



Energy and Climate Dialogue with Ukraine  
Bellona Europa Office, Brussels, 19<sup>th</sup> October 2015

**Rotterdam Opslag en Afvang Demonstratieproject (ROAD)**  
*Building a (Business) Case for CCS in Rotterdam*

Andy Read, Capture Director, ROAD


SUPPORTED BY



Government of the Netherlands



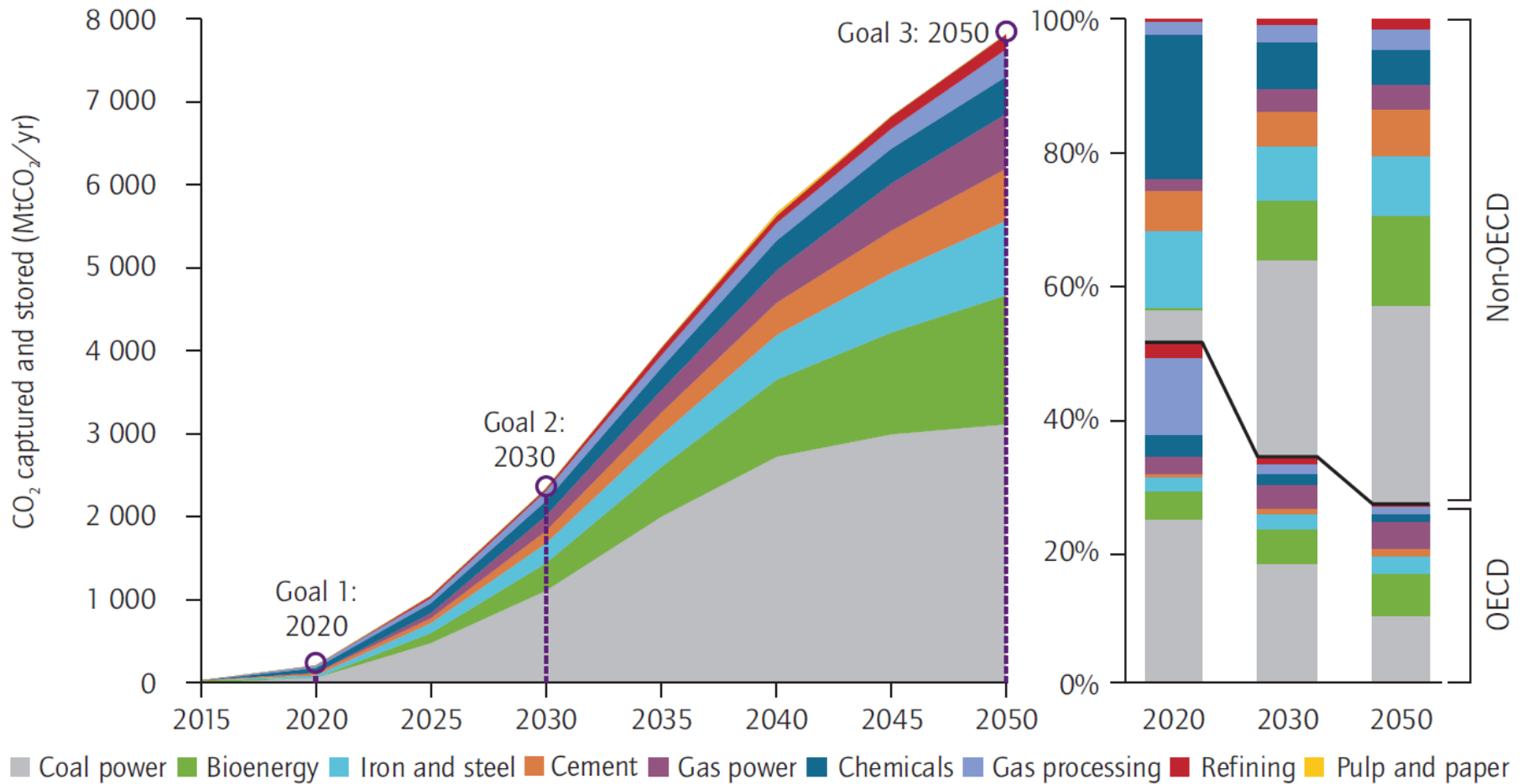
Co-financed by the European Union  
European Energy Programme for Recovery

A path of smooth, dark, rounded stones is laid out on a light-colored sandy beach. The stones are arranged in a gentle curve that leads from the foreground towards the background, eventually fading into the distance. The lighting is soft, creating subtle shadows and highlights on the wet-looking sand and the smooth surfaces of the stones.

