

20260518 EUBCE visit

Amer Bio CHP in the circular economy

Mark Bouwmeester



[0m25]

Welcome at the Amer bio CHP.

My name is Mark Bouwmeester,

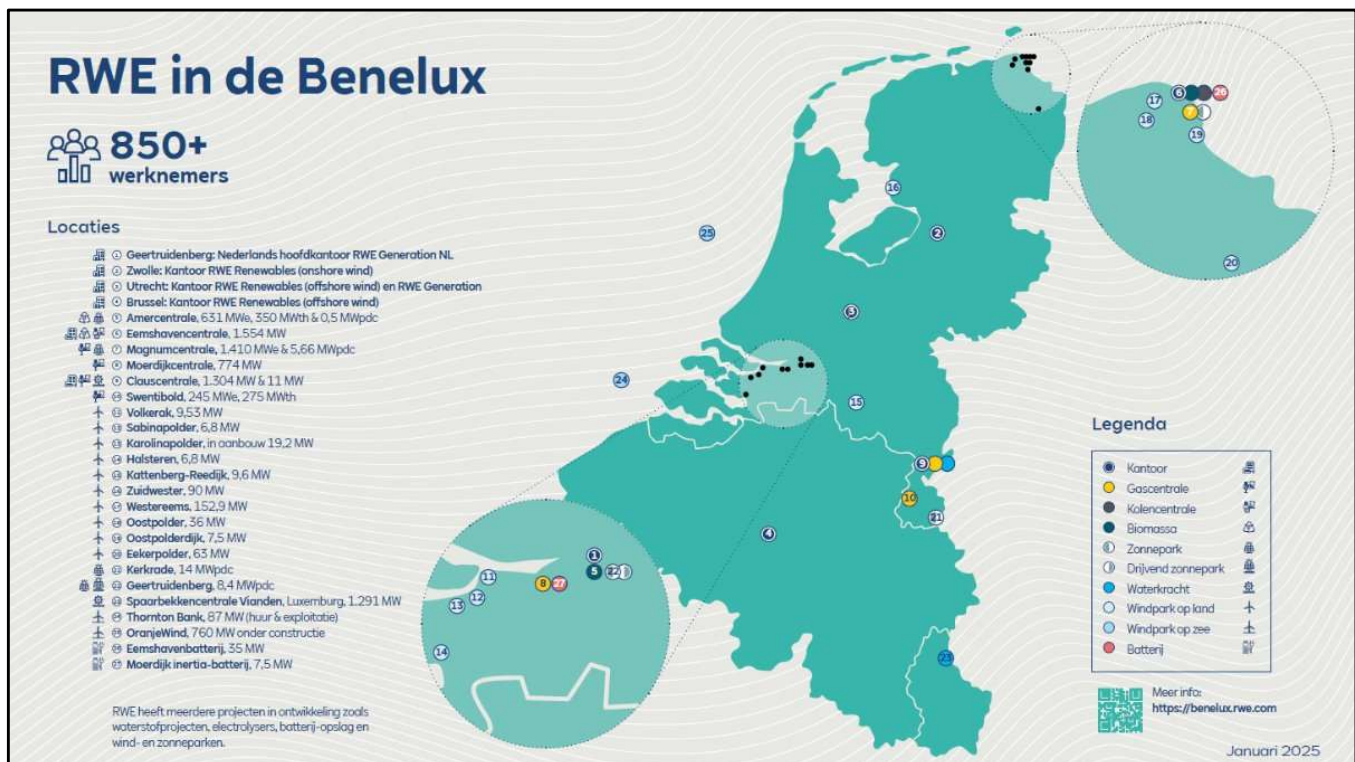
My official function name is technical project manager at RWE Generation NL.

Lot of work, I do is concept design, project development and new bio commodity development.

For today, I was asked to give you a short deep dive into the role of bio energy in the bio based economy.

RWE Presentation Fiscal Year 2025

Introductie RWE



[0:20]

Welcome at the Amercentrale - Welcome at RWE here in the headquarters of RWE Generation in the Netherlands – *aanwijzen in de lijst*

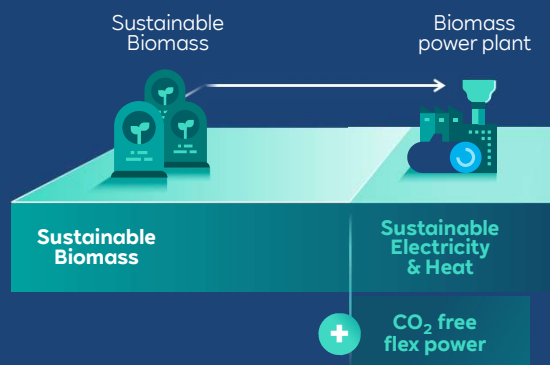
And from the looks, outside, you could see that it is not just an office.

And that it is not the newest office - This office has history.

Already in 1953, this location, the Amercentrale, existed with headquarters next to the 1st Amer power plant.

A power plant that was not built/was not owned by a city, but supplied electricity to the province of Brabant

Amercentrale Biomass CHP



RWE 30/04/2026 Topic of the presentation, which can also be very long

[0:30]

The Amercentrale, Amer bio CHP, as we call it, today, is a combined heat and power plant that **in 25 years** has been

fully converted from hard coal to sustainable biomass operation.

Amer bio CHP is able to produce 550 MWe power up to 350 MWth district heating for

more than 50 thousand households, businesses and greenhouses, without the design fuel hard coal.

Fossil free, dispatchable ! bio-energy.

The Amercentrale is the most eastern location in the so-called power port Moerdijk.

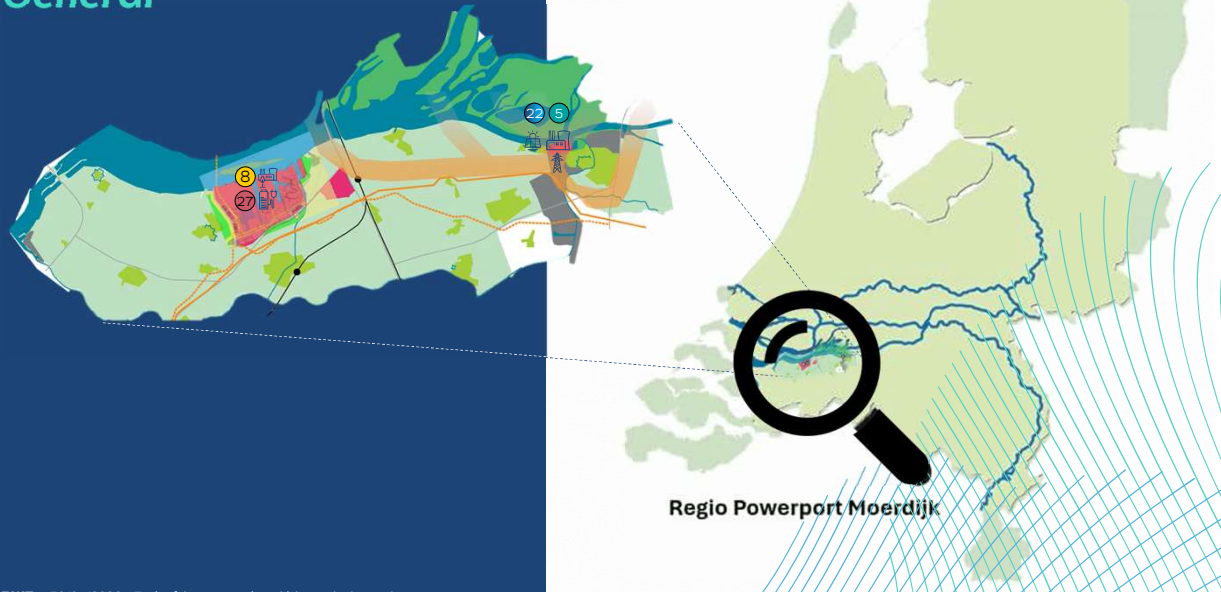
This “power” does not necessarily mean power **production**, by the way.

The energy system is changing from a model based on fuels to a model based on power and infrastructure.

And that’s what you see in this pictures of Powerport Moerdijk. Power infrastructure.

<< click >>

Powerport General



RWE 30/04/2026 Topic of the presentation, which can also be very long
[REF] https://www.youtube.com/watch?v=20h_f8WHgR

<https://www.moerdijk.nl/energie/energieprojecten-om-energie-infrastructuur-te-verbeteren/powerport/>

[1m00]

This Powerport stretches from industry harbour Moerdijk, with the RWE gas fired power plant Moerdijk, up to the Amercentrale in Geertruidenberg

The Netherlands, in the coming years, in this region, for the energy transition and for circular, sustainable industry,

has to find some 700 hectares of additional industrial area

And, indicated on the Powerport map, huge corridors are foreseen for the circular, electrified industry of the future.

Because the energy transition, heavily, depends on infrastructure. High voltage power infrastructure and gas pipelines.

>> click <<

Also the rivers are important infrastructure. River Maas to Belgium, Rhine river as the connection to the Ruhrgebiet in Germany.

