

The role of nuclear energy in the Dutch energy system

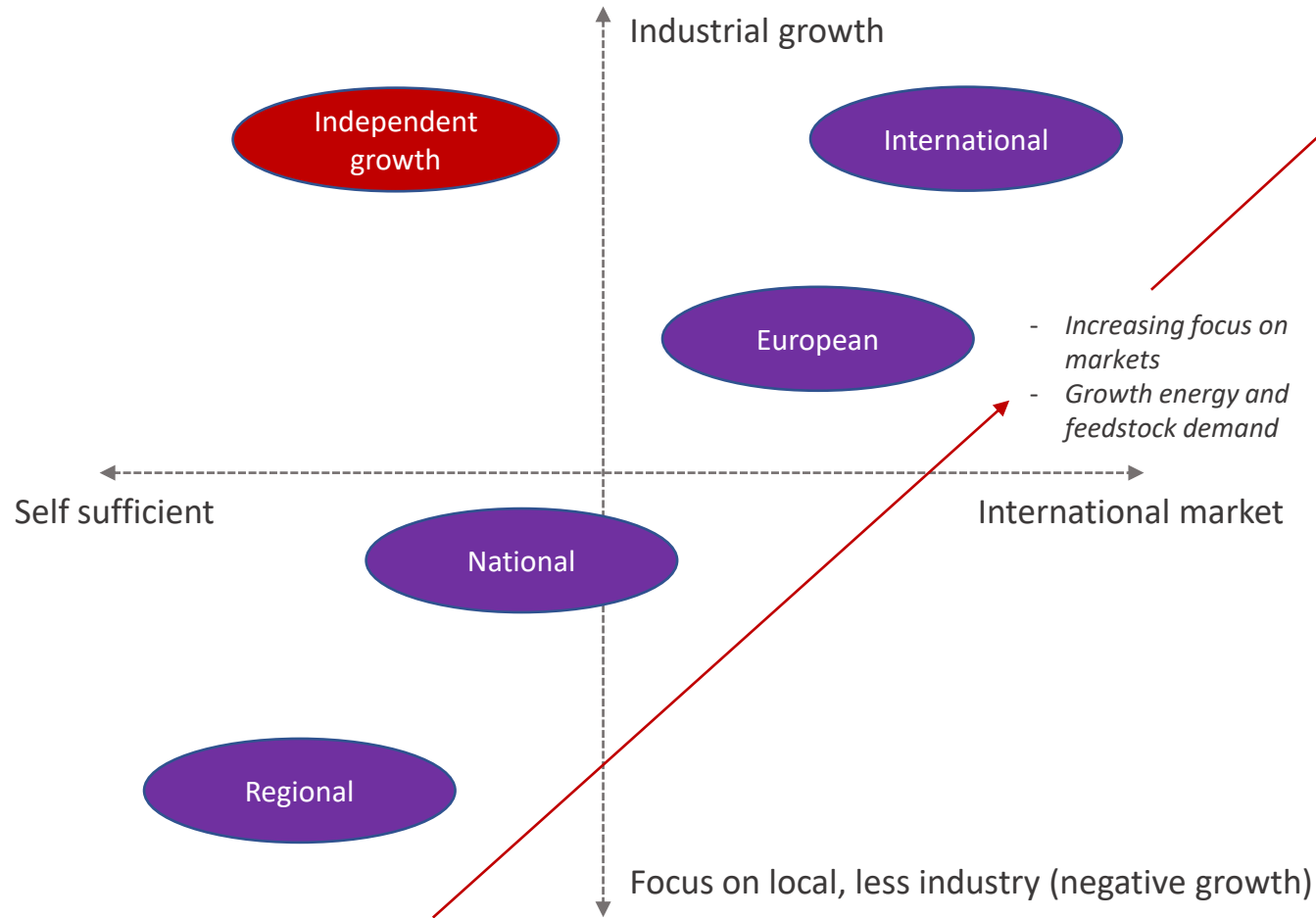
Webinar VEMW 24 June 2021

WHO WE ARE	WHAT WE DO
<ul style="list-style-type: none"> • eRisk Group is founded in 2007. We are an advisory boutique of senior energy and financial specialists with extensive experience in the energy and financial markets • We work in a partnership with EnergyQuants, specialists in modelling energy markets 	<ul style="list-style-type: none"> • Energiestrategy & investments advice, market scenario's, feasibility studies, and risk analysis • Long term scenario analysis based on a quantitative approach with PPSGen, our in house developed model for the North-West European energy markets

RELEVANT WORK

				
<ul style="list-style-type: none"> - Blue hydrogen - Markets team within H-Vision project - Modelling market dispatch of hydrogen power plants up to 2035 - H-Vision partners (Shell, BP, Gasunie, Uniper, PoR, EBN, Air Liquide) 	<ul style="list-style-type: none"> - Power to heat. - Industrial Hybrid Energy Systems - Unlocking Industrial Demand Response - TKI project, various partners (TNO, Sympower, Alliander, Scholt Energy, industriële partners. 	<ul style="list-style-type: none"> - Market research & development of a possible realization of a General Fusion power plant around 2030 - General Fusion is a Canadian company developing a proprietary fusion technology 	<ul style="list-style-type: none"> - Valuation heat infrastructure (Rotterdam-Westland-The Hague) - Develop heat model to assess various market organisation models - Warmtealliantie Zuid-Holland 	<ul style="list-style-type: none"> - Support assessment of large variety of renewable energy investment proposals - Strategic choices regarding energy transition

