Climate Agreement.

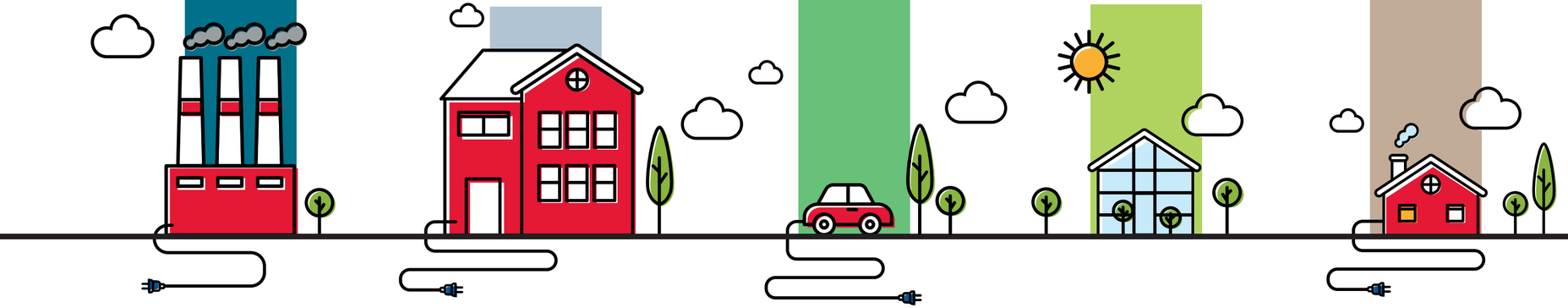
14.3
MEGATONNES

3.4
MEGATONNES

7.3
MEGATONNES

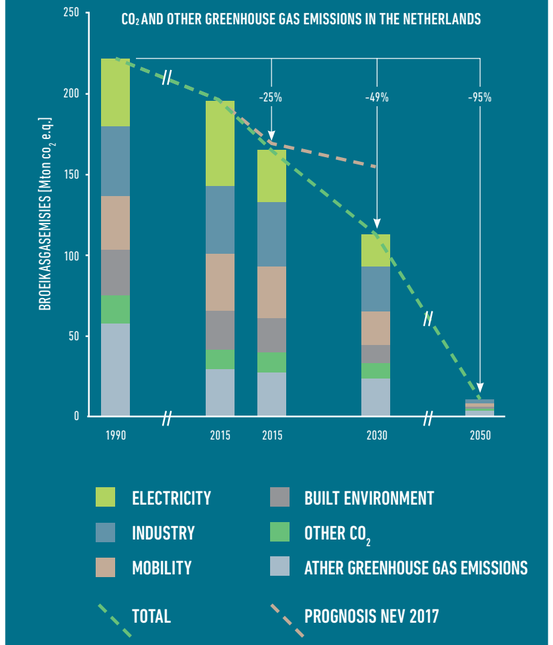
3.5
MEGATONNES

20.2
MEGATONNES



INDUSTRY | **BUILT ENVIRONMENT** | **MOBILITY** | **AGRICULTURE** | **ELECTRICITY**

CO_2 AND OTHER GREENHOUSE GAS EMISSIONS IN THE NETHERLANDS.

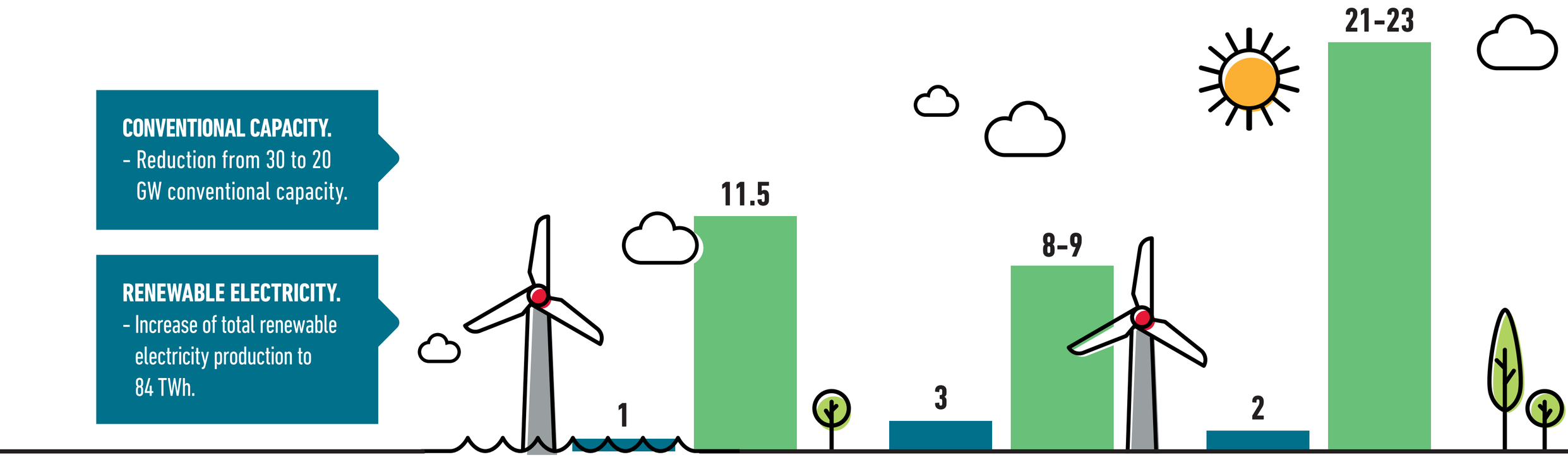


ELECTRICITY: FROM NOW TO 2030.

in numbers 2018 2030

CONVENTIONAL CAPACITY.
- Reduction from 30 to 20 GW conventional capacity.

RENEWABLE ELECTRICITY.
- Increase of total renewable electricity production to 84 TWh.



