YOKOGAWA

Co-innovating tomorrow™

De basis voor net-zero uitstoot en duurzame energie

Patrick Kools

Director Clean Energy EU

20nd June 2023

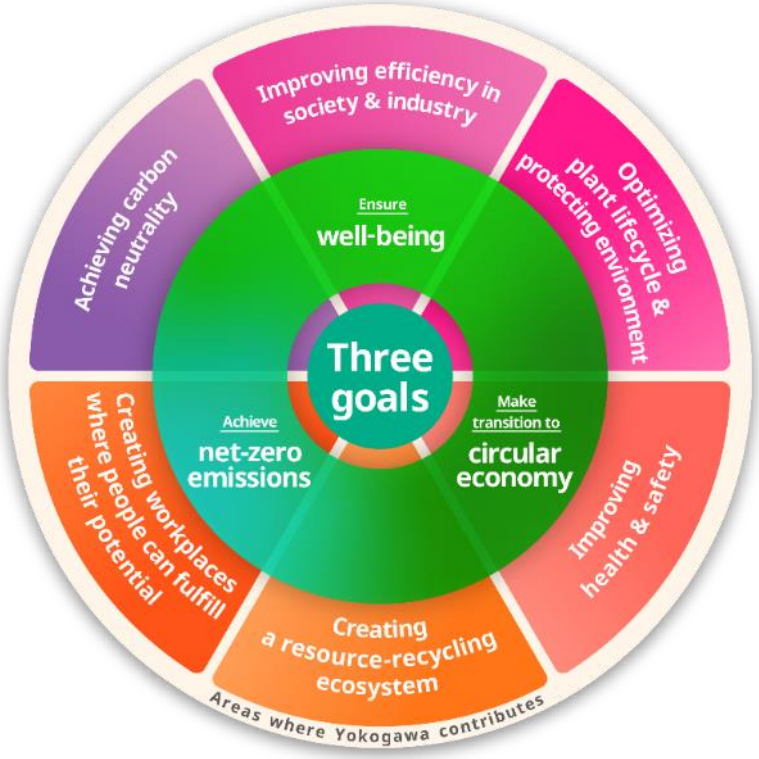
Wereldwijd, missie-gedreven, marktleider

Quick Facts

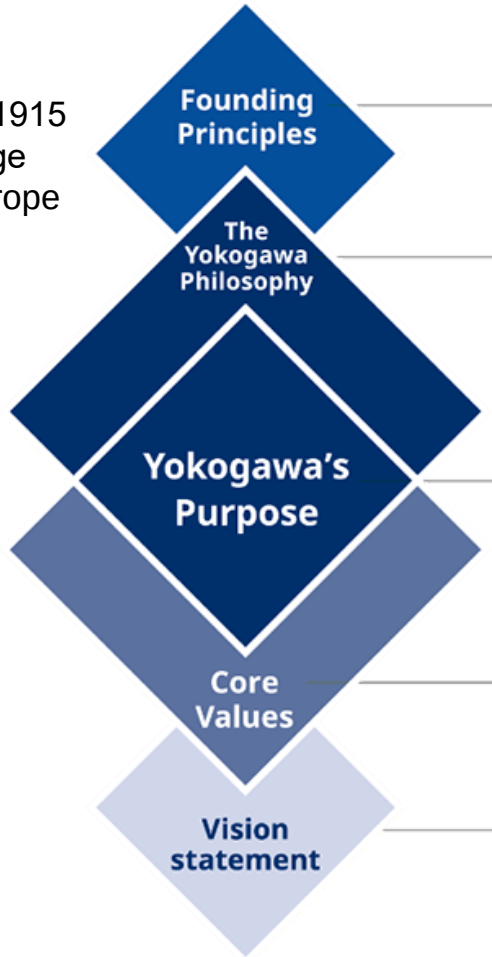
YOKOGAWA Co-innovating tomorrow™

Market leader • Partner to most Industry majors • Founded in Tokyo in 1915
$3.5bn revenue • c. 17,000 employees • Listed Tokyo Stock Exchange
Present in +200 countries • Global HQ in Tokyo • 40-year history in Europe
European HQ in Amersfoort, NL

Sustainability Goals



Mission, Vision & Values



Quality first | Pioneering spirit | Contribution to society

As a company, our goal is to contribute to the realization of a sustainable society through broad-ranging activities in the areas of measurement, control, and information.

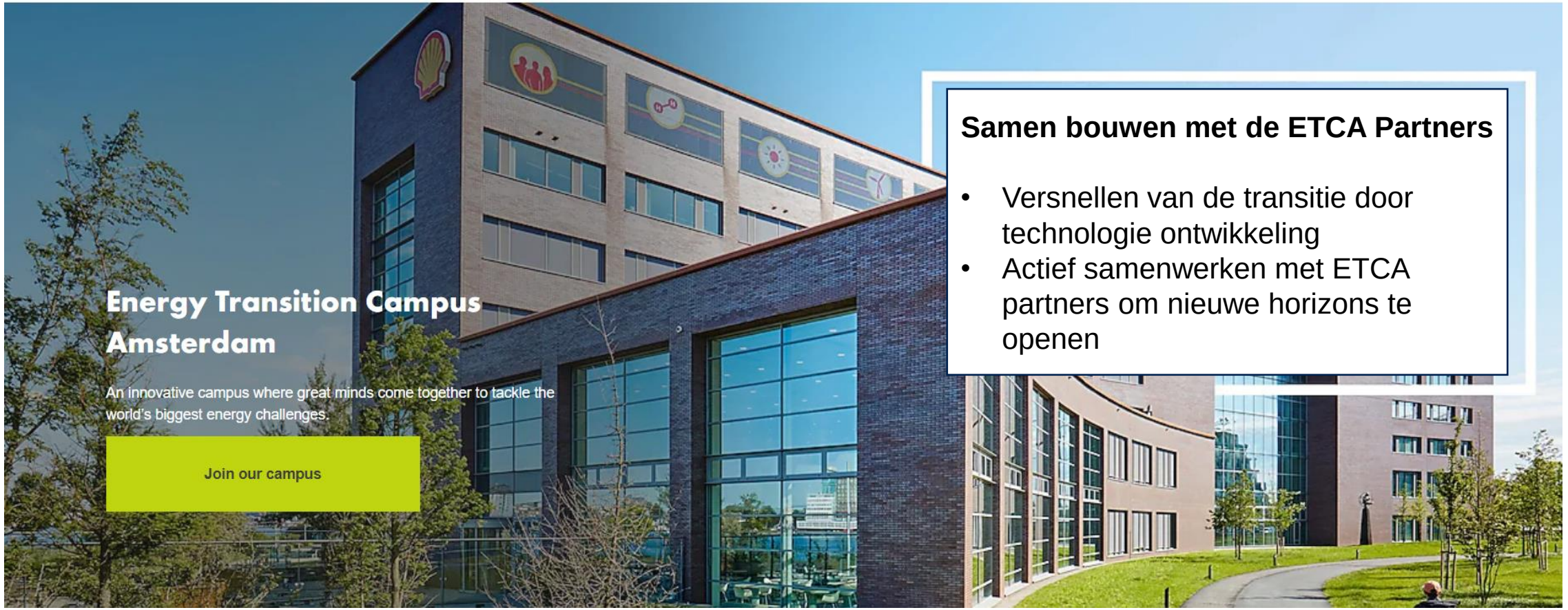
Individually, we aim to combine good citizenship with the courage to innovate.

Utilizing our ability to measure and connect, we fulfill our responsibilities for the future of our planet.

Respect | Value Creation | Collaboration | Integrity | Gratitude

Through autonomy and symbiosis, Yokogawa will create sustainable value and lead the way in solving global issues.

Actief Lid Energy Transition Campus Amsterdam

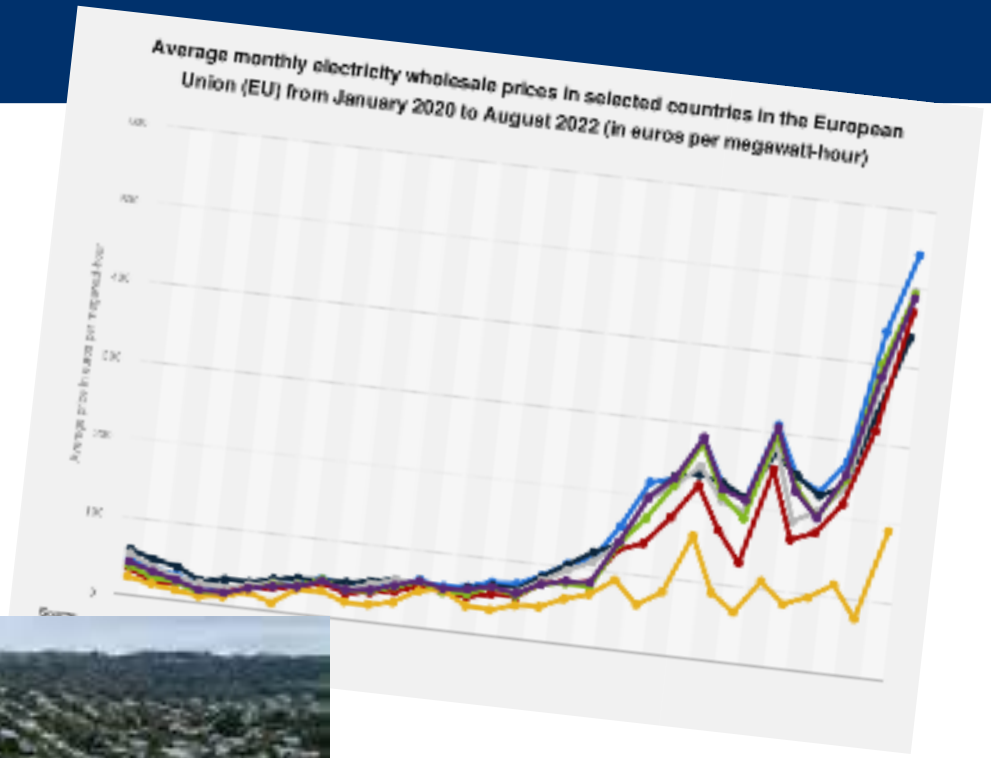


Samen bouwen met de ETCA Partners

- Versnellen van de transitie door technologie ontwikkeling
- Actief samenwerken met ETCA partners om nieuwe horizons te openen

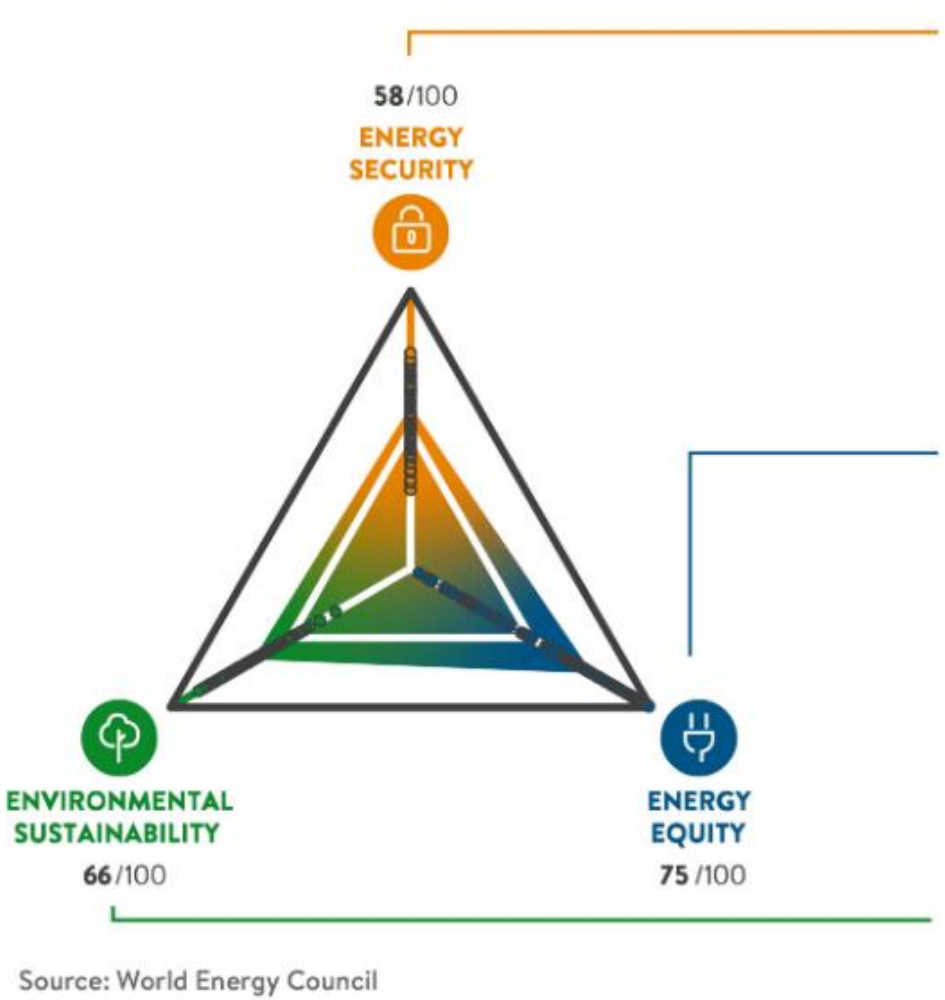
De Energie Transitie… en Trilemma

Moeilijke Tijden



Energie Trilemma

WORLD ENERGY COUNCIL



Reflects a nation's capacity to meet current and future energy demand reliably, withstand and bounce back swiftly from system shocks with minimal disruption to supplies.