The market structure sets the main steering mechanism (government, EU-ETS, global commodities)

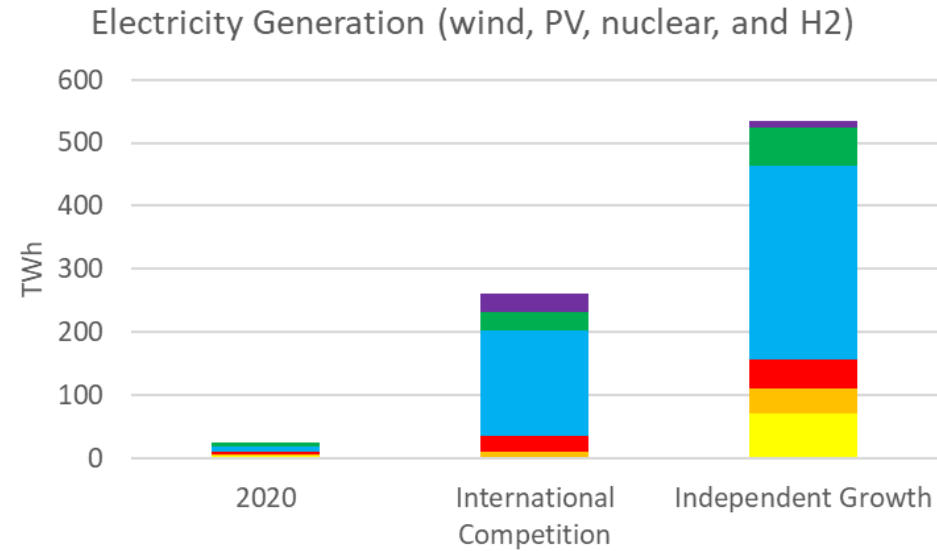
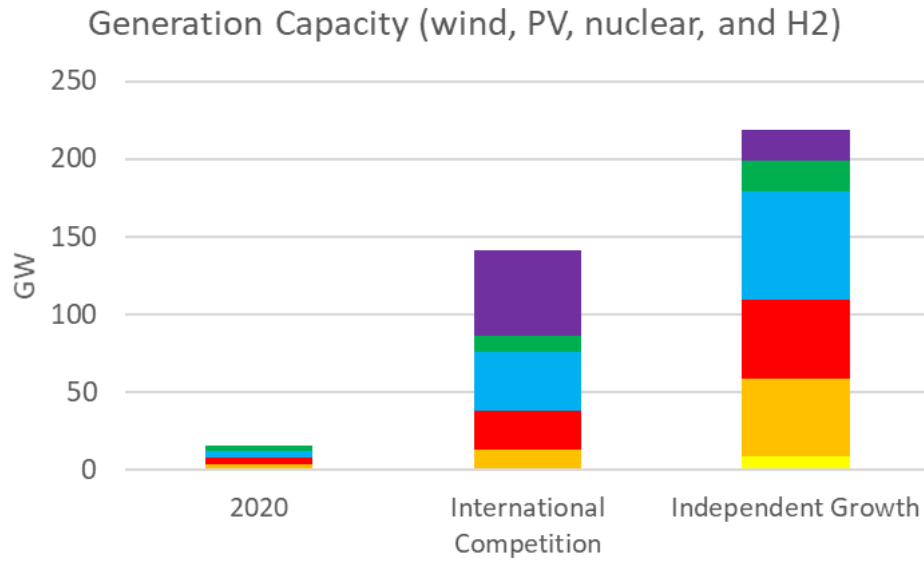


Berenschot/Kalavasta Scenarios

- Distinguishing factor is decision level (from city to national to EU-ETS to global markets)
- Where / how decisions are made determine the results (energy demand, industrial growth, renewable generation capacity)