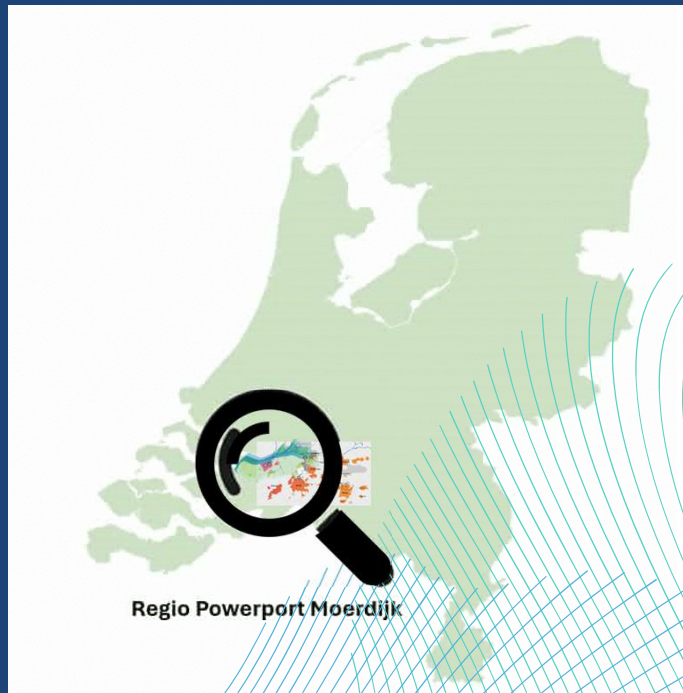
Considering warmer and dryer summers, there is a chance that these river ways need back up. For example from pipelines.

Even the village of Moerdijk will have to be sacrificed for this Powerport – aanwijzen – for this infrastructure.

To get a bit of feeling of sizes in the Netherlands – distance between Amercentrale and Moerdijk powerplant is 20kms

Amercentrale Amerwarmtenet

- One of the largest district heating networks in the Netherlands.
- Supply a total of more than 1,900,000 GJ of heat to
- 51,000 households and
- 355 businesses
- in Breda, Tilburg, Oosterhout, Geertruidenberg, Made, Dongen and Sprang Capelle



RWE 30/04/2026 Topic of the presentation, which can also be very long

[REF] <https://ennatuurlijk.nl/leveringsservice/in-jouw-buurt/warmtenet-midden-en-west-brabant>

[0m55]

The Amer power plant, the Amer Bio CHP, is connected the Amernet district heating network.

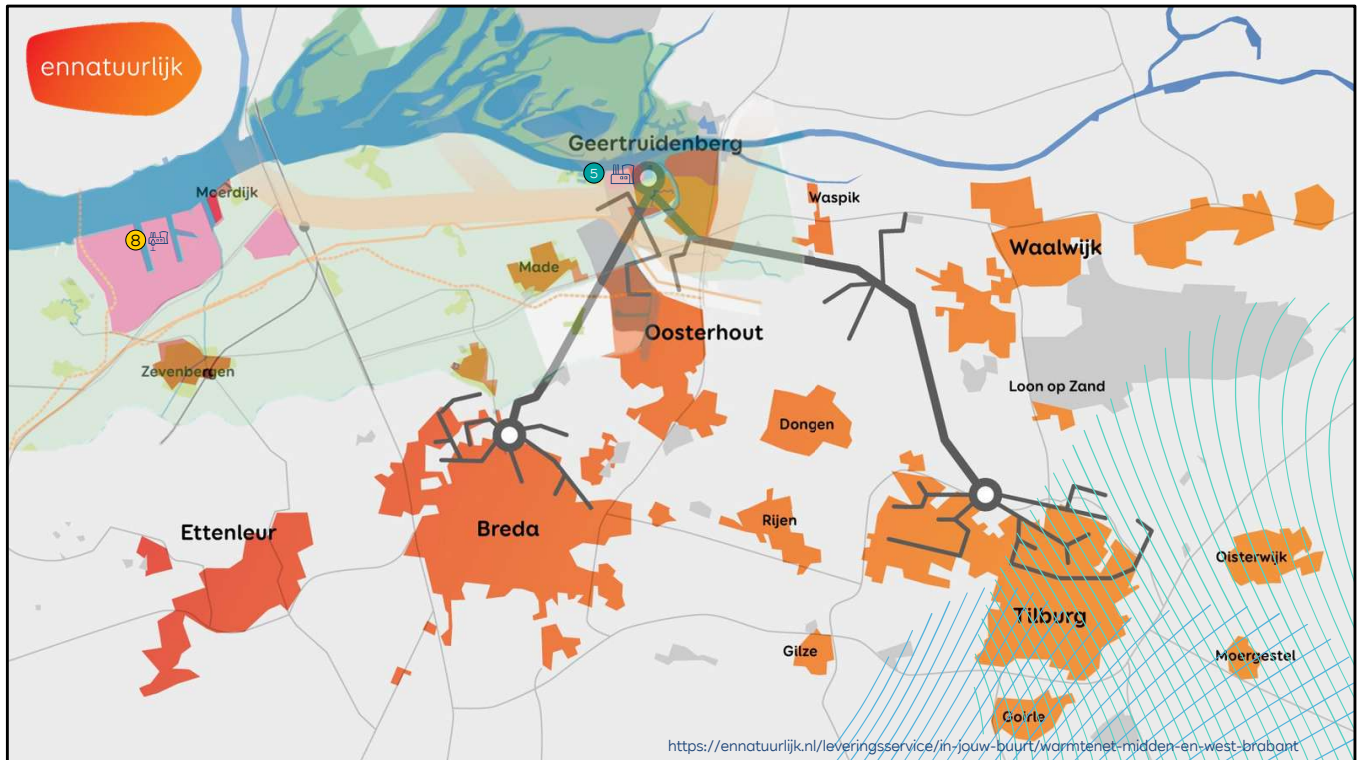
If you think district heating is history or if you think district heating is the future heating, independent of natural gas, both are right.

In the eighties, the idea was to diversify domestic heating and not have all the households heated by Groningen gas.

More than 50 thousand households and over 150 business are heated via the district heating network that was – once - heated by residual heat from coal firing.

Today, sustainable biomass heats the Amer district heating network.

For this future energy system, we have to think bigger than powerplants.



[0m35]

Again, to understand the size of the Netherlands, distance between Moerdijk power plant and the Amercentrale is some 20kms - aanwijzen

But that also shows the size of this district heating network.

EnNatuurlijk. Operator of the district heating network is developing the future of district heating.

Multiple heat production sources, CHP, geo-thermal, heat-pumps, electrical boilers, heat storage.

And at the same time expansion projects are developed.

I want to emphasize the importance of governmental decisions wrt district heating networks and power-networks.

That's infrastructure that transcends (overstijgen) power stations.

So we have to think bigger . . .

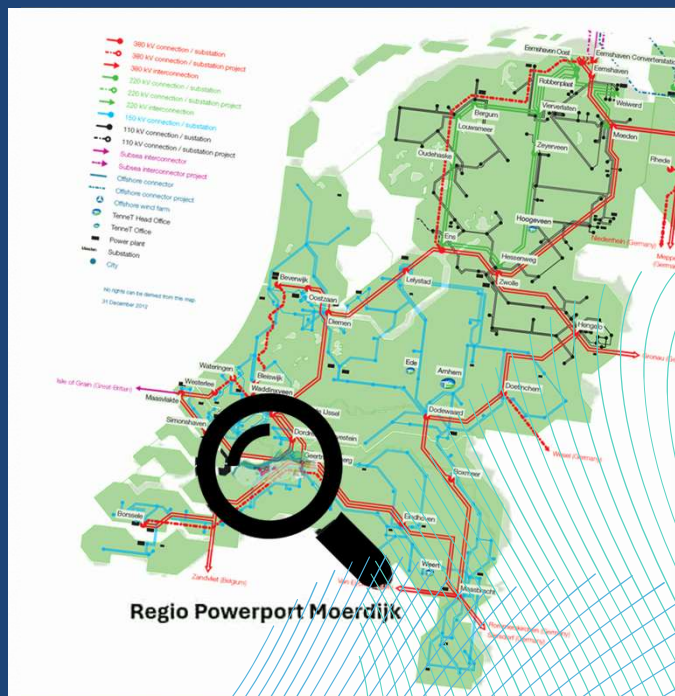
HV grid

380 kV
150 kV



<https://www.tennet.eu/nl/projecten/provincies/noord-brabant/hoogspanningsstations-geertruidenberg-150kv-en-380kv>

RWE 30/04/2026 Topic of the presentation, which can also be very long



[REF] Tennet

[0m40]

As said, high voltage power infrastructure. The Dutch high voltage network. << *rechts aanwijzen* >>

That is another dimension than the power plant or heating network. And is regulated by national government.

This Amer location is close to grid connections to the 150kV and 380kV systems that connect the Netherlands.

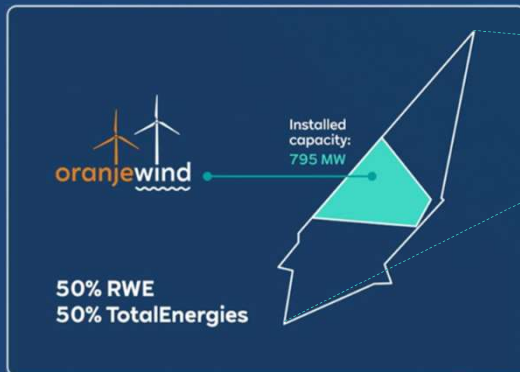
Rotterdam, Amsterdam, Antwerp, Germany... You can see it – outside – from all the overhead wires – << *foto aanwijzen* >>

This location is an important hub for the Dutch high voltage grid. Dutch power grid operator, Tennet, is expanding the transformation station.

