

PATHWAYS TO A DECARBONISED PORT

Clingendael CIEP Energy Lecture – April 13 2017
Allard Castelein – CEO Port of Rotterdam

THE WORLD AGREES

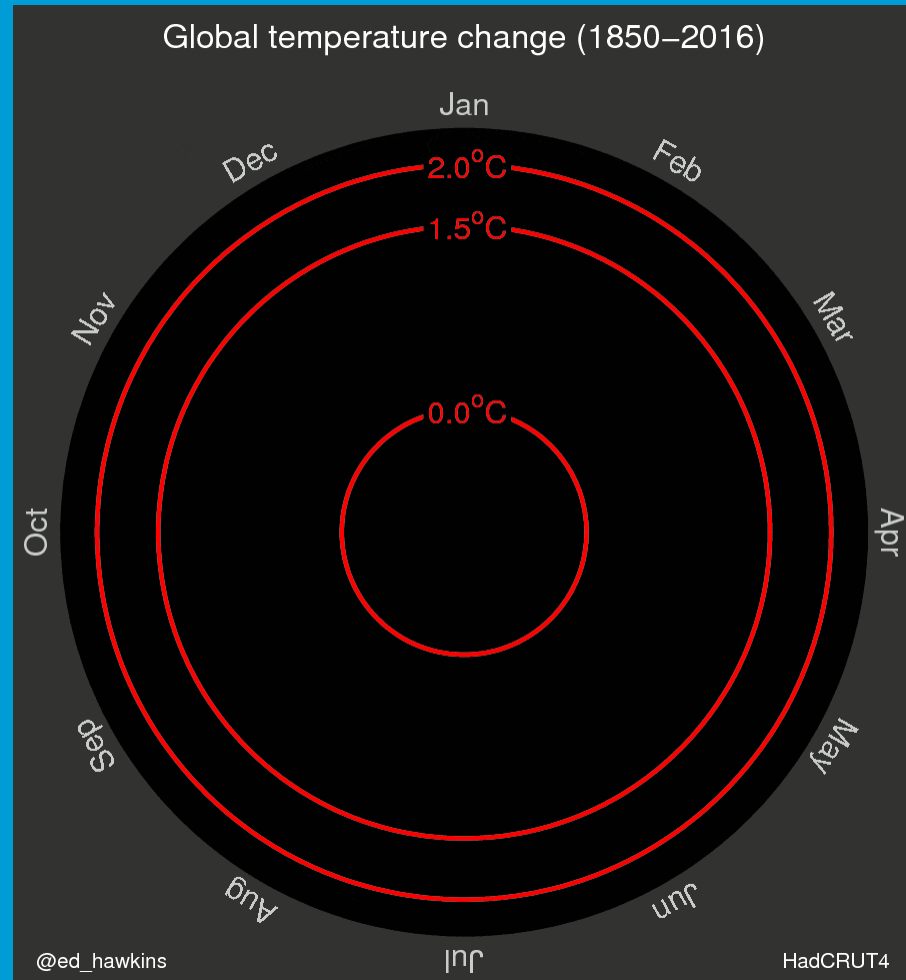
... reach global peaking of greenhouse gas emissions as soon as possible ... rapid reductions as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century ...

2°C

above pre-industrial levels
and pursue efforts to limit
temperature increase to 1.5°C



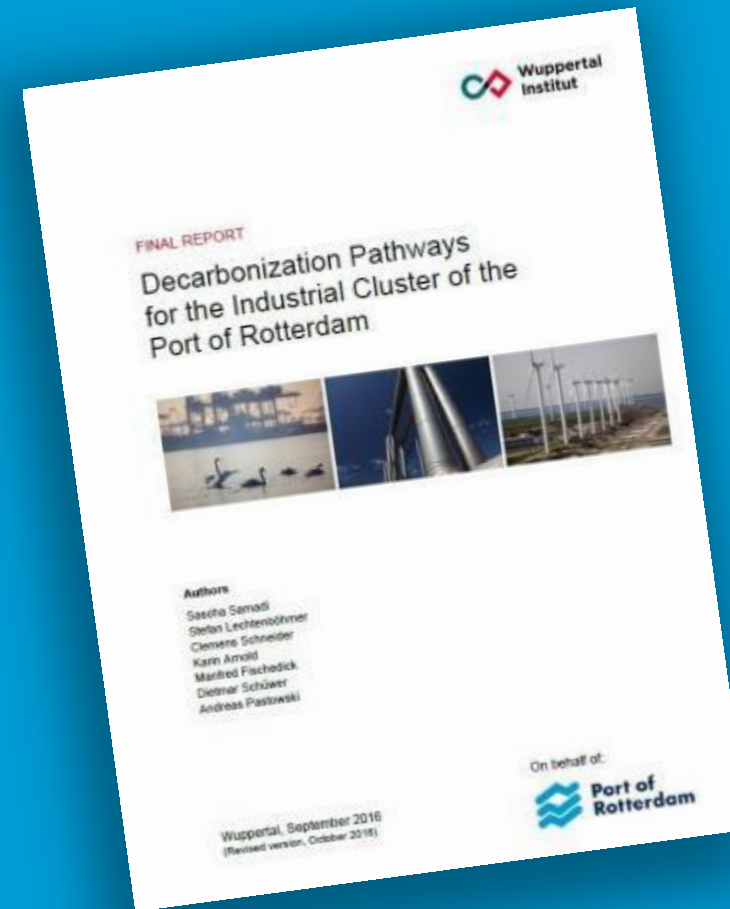
WE'RE RUNNING OUT OF TIME





13 april 2017

NOW WHAT?