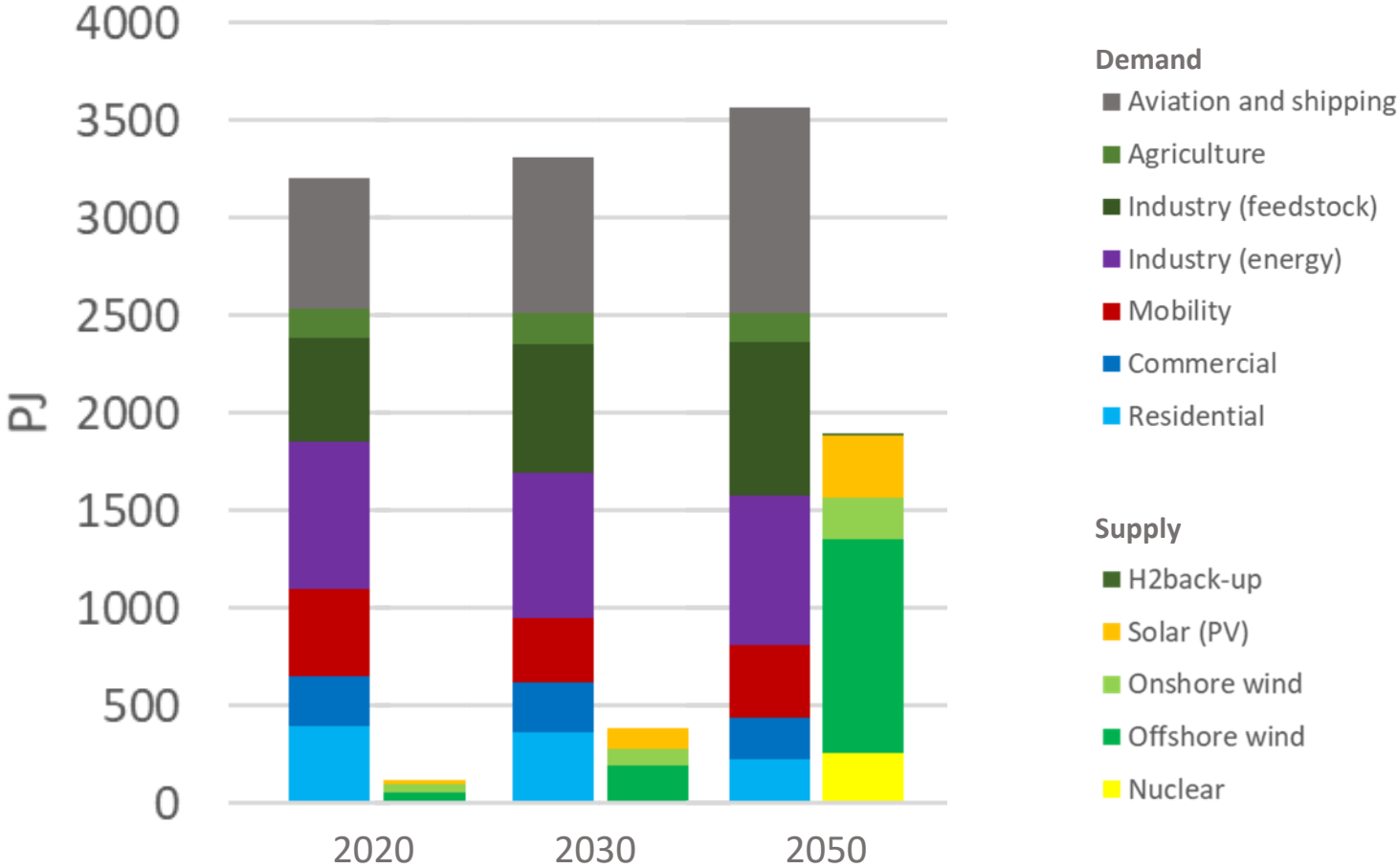
eRisk Group alternative scenario

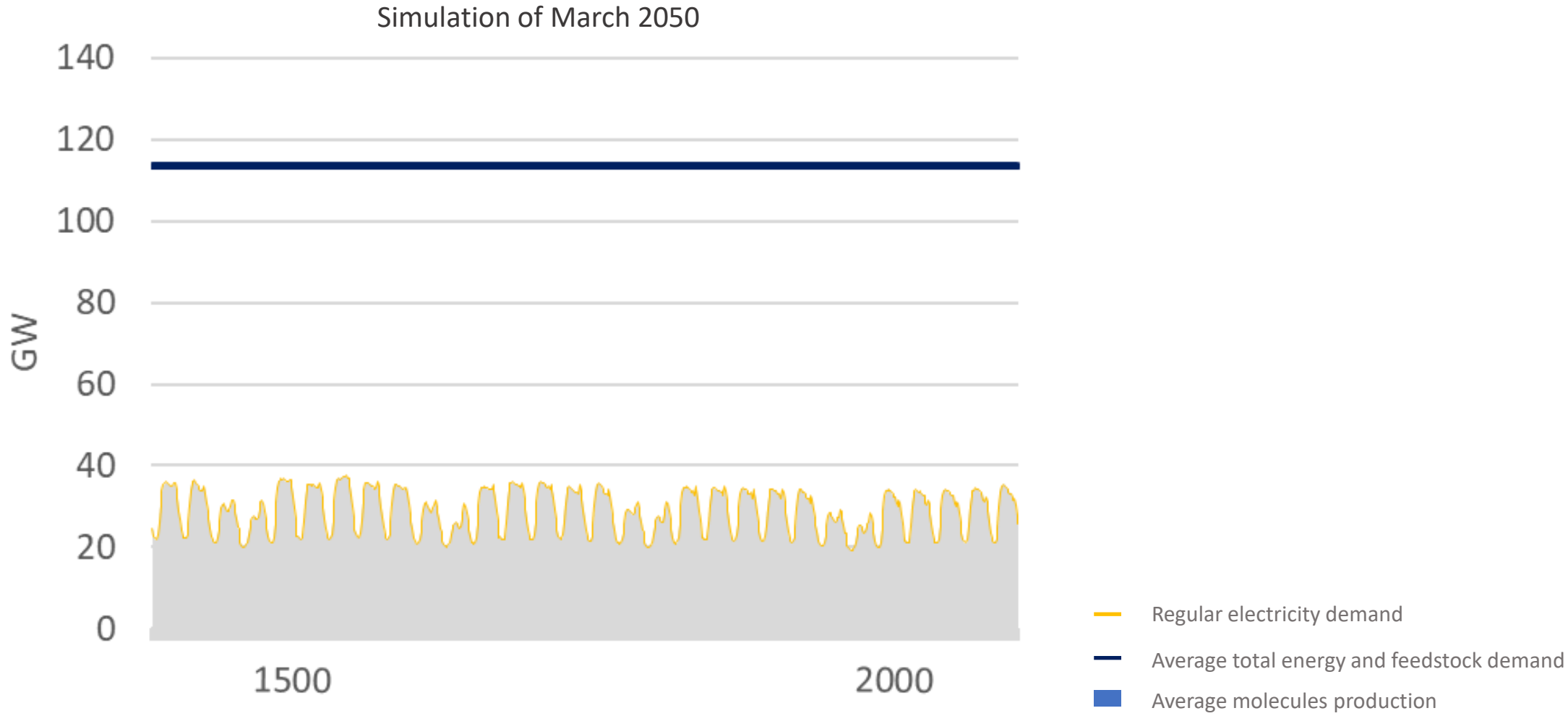
- Assuming national decision making & similar energy & feedstock demand as International Scenario
- High ambition for local renewable energy generation (70GW offshore, 20GW onshore, 100GW PV)
- Includes 9GW nuclear in 2050

