



# Rotterdam Opslag en Afvang Demonstratieproject (ROAD)

*IGRC-2011 Seoul*

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## Co-operating Partners ROAD

- **Maasvlakte CCS Project C.V.** is a joint venture of:
  - Electrabel Nederland (GDF SUEZ Group)
  - E.ON Benelux
- In **co-operation** with partners:
  - TAQA Energy
  - GDF SUEZ E&P
- With **financial support** of:
  - European Commission (EU)
  - Government of the Netherlands
  - Global CCS Institute



TAQA



Co-financed by the European Union

European Energy Programme for Recovery



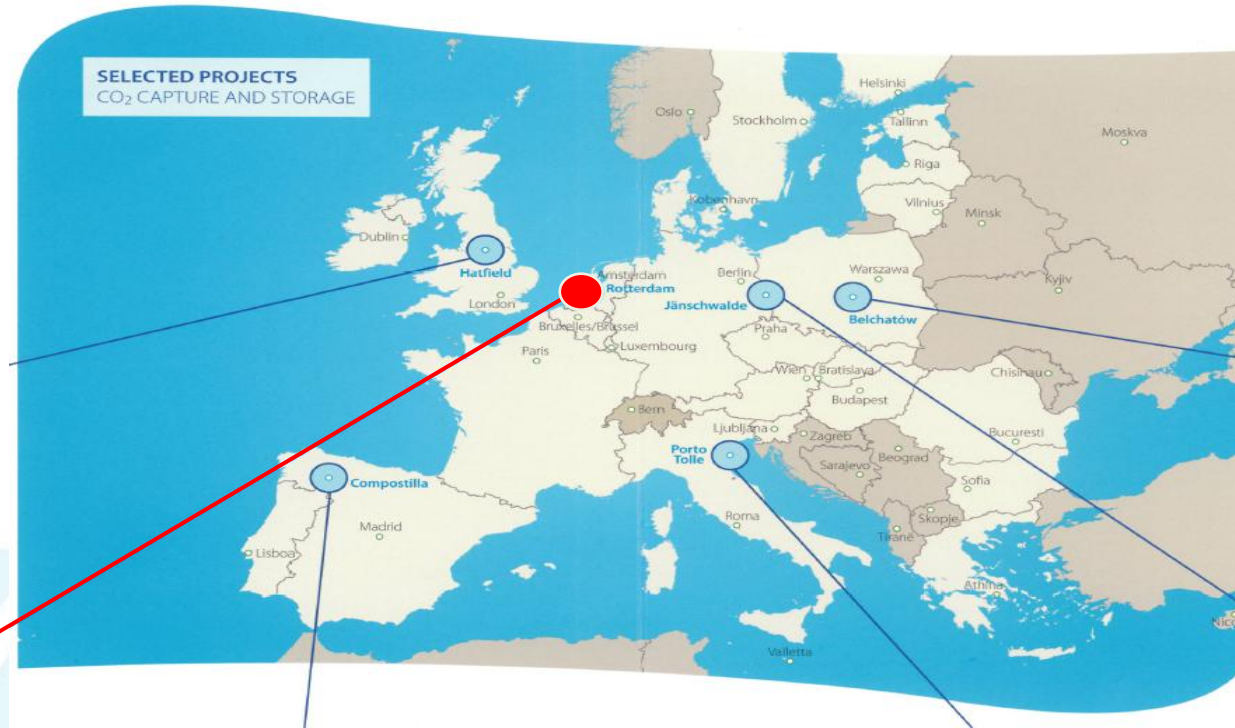
Government of the Netherlands



GLOBAL  
CCS  
INSTITUTE

# European Energy Programme For Recovery (EPR)

ROAD selected by European Commission as one of six EPR projects



**Don Valley (UK)**  
Pre combustion  