OFFSHORE WIND

11.5 GW of offshore wind capacity = 49 TWh

ONSHORE WIND

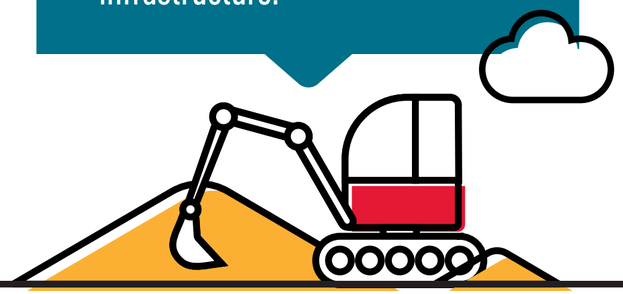
INLAND SOLAR ENERGY

De amount of onshore wind and inland solar capacity in 2030 is 35 TWh

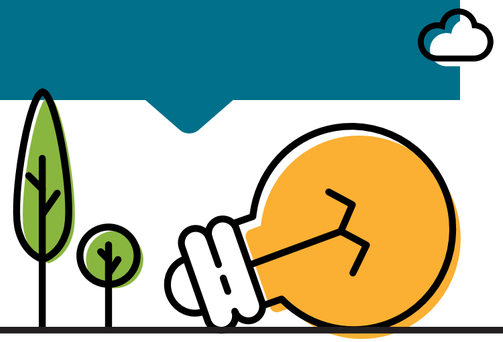
Total = 84 TWh

IMPACT ON GRID MANAGEMENT.

GRID ADJUSTMENTS.
- Increasing capacity of the electricity grid to accommodate the growing demand.
- Gradually less usage of the natural gas grid.
- Additional yearly investments in infrastructure.



CONSULTATION.
- Increased consultation of stakeholders so planned investments and projects are in scope.



USING GRIDS IN A SMART WAY.
- Invest in smarter appliances in order to maintain grid balance.
- Innovation and research into a new destoination for the natural gas grid.

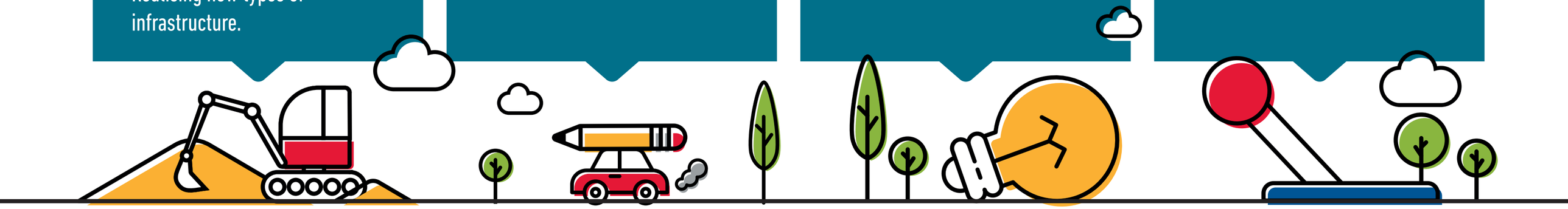
AGENDA DUTCH GRID OPERATORS CLIMATE AGREEMENT.

INCREASING CAPACITY.
- Creating room in the regulatory framework for timely and pro-active grid investments, making sure that costs for phasing out the natural gas grid are distributed in a fair way.
- Designing a market for flexibility, creating inland power outlets.
- Realising new types of infrastructure.

FORECASTING.
- Regional and local planning renewable generation capacity, EV-infrastructure, district driven aproach.
- Starting a knowledge centre and guidelines to support the district driven approach, including help from grid operator employees.

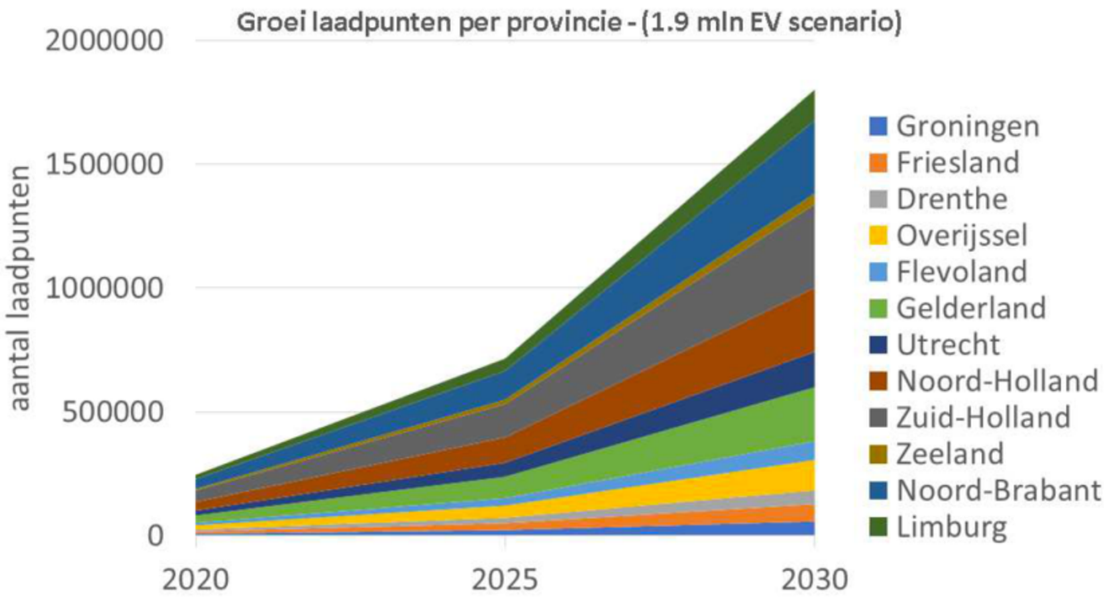
MAKING SMART USE OF THE GRIDS.
- Flexible load, automatic curtailment and smart charging.
- Taking into account cyber security

LABOUR MARKET.
- Growing and changing demand for employees.
- Shortage of technical employees.
- Ageing of labour force.