Assesses a country's ability to provide universal access to affordable, fairly priced and abundant energy for domestic and commercial use.

Represents the transition of a country's energy system towards mitigating and avoiding potential environmental harm and climate change impacts.

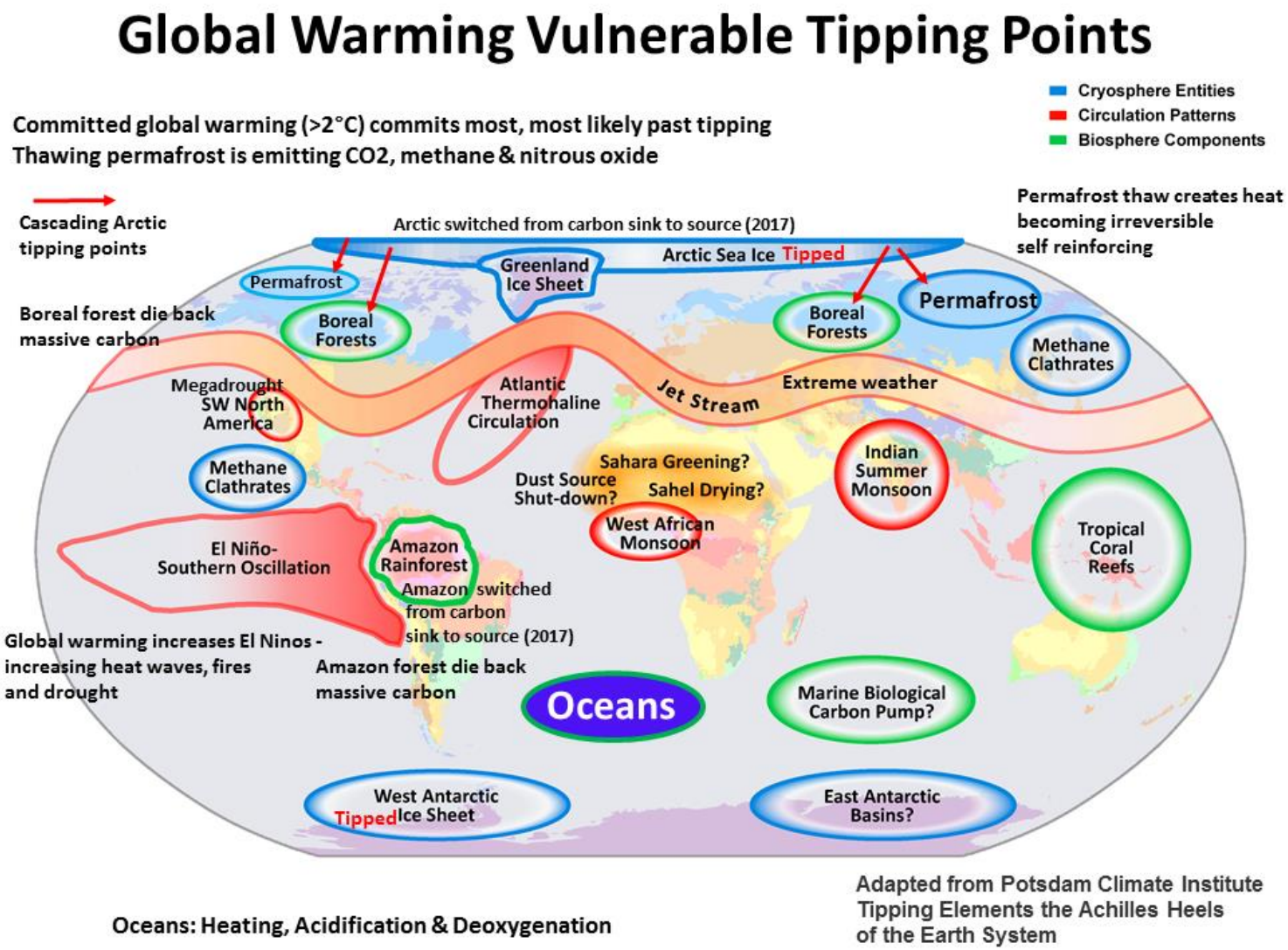
Source: World Energy Council

Onze Menselijke Leefwereld is Kwetsbaar

Politici, economen en wetenschappers dachten dat “Tipping Points” (kantelpunten) onwaarschijnlijk waren.

Er zijn steeds meer aanwijzingen dat ze meer waarschijnlijk zijn dan gedacht en onderling verbonden zijn.

Dit leidt tot onomkeerbare veranderingen.



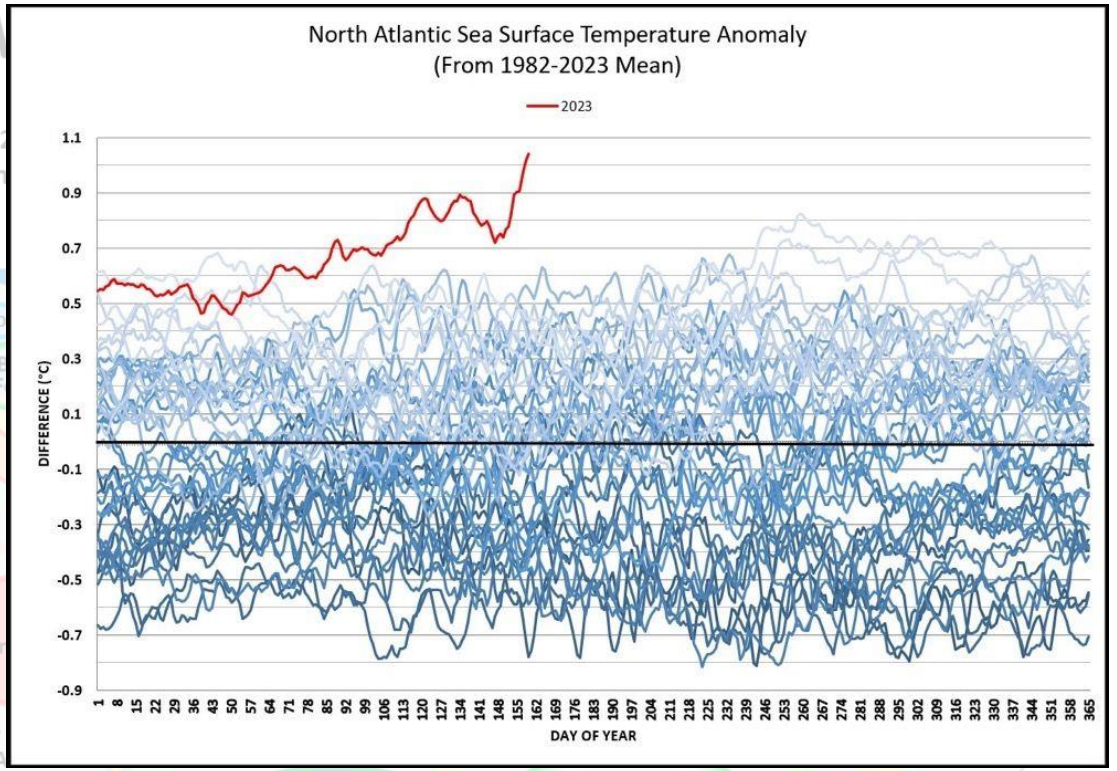
Source: Nature, https://www.nature.com/articles/d41586-019-03595-0

Onze Menselijke Leefwereld is Kwetsbaar

Politici, economen en wetenschappers dachten dat “Tipping Points” (kantelpunten) onwaarschijnlijk waren.

Er zijn steeds meer aanwijzingen dat ze meer waarschijnlijk zijn dan gedacht en onderling verbonden zijn.

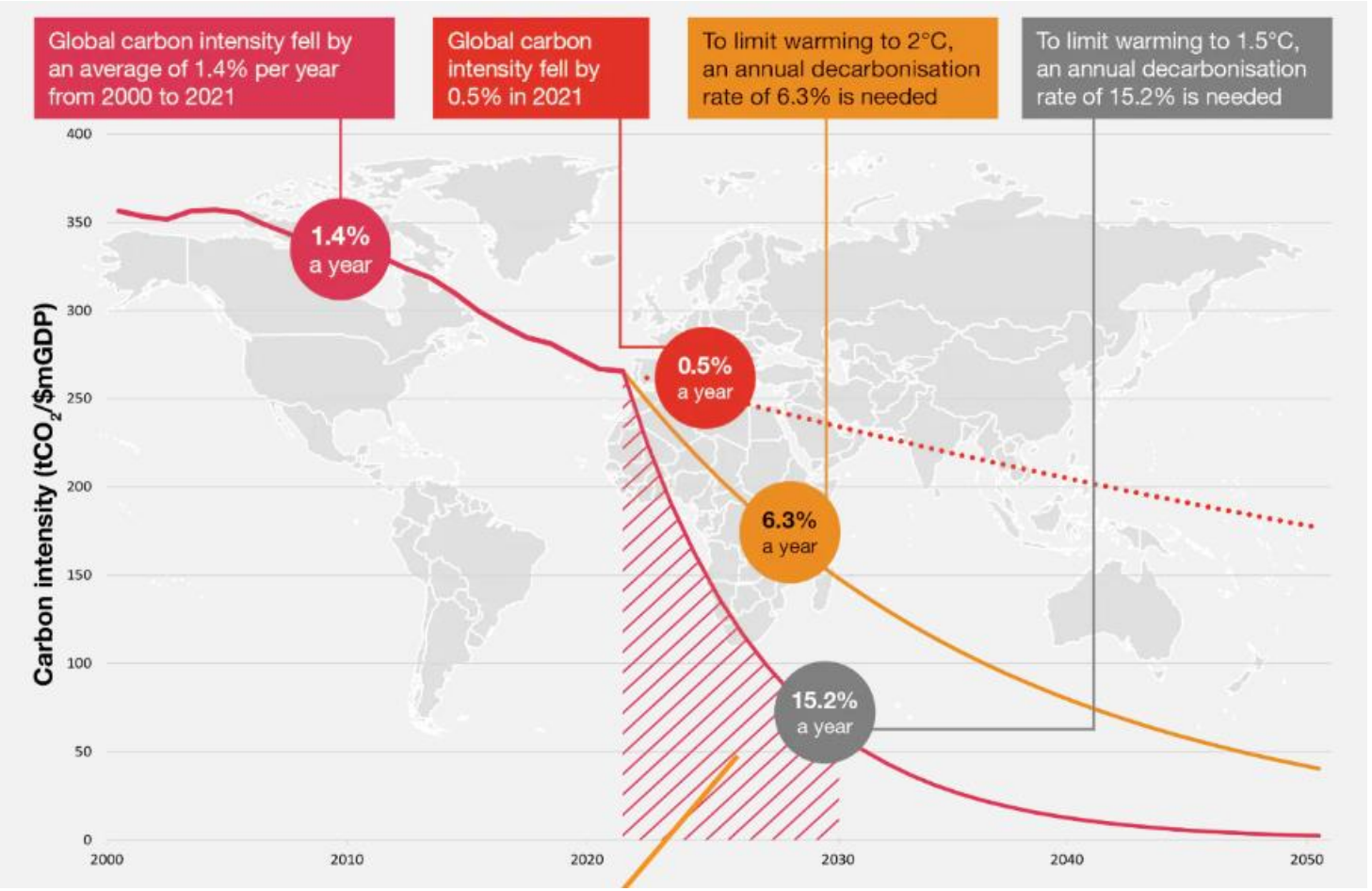
Dit leidt tot onomkeerbare veranderingen.



Source: Nature, https://www.nature.com/articles/d41586-019-03595-0

Geen Tijd om Achterover te Leunen

- Wereldwijde Carbon Intensity verminderde slechts 0.5% in 2021.
- Om binnen 1.5 te blijven is een 77% reductive nodig voor eind 2030. Dit is een jaarlijkse afname van 15.2%.
- Dit is 11 keer sneller dan de wereldwijd gemiddelde afname van de afgelopen 20 jaar!



Source: PWC Net Zero Economy Index 2022
https://www.pwc.co.uk/services/sustainability-climate-change/insights/net-zero-economy-index.html

RePower EU – Onze afhankelijkheid van Russisch gas

- ✓ Beeindig onze afhankelijkheid van Russisch gas
- ✓ Bereik de Fit for 55 Doelen

More rooftop solar panels, heat pumps and energy savings to reduce our dependence on fossil fuels, making our homes and buildings more energy efficient.

Decarbonising Industry by accelerating the switch to electrification and renewable hydrogen and enhancing our low-carbon manufacturing capabilities.

Speeding up renewables permitting to minimise the time for roll-out of renewable projects and grid infrastructure improvements.