Offshore  
Gas reservoir

**road (Rotterdam)**  
CCS  
Post combustion  
Offshore  
Gas reservoir

**Compostilla (Spain)**  
Oxfuel + CFB  
Onshore  
Saline aquifers

**Porto Tolle (Italy)**  
Post-combustion  
Offshore  
Saline aquifers

**Bełchatów (Poland)**  
Post combustion  
Onshore  
Saline aquifers

**Jämschwalde (Germany)**  
Oxy fuel / post combustion  
Onshore

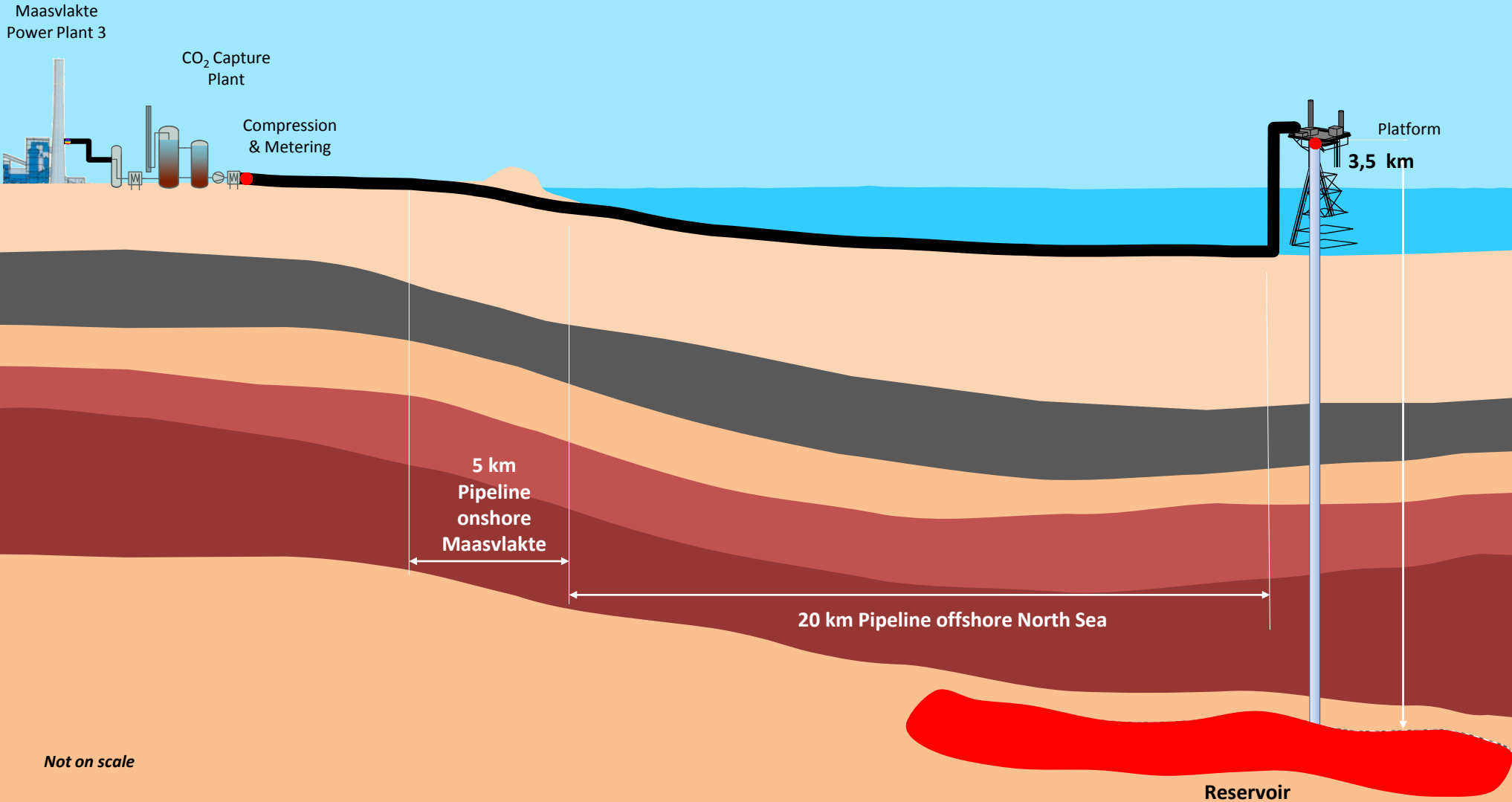
## Objectives ROAD

- Demonstrate feasibility (technical, economic) of large-scale, integrated CCS chain
- Capture and storage of ca. 1.1 Mton CO<sub>2</sub> per year in (nearly) depleted gas reservoirs in period of 2015 - 2020
- Acquire knowledge and experience with deployment of large-scale, integrated CCS chain:
  - Technical
  - Legal
  - Economic
  - Organizational
  - Social