THE PORT IS CARBON INTENSIVE

Crude oil

Oil Products

Coal

LNG

Waste

Biomass



> **30**
refinery
processes



> **40**
petrochemical
processes



> **70**
electricity
generation
units

Fuel & Feedstock

Products

Natural Gas

Electricity

20%

of the Netherlands'
total CO₂ emissions

PATHWAYS TO A DECARBONISED PORT

CLOSED
CARBON
CYCLE

BIOMASS
AND CCS

TECHNOLOGICAL
PROGRESS

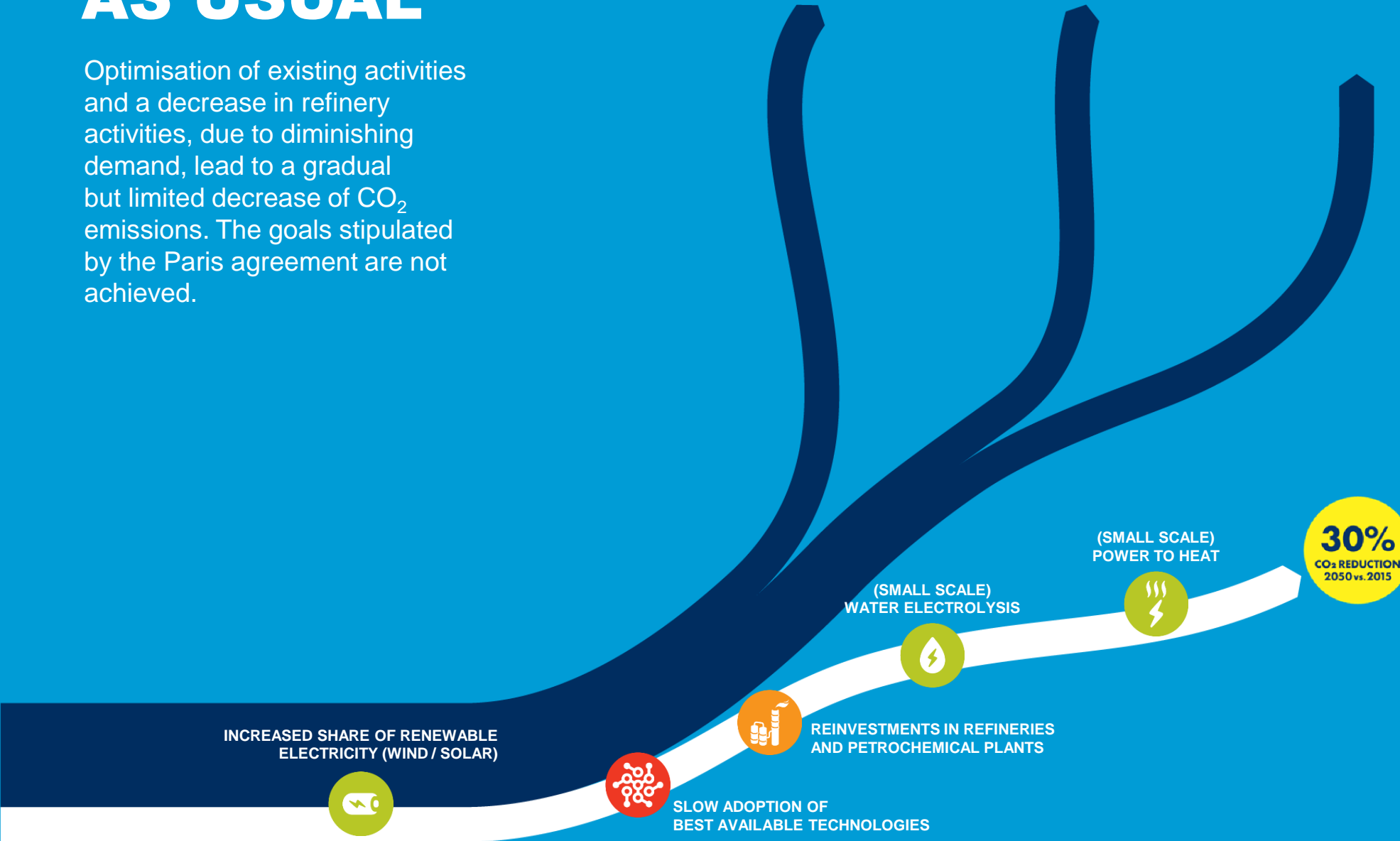
BUSINESS
AS USUAL

PARIS
AGREEMENT