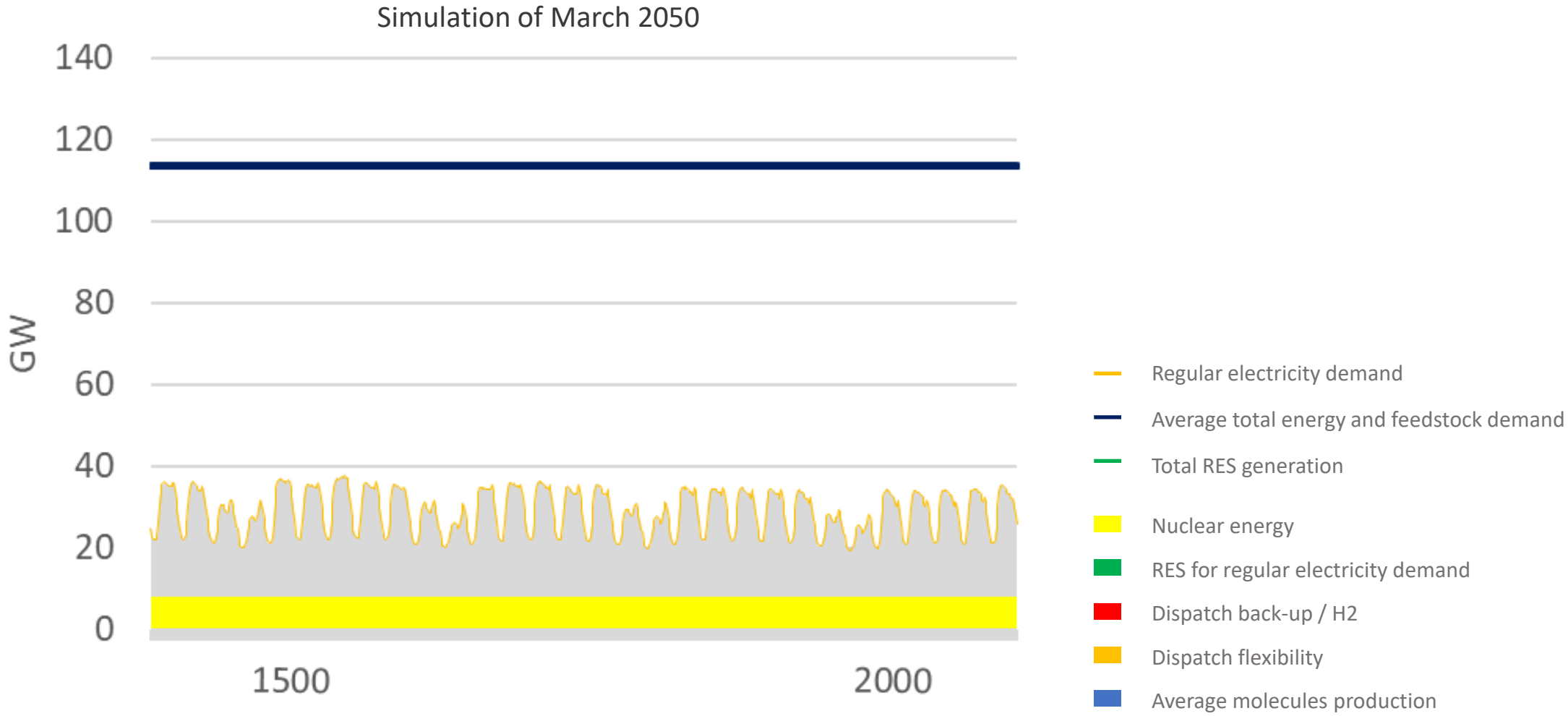


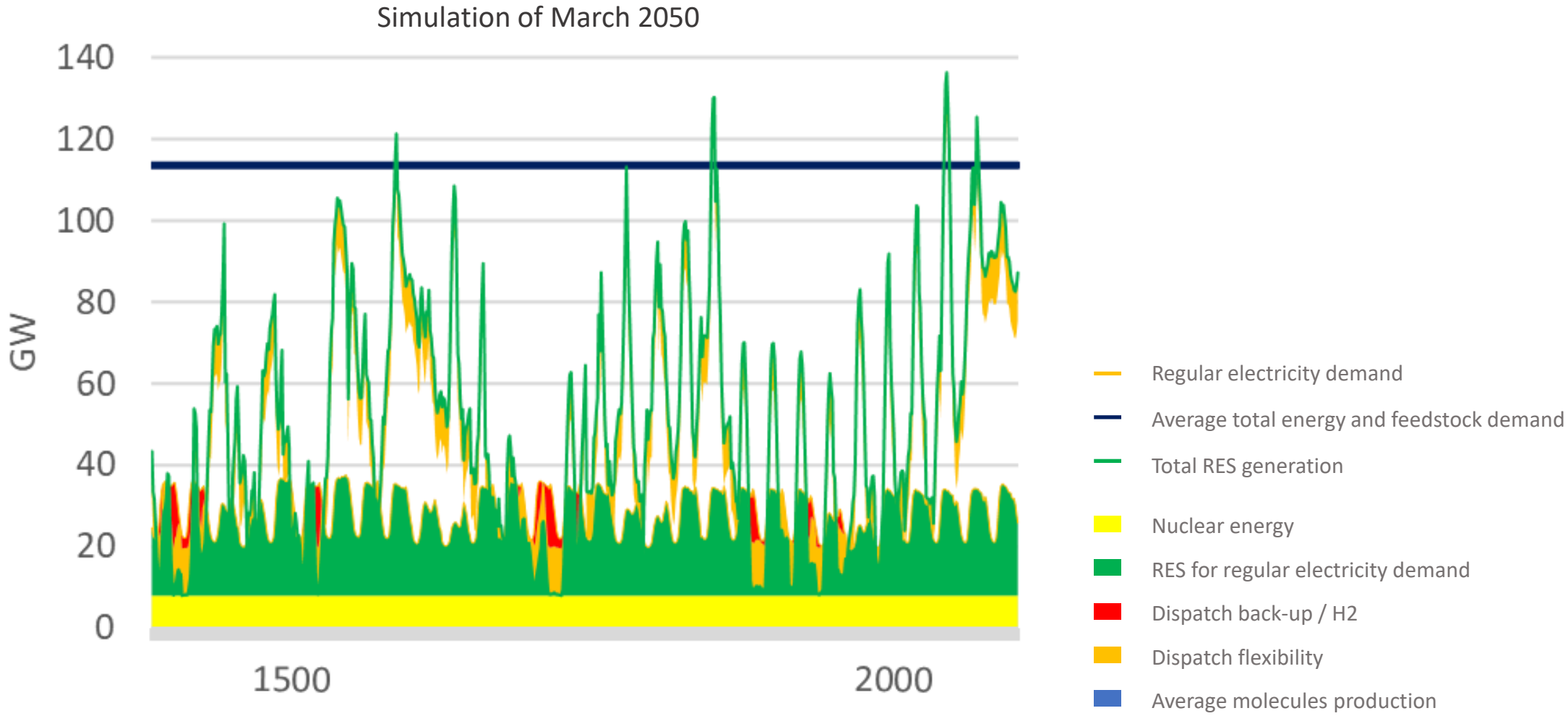
- H2 (back-up) & other
- Wind onshore
- Wind offshore
- PV ground