## Location: Maasvlakte Power Plant 3



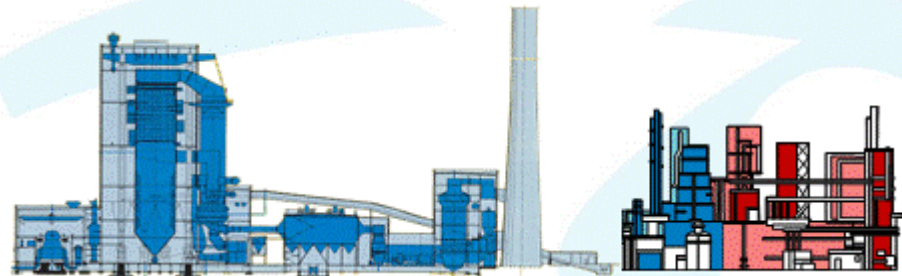
# CCS-chain



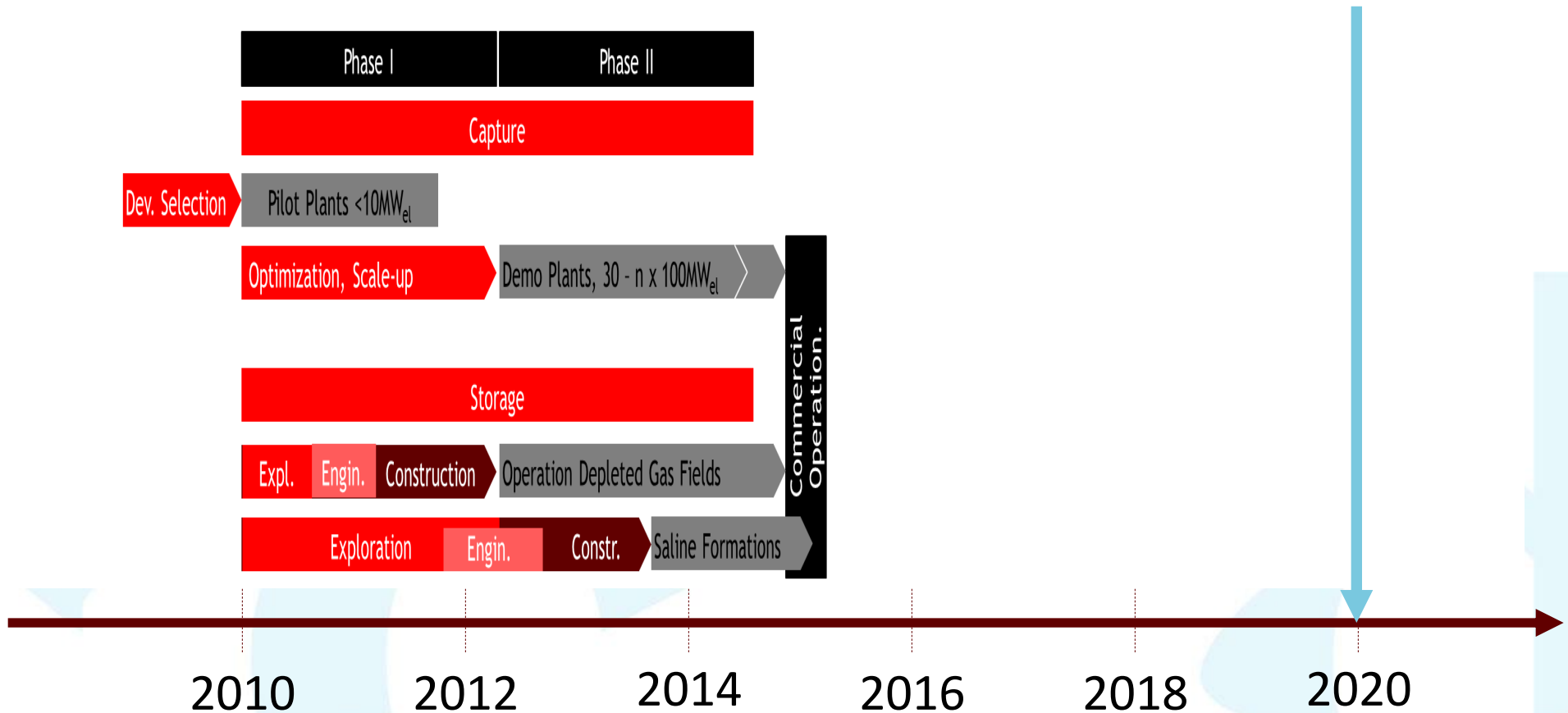
Not on scale

## Time Path and Milestones

- 14 July 2009 : EU project proposal submission
- September 2009 : Project selection by EU
- May 2010 : Grant decision by Government of the Netherlands
- September 2010 : Publication starting note Environmental Impact Assessment
- Q2 2011 : EIA and permit procedures