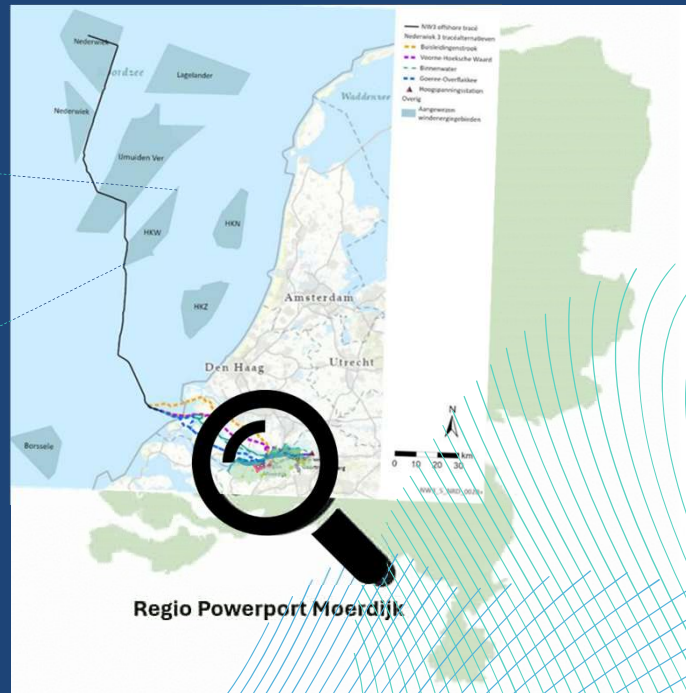
This is huge when comparing to the power plant, which already is not a small installation as you will experience during the plant tour.

But we have to think bigger than just Netherlands above Amsterdams Peil. Above sea level.

HV grid connection for off shore wind parks



[REF] <https://www.oranjewind.nl/>



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[0m40]

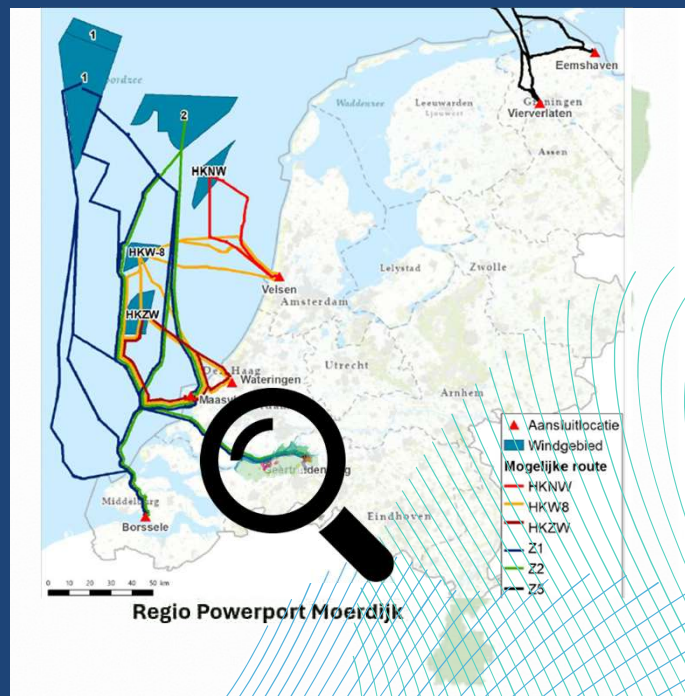
Future electrification of the Netherlands, of north-west Europe, is supported by large scale off shore wind development.

This power hub in the high voltage grid, the Amer location, is looked at for connecting off shore wind parks to the high voltage grids.

One of the off shore wind parks is RWE's windpark Oranjewind, which is being developed, together with Total Energies, to carry the risks together.

Almost 800 MW electrical installed capacity << *aanwijken* >> which is one and a half time the installed capacity of the Amer bio CHP.

HV grid connection for Off shore wind parks



[0m30]

In case you wonder why this high voltage connection for off shore wind is projected at such an inland location.

Coastal connection opportunities, already have been taken or are not favoured due to high voltage grid congestion.

As you can see, there, already, is other wind parks with connections at other locations to the Dutch high voltage grid.

Again. Dutch authorities regulate the development of this important infrastructure.

By the way, compared to piping infrastructure, bringing high voltage power lines to deep inland locations is relatively easy.

DC connections could be a future perspective for the European power grid.

Hydrogen

The planned European Hydrogen Backbone

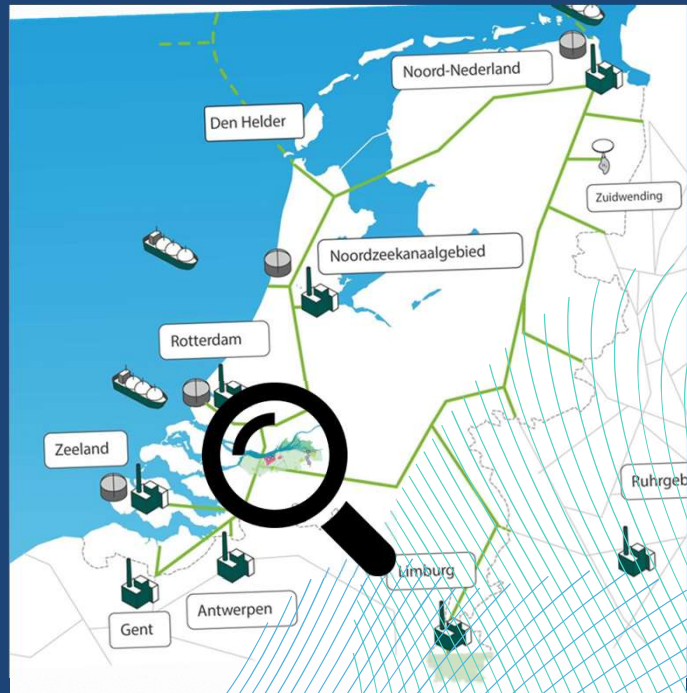


[REF] ehb.eu 2025

Analysts agree, but not all lobbyists: the role of hydrogen for climate neutrality is crucial but secondary to direct electrification

[REF] Agora Energiewende, Agora Industry (2021): 12 Insights on Hydrogen

RWE 30/04/2026 Topic of the presentation, which can also be very long



[REF] <https://www.gasunie.nl/>

[1m00]

... Easier than, for example, transporting hydrogen to deep inland locations. Not only a projection on the Netherlands, but there is also a European planned hydrogen backbone.

But I also added this quote from Agora, on of the 12 insights on hydrogen.

The high voltage infrastructure will supply wind based power to future users of power, such as batteries, industrial heat pumps, high voltage boilers and electrolyzers, being a match with the off shore wind connection.

In the Oranjewind project, we call these kind of power users the **on-shore part of the off shore wind park**.

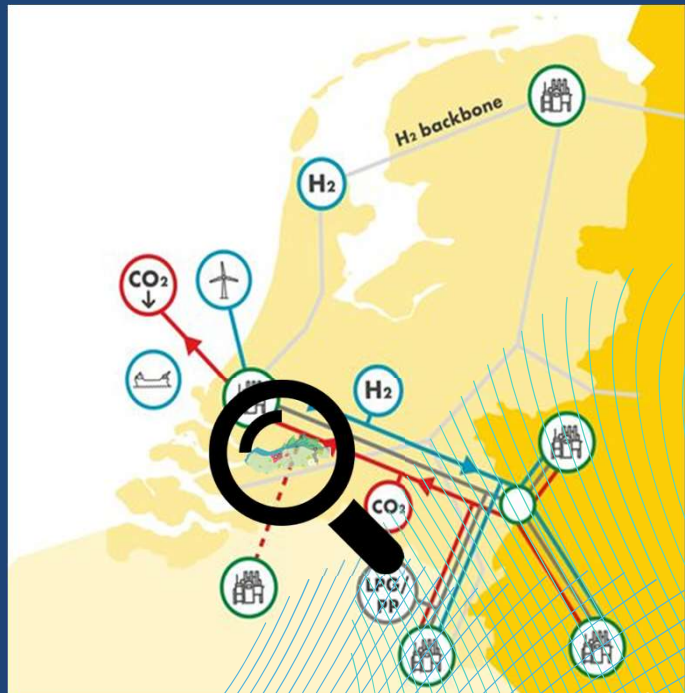
System integration. It is explained on the Oranjewind website, if you want to know more about it.

This projected hydrogen network is projected over the Powerport. A picture of Gasunie and the ministry of economic affairs. So, the government.

Future energy supply, may be it is hydrogen, ammonia, methanol, shipped to NW Europe, could be transported via pipeline infrastructure To chemelot chemical industry and the Ruhrgebiet, or the ships, via water supply

the energy to the locations << *aanwijzen* >>

Delta Rhine Corridor Hydrogen CO2 and others?



RWE 30/04/2026 Topic of the presentation, which can also be very long

<https://energeid.nl/gasunie-koopt-voor-maximaal-e25-mrd-gas-pijpleidingen-in/> Page 12