*“It is better to take many small steps in the right direction  
than to make a great leap forward only to stumble backward”*

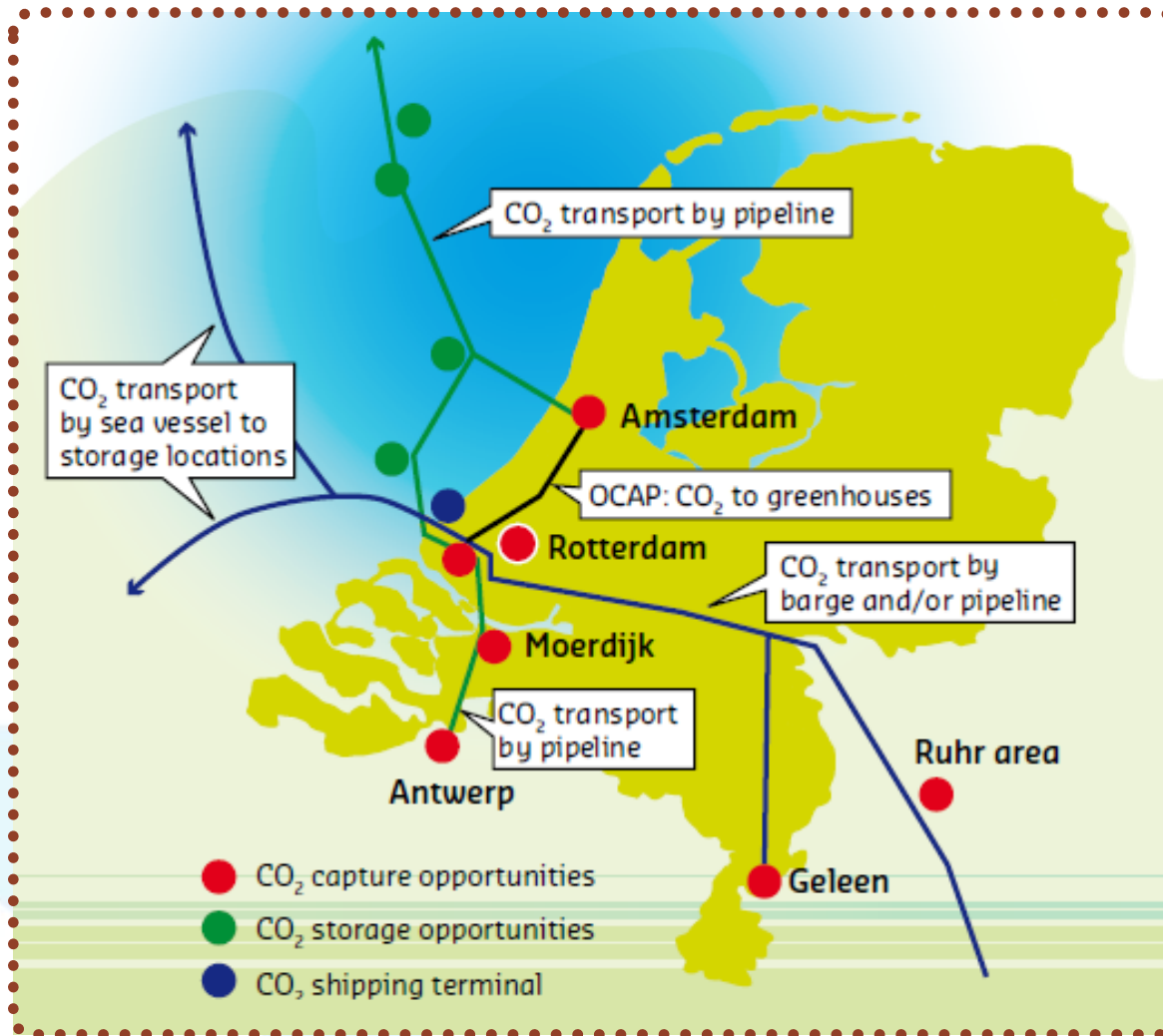
*~Chinese proverb*

# CCS Roadmap 2050



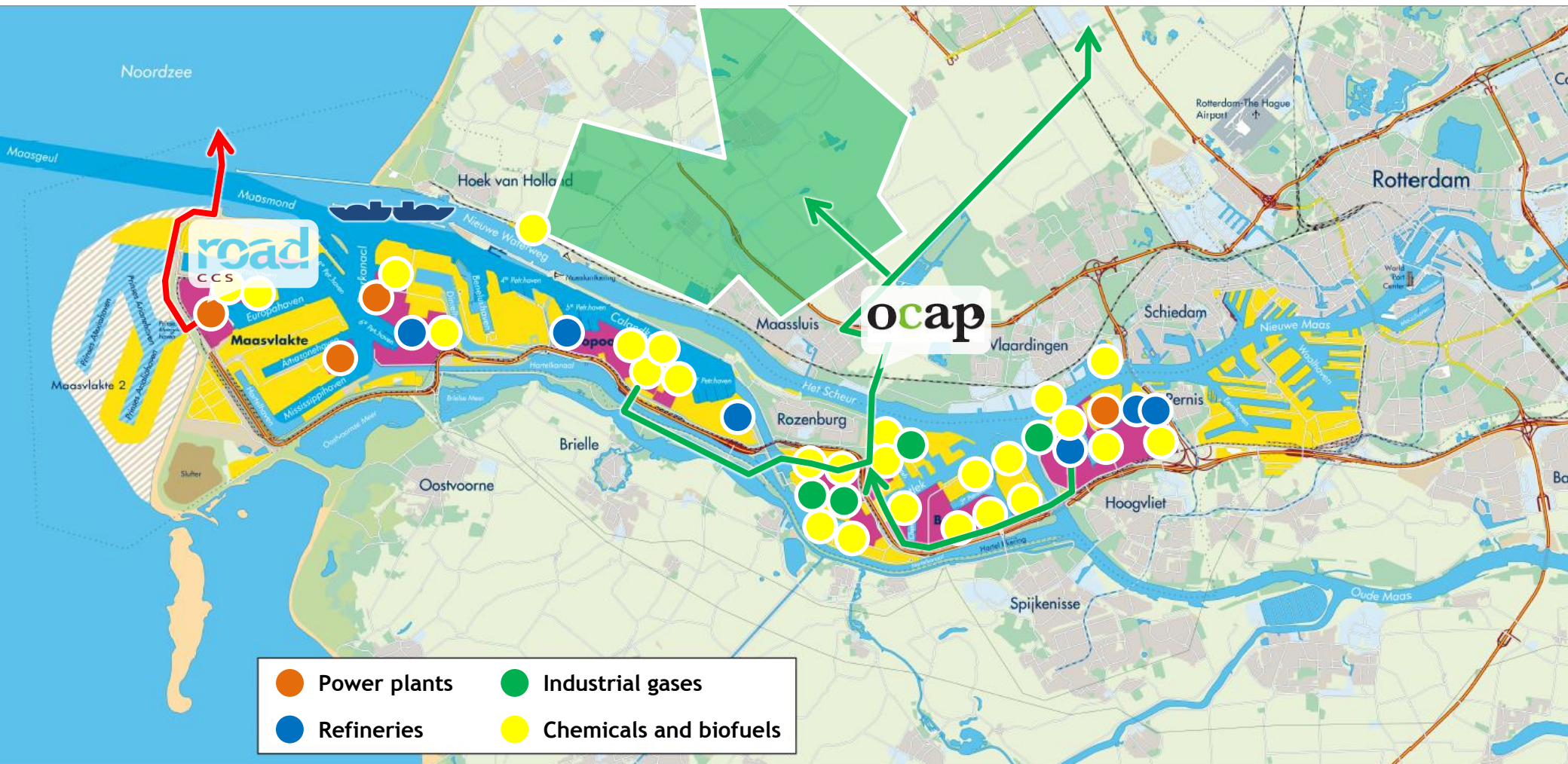
Source: Technology Roadmap: Carbon Capture and Storage 2013 (IEA, 2013)

## Rotterdam Vision: CO<sub>2</sub> Hub of Northwest Europe



- Europe will need CCS to meet climate targets
  - Not only in power, but essential in industry
- CO<sub>2</sub> hubs will strengthen sustainable economic growth at lower costs
- Rotterdam is ideal place in North-west Europe: “Gateway to 350 mln. customers”