- Q4 2011 : FID decision
- 2013 : Power plant (MPP3) operational
- 2015 : Integrated CCS chain operational
- 2015-2020 : Demonstration phase CCS chain



# Acceleration commercial deployment CCS





## Capture Location: Maasvlakte Power Plant 3



## CO<sub>2</sub> Capture Unit



## CO<sub>2</sub> Storage Location: P18 gas reservoirs



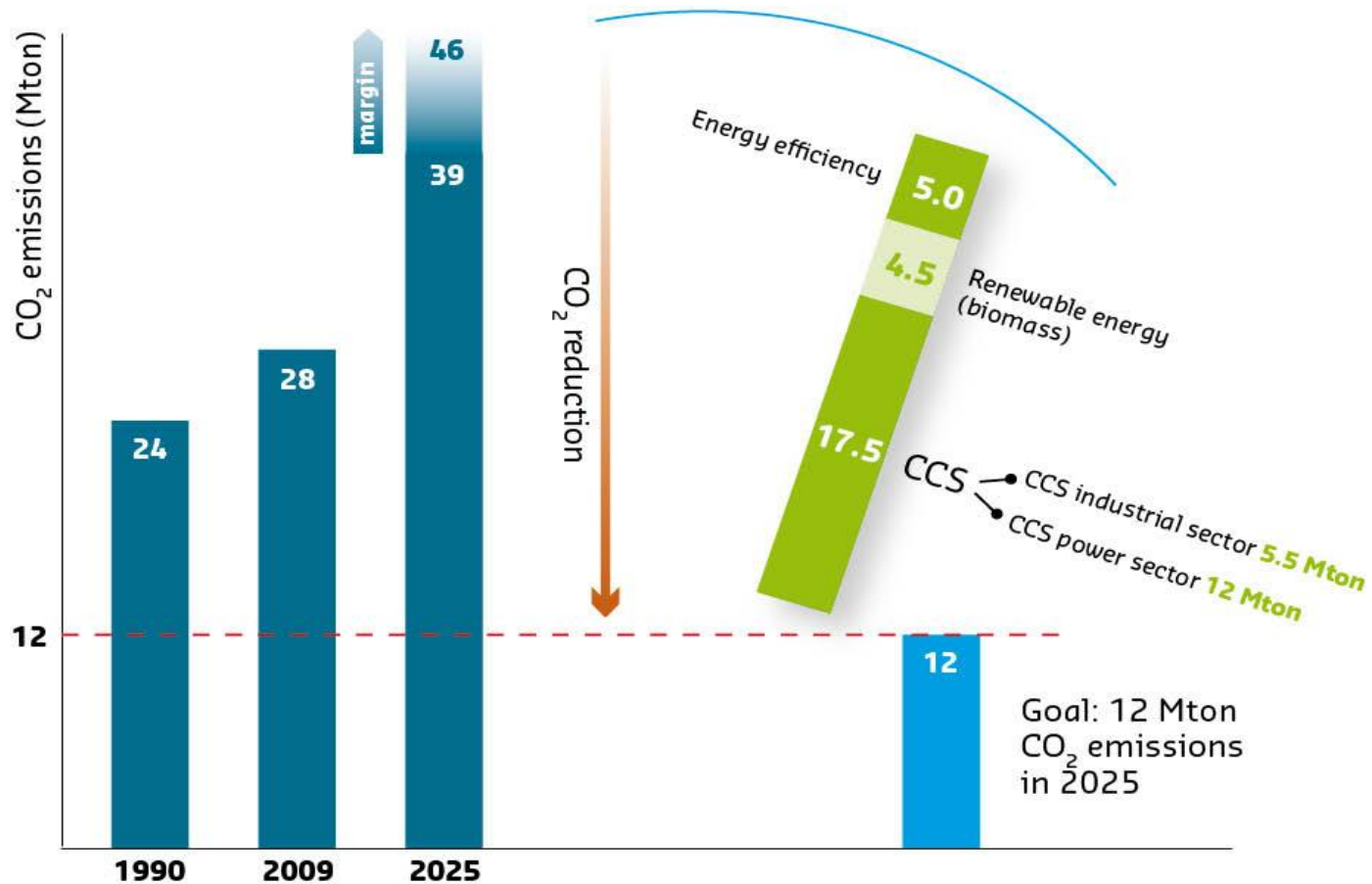
## Why CCS Demonstration Projects in The Netherlands?