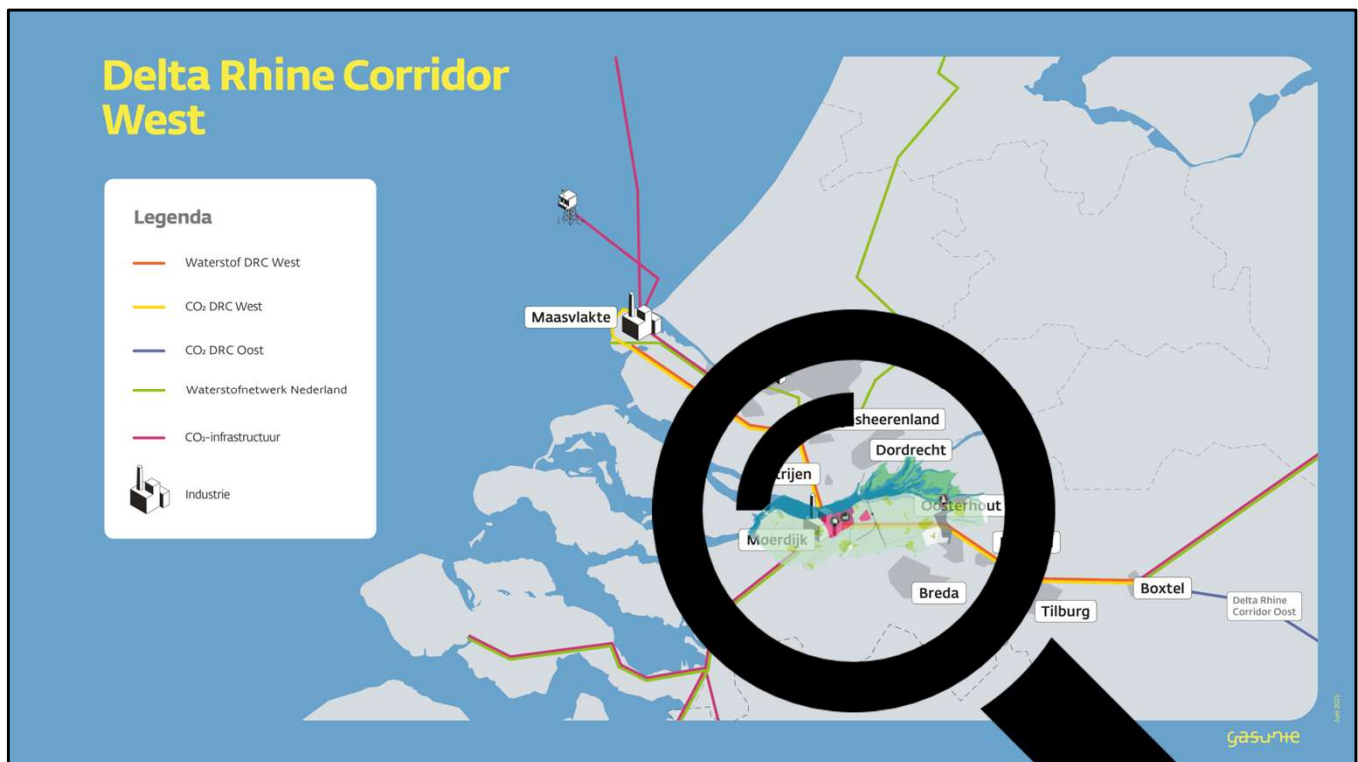
[0m25]

It is not only high voltage power infrastructure and hydrogen infrastructure that is projected over this Powerport.

In the so called Delta Rhine Corridor, also carbon-dioxide infrastructure is planned for.

And also a DC grid was projected in this Delta Rhine Corridor.

To supply the off shore wind power to deep inland locations. << click >>



[0m20]

Again, green hydrogen, methanol, ammoniak, power.

There is also CO₂ infrastructure projected in this Delta Rhine Corridor.

Will it be used in the industrial clusters, such as Chemelot and Ruhrgebiet?

Or transported from these chemical clusters to the North sea, in case of captured CO₂.

And, then, how will these future commodities be transported?

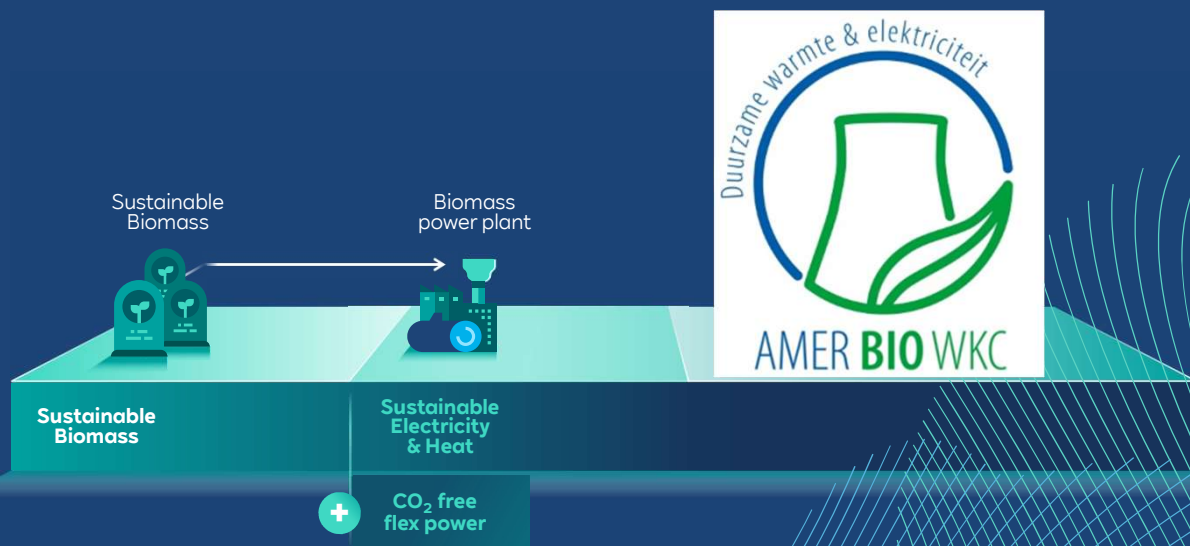
Will it be pipeline infrastructure or the water ways, I showed you.

And what is the share for transportation as high voltage power.

Deze intro kost 8 minuten. Is dat het waard?

De rest is 10 minuten. Dus ik denk: Ja.

Amercentrale Biomass CHP



RWE 30/04/2026 Topic of the presentation, which can also be very long

Page 14

[1m20]

The Amer bio CHP is close to all these projected future infrastructure and that creates opportunities.

The Amer bio CHP, today, is able to supply fossil free, dispatchable, sustainable energy.

Conversion to biomass started in the early 2000s when the Amer power plant was a baseload unit, running on hard coal.

It was a huge de-fossilisation opportunity to convert such a power plant to sustainable biomass based operation.

As you all know, bio energy and the CO2 neutrality and sustainability, it is all based on sustainable biomass.

Sustainability is certified:

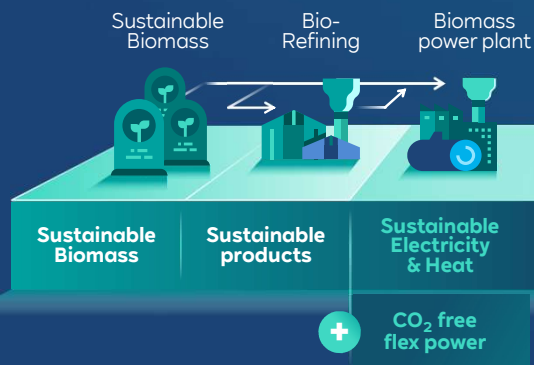
There is categories as land-use-change, water usage, social circumstances, CO2 sinks, etc that define if biomass is or could be sourced sustainable.

In order to sustain biomass based energy production, biomass in-the-long-run has to stay sustainable, available and affordable.

Today, the main biomass feedstock is wood pellets, made from forestry residues and saw dust.

Biomass availability

Process residues



Wood and wood products

- Firewood, sawdust, and wood chips

Agricultural residues

- Crop waste like corn stalks, rice husks, sugarcane bagasse, wheat straw

Animal manure

- Rich in organic material, often used in biogas production

Food waste

- A significant contributor to organic biomass sources

Energy crops

- Specifically grown for energy purposes, such as switchgrass, miscanthus, cane, and algae

[Creating value in the biobased economy 2025.pdf](#)

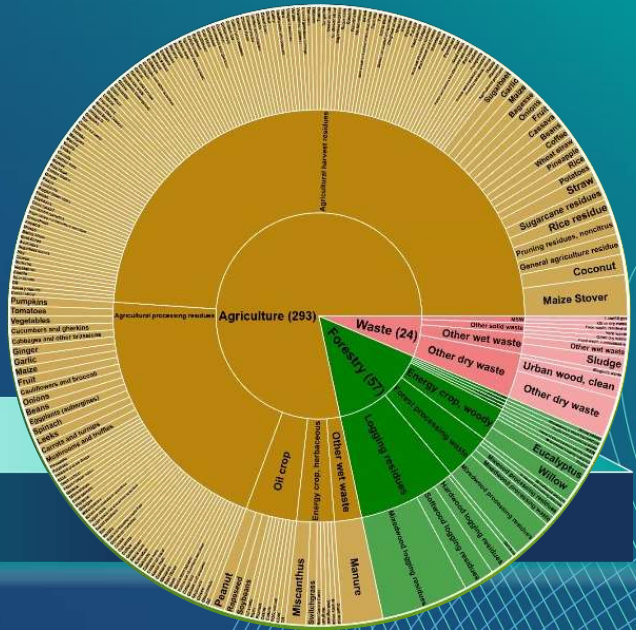
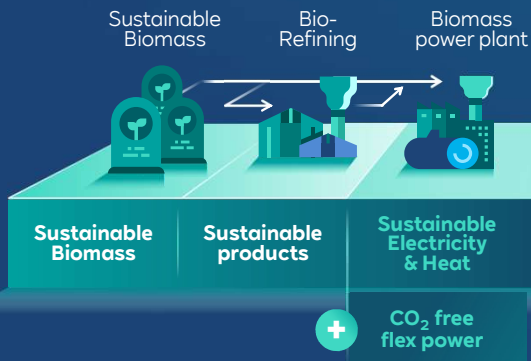
[0m20]

But these forestry residues and saw dust, in the near future, will also be feedstock for bio chemistry.

That's why we develop bio energy beyond wood. To grow the volume of applicable biomass.

We do research, we test agricultural residues and energy crops as new bio commodity options.

Biomass availability
Process residues



[REF] Oak Ridge Nations Laboratory – IEA BioEnergy – Task 43 - Progress and Challenges in Assessing Biomass Availability

[1m10]

In the IEA task groups, this presentation is made of all bio feedstocks.

And there is all kinds of reports and research on the amount of available bio feedstocks.

For example the Billion ton report ↔ biomass ↔ US Department of Energy - 2016

And more recently, India ⇔ 4,8 billion tons of biomass

For the Netherlands, these calculations also are done over and over, again.

Due to climate conditions and available or occupied land, the availability of sustainable biomass in the Netherlands is not enough to cover our feedstock usage.

But that is, if you want to replace our existing, heavy fossil based, economy with bio feedstocks.