2030

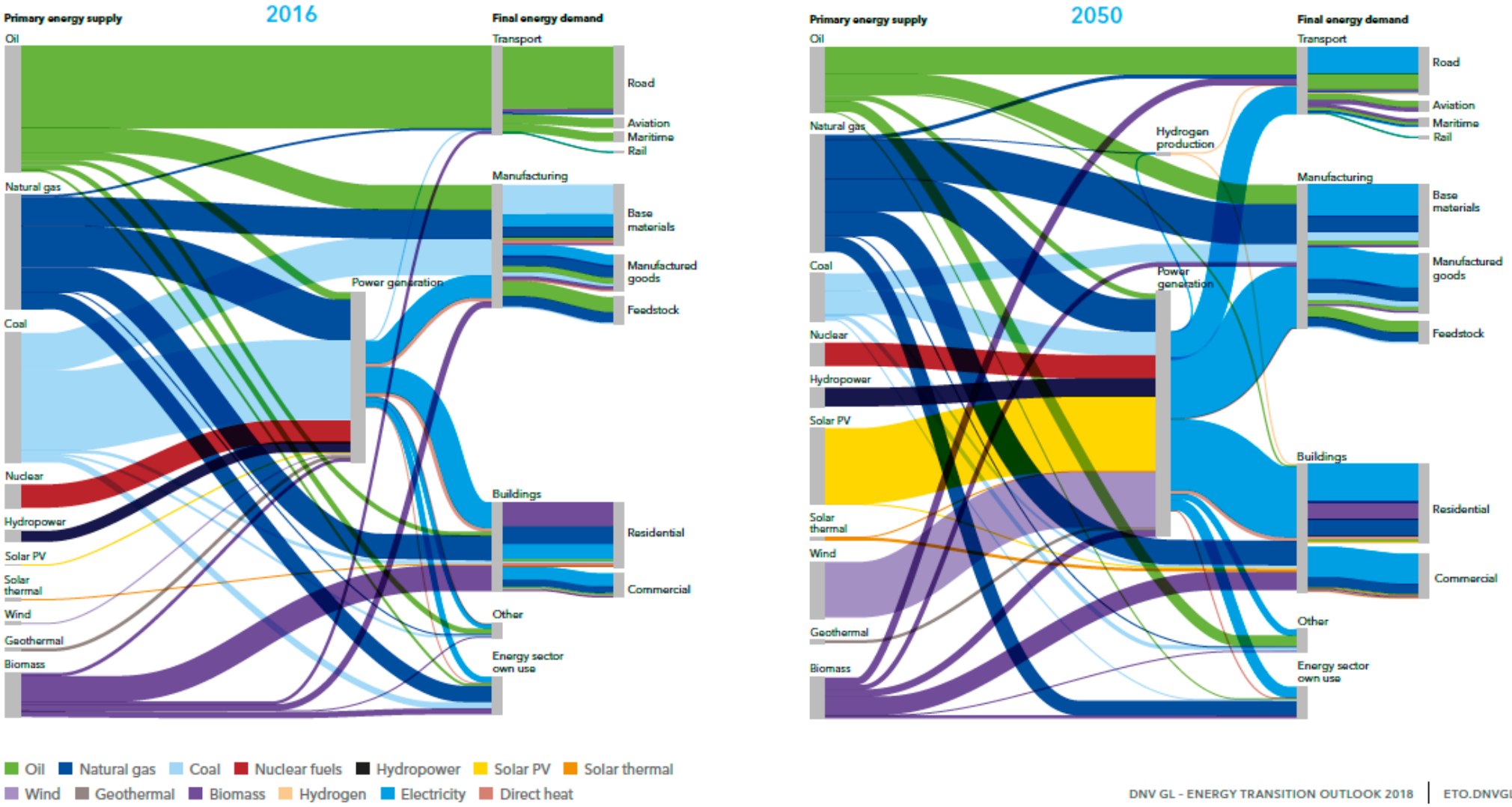
Doubling the EU ambition for biomethane to produce 35 bcm per year by 2030, in particular from agricultural waste and residues.

Diversifing gas supplies and working with international partners to move away from Russian gas, and investing in the necessary infrastructure.

A Hydrogen Accelerator to develop infrastructure, storage facilities and ports, and replace demand for Russian gas with additional 10 mt of imported renewable hydrogen from diverse sources and additional ~~5 mt~~ of domestic renewable hydrogen.

10 mt

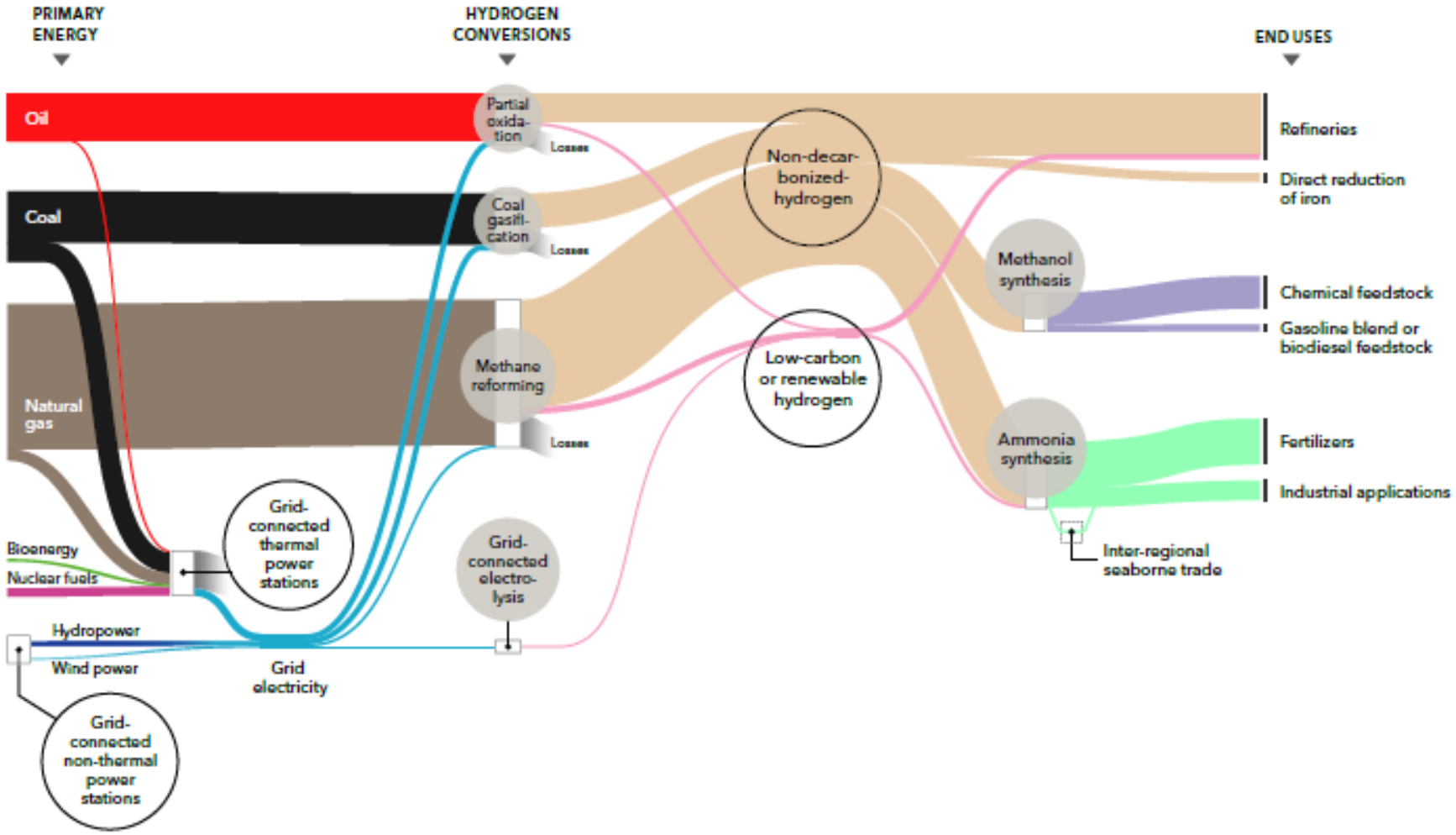
De Energie Transitie is een Herbedrading van onze hele wereld



DNV GL - ENERGY TRANSITION OUTLOOK 2018 | ETO.DNVGL.COM

2020 - Waterstof is niet nieuw

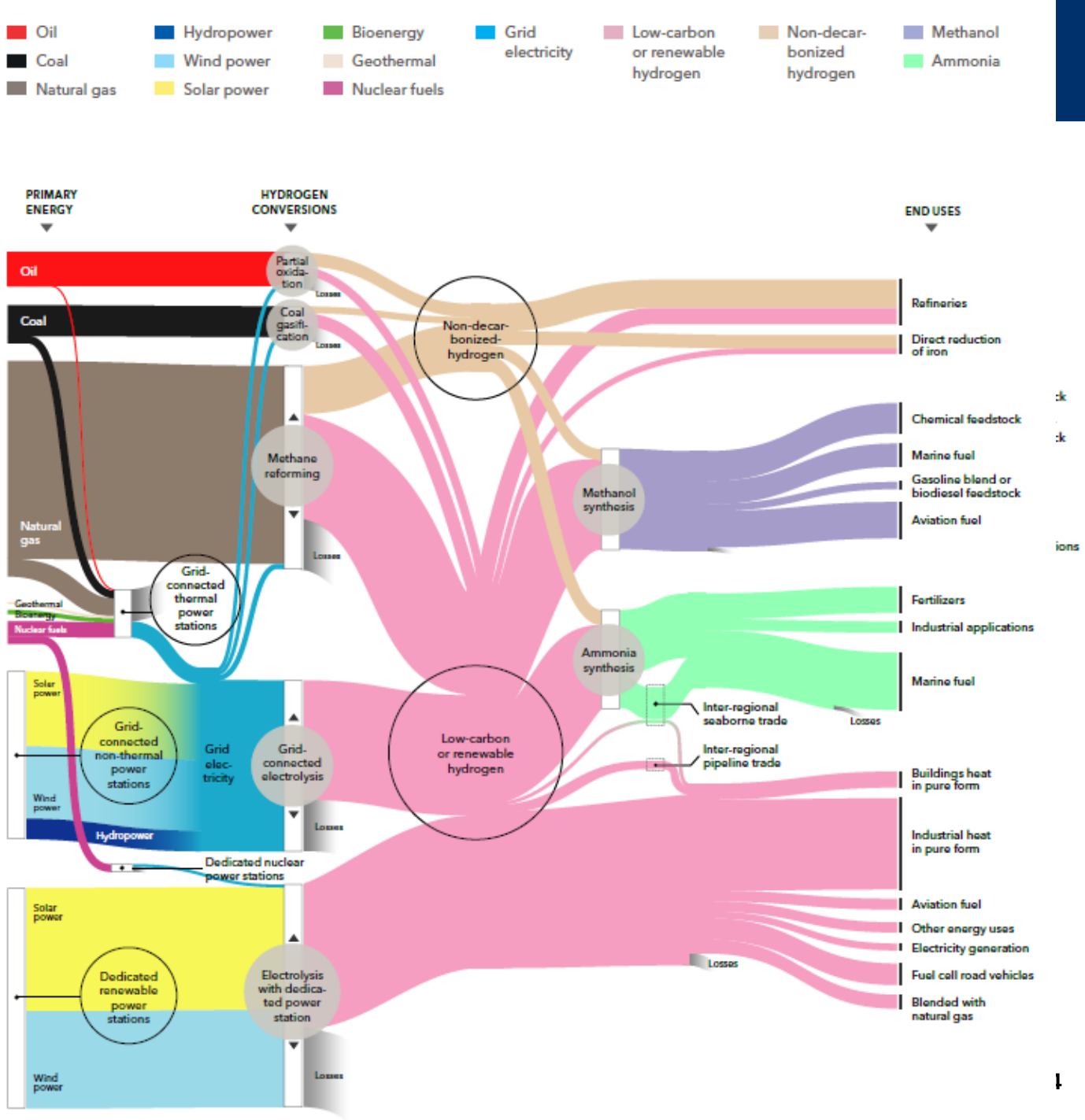
- Ook op dit moment wordt er veel (non-decarbonized) Waterstof geproduceerd
- CO2 uitstoot 830 Mt (2.2% van wereldwijde uitstoot) in 2018



2050 - Meer H2, Minder CO2

- Steeds meer Low-Carbon H2 of Renewable H2

- Andere toepassingen:
  - Decarboniseren bestaande H2
  - Energie
  - Feedstock
  - DRI