# Rotterdam CO<sub>2</sub> Hub: First Steps



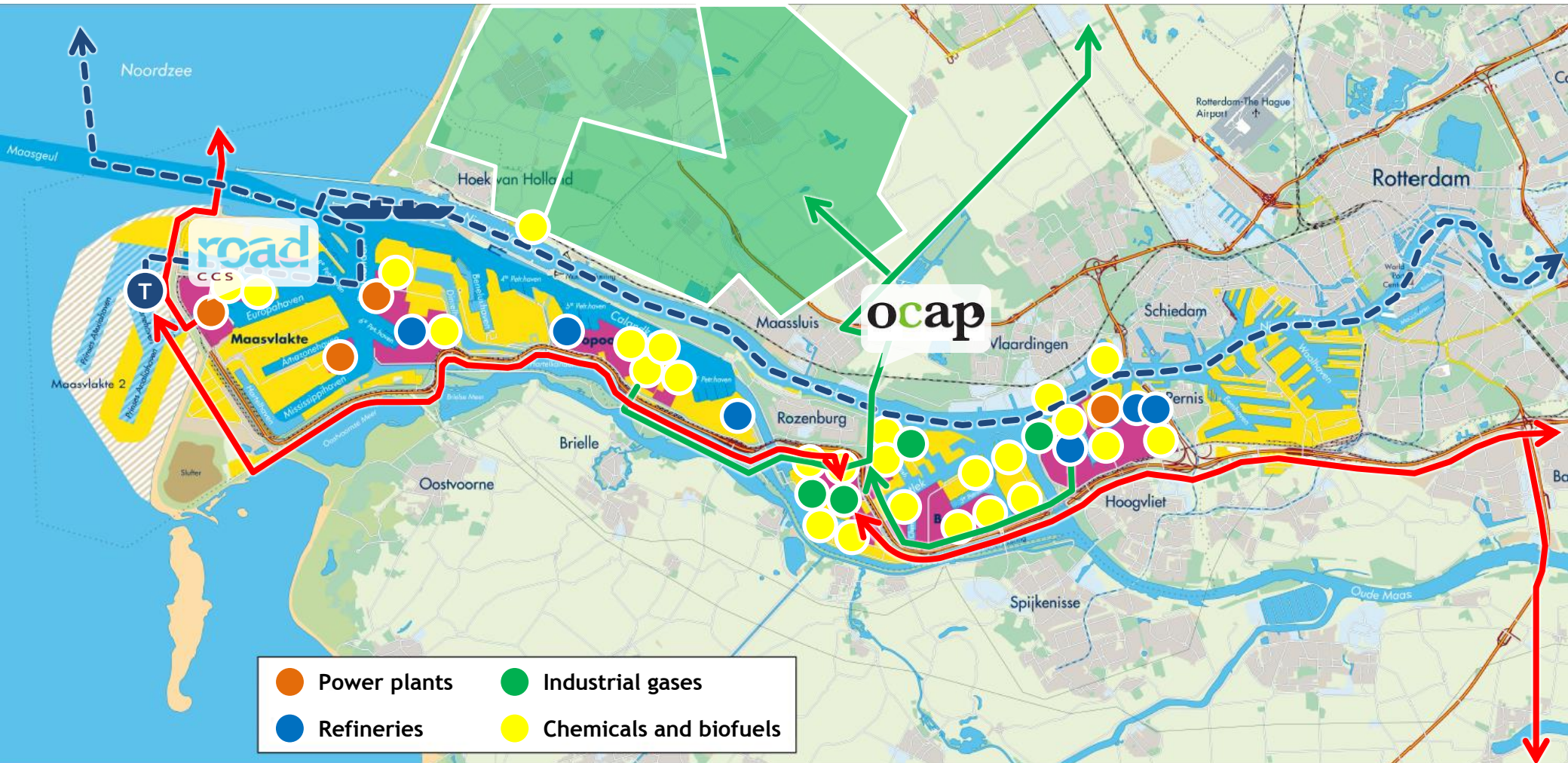
- |  |  |
|--|--|
| <span style="color: orange;">●</span> Power plants | <span style="color: green;">●</span> Industrial gases        |
| <span style="color: blue;">●</span> Refineries     | <span style="color: yellow;">●</span> Chemicals and biofuels |