- PV rooftop
- Nuclear

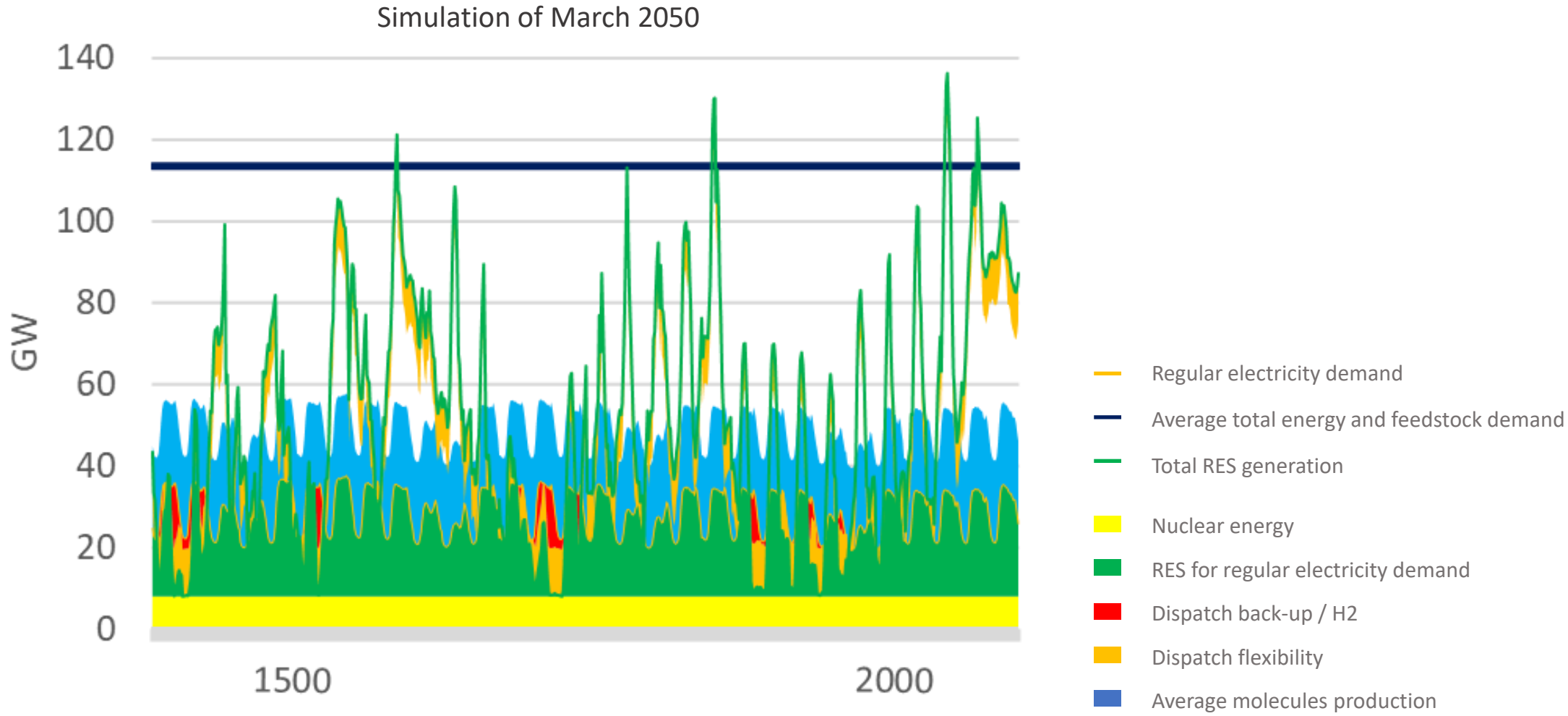
Supply & demand: The final energy and feedstock demand and the CO2 neutral generation