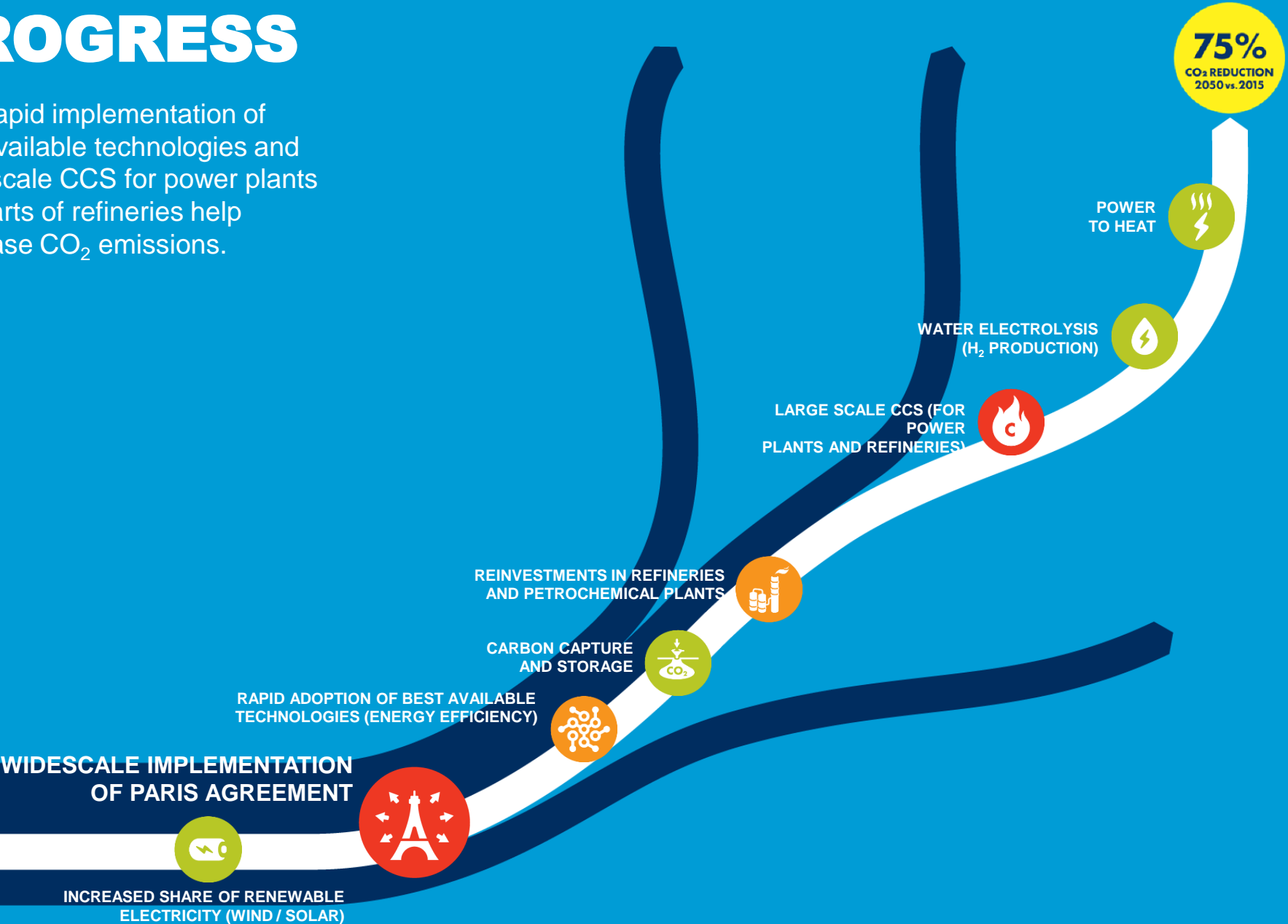
BUSINESS AS USUAL

Optimisation of existing activities and a decrease in refinery activities, due to diminishing demand, lead to a gradual but limited decrease of CO₂ emissions. The goals stipulated by the Paris agreement are not achieved.



TECHNOLOGICAL PROGRESS

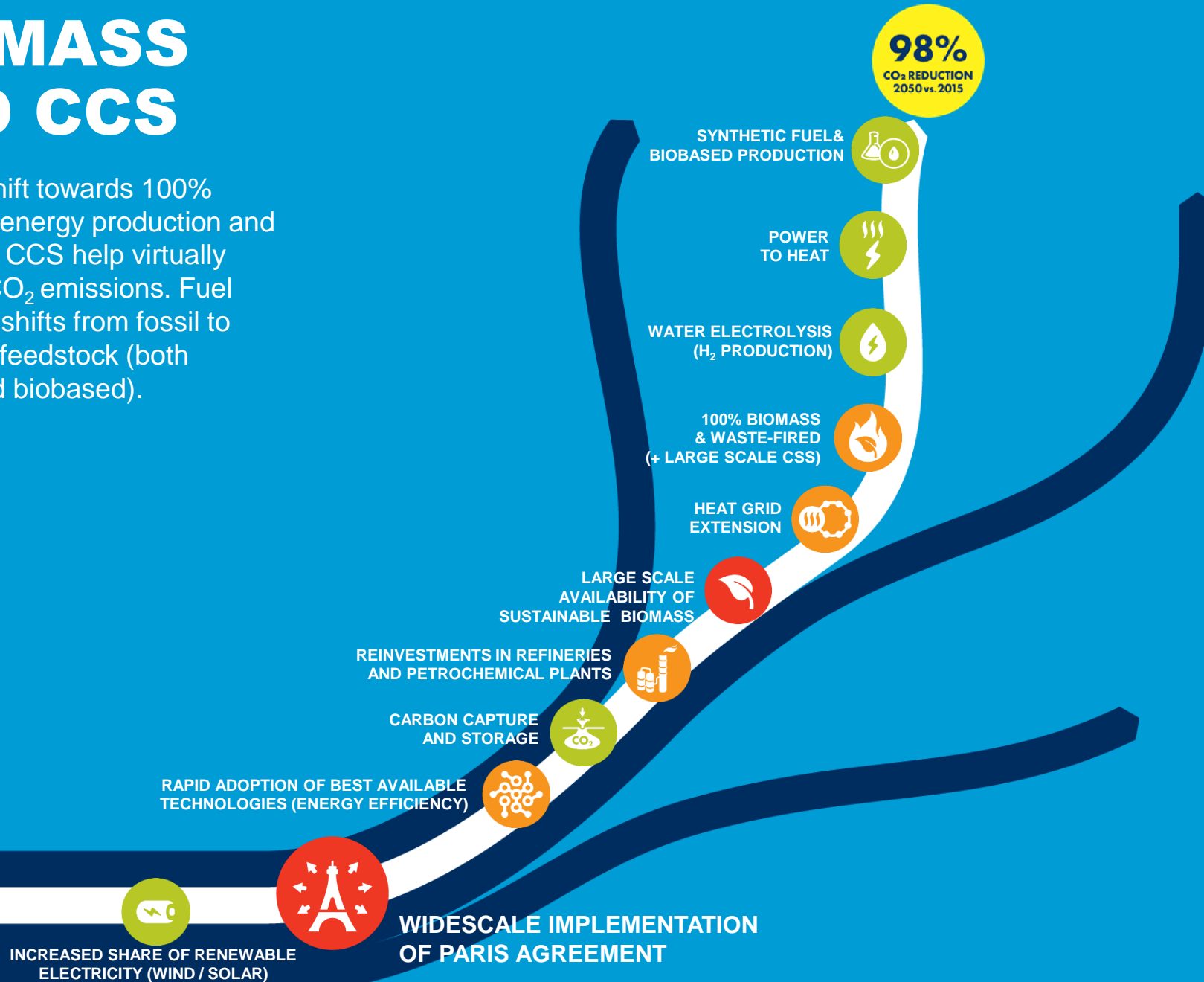
Both rapid implementation of best available technologies and large scale CCS for power plants and parts of refineries help decrease CO₂ emissions.