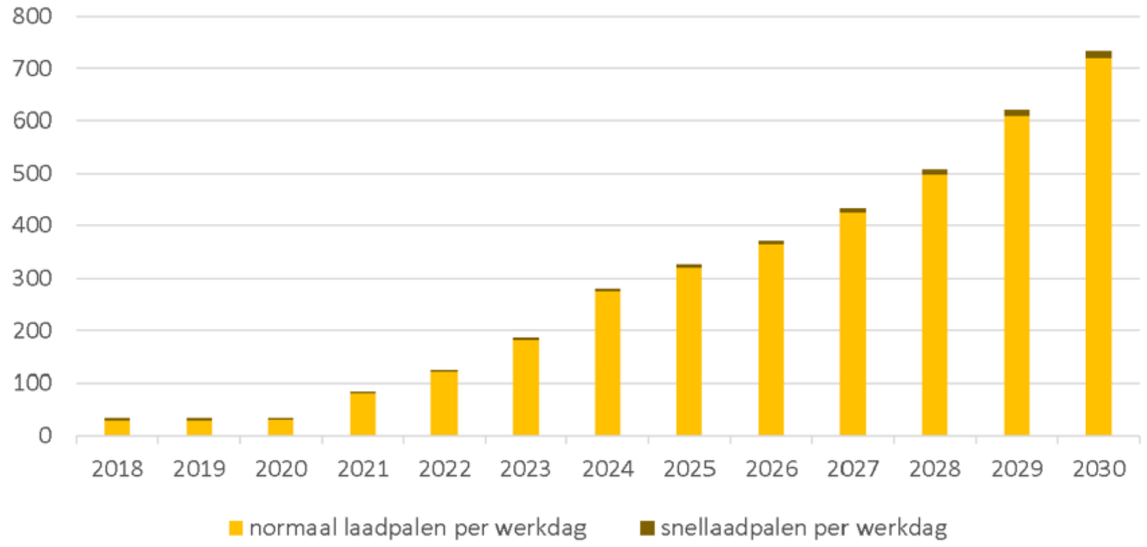


EV Roadmap based on Climate Agreement

Foreseen growth charging points by state



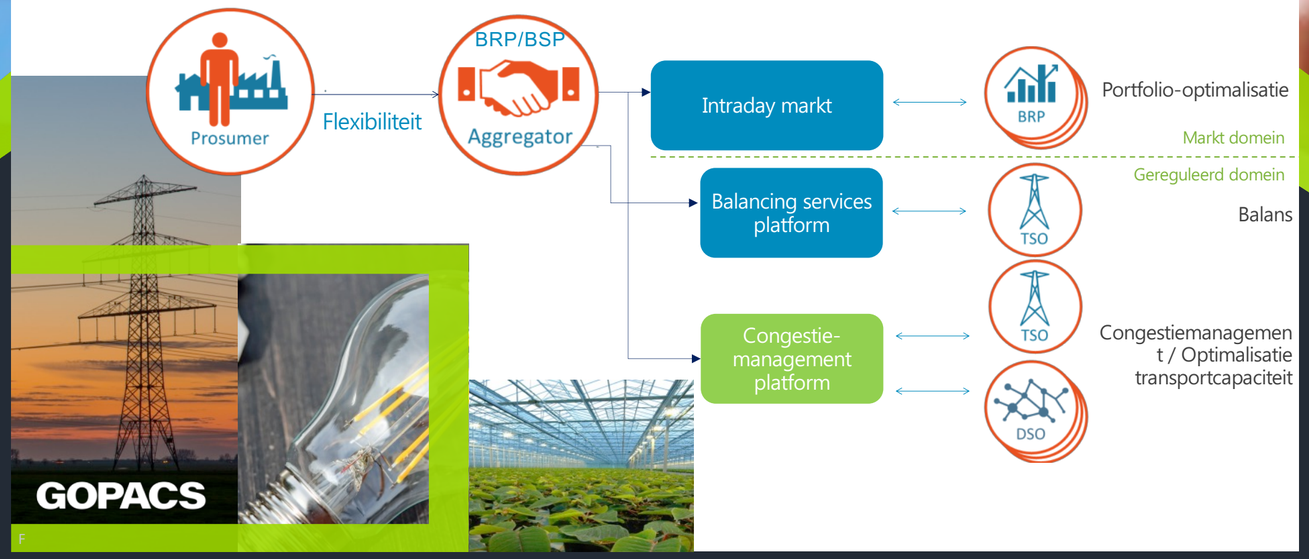
Foreseen installed charging poles per day