Waterstof Groeicurve in EU – Fit for 55 Doel

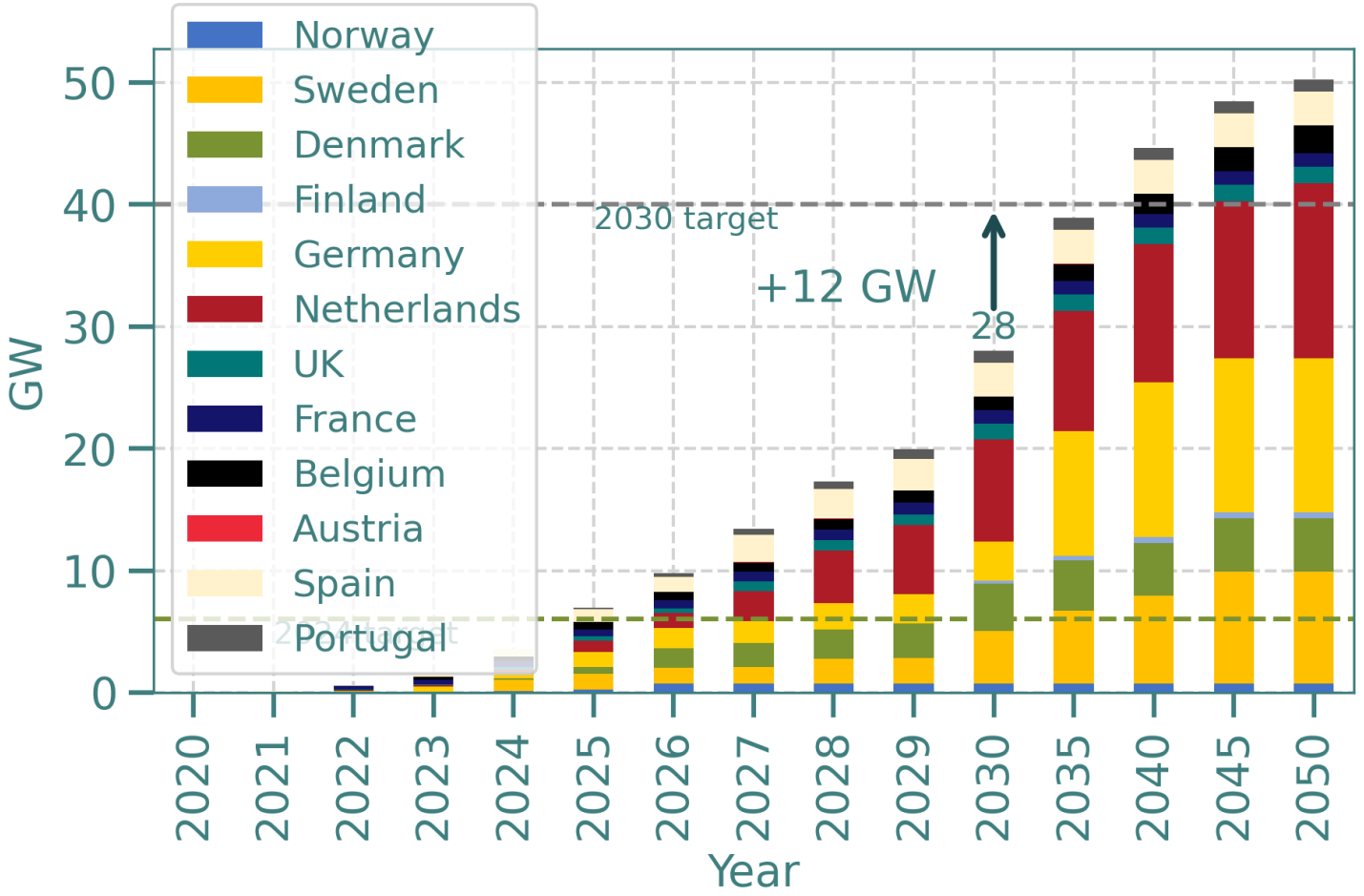
Hoge verwachtingen voor H2

In Fit-for-55 was het doel om 5.6 MT hernieuwbare H2 beschikbaar te hebben.

In REPowerEU is dat verhoogd naar 20 MT, waarvan 10 MT geproduceerd in de EU.

Dat is equivalent aan 100 GW aan (electrolyzer) productiecapaciteit.

Doel is vervanging van 50 bcm Russisch gas.



https://energypost.eu/how-to-ramp-up-hydrogen-under-the-new-repowereu-targets/

https://thema.no/en/nyheter/store-steg-naermere-men-langt-igjen-til-40-gw-elektrolyse-i-eu-i-2030/

Een ongelooflijke uitdaging

20 MW → x 5,000 → 100 GW

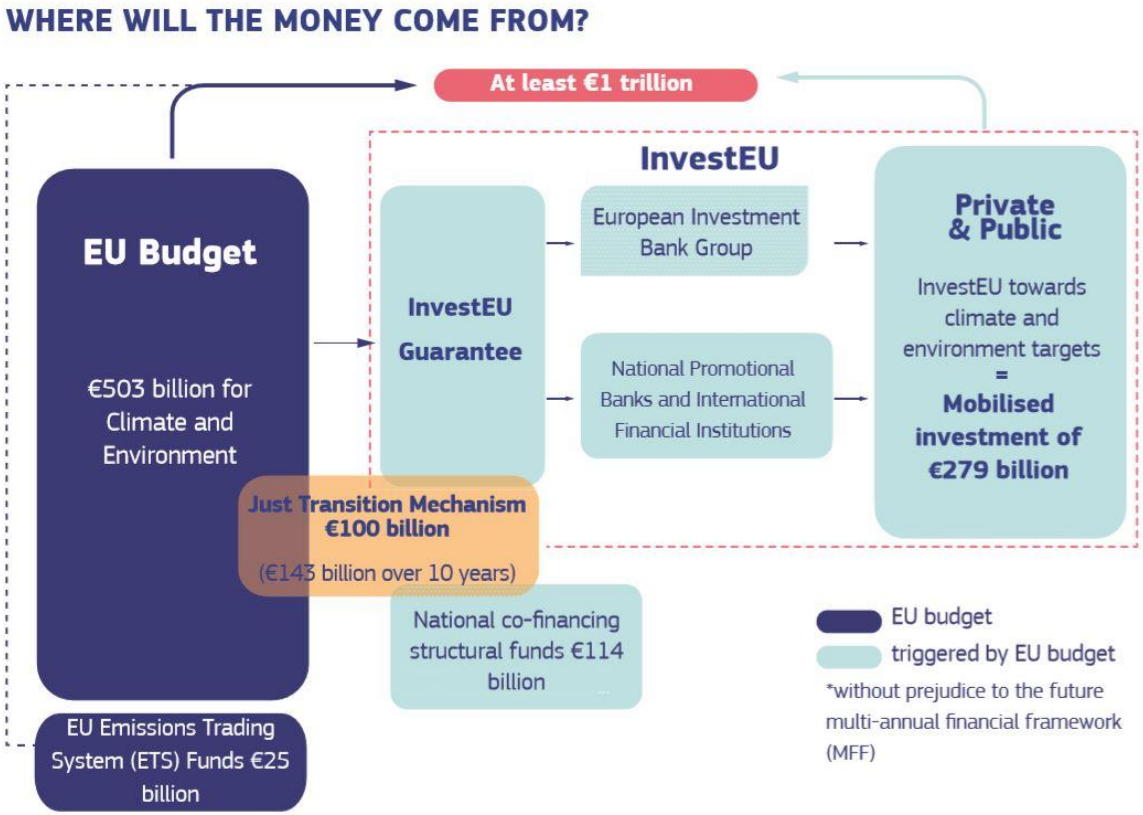
= 100,000 MW

Nu

2030

De Inzet van de EU is ook Enorm

503 Billion € for Climate and Environment



The European **climate law** makes reaching the EU's climate goal of **reducing EU emissions by at least 55% by 2030** a **legal obligation.**

REPowerEU

The REPowerEU Plan will rapidly reduce our dependence on Russian fossil fuels by fast-forwarding the clean energy transition and adapting our industry and infrastructure to different energy sources and suppliers.

Additional investments of €210 billion are needed between now and 2027 to phase out Russian fossil fuel imports, which are currently costing European taxpayers nearly 100 billion euros per year

IPCEI

Important Projects of Common European Interest

IPCEI H2 — **5.2 Billion €**

RVO

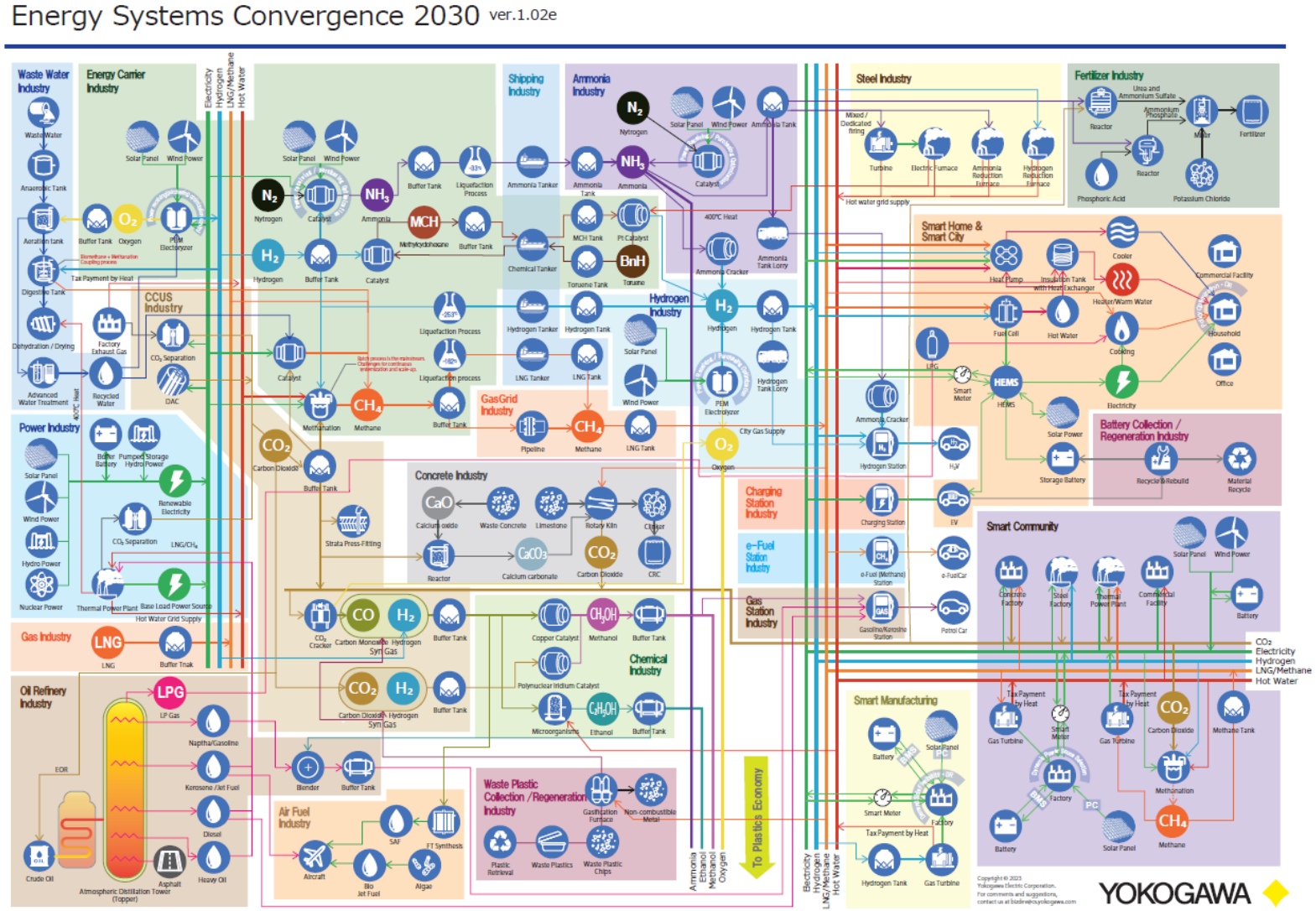
35 M €	Wave 1 Hy2Tech
783,5 M €	Wave 2 Hy2Use
600 M €	Wave 3 RHATL Regional Hubs and Their Links
200 M €	Wave 4 Mobility & Transport

Naar Digitale Samenwerking

Energy Convergence

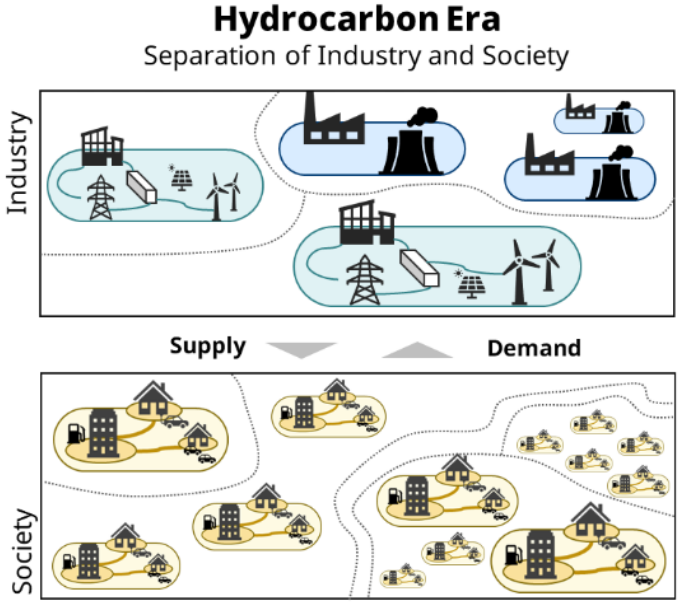
We gaan naar een energie systeem met oneindig aanbod.