- Industrial areas with many point sources (large CO<sub>2</sub> emitters)
- New power stations under construction with potential deployment of CCS
- Onshore and offshore gas reservoirs which will deplete in years to come
- Depleted gas reservoirs have appropriate structure for permanent CO<sub>2</sub> storage
- Indepth knowledge of gas transport because of dense natural gas grid
- Vast experience with exploration and production of oil and gas, and gas storage in aquifers and gas reservoirs

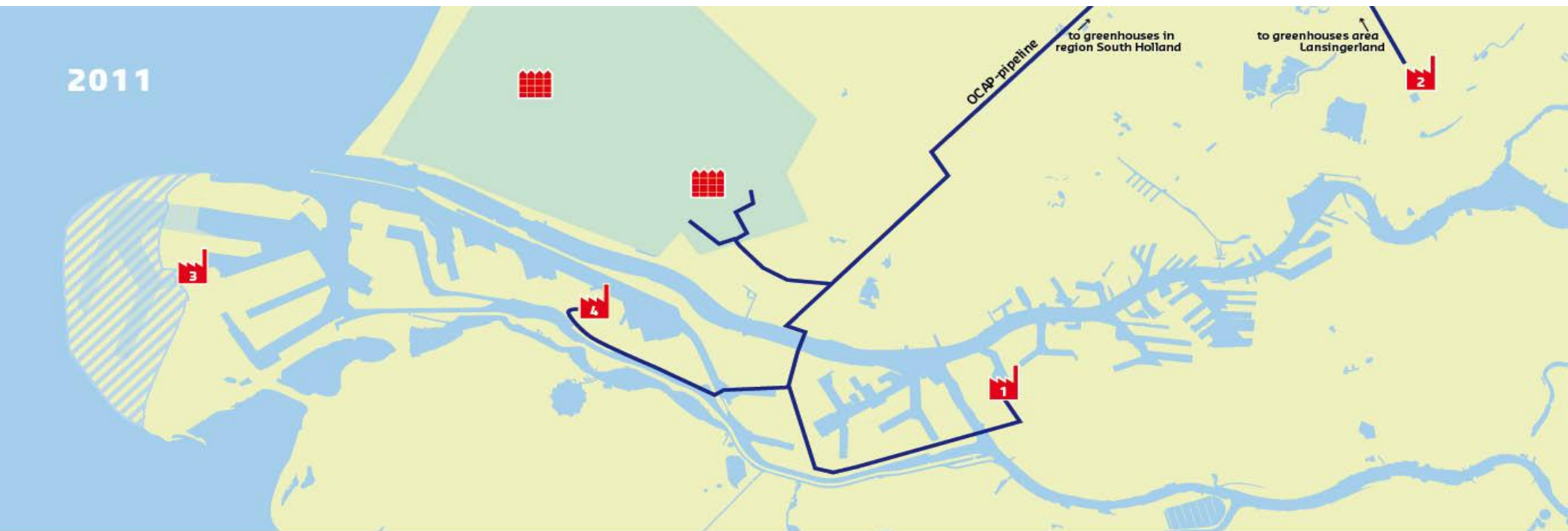
***“God’s greatest gift to Rotterdam is its location”***