40 km



# Rotterdam CO<sub>2</sub> Hub: Vision 2030



- |  |  |
|--|--|
| <span style="color: orange;">●</span> Power plants | <span style="color: green;">●</span> Industrial gases        |
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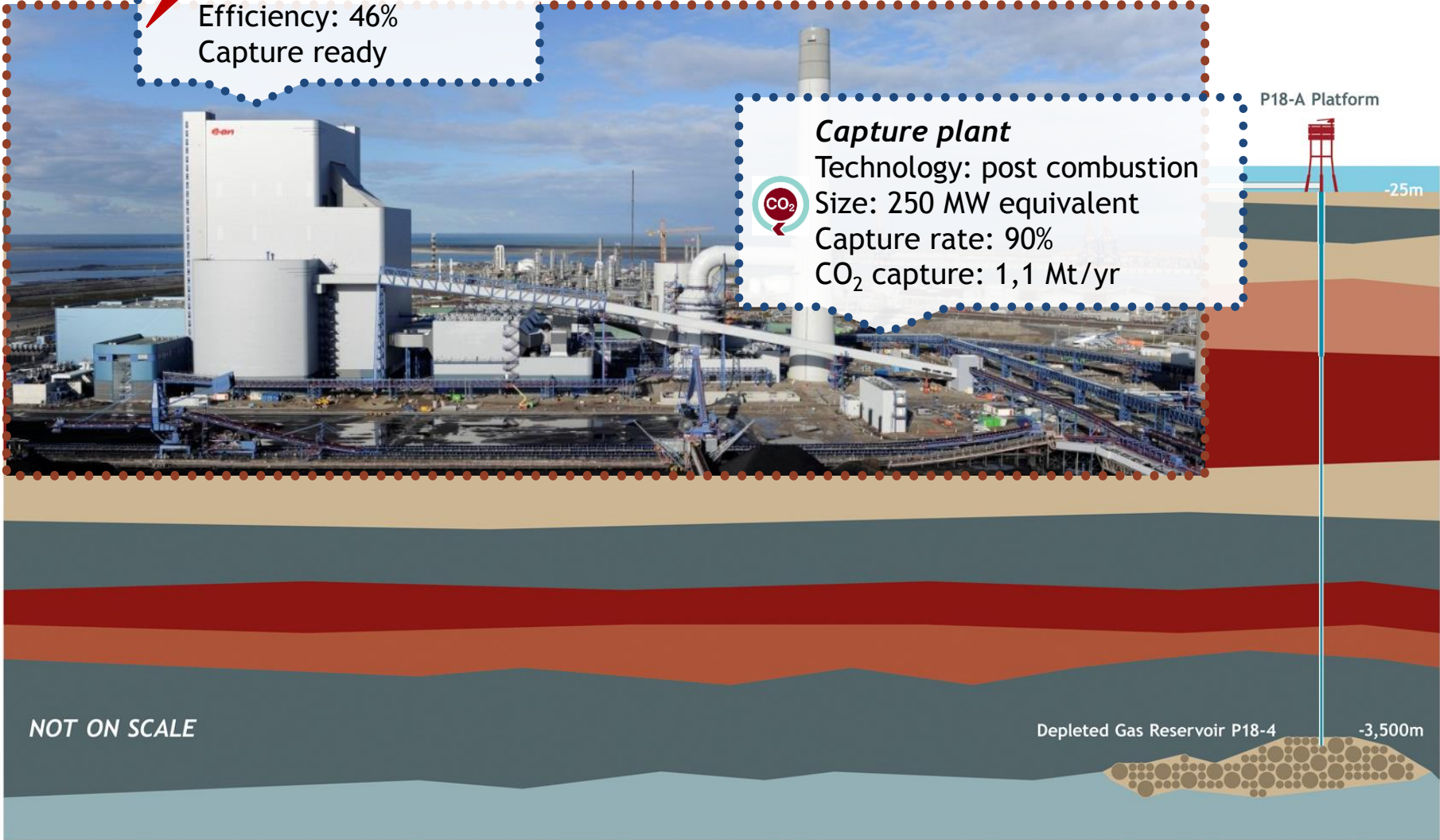
# Integrated CCS Chain ROAD

## Power plant

- ⚡ Output: 1 070 MWe
- Efficiency: 46%
- Capture ready

## Capture plant

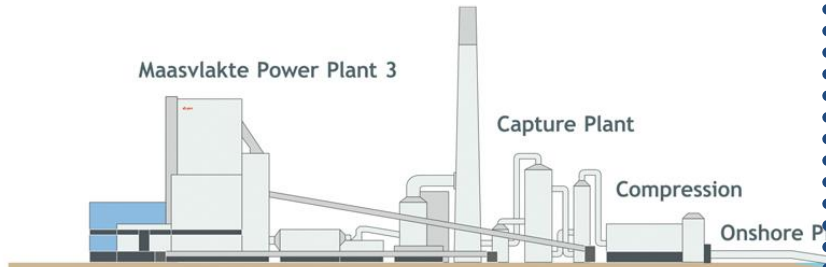
- 🌡️ Technology: post combustion
- Size: 250 MW equivalent
- Capture rate: 90%
- CO<sub>2</sub> capture: 1,1 Mt/yr



NOT ON SCALE

Depleted Gas Reservoir P18-4 -3,500m





**Storage**  
Depleted gas reservoir P18 (TAQA)  
Depth: -3,500 m  
Storage capacity: 35 Mt (P18)  
8 Mt (P18-4)  
Available: 2017  
Alternatives / future expansion options are in focus (i.a. EOR)