“Decarbonization pathways for the industrial cluster of the Port of Rotterdam”
Wuppertal Institute
Simplified for clarity reasons.

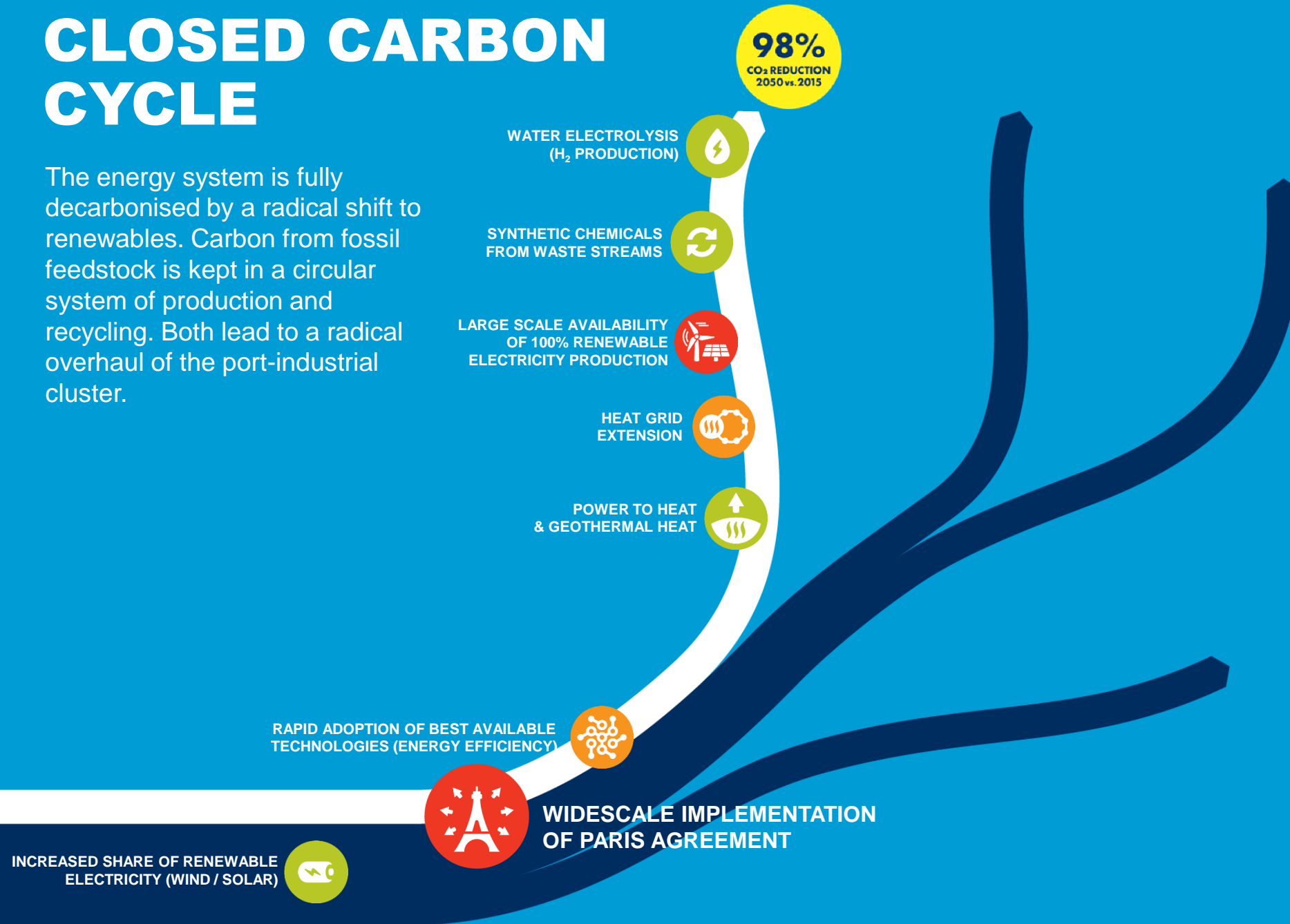
BIOMASS AND CCS

A drastic shift towards 100% renewable energy production and large scale CCS help virtually eliminate CO₂ emissions. Fuel production shifts from fossil to renewable feedstock (both electric and biobased).