Alexander Rinnooy Kan, chairman Social Economic Council

# Rotterdam Climate Initiative CCS objectives










# Rotterdam CCS Network 2011



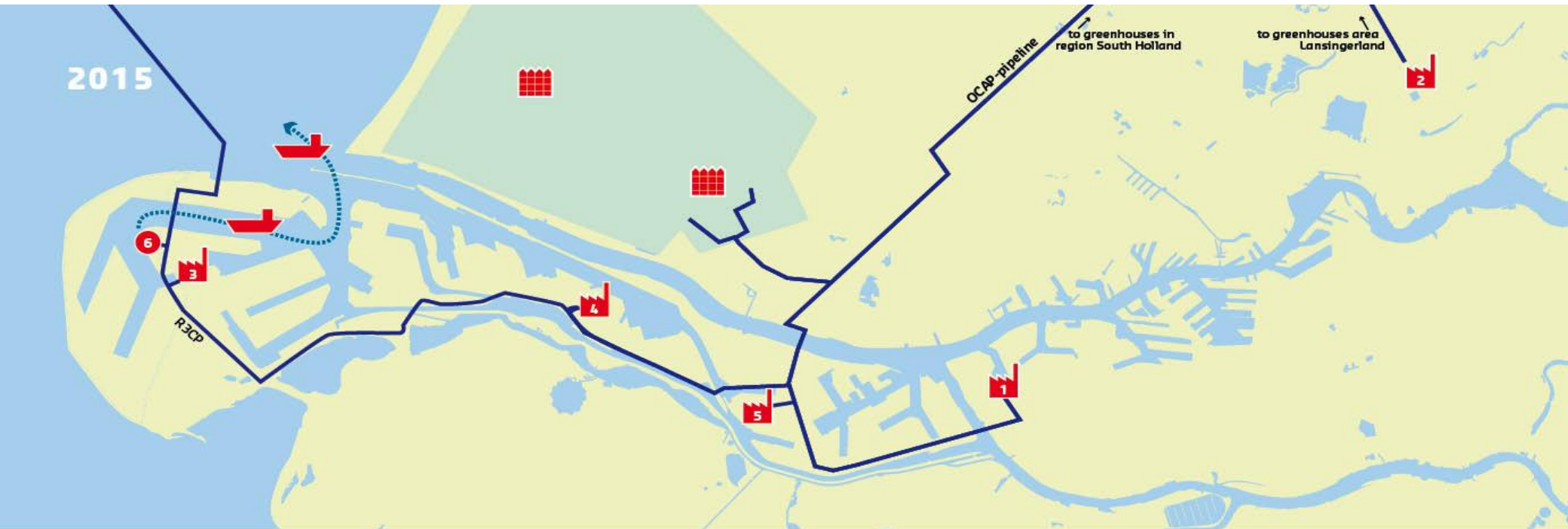
1 Shell Pernis  
2 E.ON-ROCA

3 E.ON CO<sub>2</sub>-Catcher (CATO-2 pilot project)  
4 Abengoa

 Maasvlakte II, under construction  
 Transport by pipeline  
 Transport by ship

 CO<sub>2</sub> capture  
 Green houses  
 Energy intensive industry  
 CO<sub>2</sub> Hub