## ROAD



NOT ON SCALE

## Status ROAD

- Engineering



- Permits



- Contracts



- Finance



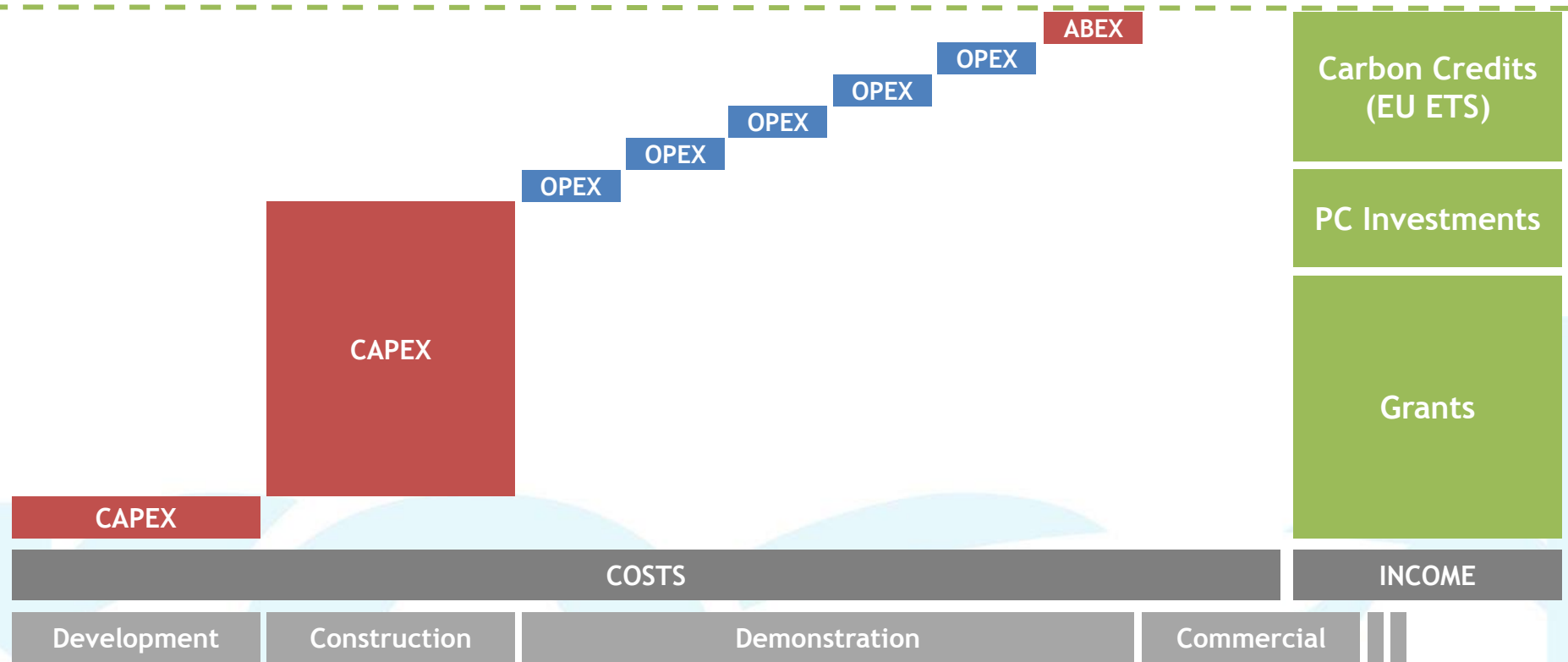
**Capture plant**  
Size: 250 MW equivalent  
Capture Rate: 90%  
CO2 capture: 1.1Mt/year