CLOSED CARBON CYCLE

The energy system is fully decarbonised by a radical shift to renewables. Carbon from fossil feedstock is kept in a circular system of production and recycling. Both lead to a radical overhaul of the port-industrial cluster.







HOW?

ENERGY TRANSITION PROGRAM

- ALTERNATIVE FUELS
- BIOBASED
- ENERGY INFRA
- CIRCULAR
- COMMUNICATION
- STRATEGY & FINANCE



MAKE IT HAPPEN

'COALITIONS OF THE WILLING'

120
companies

REPRESENTING
140,000+ EMPLOYEES
49,925 PATENTS

AND OVER

€200bn
IN COMBINED REVENUES

“Engie combines pumps, cars and batteries to form a virtual power station.”

“Paper sludge gains value thanks to Alucha and University of Twente’s mobile pyrolysis plant.”

“Schultz signs emissions Green Deal with inland shipping sector.”

“Cryoc marine fuel sytem for hopper dredger.”

“BNG Bank makes EUR 100 million available for energy

“Hydrogen for Air Products’ Newest Fueling Station Comes From a Sustainable Source--Municipal

“Eneco uses hundreds of Tesla batteries to build back-up network as Rotterdam ethanol plant”

“Research into use of ‘green hydrogen’ in refining process.”

“Corbion and Total preparing industrial sector for bioplastics.”

“ExxonMobil starts constructing energy-efficient Hydrocracker at Rotterdam refinery.”

“Belgian Alco Bio Fuel

“Damen Shipyards introduces sustainable water bus.”

“Belgian Alco Bio Fuel

as Rotterdam ethanol plant”

Strategy: renew the existing, support the new

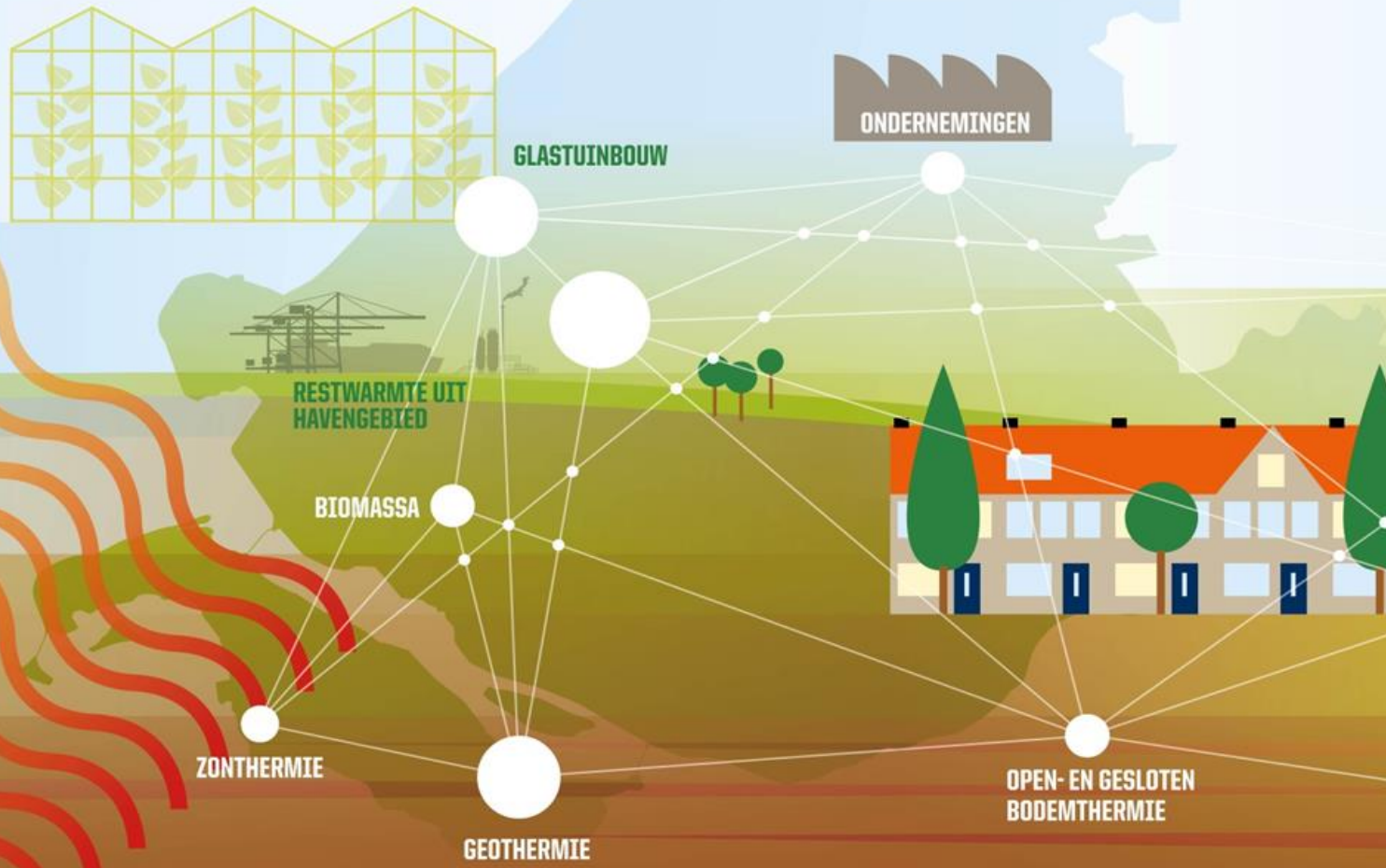


Production of wind turbines

PORTXL
world port accelerator

Warmtealliantie Zuid-Holland

Vijf partners werken aan een warmtenet voor een betaalbare, betrouwbare en CO₂-arme warmtevoorziening