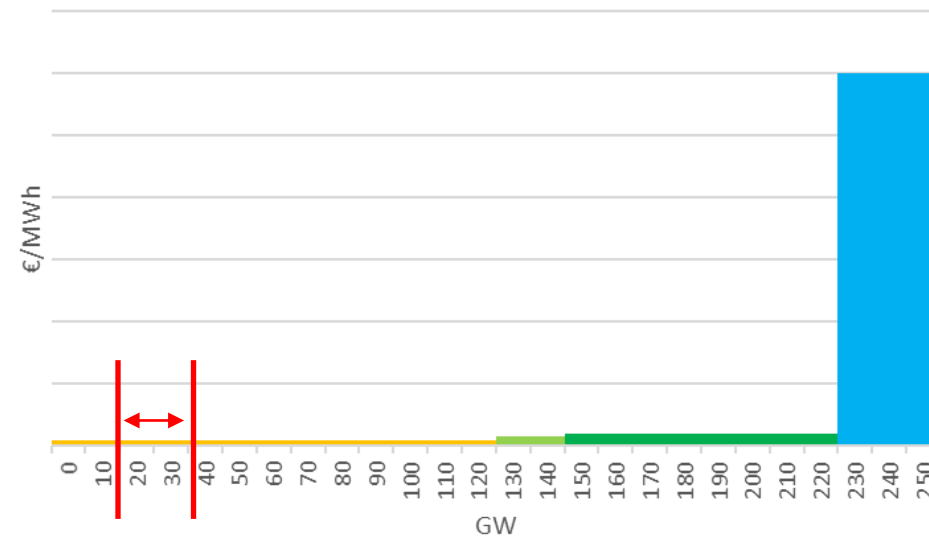
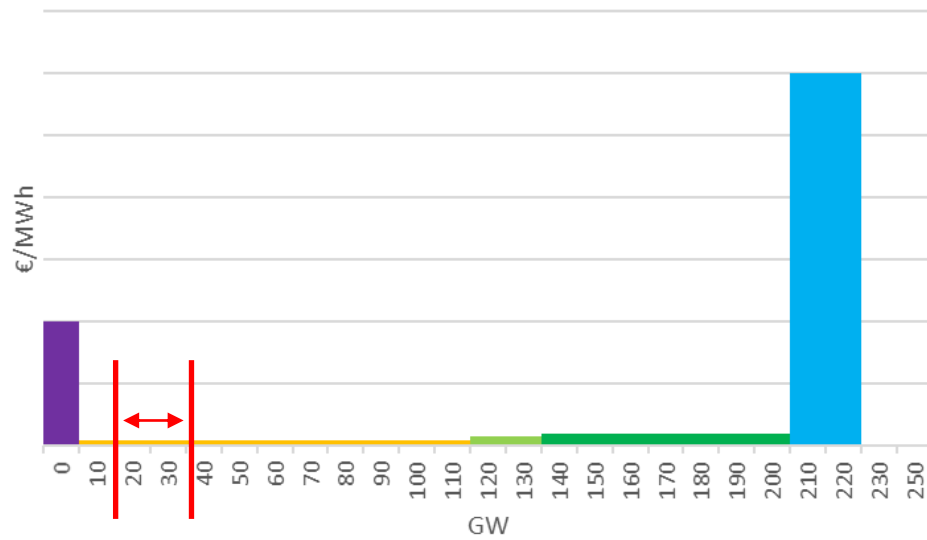