**Power plant**  
Output: 1 070 MWe  
Efficiency: 46%  
Capture ready

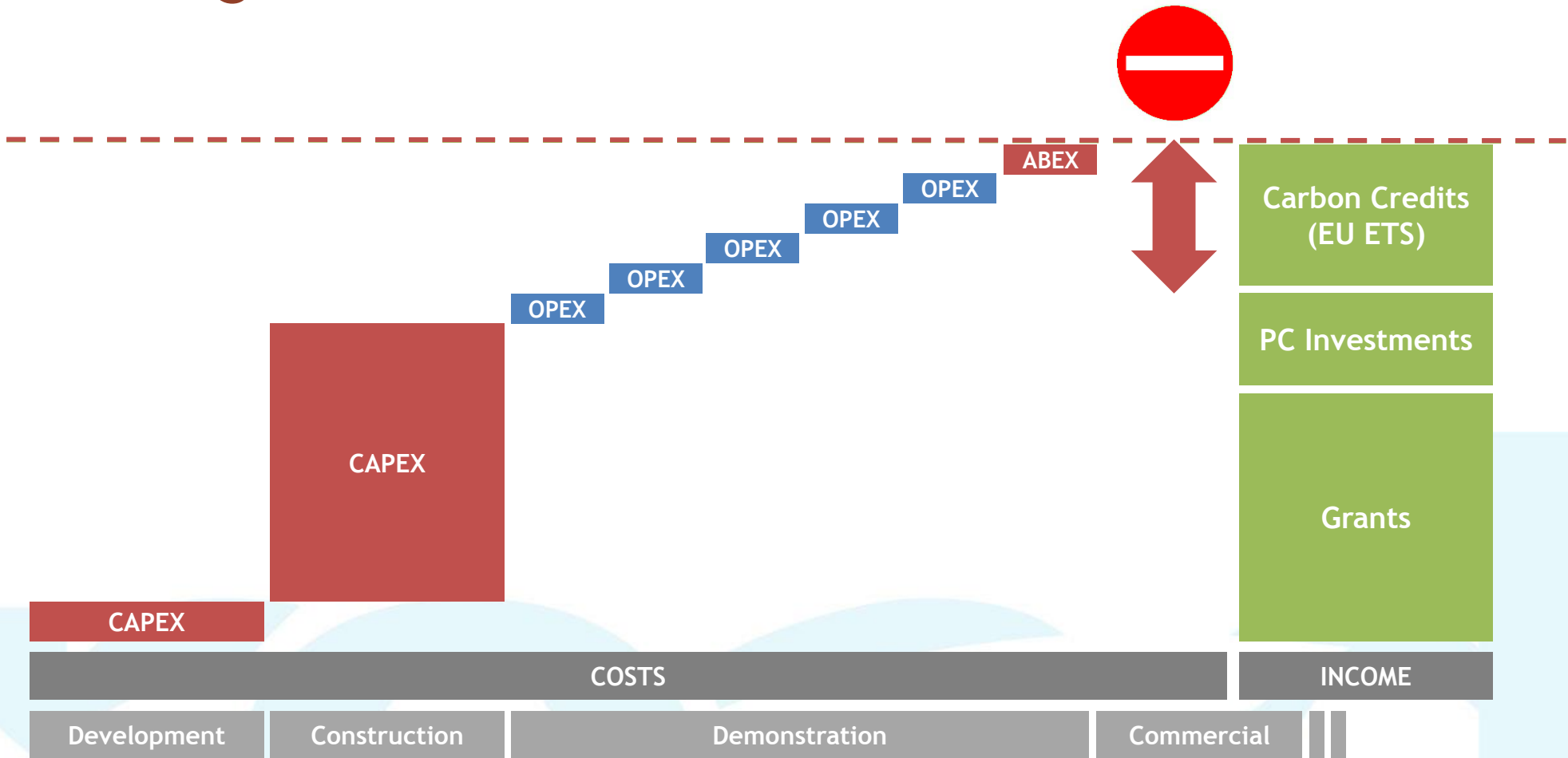


The main challenge - building a business case!