[0m45]

However, it is not the aim to convert *all* fossil fired power plants to bio energy.

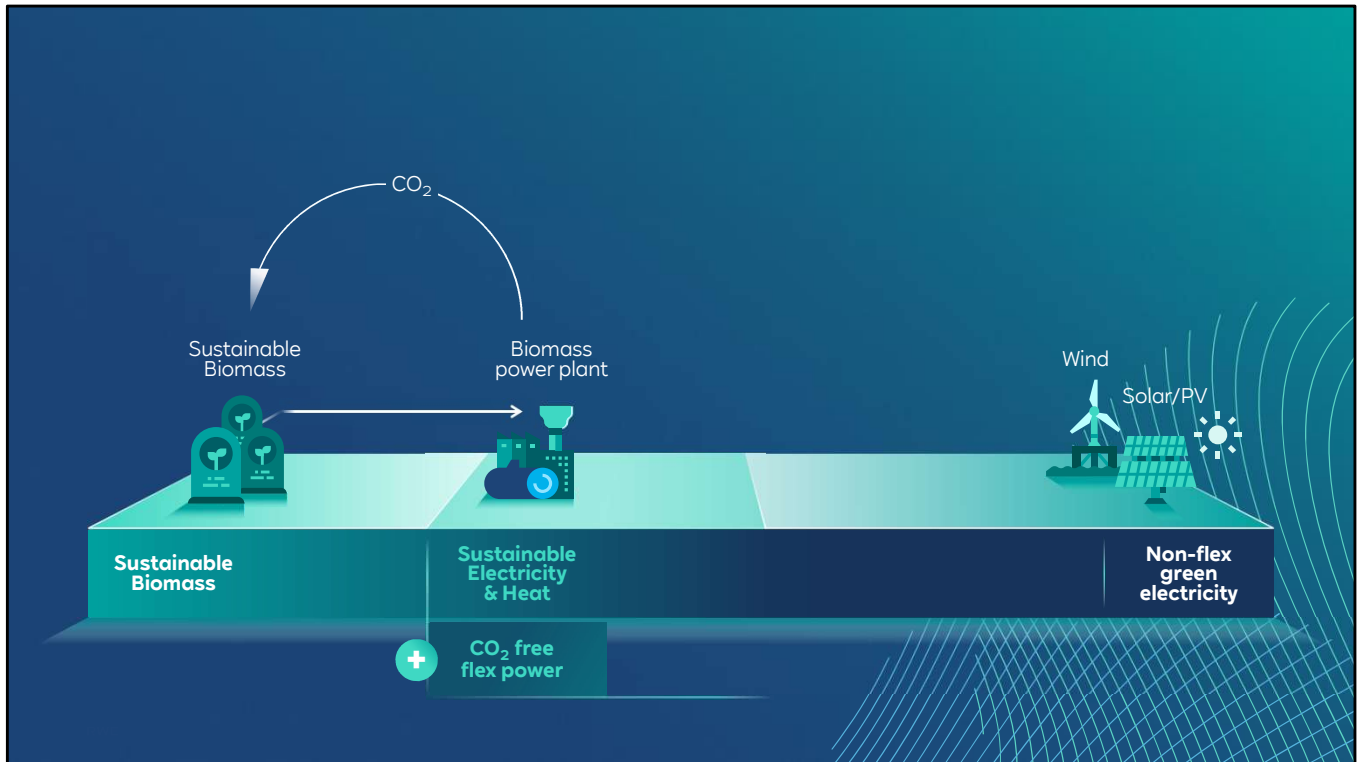
The world is expanding solar and wind capacity at an enormous pace, replacing fossil powered plants.

Expanded wind energy will provide the new base load.

RWE has been investing at large scale in renewables and will, in coming years, keep investing for billions per year in renewable energy.

According to the latest RWE stakeholder meeting, 35 billion euro in the coming 4 to 5 years!

Coupled to wind and solar power, we need bio energy as the back up. As the reliable source for fossil free, dispatchable, energy.



[1m00]

The sustainability of biomass usage is depending on photosynthesis. The closed carbon loop.

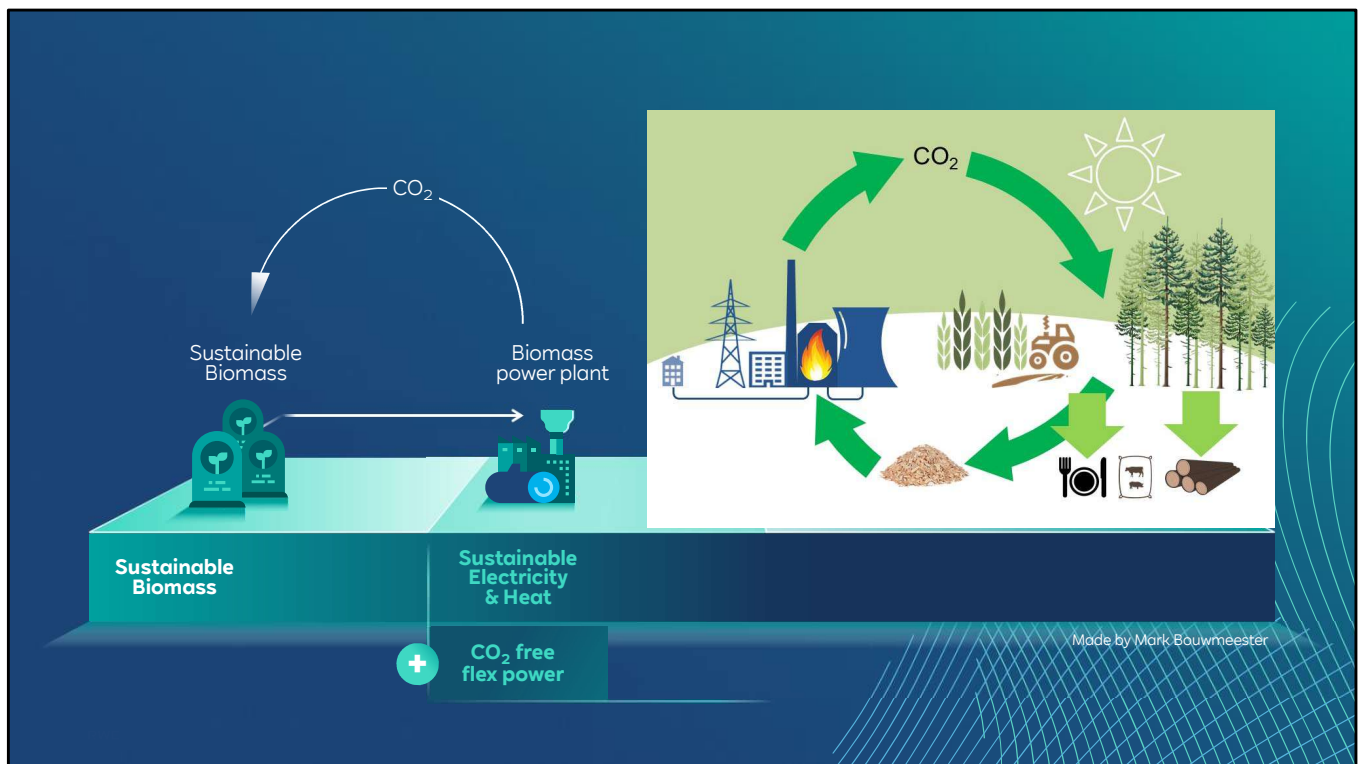
Actually, the sustainability it is depending on *the speed* of this photosynthesis. And that has to do with the *efficiency of photosynthesis*.

Typical solar-to-chemical energy efficiency is 1–2% with a theoretical maximum, often estimated around ~4–6%

Electrification will increase the demand for electricity.

But that growth will not be covered by thermal energy, by firing more feedstocks in more boilers.

That growth will be covered by increase emission free power production with back up from fossil free, dispatchable, energy.



[overslaan]

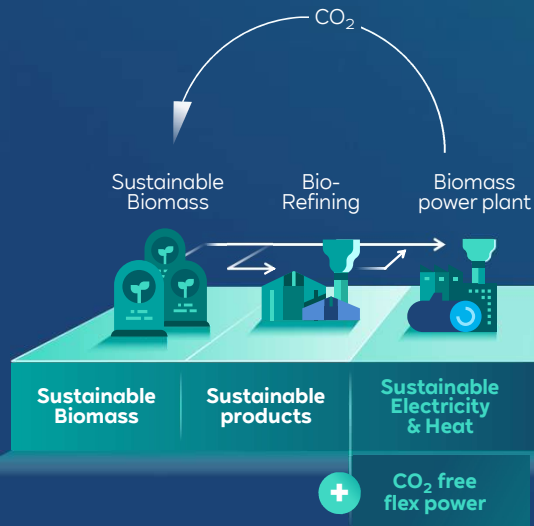
Commercial forests are grown for products. Biomass for bio energy is based on residues.

As said, we are not only looking for wood residues but residues from agricultural processes, as well.

Residues from food processing for example. Bagasse, (citrus) pulp, husks, shells, pits, etc.

We have to be careful that sustainable biomass for bio energy or biofuels do not compete with food and feed.

Biomass availability Process residues



Securing reliable
biomass supply chains

Creating value in the biobased economy 2025.pdf

[0m55]

And there is other users of biomass feedstocks. Biomass processing is supplying sustainable process residues.