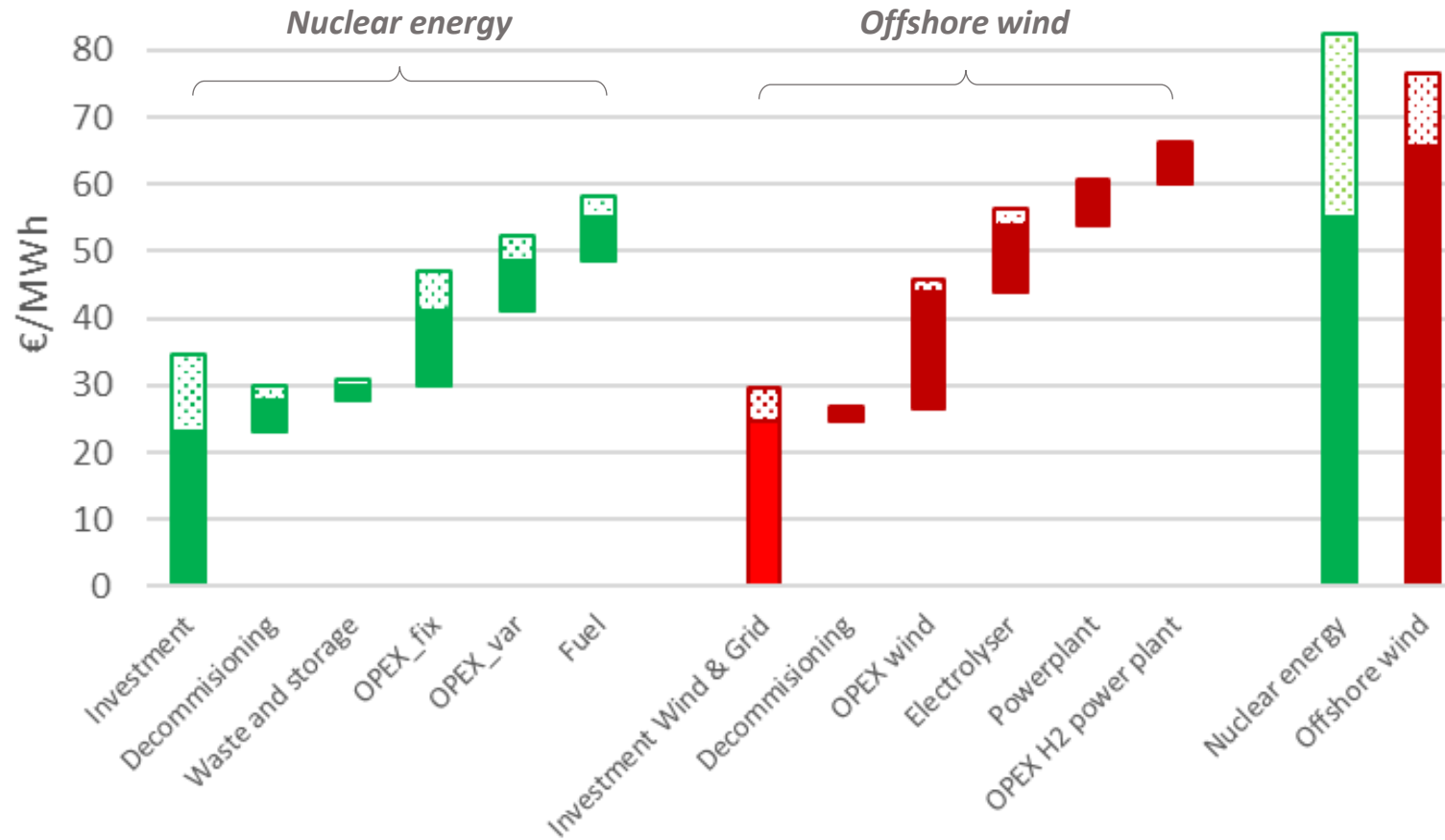
The prevailing energy only market functions suboptimal while pursuing public policy goals: cheap, reliable, and sustainable



↔ Range between which regular electricity demand moves

- PV
- Onshore wind
- Offshore wind
- Gas
- Nuclear energy

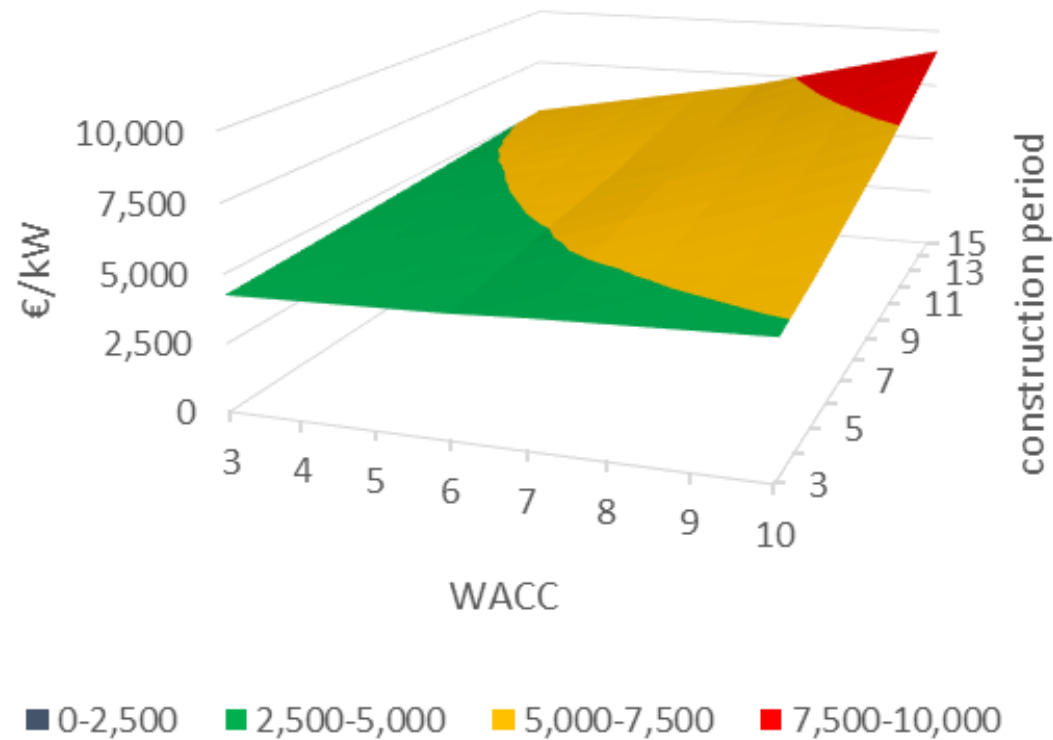
Energy sources should be compared on their real cost