GOPACS

grid operator platform for congestion solutions

Enabling customers to monetise their flexibility resources



Growing demand for flexibility
Congestion management modest share, but essential

Main drivers

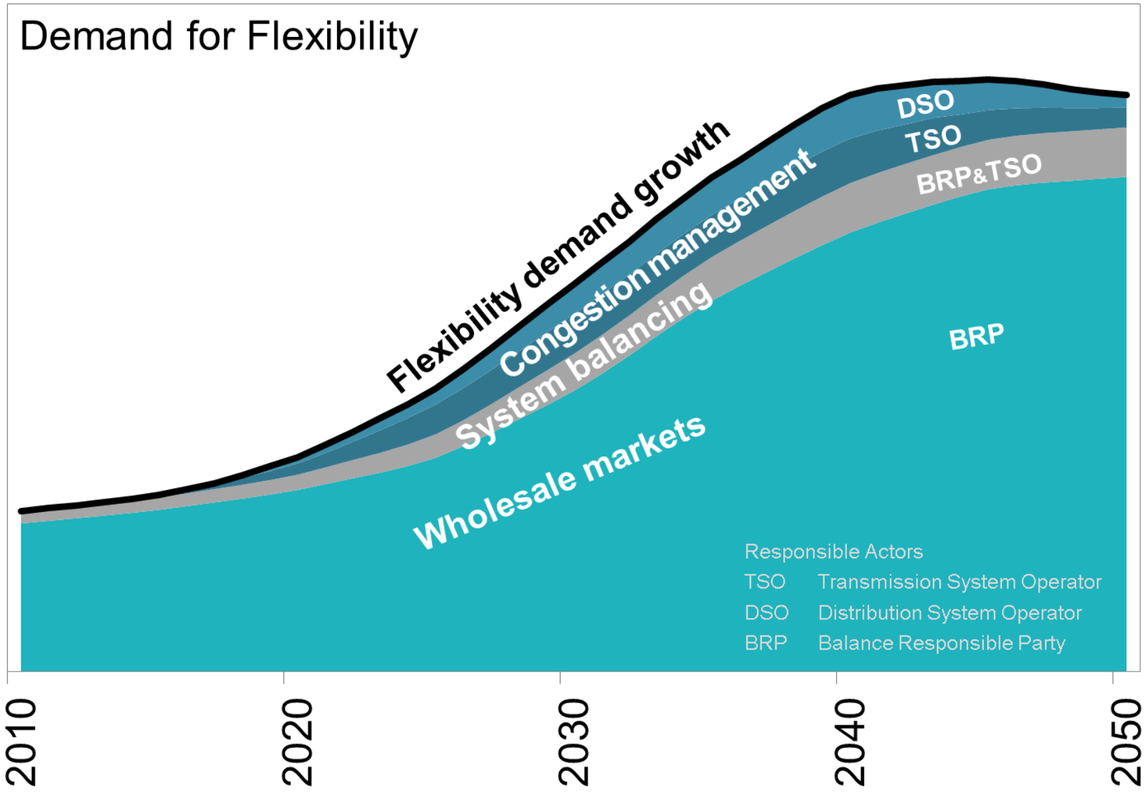
- Growth variable renewable generation with envisaged ambitious national target of ~70% wind + solar in generation mix by 2030.
- New demand electrification heat, mobility, industry
- New business models, dynamic pricing ed.

Demand for flexibility increases in 3 domains

- Wholesale markets
- Balancing
- Congestion management

Congestion management essential

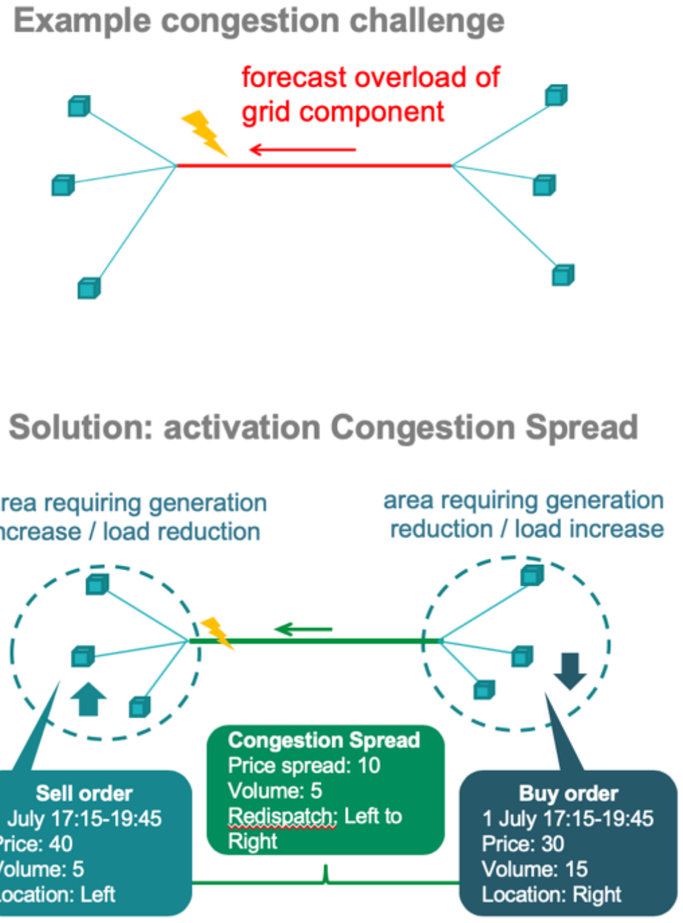
- Grid needs to facilitate users and broad flexibility demand
- Manage congestion in ways consistent with market model
- Need for effective tooling built on TSO – DSO cooperation