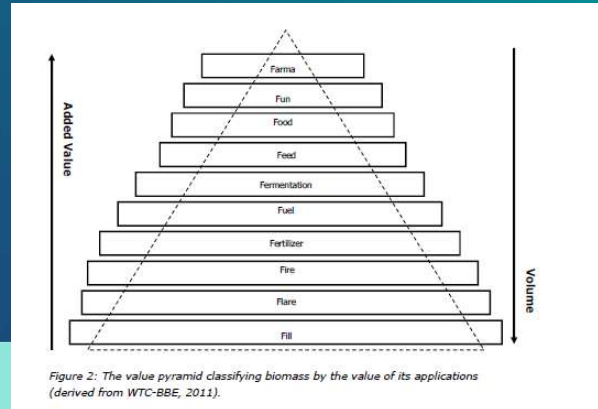
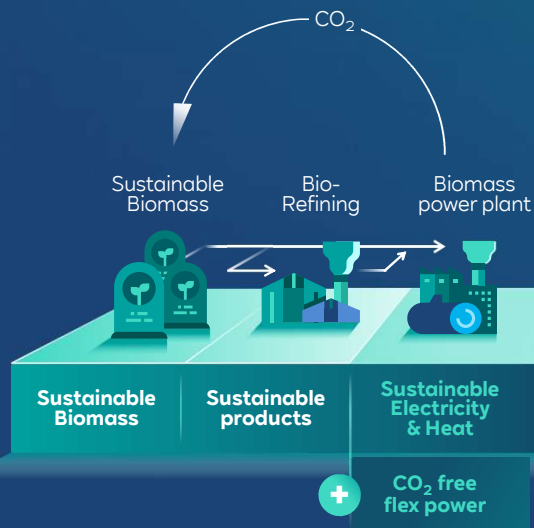
Process residues, in future, will be feedstocks for biorefineries. For bio chemistry. So, there is a need to develop reliable, sustainable, biomass supply chains. I'm a member in the International Energy Agency task group 40, supported by RWE, which is about "deployment of resilient biogenic value chains and carbon management" – that's what we need: Resilient, reliable, infrastructure.

One of the members of Task40, Ric Hoefnagels of Utrecht University delivered a presentation "the world is flat", based of the book of Thomas Friedman.

With the developments of the last half year, the world is not that flat, anymore. We've seen the importance of resilient, reliable supply chains .

..

Biomass affordability Cascading



[REF] 2011 WTC-BBE - Wageningen - value pyramid

[1m15]

Affordable feedstocks... Also something, we've learned to appreciate, these last months...

How to make that bio based economy affordable, is a question, I often get asked.

Cascading

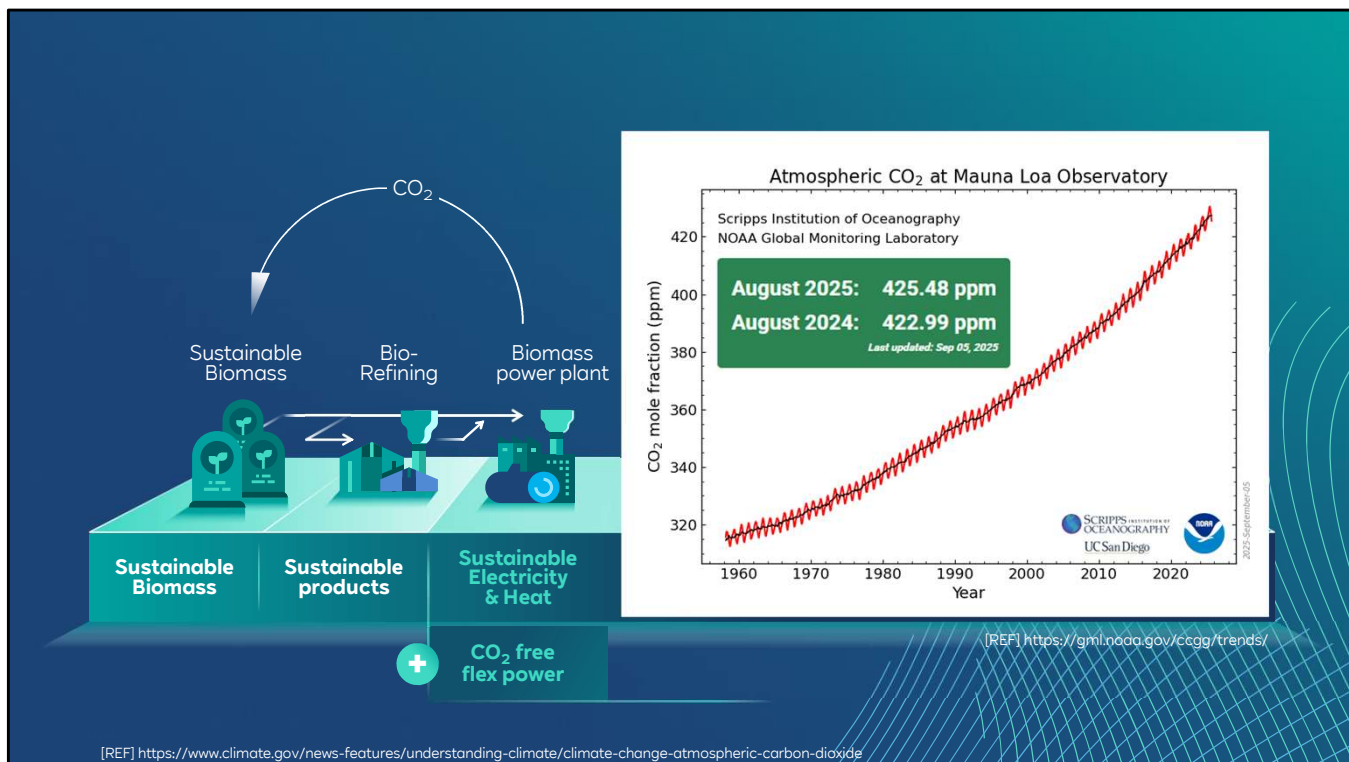
Via bio chemical processes, we can produce our health products, our food, animal feed, top-of-this pyramid products - *aankijken in piramide*

What we often call "higher value applications" and in the bottom, we want to avoid landfill with residues or flaring of biomass based gases and liquids.

Biomass feedstock for chemistry and materials is the future, we can produce everything from fossil feedstocks.

However, this transition requires huge amounts of investment money to make the transition.

If we cascade biomass, just as we are doing for fossil feedstocks, large scale feedstock and bio-energy become affordable.



[m]

Ok. So, at Amer bio CHP, RWE is producing - at large scale - bio energy.
Sustainable, CO₂ neutral, dispatchable energy.

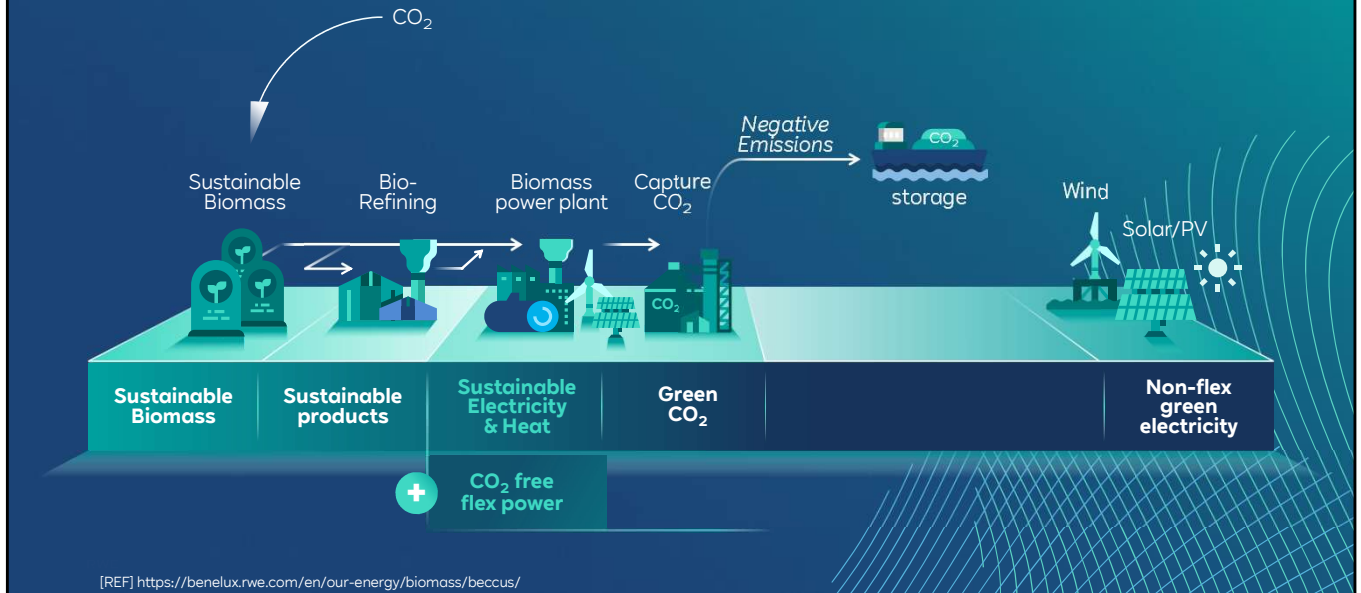
CO₂ neutral... So, this process supports reduction of the increasing fossil CO₂ emissions to the atmosphere.

However, a CO₂ neutral bio based economy is not enough

Actual global average atmospheric CO₂ concentration is approximately 422 ppm.
In 2024, the increase in atmospheric CO₂ was the largest one-year increase on record...

It is **crucial to reduce atmospheric carbon . . .**

Reducing atmospheric CO₂



[0:35]

Atmospheric CO₂ concentration needs to be decreased to below 400 ppm in order to reach for a below-2oC-future.