- OCC Nuclear: €5.000 per kW
- OCC Wind / Electrolyser / Powerplant: €3.400 per kW
- WACC 3%

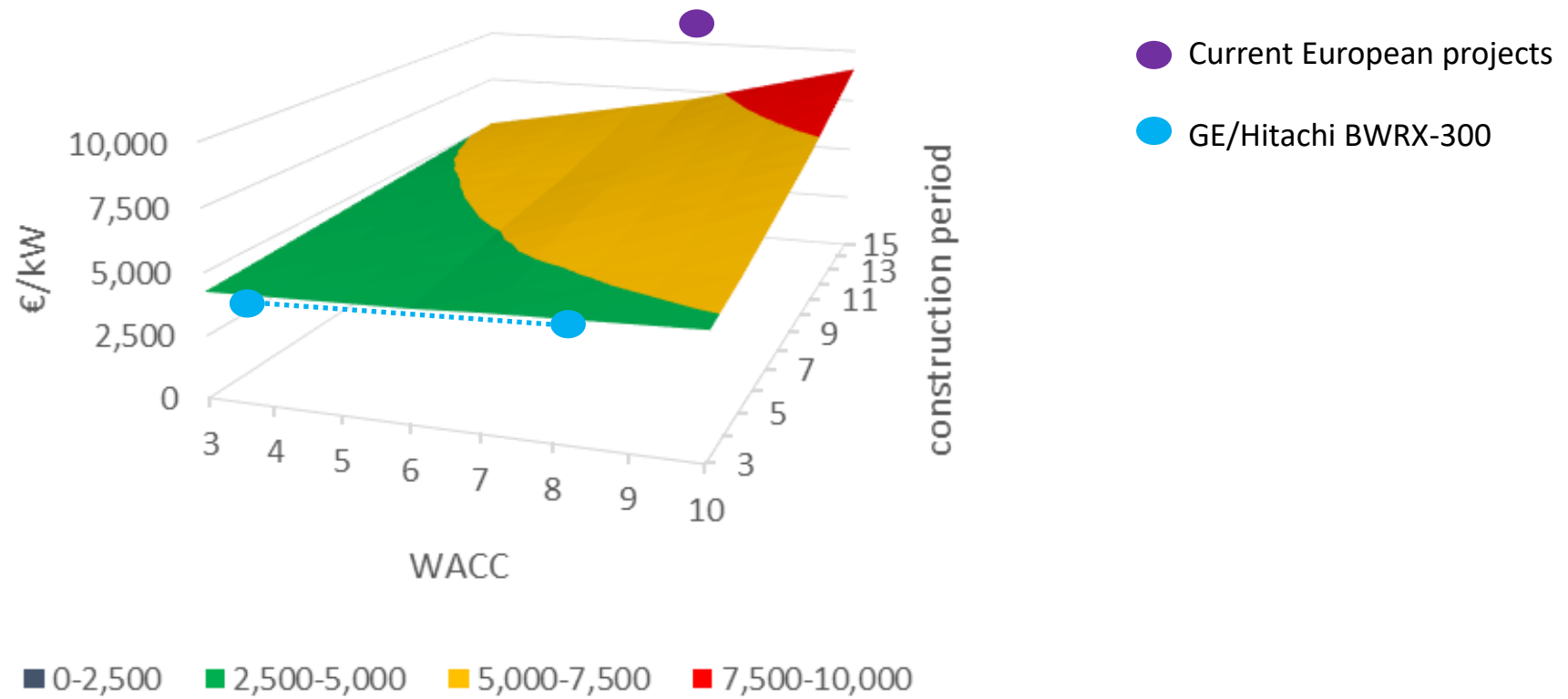
WACC and construction period determine the size of the investment

€/kW at different construction periods and WACCs



Market structure and the role of the government both have a large impact on the final cost price of nuclear energy

€/kW at different construction periods and WACCs



Nuclear energy can be part of a solution to address energy transition challenges and must be weighed against long term ambitions and alternatives

1. The challenge to develop sufficient supply for a CO2 neutral energy- and feedstock demand in 2050 is huge
2. Nuclear energy is a competitive technology if prerequisites are satisfied
3. The development of nuclear energy raises a number of obligations but creates opportunities as well

Full presentation (30min) for Province of Zeeland (in Dutch):

<https://eriskgroup.com/de-rol-van-kernenergie-in-het-nederlandse-energiesysteem/>

- Market failure
 - Lack of certain market incentives
 - Prices uncertain / volatile
- Market intervention
 - Suboptimal choices
 - Market distortions
 - Subsidy paradox:

Lack of investment in innovative clean energy technologies

Ineffective way to create value on energy system level



Seems a more visible hand is needed to create an energy system enabling CO2-neutrality in 2050

INVISIBLE HAND

Market paradigm


- Limits the range of option to reach carbon neutral world
- Ignores societal transaction costs



- No guarantees that targets will be met
- Solutions have to fit commercial investment horizon

VISIBLE HAND

Government action

- Transaction approach
 - Focus on realizing targets
- 
- Lower societal transaction costs
 - Government guarantees environment to operate



CIEP: From an invisible hand to a more visible hand

Technology	Efficiency
Nuclear Power	40%
Electrolysis	75%
Hydrogen Power Production	60%
Molecule Production (DAC+H2)	35%
Battery	95%
Pump Storage	80%