# Rotterdam CCS Network 2015







- 1 Shell Pernis
- 2 E.ON-ROCA
- 3 ROAD
- 4 Abengoa

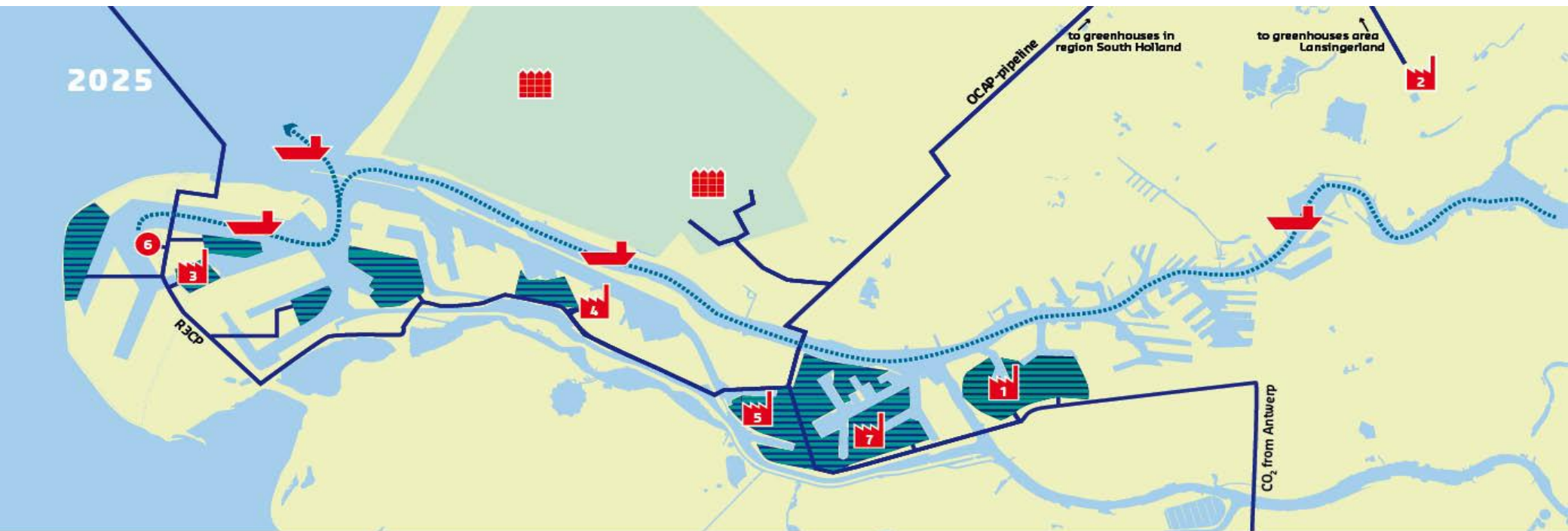
- 5 Air Liquide
- 6 CO<sub>2</sub> Hub CINTRA

Pegasus: location not yet determined


-  Maasvlakte II, under construction
-  Transport by pipeline
-  Transport by ship




-  CO<sub>2</sub> capture
-  Green houses
-  Energy intensive industry
-  CO<sub>2</sub> Hub





# Rotterdam CCS Network 2025



- 1 Shell Pernis
- 2 E.ON-ROCA
- 3 ROAD
- 4 Abengoa
- 5 Air Liquide

- 6 CO<sub>2</sub> Hub CINTRA
- 7 Air Products
-  Connecting industry to CCS network (not just large scale demo's)

-  Maasvlakte II, under construction
-  Transport by pipeline
-  Transport by ship

-  CO<sub>2</sub> capture
-  Green houses
-  Energy intensive industry
-  CO<sub>2</sub> Hub

Pegasus: location not yet determined



# CO<sub>2</sub> Capture, Transport and Storage Chain

## CAPTURE



*Power plants*



*Chemical industry*

## TRANSPORT

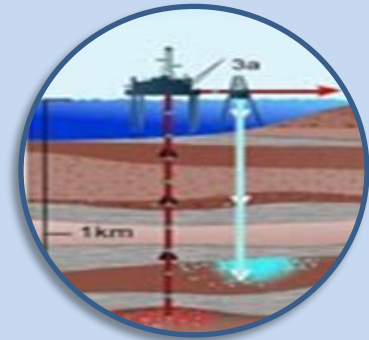


*Pipelines*



*Shipping*

## STORAGE



*Depleted gas reservoirs*



*Enhanced Oil Recovery*

## Regional Vision and Co-operation



ROTTERDAM.CLIMATE.INITIATIVE

gasunie



e.on



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