Restwarmte uit Shell Pernis voor regio Rotterdam

Energielevering uit Shell Pernis is: **20** Megawatt

= **0,6** Peta Joule

≈ **16.000** Huishoudens verwarmen

Partners in dit project zijn Shell Pernis, Havenbedrijf Rotterdam en Warmtebedrijf Rotterdam

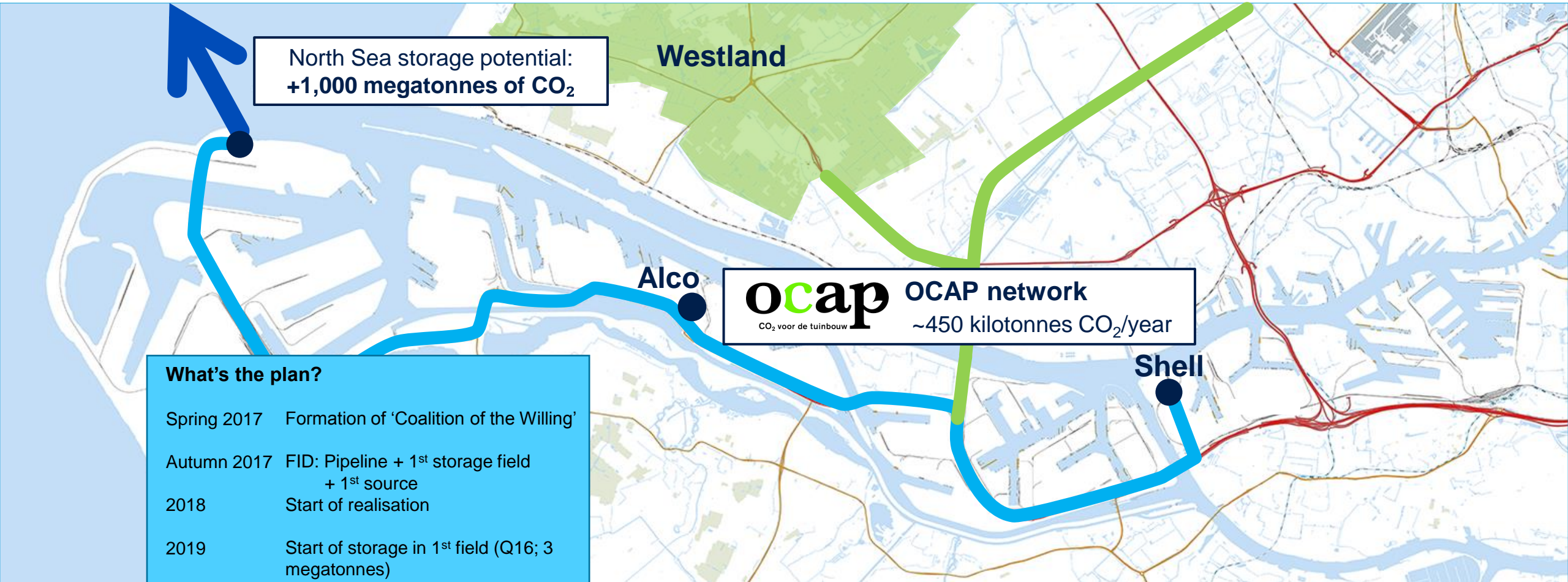
- VNPI will be making a realistic assessment of the actual potential in terms of residual heat that can be tapped into at the Rotterdam refineries
- The study will be rounded off by 15 June, and its results will be announced on 27 June

NETHERLANDS
PETROLEUM
INDUSTRY
ASSOCIATION

VERENIGING
NEDERLANDSE
PETROLEUM
INDUSTRIE

CCS Ambition of the port of Rotterdam

Storage in the North Sea gas fields | Pernis-Maasvlakte Pipeline | Capture on location at companies



What's the plan?

Spring 2017	Formation of 'Coalition of the Willing'
Autumn 2017	FID: Pipeline + 1 st storage field + 1 st source
2018	Start of realisation
2019	Start of storage in 1 st field (Q16; 3 megatonnes)
2020	Start of storage in 2 nd field (P18; 40 megatonnes)
> 2020	Roll out in other North Sea fields & Re-use of CO ₂ (CCUS)