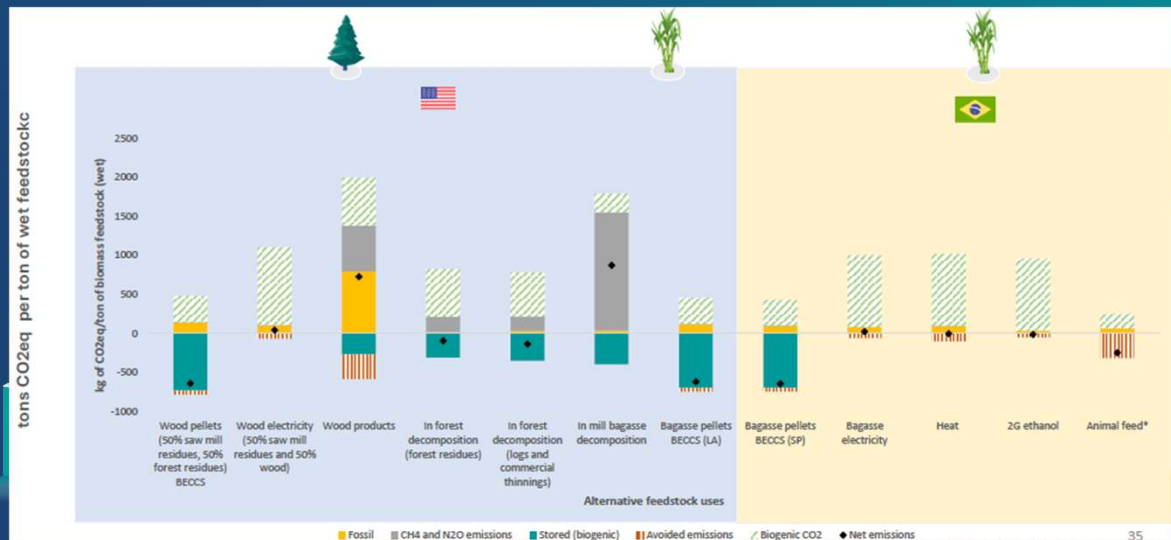
So, we need to remove CO₂ from the atmosphere. Permanent

One of the options is direct air capture. But it is more effective to capture carbon from CO₂ richer fluegases. BECCUS, we call it.

Bio energy with carbon capture for utilisation and permanent storage.

As biomass usage is CO₂ neutral, capturing biogenic CO₂ and storing this permanently results in CO₂ removal from the atmosphere.

Reducing atmospheric CO2

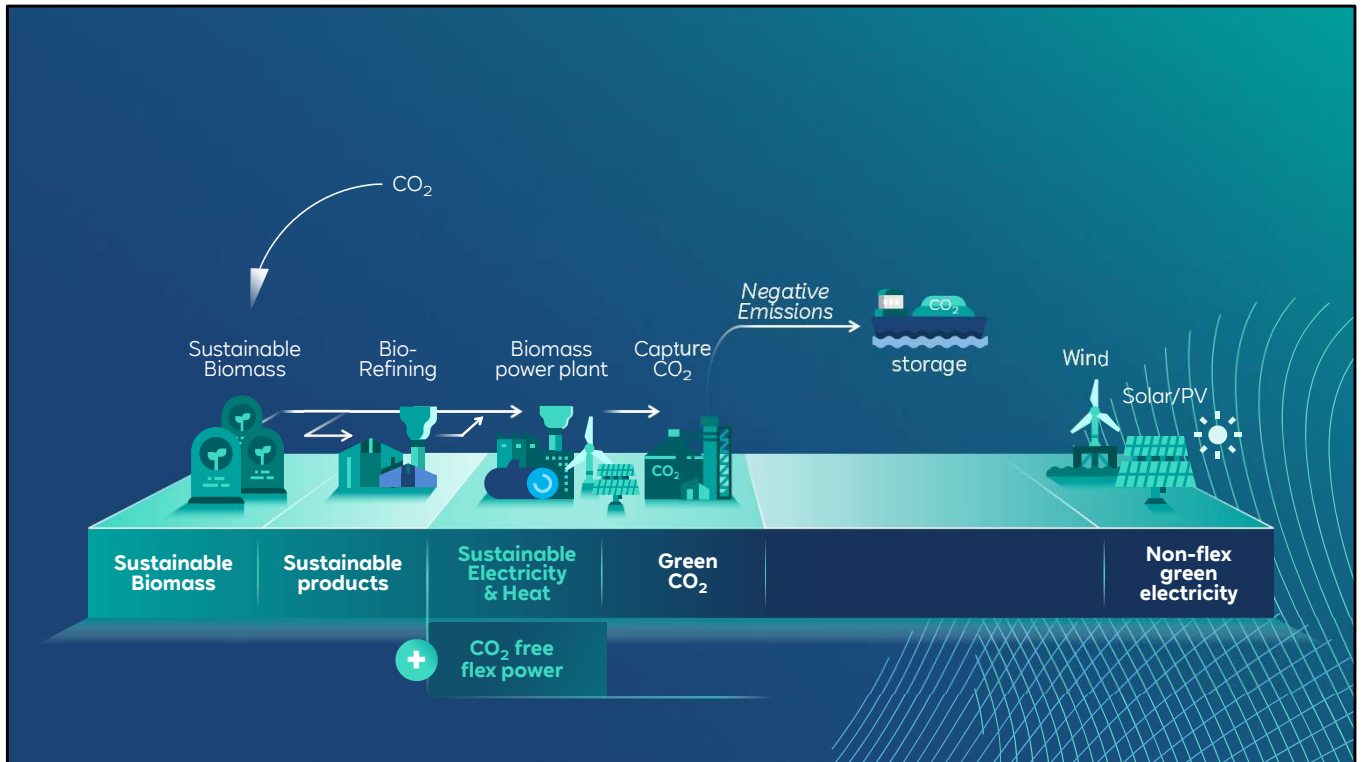


[REF] <https://onlinelibrary.wiley.com/doi/10.1111/gcbb.70089>

[0m25]

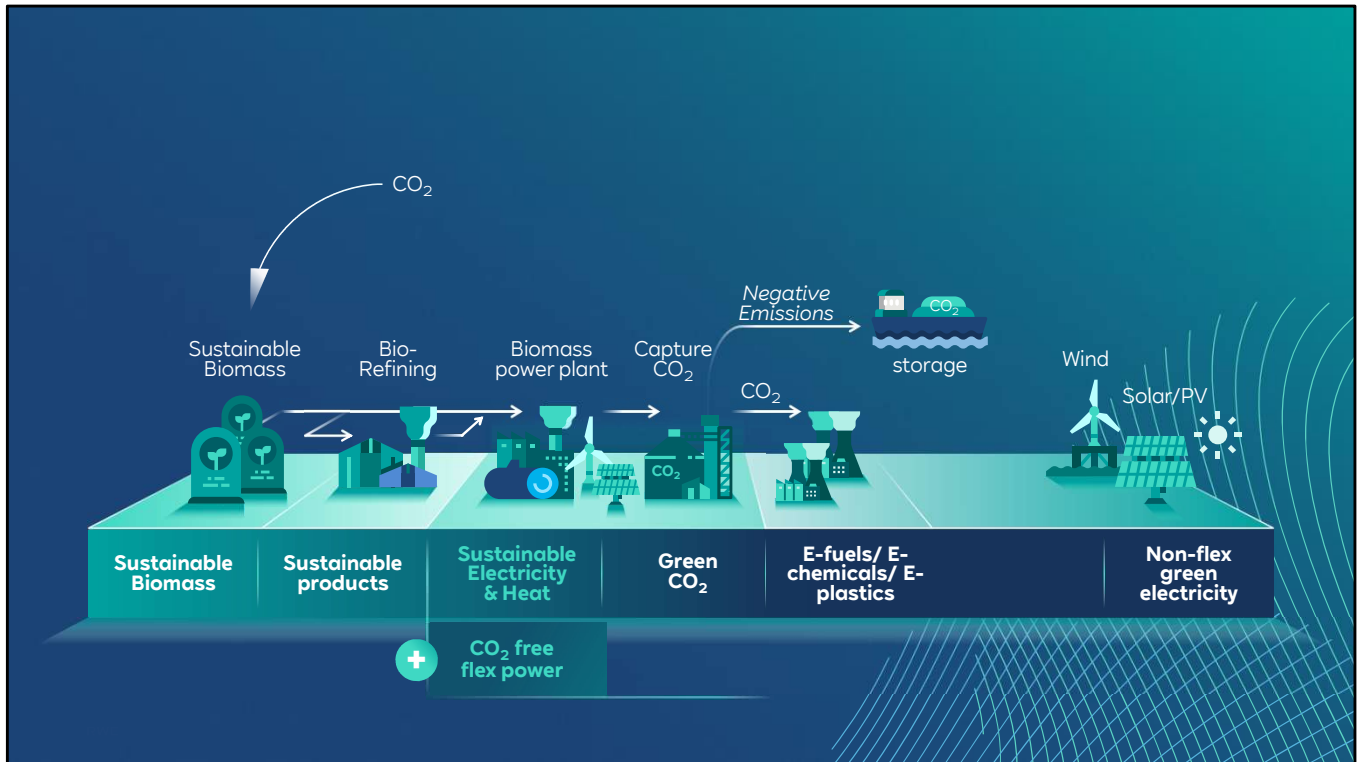
Together with Utrecht University and Solidaridad, we have executed studies and calculations to actually show that, **indeed, per ton of wet feedstock, used for bio energy production, negative CO2 emissions are possible.**

We've calculated for two countries and compared two feedstocks. Both, wood pellets and agricultural biomass pellets for BECCUS, have impact. In this case sugarcane bagasse.