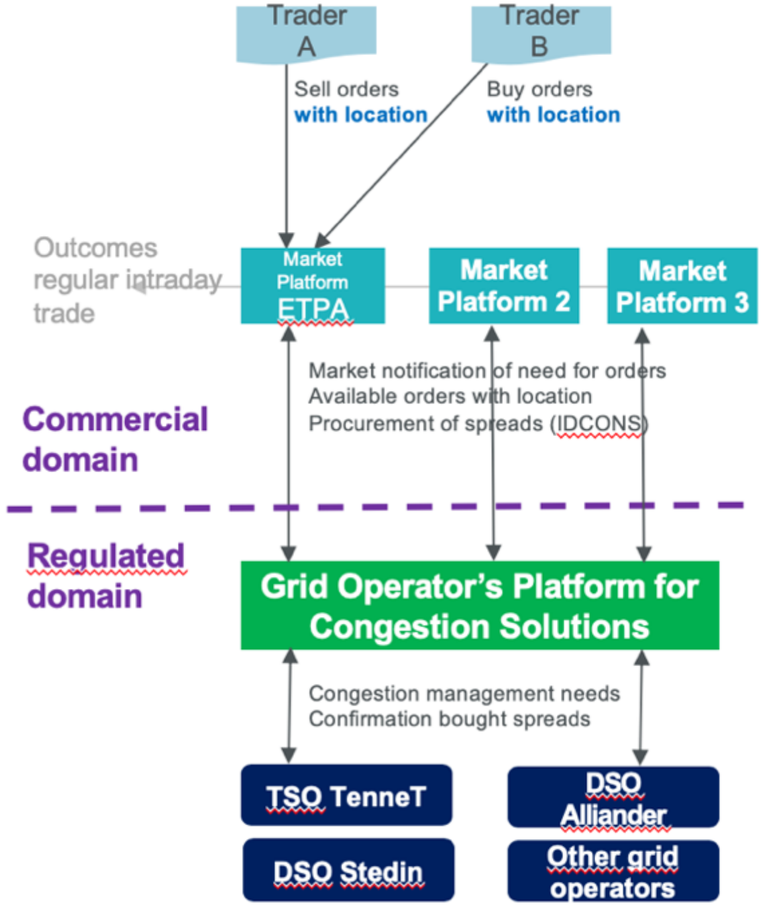


Gopacs: TSO & DSO intraday congestion platform

- Result of true DSO-TSO cooperation
- Launched 29th january 2019, by all Dutch DSO's & TSO Tennet
- Building on the existing Intraday Market, easy access for market parties
- Mitigating local congestion by procuring spreads (re-dispatch)
- Platform supports TSO-DSO coordination to avoid mutual harmfull interference
- First implementation in Europe

Gopacs: TSO & DSO intraday congestion platform





Towards Active System Management & Digital Grids

Trends

- Data is crucial: access to data equals access to customers & markets
- Accessibility to data & sharing of data is going to be addressed in a generic way (cross sectoral) at national and EU level
- GDPR compliancy is transforming a supplier centric market model to a customer centric market model