Het energie systeem moet een antwoord geven op waar (distributie), wanneer (opslag) en hoe (vorm) energie geleverd gaat worden.

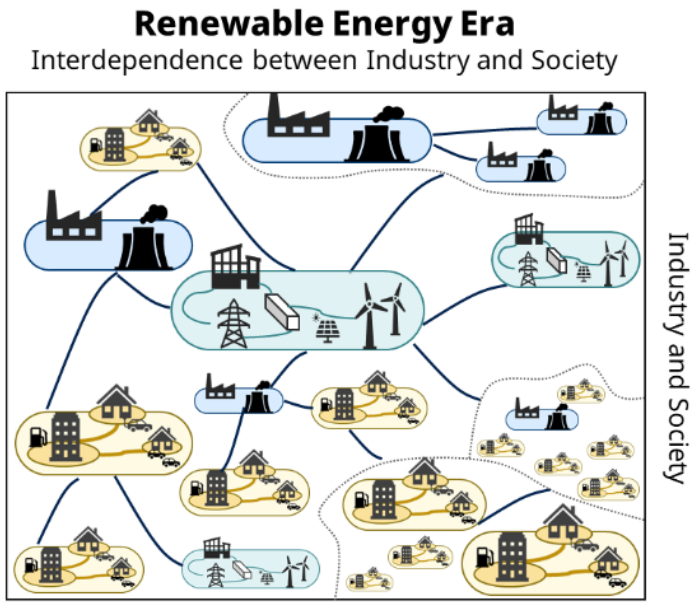


Asset Verspreiding

In het toekomstige energie system zullen assets modulair en verspreid zijn, en zullen de grenzen tussen industrie en de maatschappij vervagen.



- No material or energy exchanges between similar or co-located industries
- Less investment on alternative clean energy
- Heavy dependence on fossil fuel sources
- Unstable energy supply

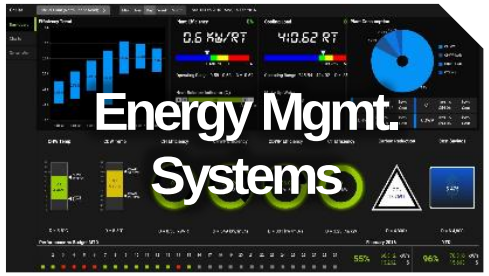


- Active material and/or energy exchanges between industries and regions
- Focus on alternative clean energy investments
- Appropriate and varied energy mix
- Stable energy supply

Grenzen aan Individuele Optimalisatie

In de industriele wereld, maken bedrijven inspanningen om CO2 te reduceren.

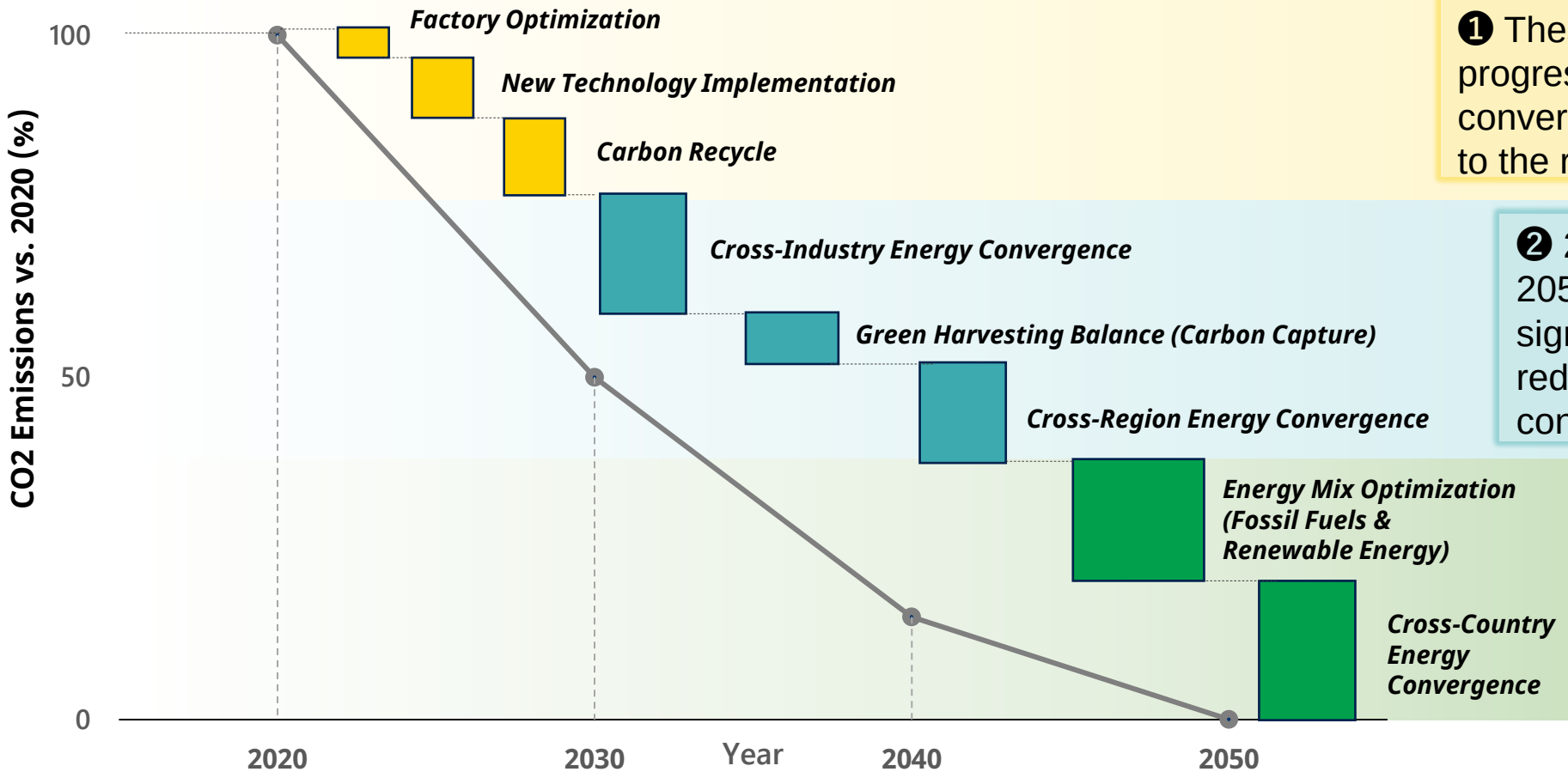
Deze dragen zonder twijfel bij aan het verbeteren van het milieu, maar bereiken al snel hun grenzen.



- Deze individuele initiatieven weerspiegelen een gesloten paradigma van een bedrijf dat onderdeel is van een supply chaing → “Doen voor mezelf” or “Doen wat ik moet doen voor mezelf”

Roadmap naar een Gedecarboniseerde Maatschappij

Which will be accelerated by Energy Systems Convergence.

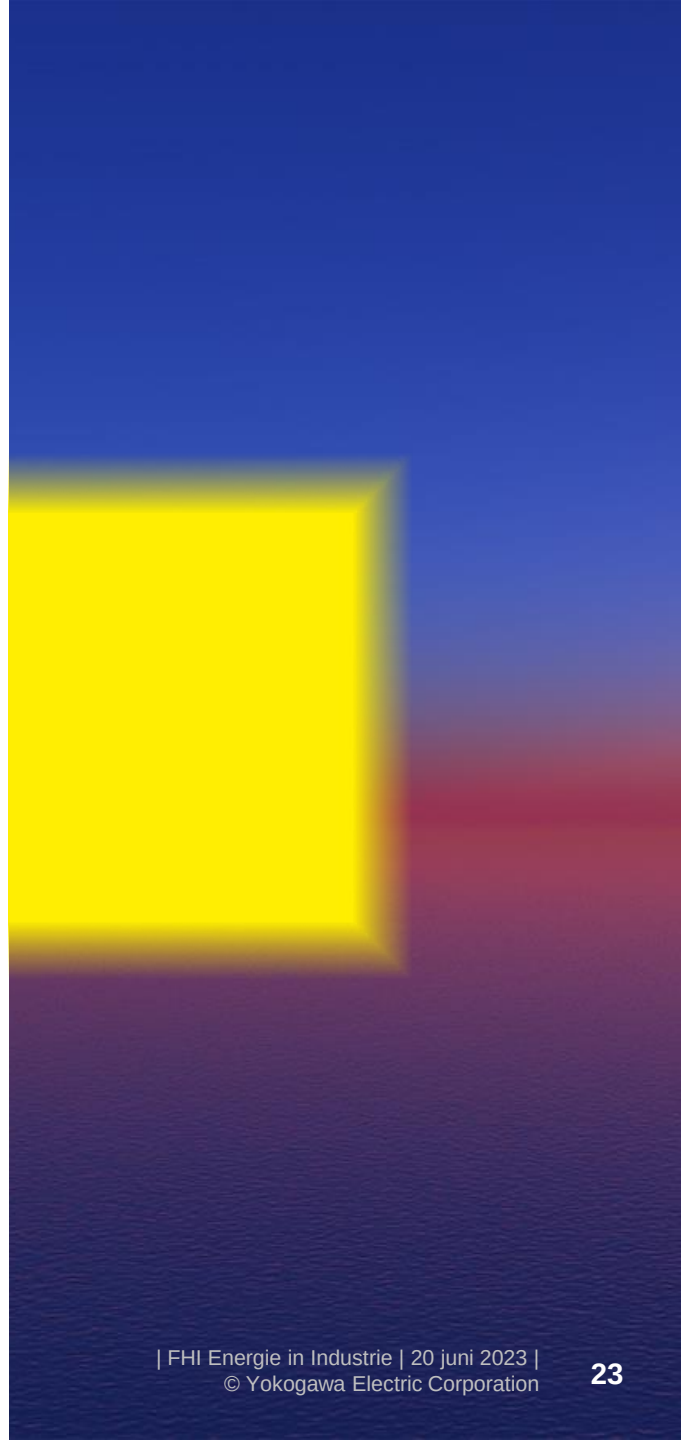


❶ These activities show a sample progression towards energy systems convergence. Each activity contributes to the reduction of CO2 emissions.

❷ 2030 is the midpoint towards 2050. We can accelerate and significantly boost our CO2 reduction efforts through energy convergence.

❸ As convergence scales from local geographies to a global landscape, we can achieve net-zero carbon emissions by 2050.