BioPort Holland

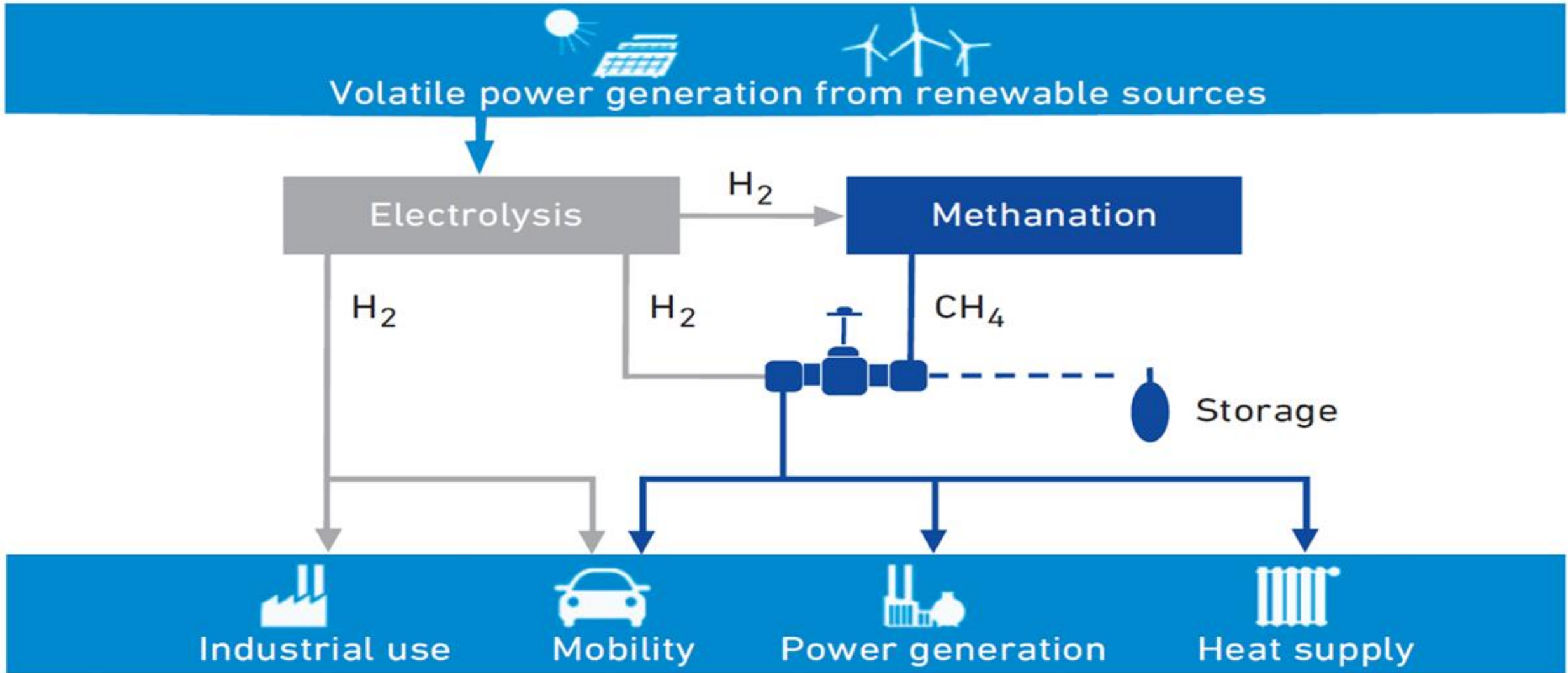
Biofuels

Letter of Interest

Survey of prospects for production of bio-LNG in the Port of Rotterdam:



Power-to-hydrogen



Waste-to-chemicals





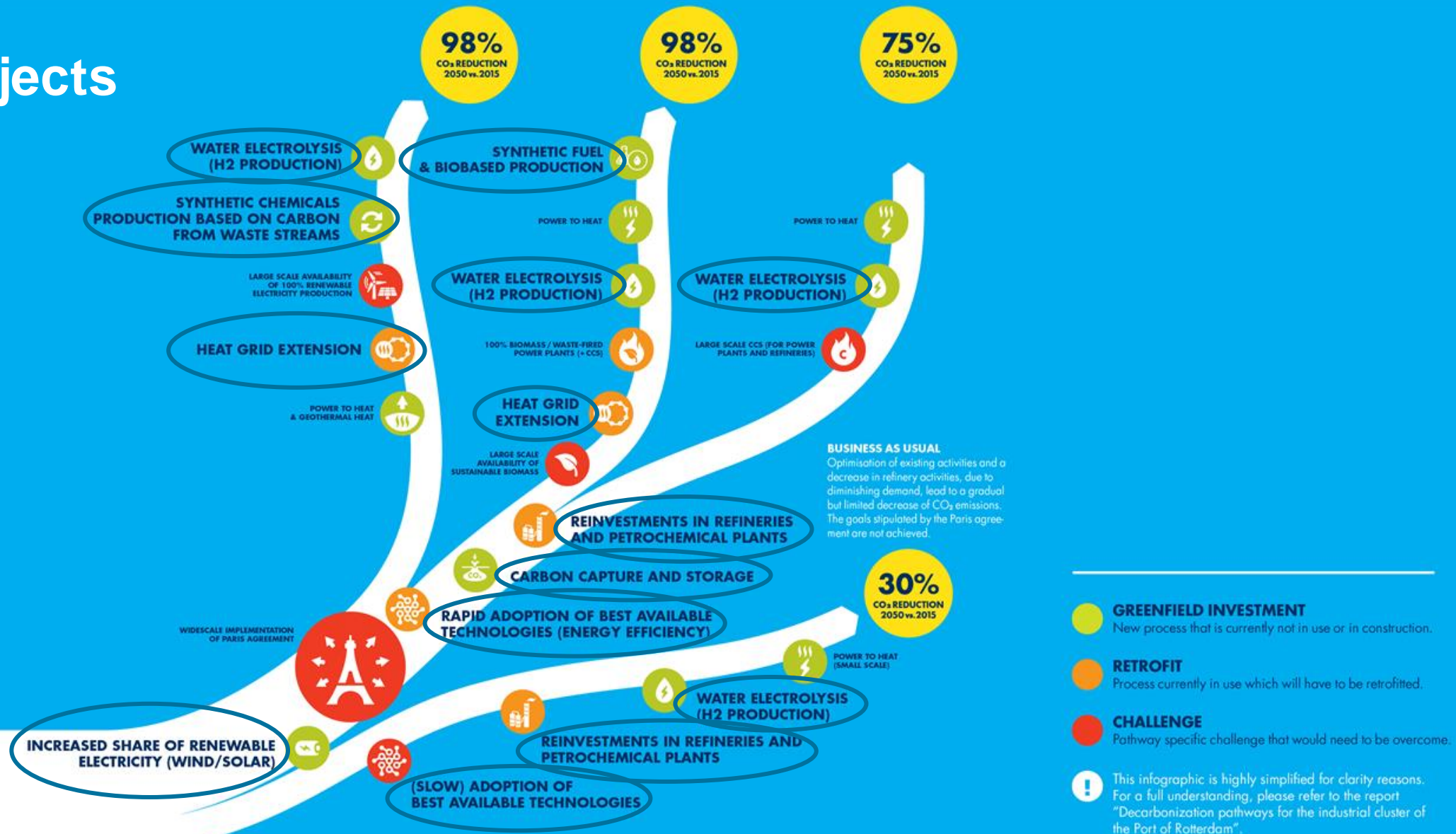
Ramlab: 3D printing



Sif



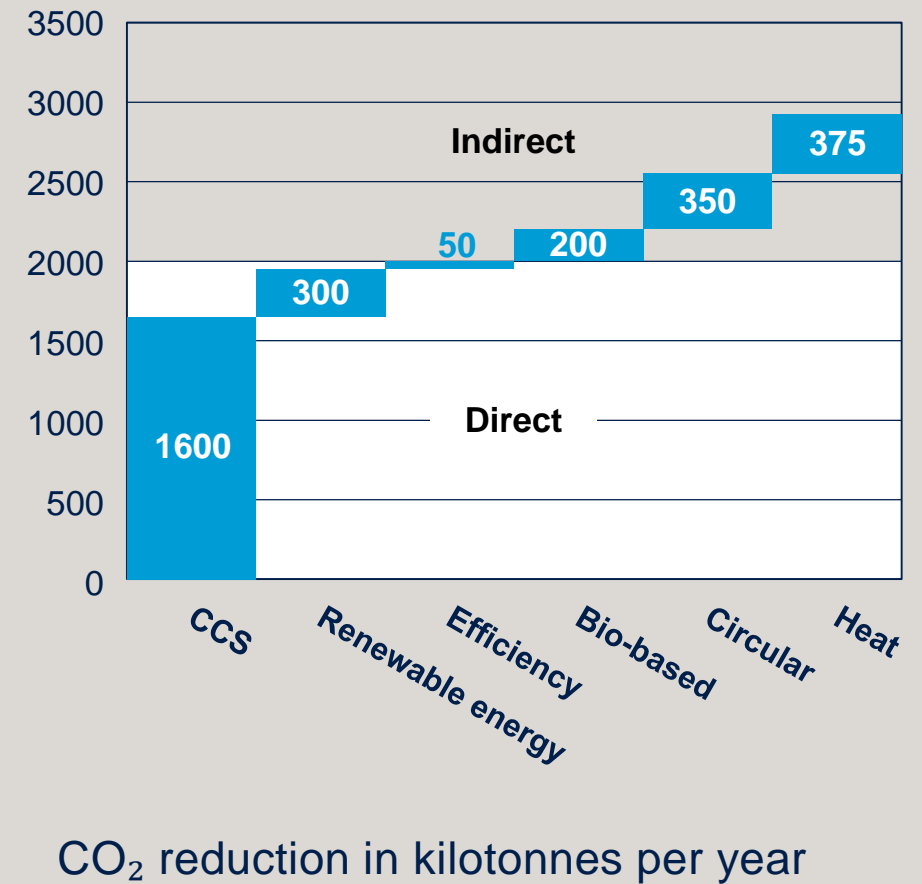
Current projects



CO₂-reduction of projects in development

Projects (in development):

- CCS: ROAD (coal-fired power plants), industry
 - Renewable energy: solar panels and wind turbines
 - Efficiency: AkzoNobel chlorine factory
 - Biobased: Bioport Holland
 - Circular: Waste-to-Chemicals, Ionika
 - Residual Heat
- **In total: 2 megatonnes direct, 1 megatonnes indirect**



The Port of Rotterdam has the ambition to be frontrunner

- Rotterdam has the ambition to be Europe's energy transition fieldlab, frontrunner and flagship region
- 'Renewing the existing' and 'Supporting the new' together will help us to realise the Paris Agreement goals





QUESTIONS?

PORT OF ROTTERDAM

URGENCY TECHNOLOGY

CLOSED-CARBON CYCLE ECONOMY

RIGHT HERE

ECONOMIC RENEWAL

INVESTING IN THE FUTURE

OFFSHORE WIND ENERGY

FUTURE

BIOBASED ECONOMY

CLOSED-CARBON CYCLE

MAKE IT HAPPEN

NOV 2050

BIOFUEL