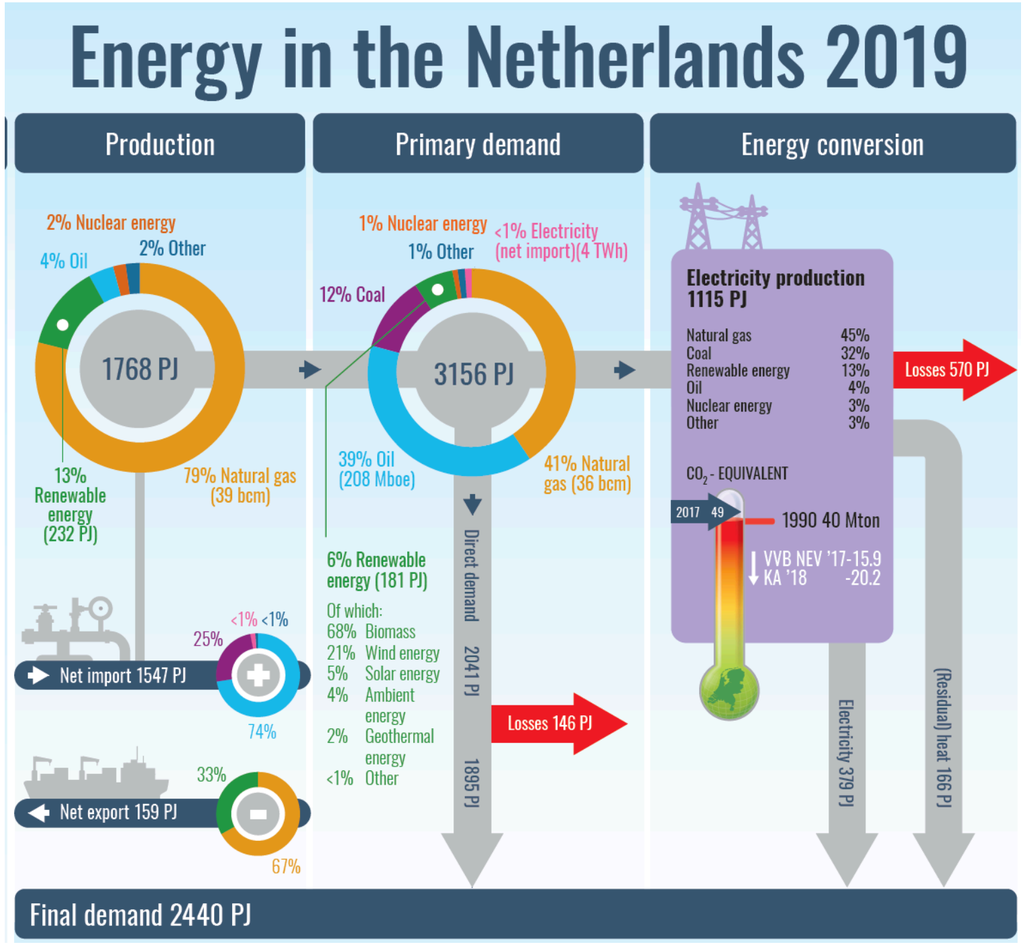
Challenges

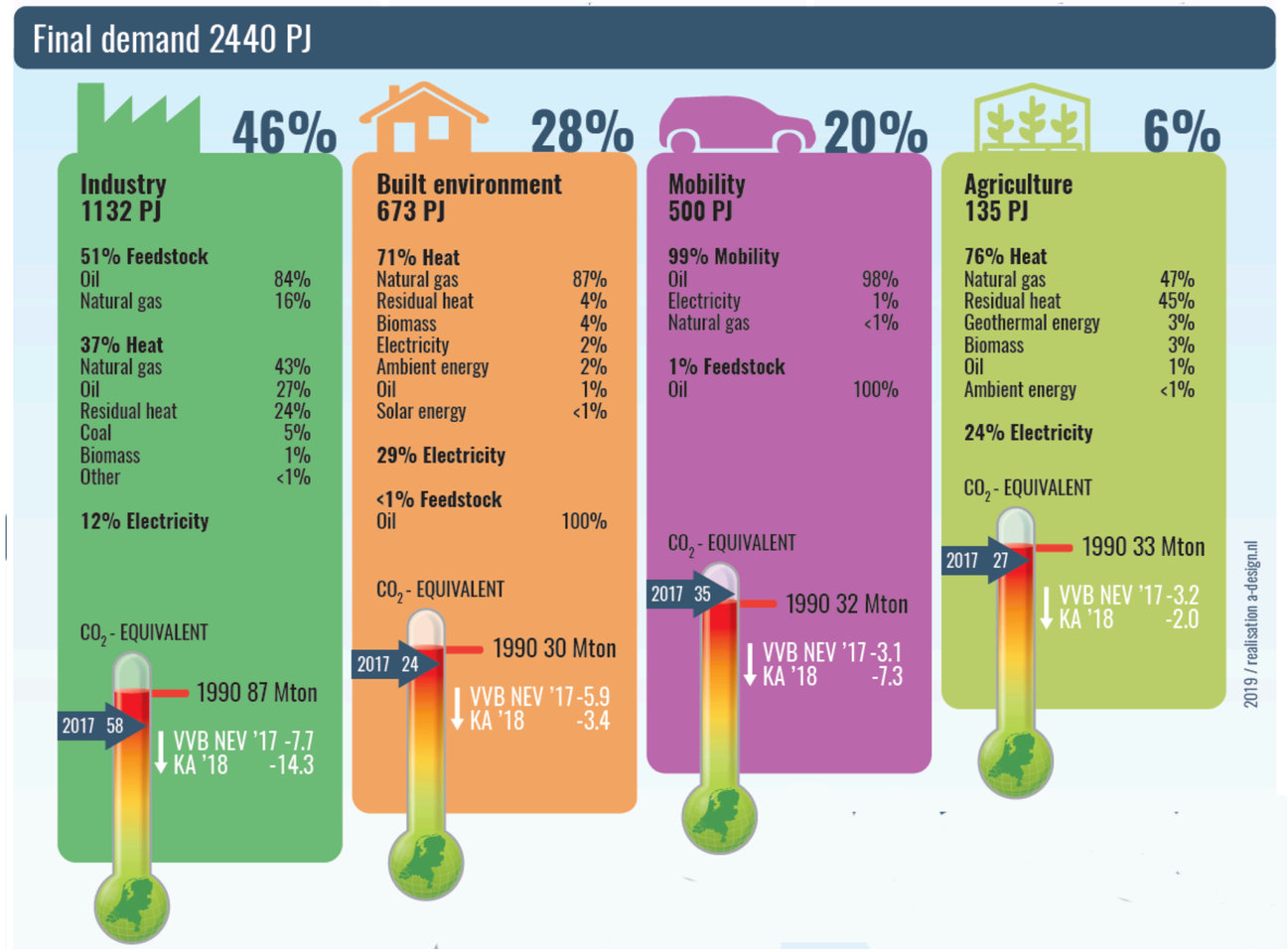
- How to define, implement and govern a generic data access and sharing framework ?
- How will DSO's ,TSO's & markets will exchange data in such a framework irrespectively whether the data is in a datahub or locally stored

Needed

- Definition of the framework at EU level, choices & implementation at MS level
- TSOs and DSOs in MS closely working together on these implementation issues

Converging energy carriers and techniques



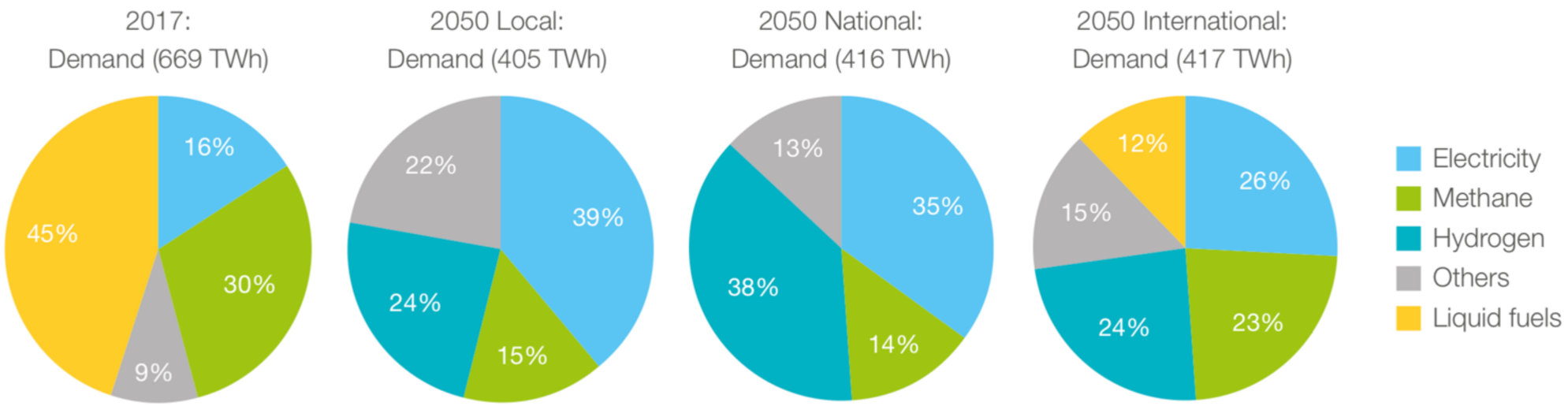


Infrastructure Outlook 2050

A joint study by Gasunie and TenneT on integrated energy infrastructure in the Netherlands and Germany

Do we need molecule solutions for electrone problems?