# Funding of Base Case



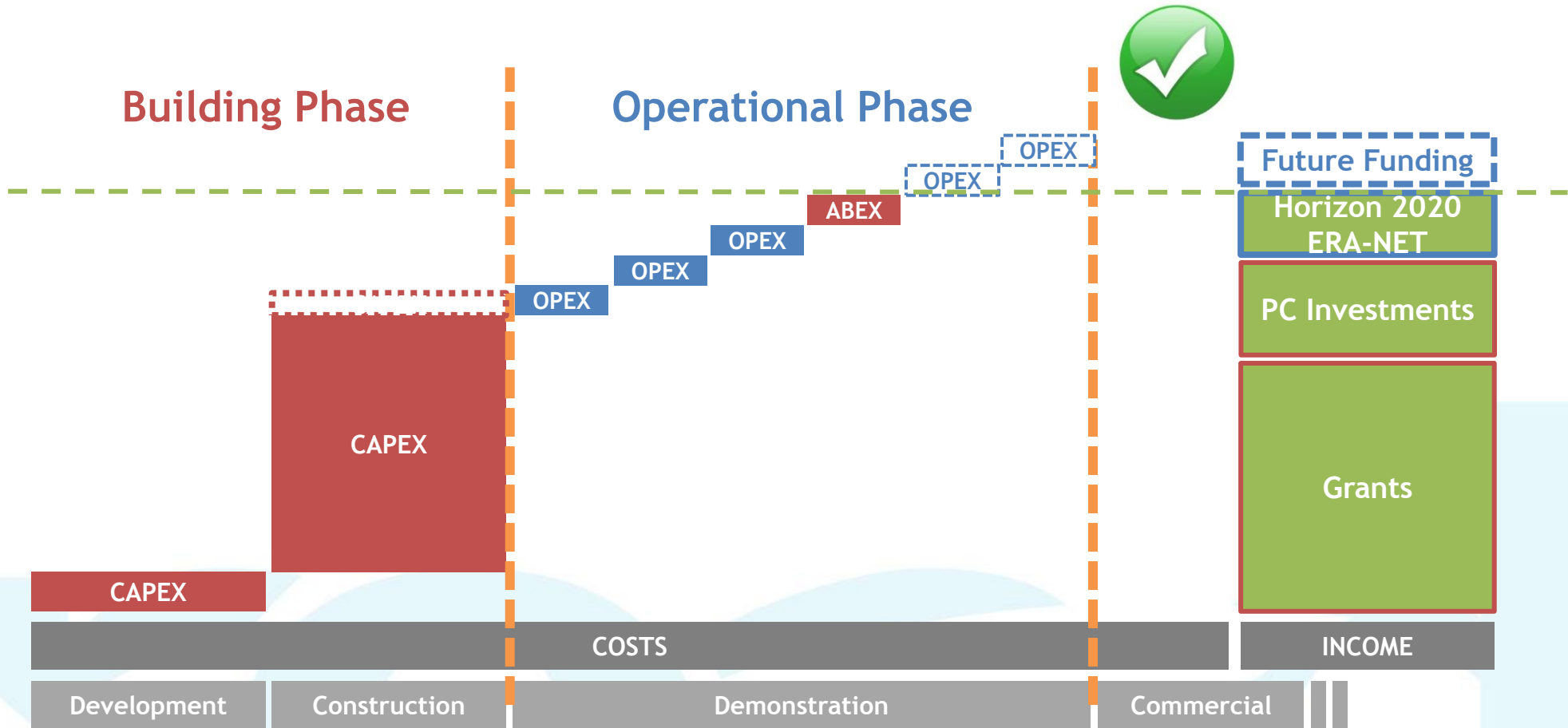
# Funding of Base Case



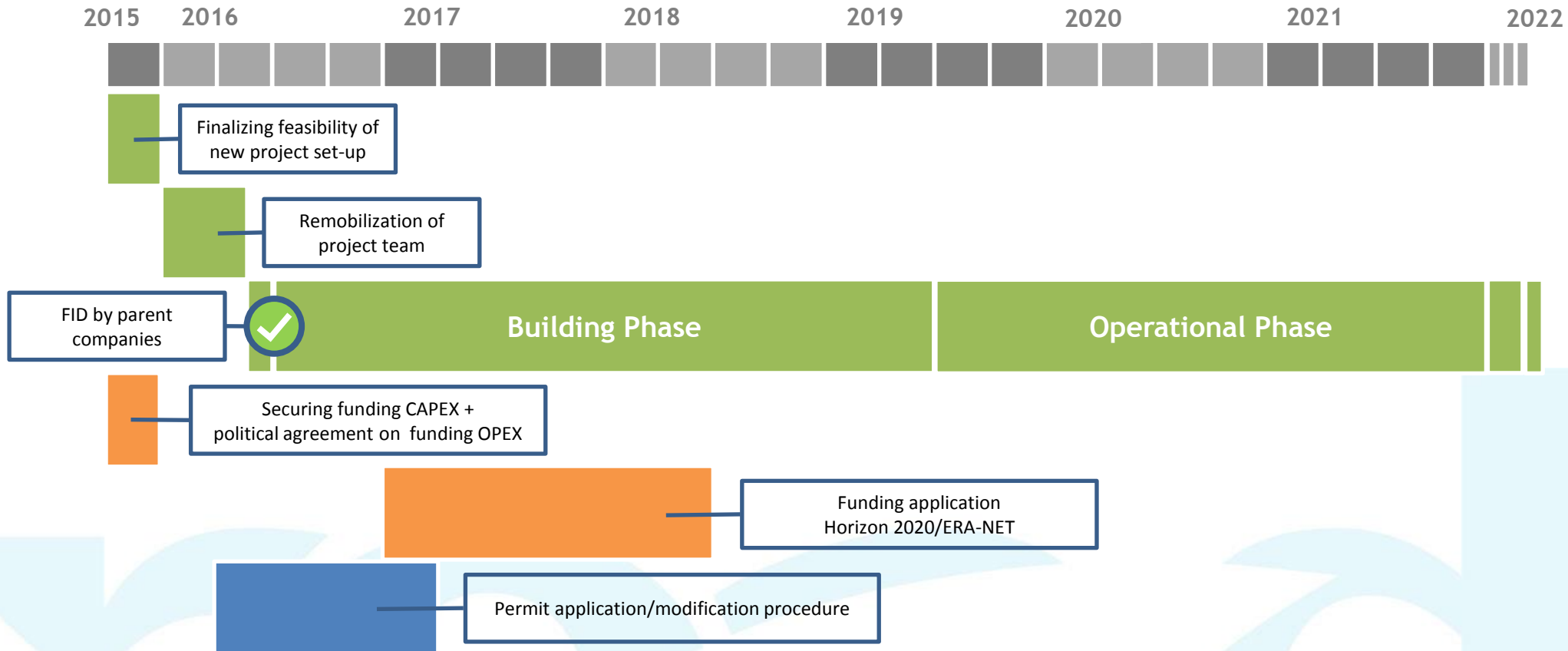
## Building a Business Case for ROAD


- Exploring alternative funding scenario's:
  - Reallocating EEPF funds
  - Private investors
  - NER300 (2<sup>nd</sup> round)
  - Horizon 2020/ERA-NET
- Improving project economics:
  - Capture: capture technologies
  - Transport: pipeline route
  - Storage: locations
  - Utilization: connection with OCAP
- Phased approach:
  - Resizing project set-up
  - Splitting CAPEX and OPEX funding

# Funding of Phased Approach



# Time Table ROAD





Utilization

Horizon  
2020  
ERA-NET

Storage

Phased  
Approach

## ROAD | Maasvlakte CCS Project C.V.

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