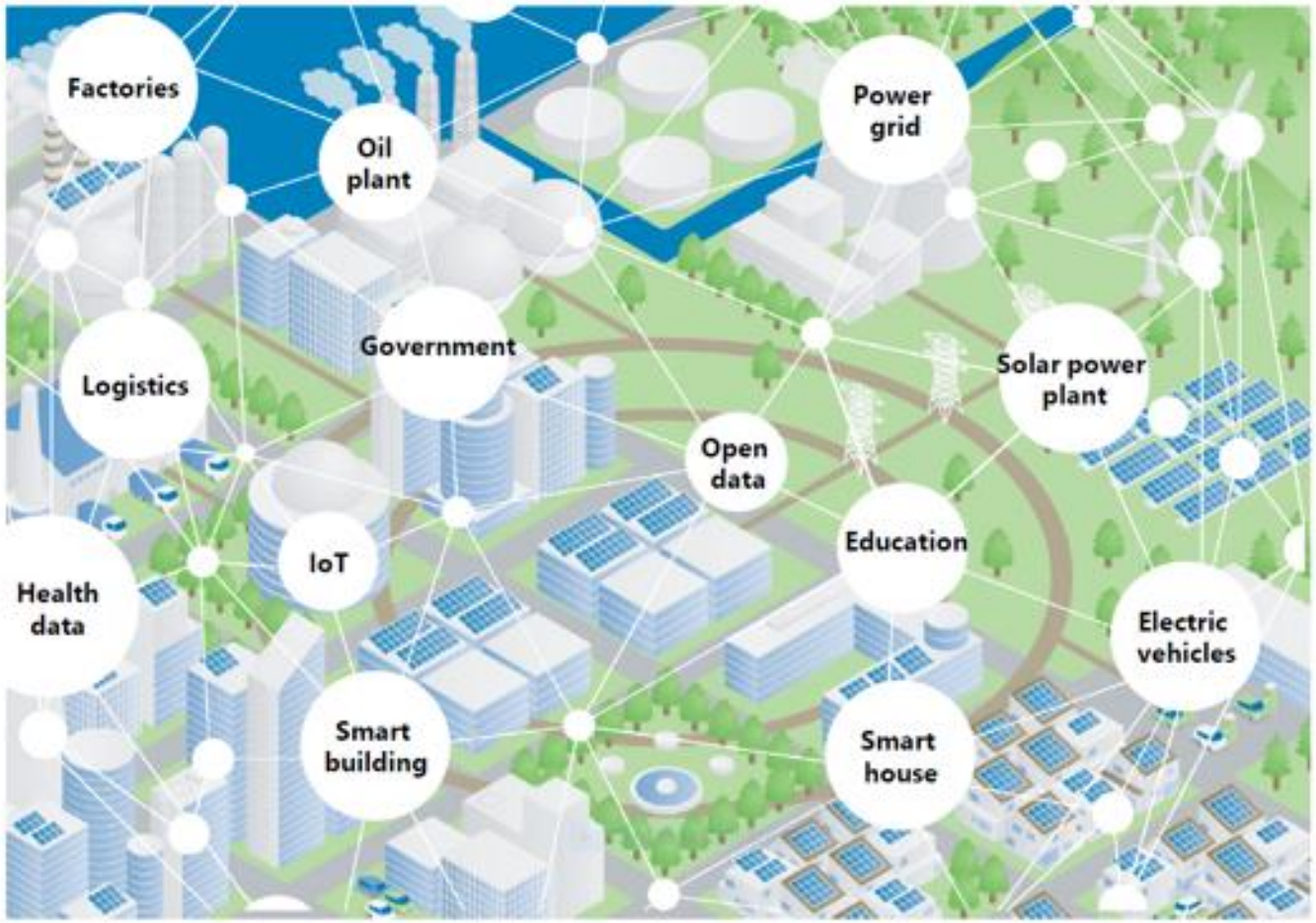
De Energie Toekomst is Digitaal



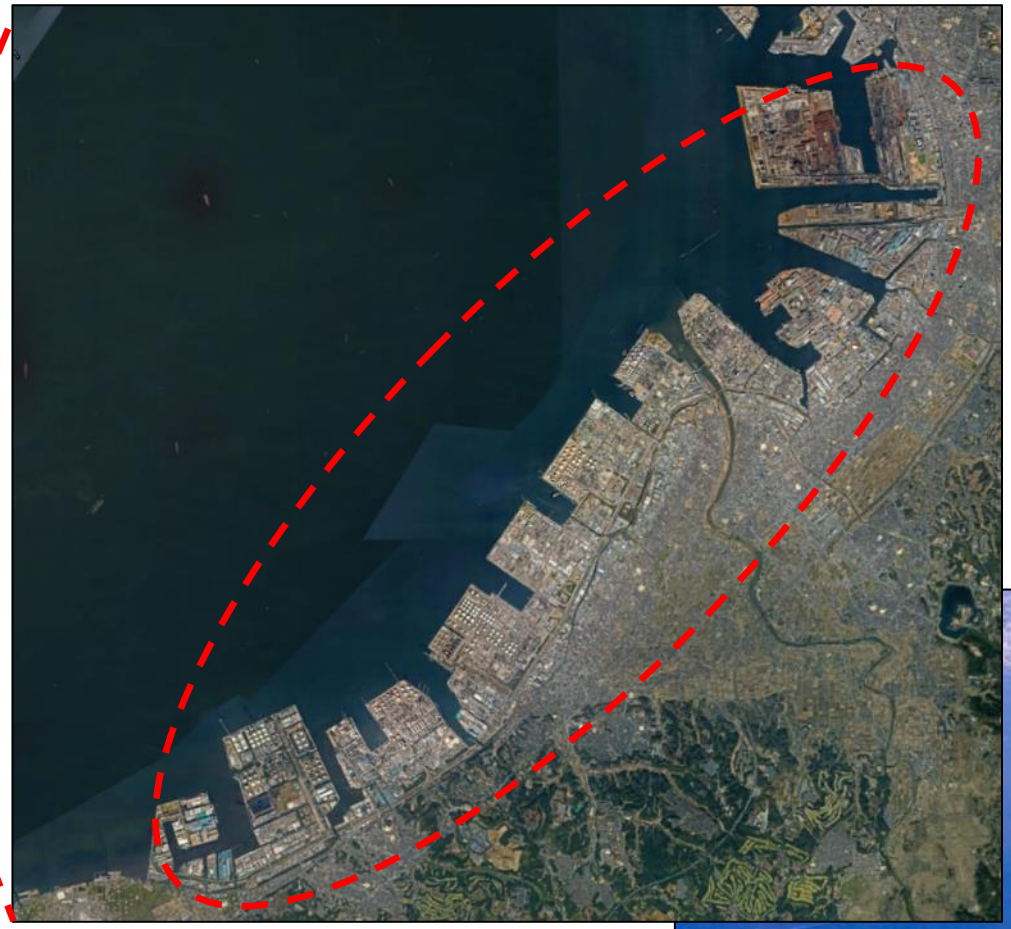
Wereldwijde Trend naar System of Systems

System of Systems

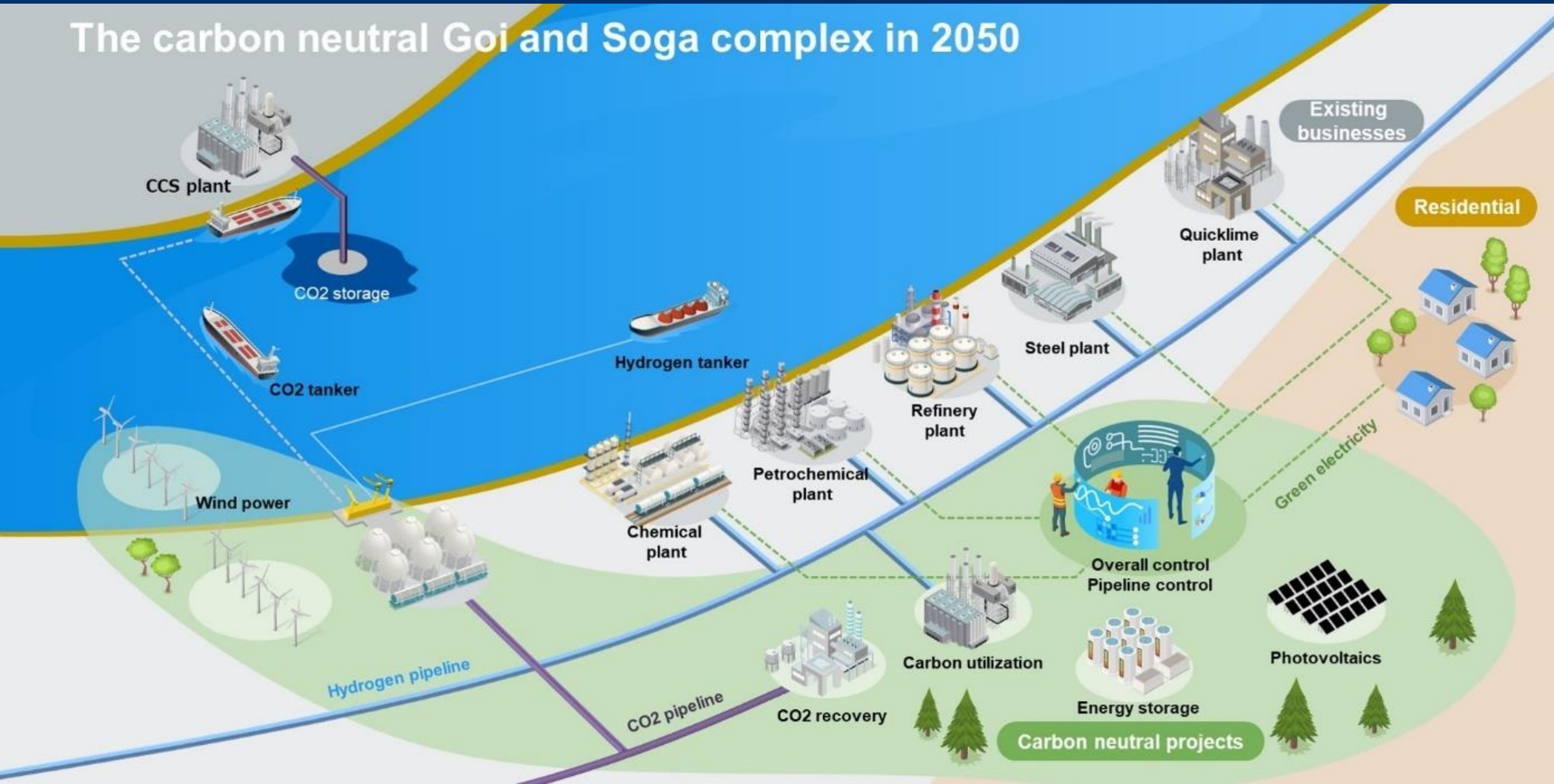
Everything is inter-connected in complicated ways, and the components function as independently operated and managed systems that work together to achieve a purpose that cannot be achieved by any single system.