Final energy demand for the Netherlands (2017 and three 2050 scenarios)



The electrification challenge

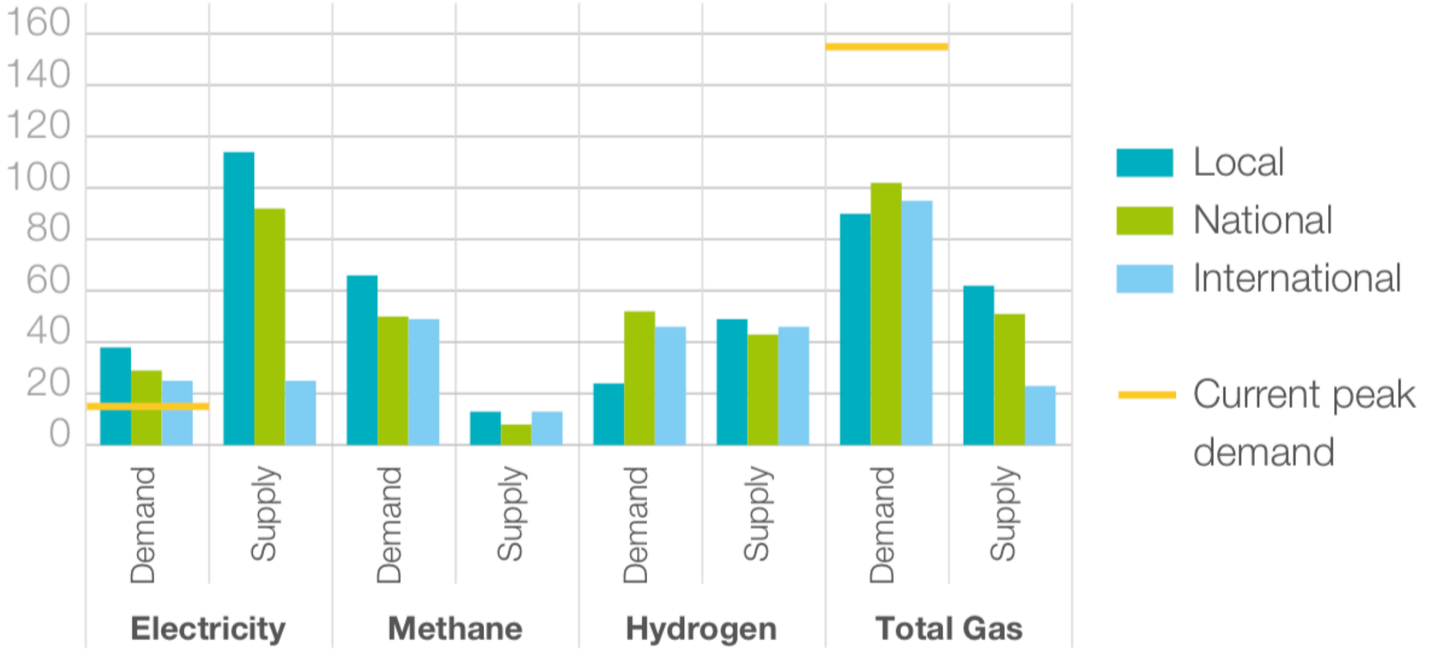


Figure 7: Dutch national peak demand and supply (GW) for the three scenarios[18].

Flexibility by molecules

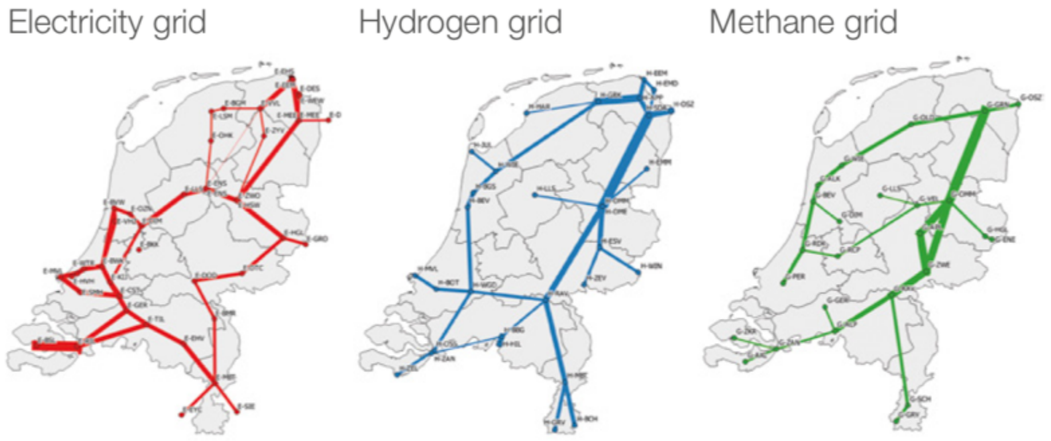


Figure 2: Geographic overview of assumed topologies for the Dutch gas and electricity infrastructures. (Line thickness represents maximum available transport capacity. Visual representation of gas and electricity capacities is not proportional.)