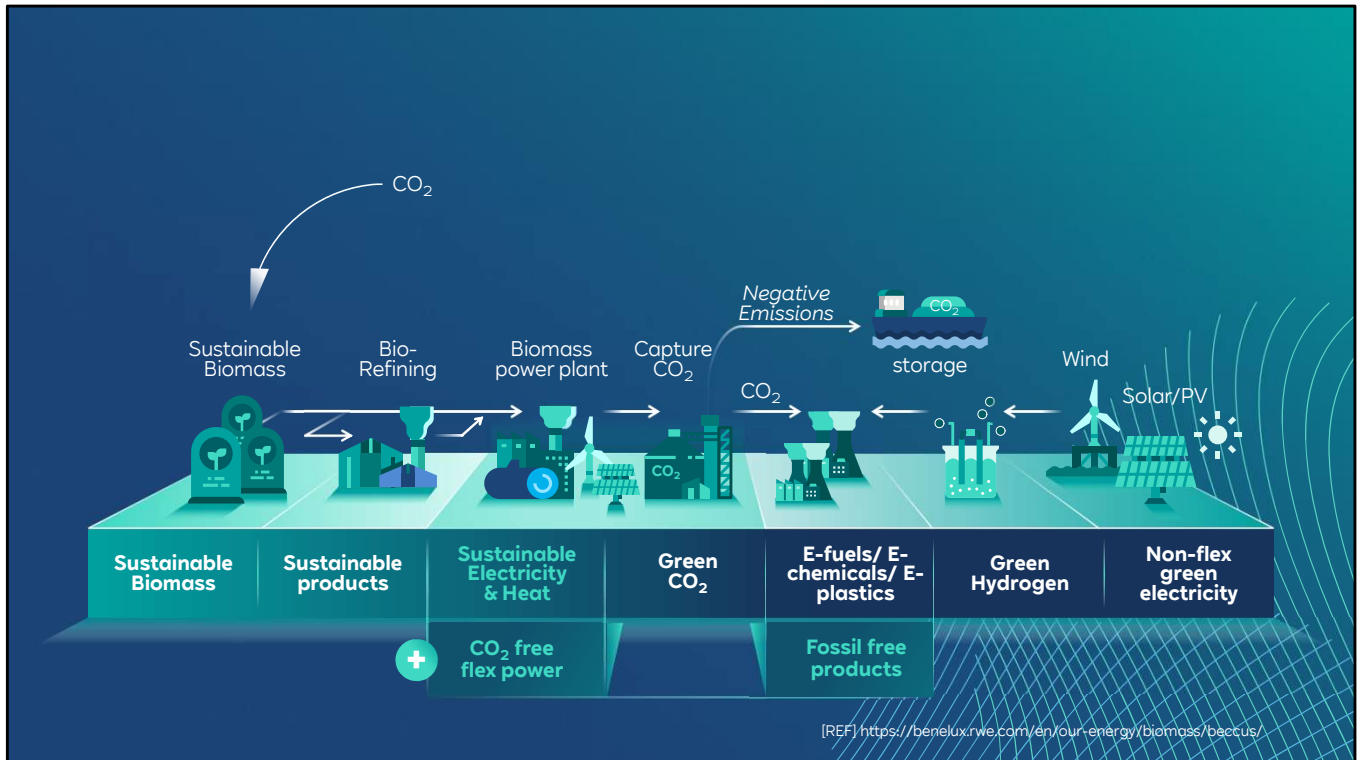
[0m05]

So, permanent storage of captured CO₂ and . . <<click>>



[0m15]

. . . CO₂ usage, not only in the natural, biogenic cycle – *aanwijzen aan de linker zijde* but in a technical cycle as well – *aanwijzen aan de rechter zijde << click >>*



[0m45]

So, via the port of Moerdijk and the port of Amer bio CHP, sustainable bio feedstocks are and in future will be supplied – *links aanwijzen*

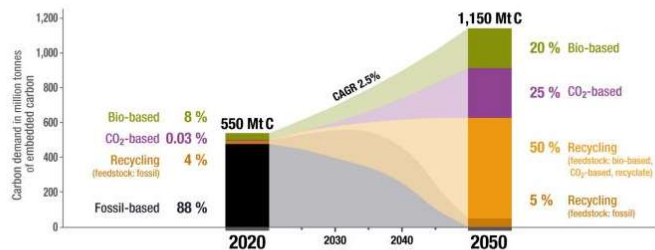
At the Amer bio CHP, these bio feedstocks are used to produce dispatchable bio energy – *power plant aanwijzen*

With bio chemical processes, we can produce bio products for the circular, bio economy and – *bio-refining aanwijzen*

With captured carbon and renewable energy from off shore wind – *rechterzijde aanwijzen*

we can increase the efficiency and affordability of converting CO2 and solar energy into chemicals, bio synthetic products as well as dispatchable bio energy production.

Carbon Embedded in Chemicals and Derived Materials updated nova scenario for a global net-zero chemical industry in 2050



available at www.renewable-carbon.eu/graphics

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Conversion volume Rotterdam HIC

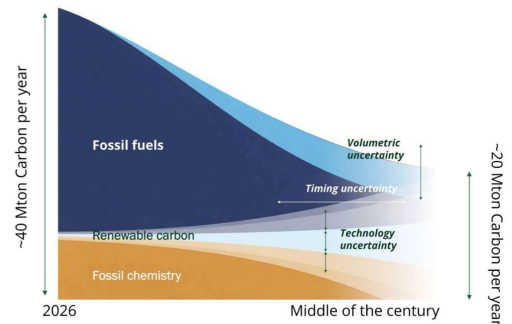


Figure 1: The future of carbon demand and conversion in The Netherlands².

15-20 Mton/yr of Carbon is still required by 2050.

[260414-Whitepaper-Syngas-Rotterdam.pdf](#)

[0m15]

The NOVA-institute, with this figure, shows that, in 2050, the world is still using the carbon molecule. Worldwide, a growth of the use of carbon is projected.

However, the origin of the carbon cannot be a fossil feedstock, mined from underground, anymore.

Right side, taken from the whitepaper “Go big or go home”, shows the Rotterdam - Harbour Industrial cluster.

Even though, world wide carbon demand growth is expected, the Rotterdam Industrial cluster faces some challenges, now fossil oil refinery with cheap Groningen gas is phased out.



[0m40]

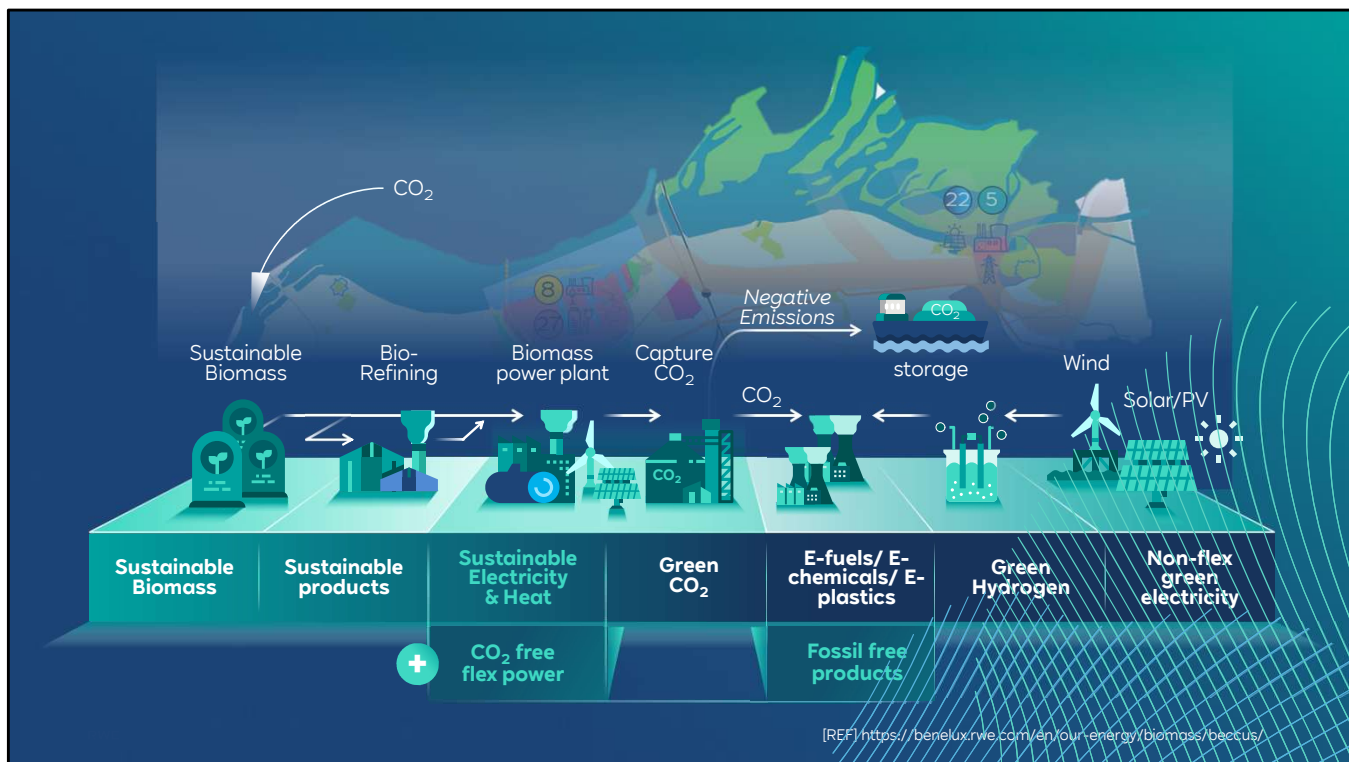
Concluding...

Projected future infrastructure will come together at energy locations.

And based on that infrastructure, these energy locations will convert into energy hubs.

Conversion from one commodity into the other, power to hydrogen, biomass to hydrogen power to fuels, etc.

Capturing carbon from biomass processes, using carbon, in combination with hydrogen, with green energy.....



[0m10]

The Amercentrale will be part of that development and bio energy plays a crucial role in balancing these future value chains.

8 minutes infrastructure + 10 minutes Amer in the transition.

RWE

Thank you for your attention

Mark Bouwmeester

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<http://www.rwegeneration.com>



RWE

Back up slides