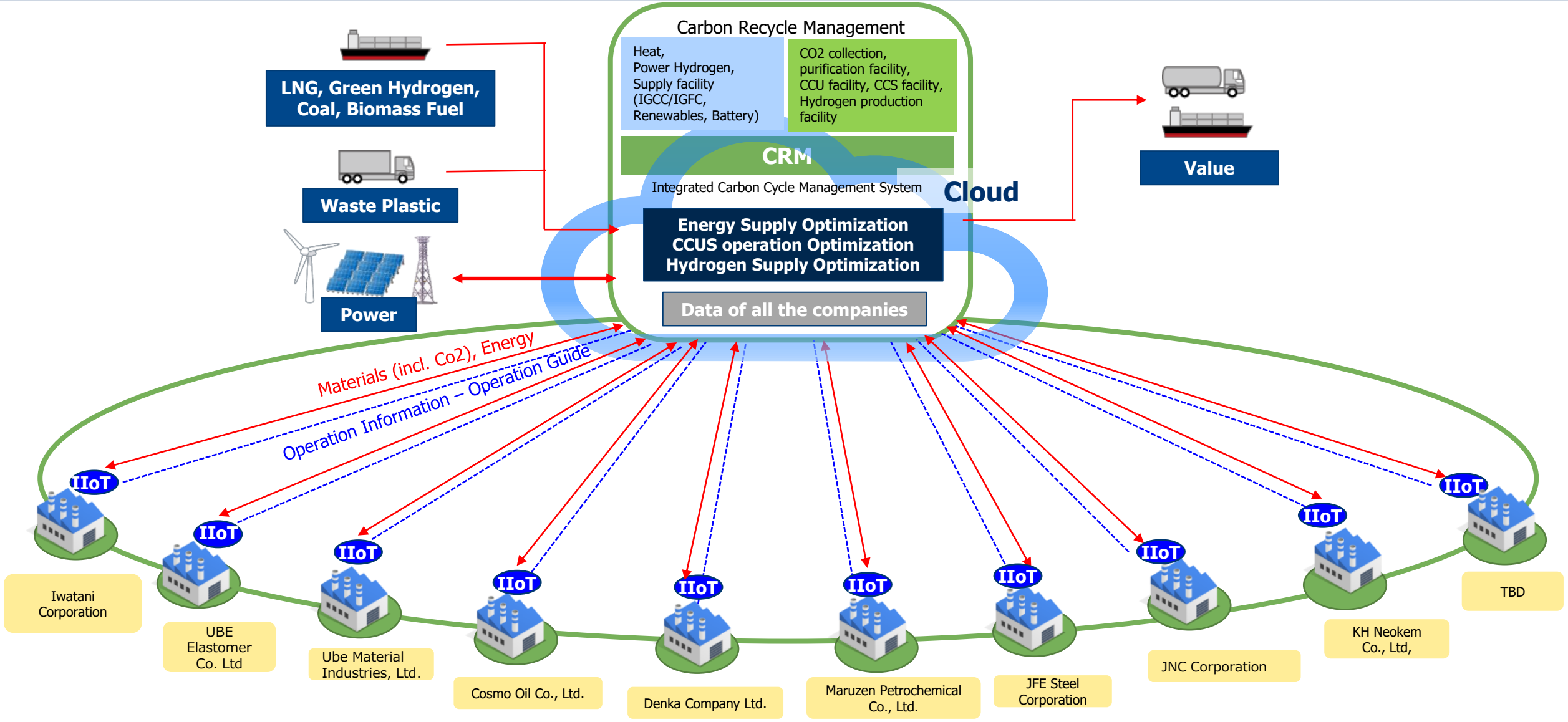
Goi: Tokyo Bay, Japan



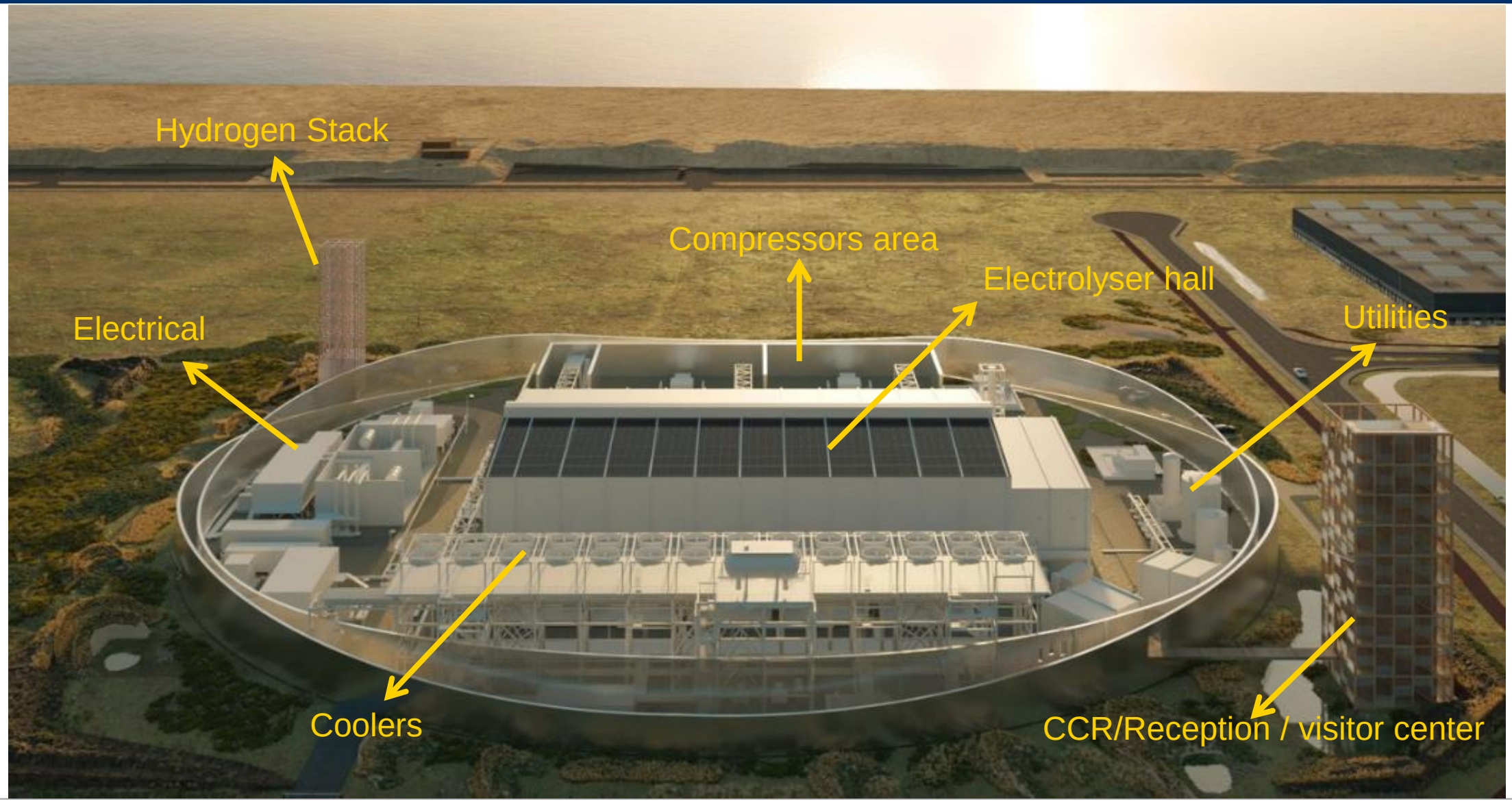
Goi: Multiple, diverse carbon-intensive businesses



Carbon Recycle Management Concept towards 2050

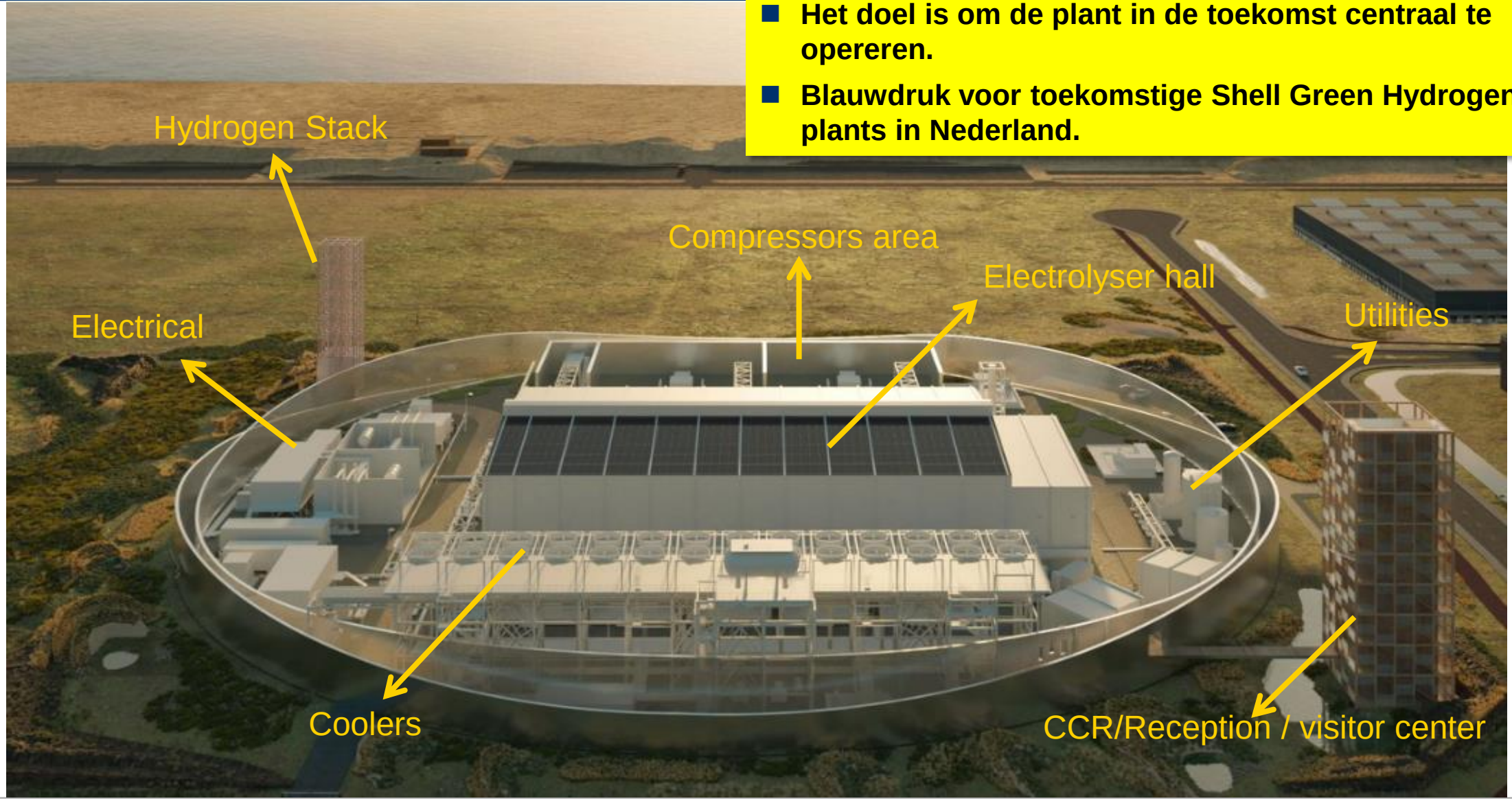


Holland Hydrogen 1



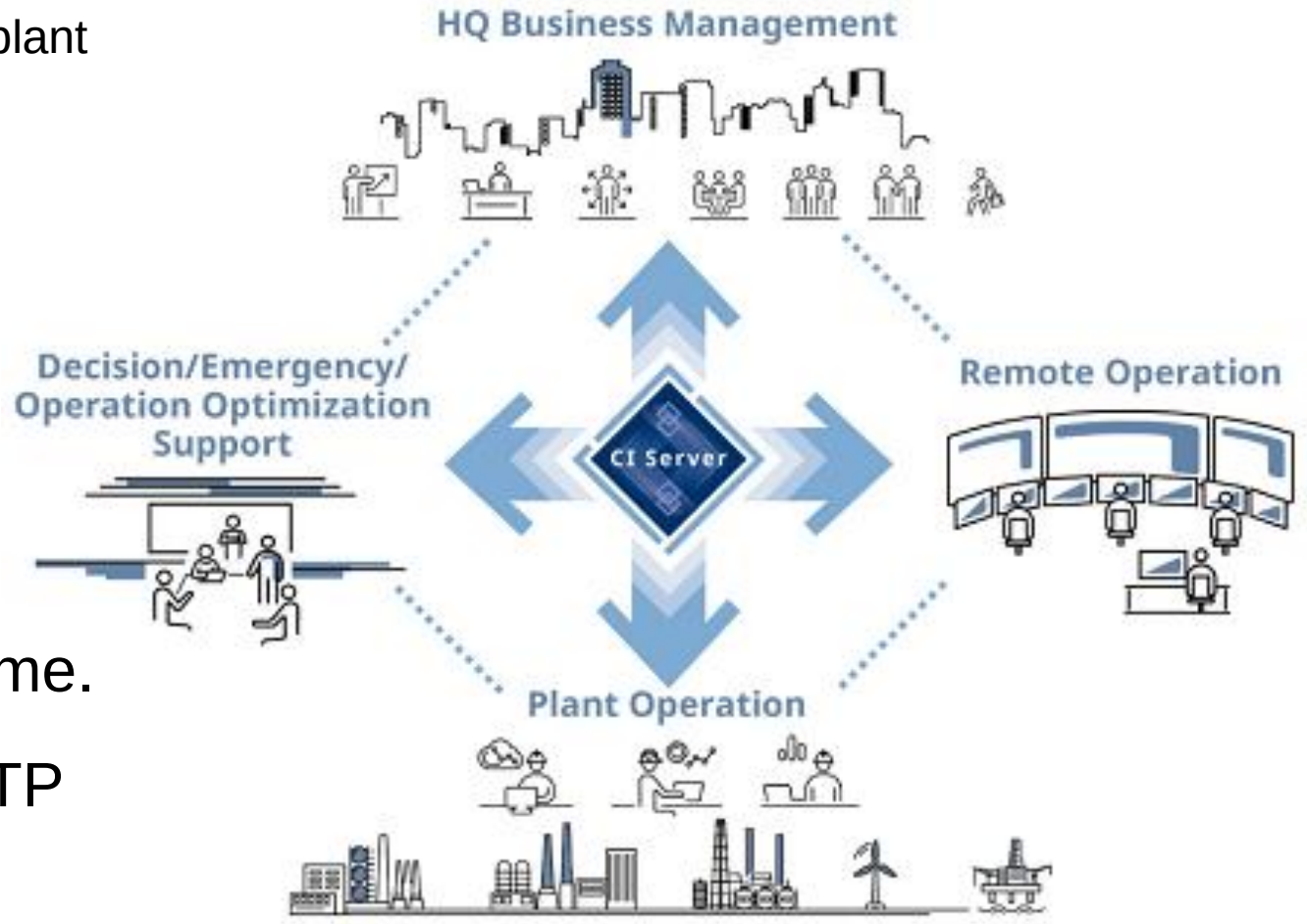
Holland Hydrogen 1

- **Plant wordt ontworpen voor 1 operator in CCR / 1 operator in het Veld.**
- **Het doel is om de plant in de toekomst centraal te opereren.**
- **Blauwdruk voor toekomstige Shell Green Hydrogen plants in Nederland.**