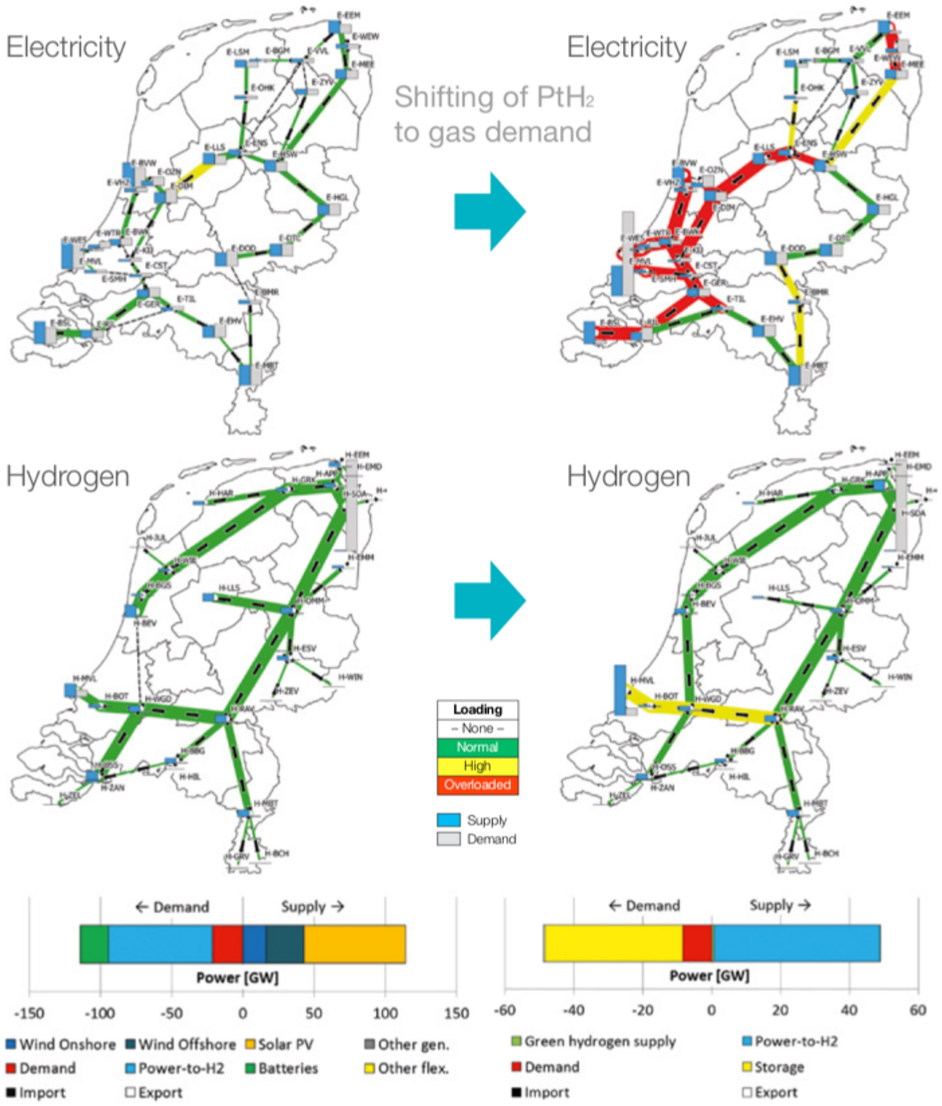


Figure 9: Impact of electrolyser location on electricity flows in the Netherlands. Snapshot 4044 (high demand and high infeed of renewable energy), with electrolysers located close to renewable electricity supply (left) and close to hydrogen demand (right).

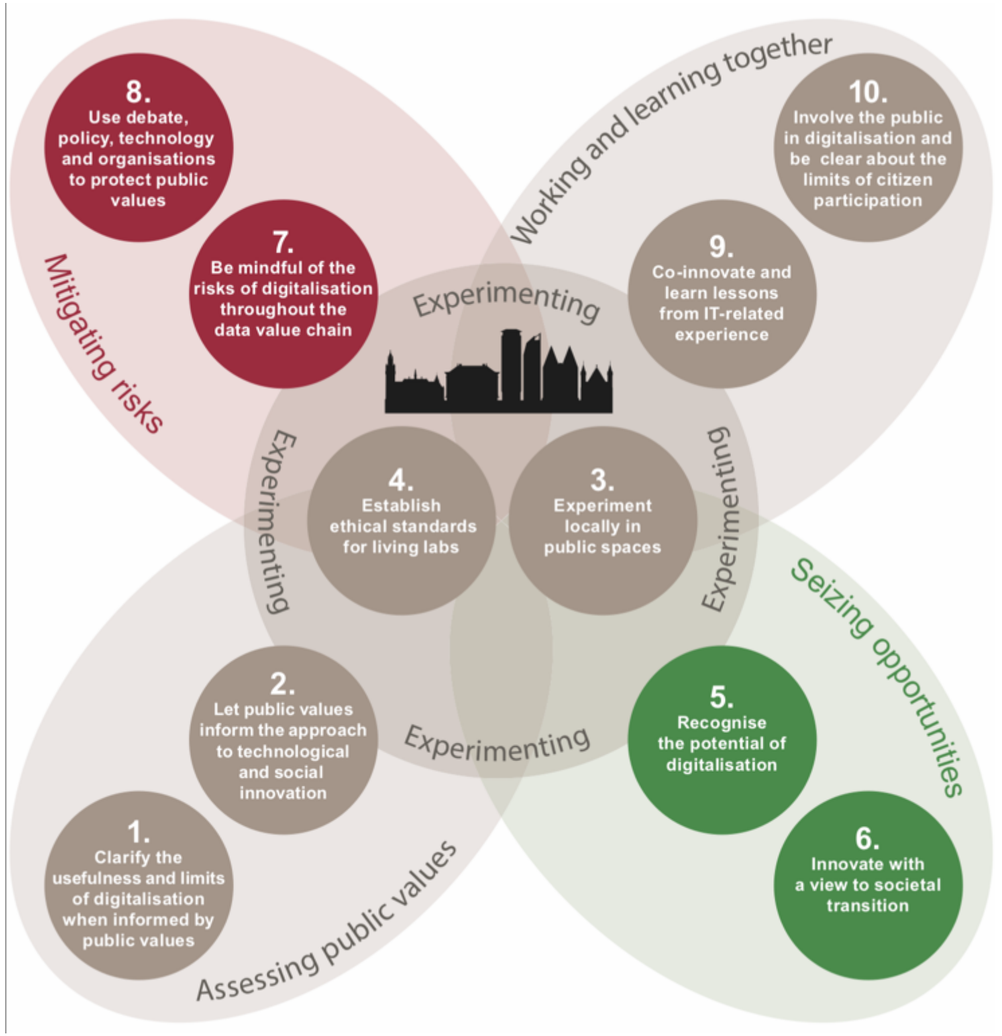
Is this EED or not?

Both the existing electricity and gas infrastructure will play a crucial role the energy system of the future

Although additional electricity storage will be available by 2050, only gas storage provides a solution for seasonal storage

Location, capacity and operation of P2G installations are decisive factors and must be aligned with both electricity and gas TSOs

Socially acceptable solutions for an integrated energy infrastructure require a new level of public and political support



How to redefine the public values of our system?