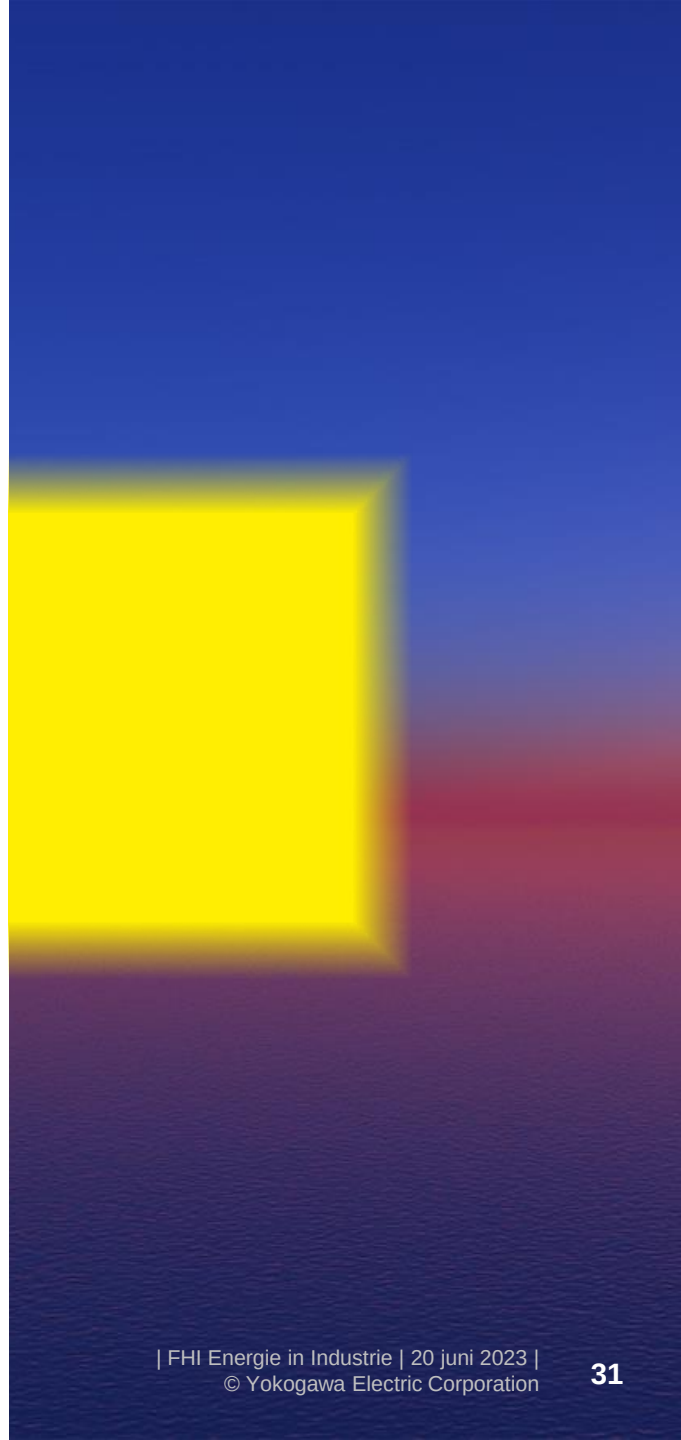


Key enabler: (Open) Digital architecture

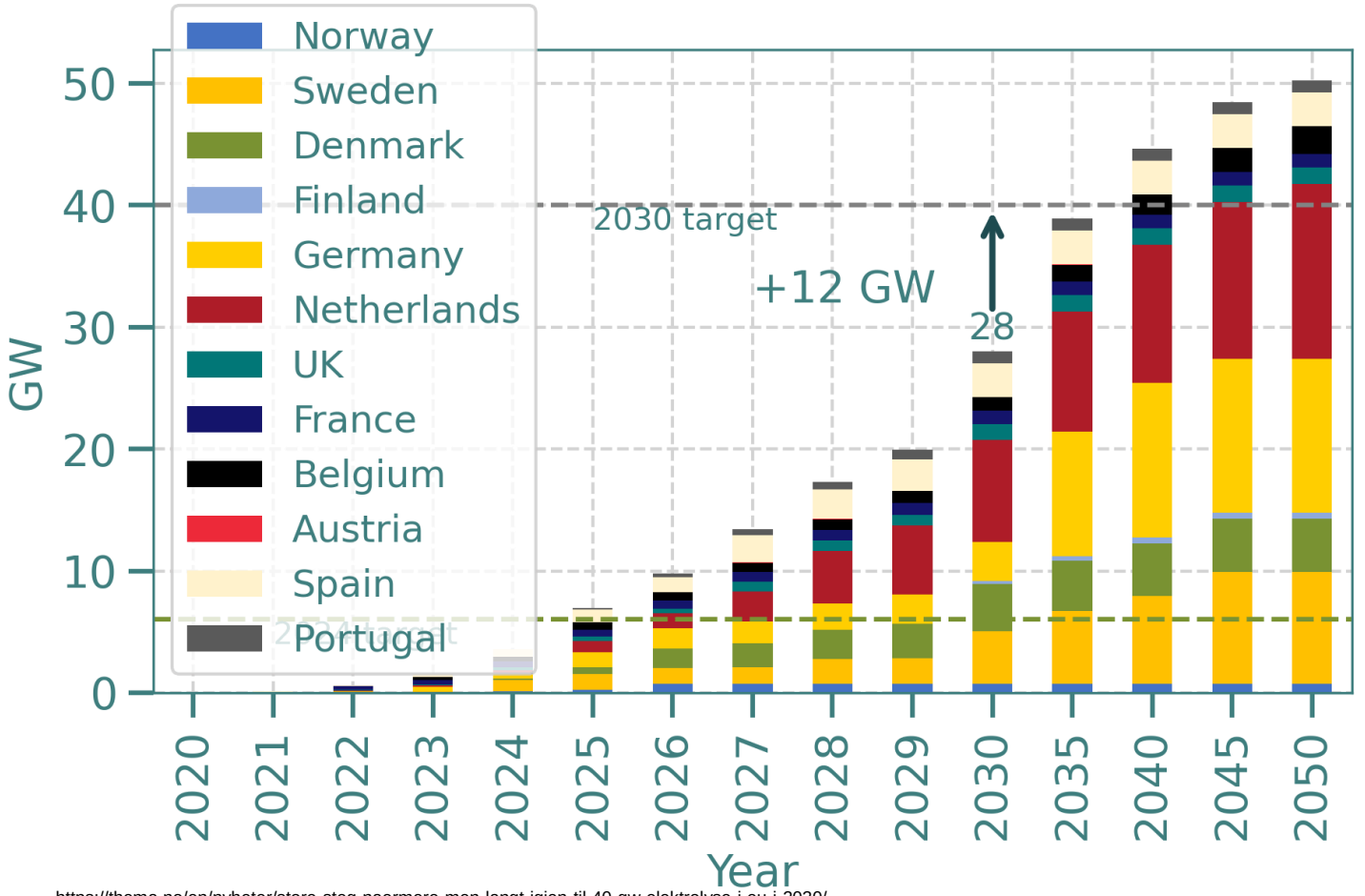
- Horizontal integration
  - By integrating equipment and systems on the plant
- Vertical integration
  - Through IT/OT convergence, it can seamlessly transport data to upper-layer systems
- Scalable and Expandable
- Central Edge Server
- Connect different sites and facilitate remote operation and support in real-time.
- Compliant with O-PAS and NAMUR MTP standards



De Energie Toekomst is Primair Digitaal

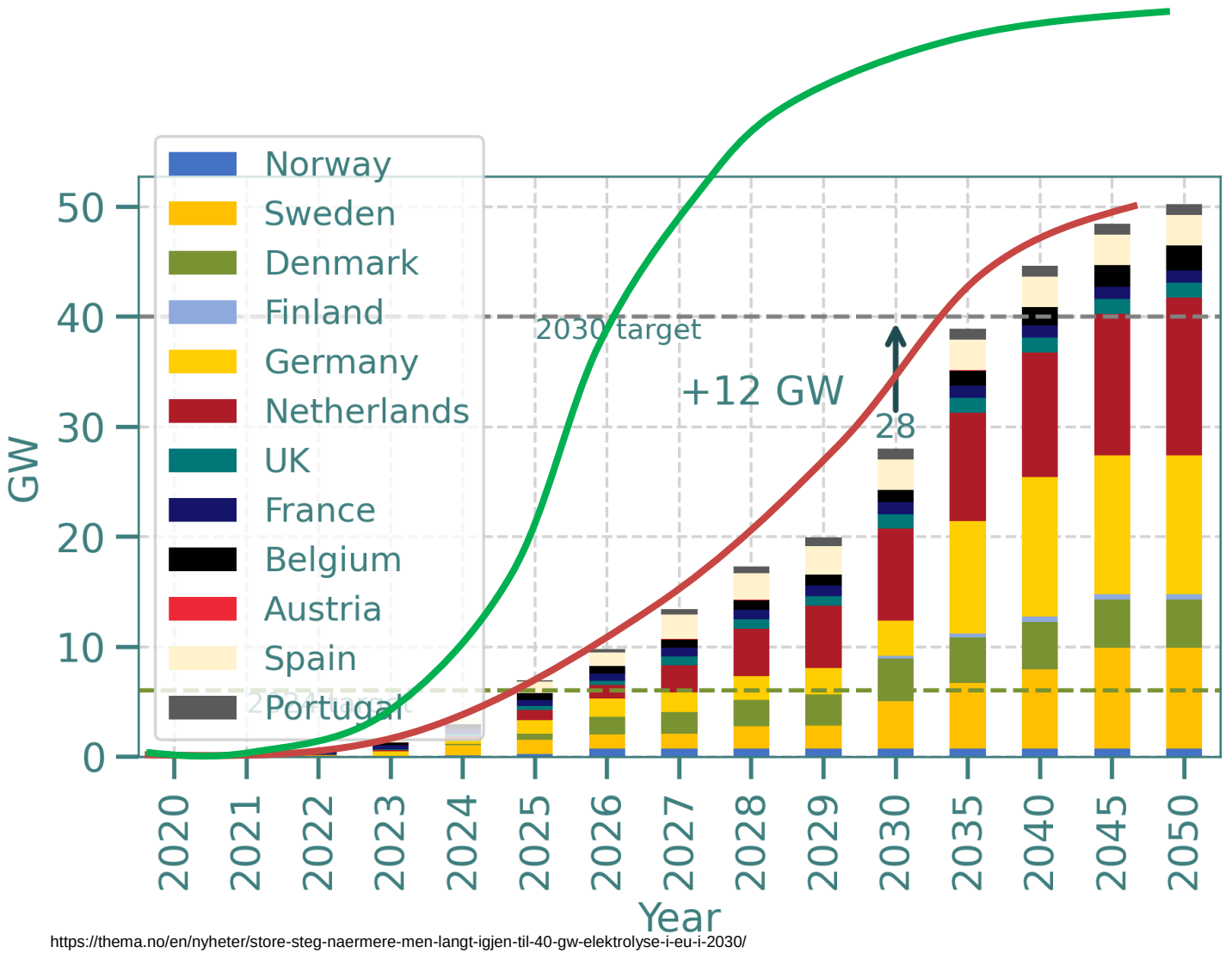


Waterstof Groeicurve in EU – Fit for 55 Doel



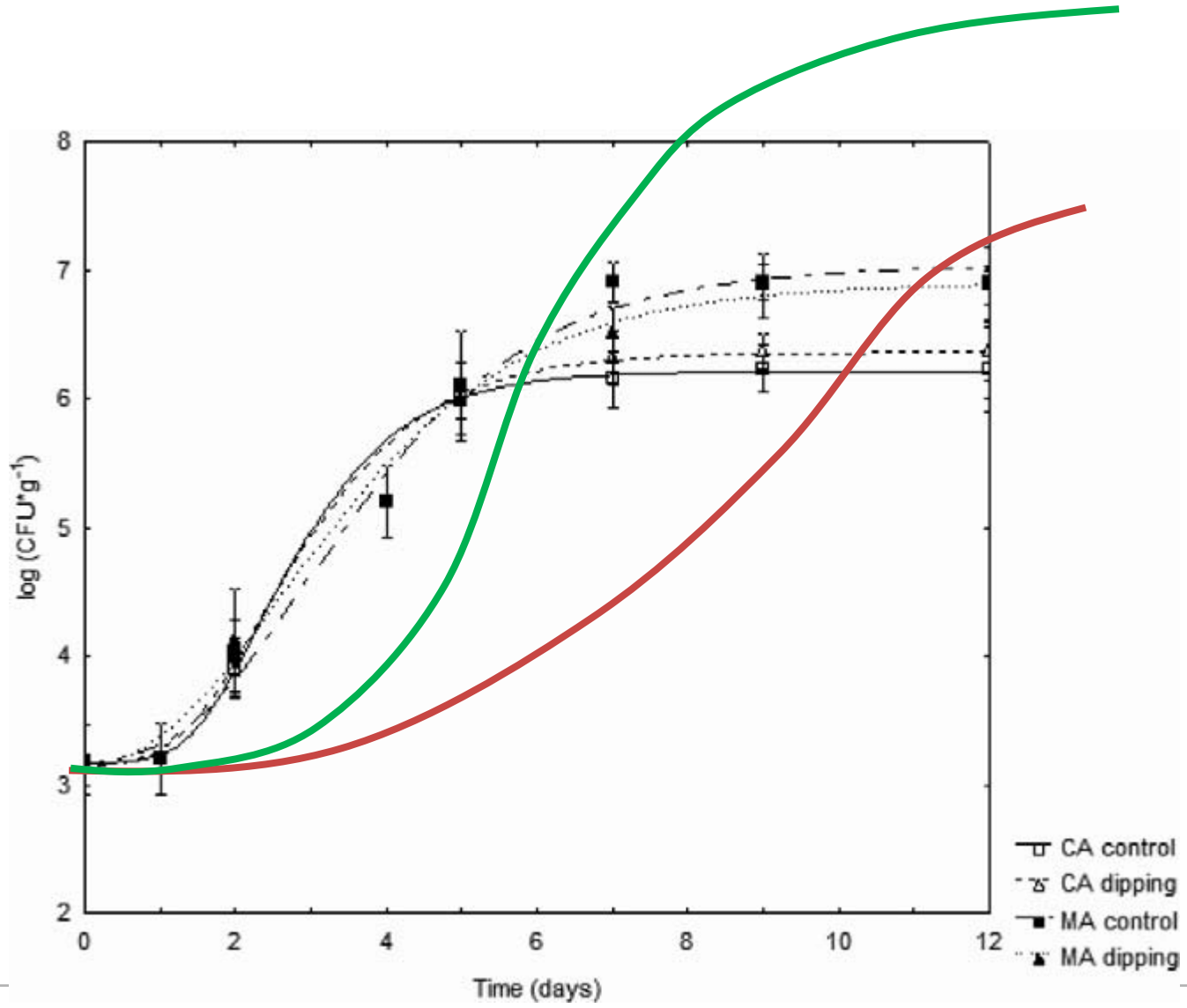
https://thema.no/en/nyheter/store-steg-naermere-men-langt-igjen-til-40-gw-elektrolyse-i-eu-i-2030/

Waterstof Groeicurve in EU



https://thema.no/en/nyheter/store-steg-naermere-men-langt-igjen-til-40-gw-elektrolyse-i-eu-i-2030/

Waterstof Groeicurve in EU



Voorwaarden voor Groei

+

+

>

Creating the conditions

- ✓ **Laten we onze ogen op het einddoel houden: Schone, Betrouwbare Energie voor iedereen**
- ✓ **Laten we samenwerken**
- ✓ **Laten we voortgang maken**

YOKOGAWA

Co-innovating tomorrow™