



# Rotterdam Opslag en Afvang Demonstratieproject (ROAD) *Lessons Learnt*

CSLF Technical Group at the 2017 Ministerial Meeting  
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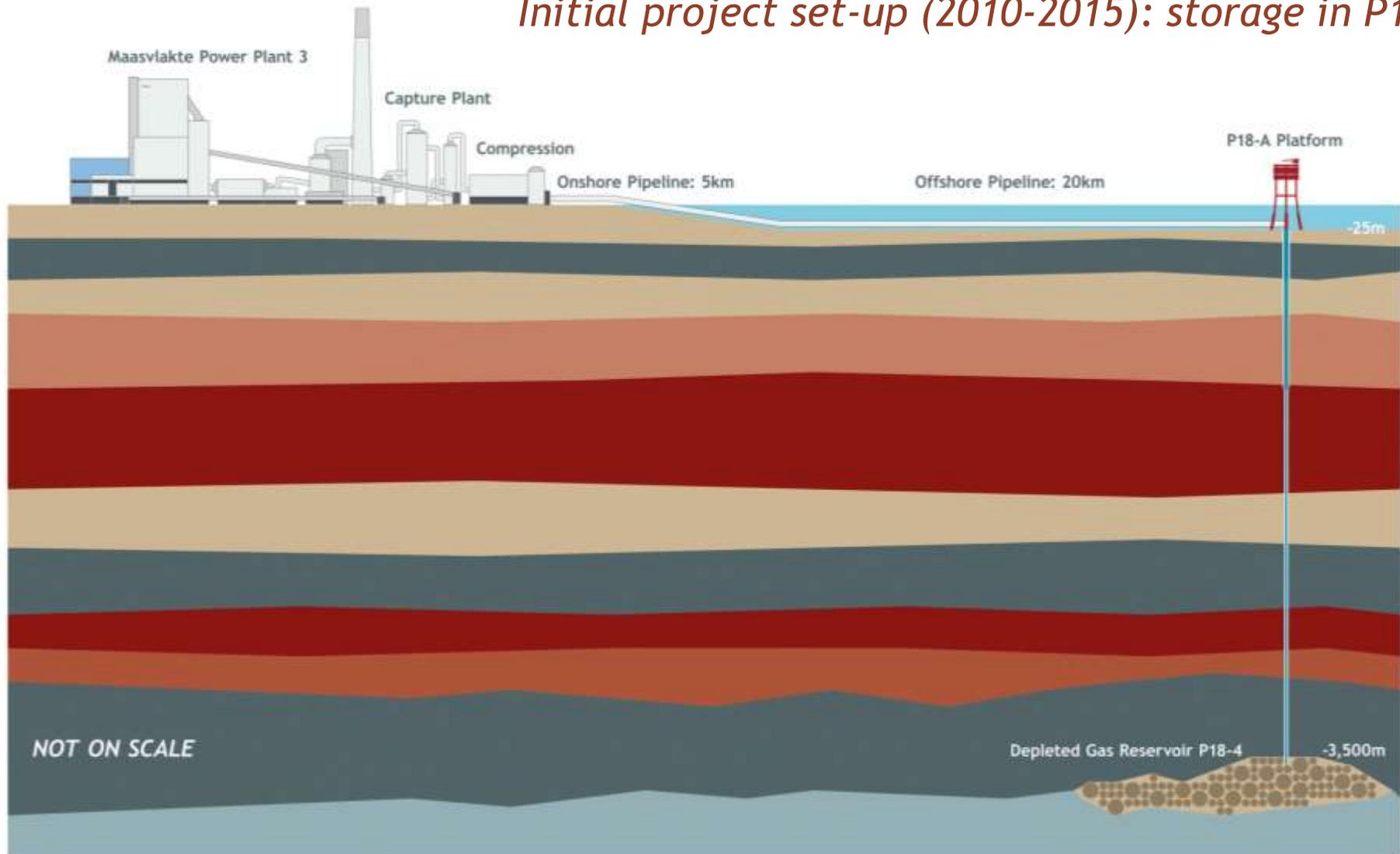


Government of the Netherlands

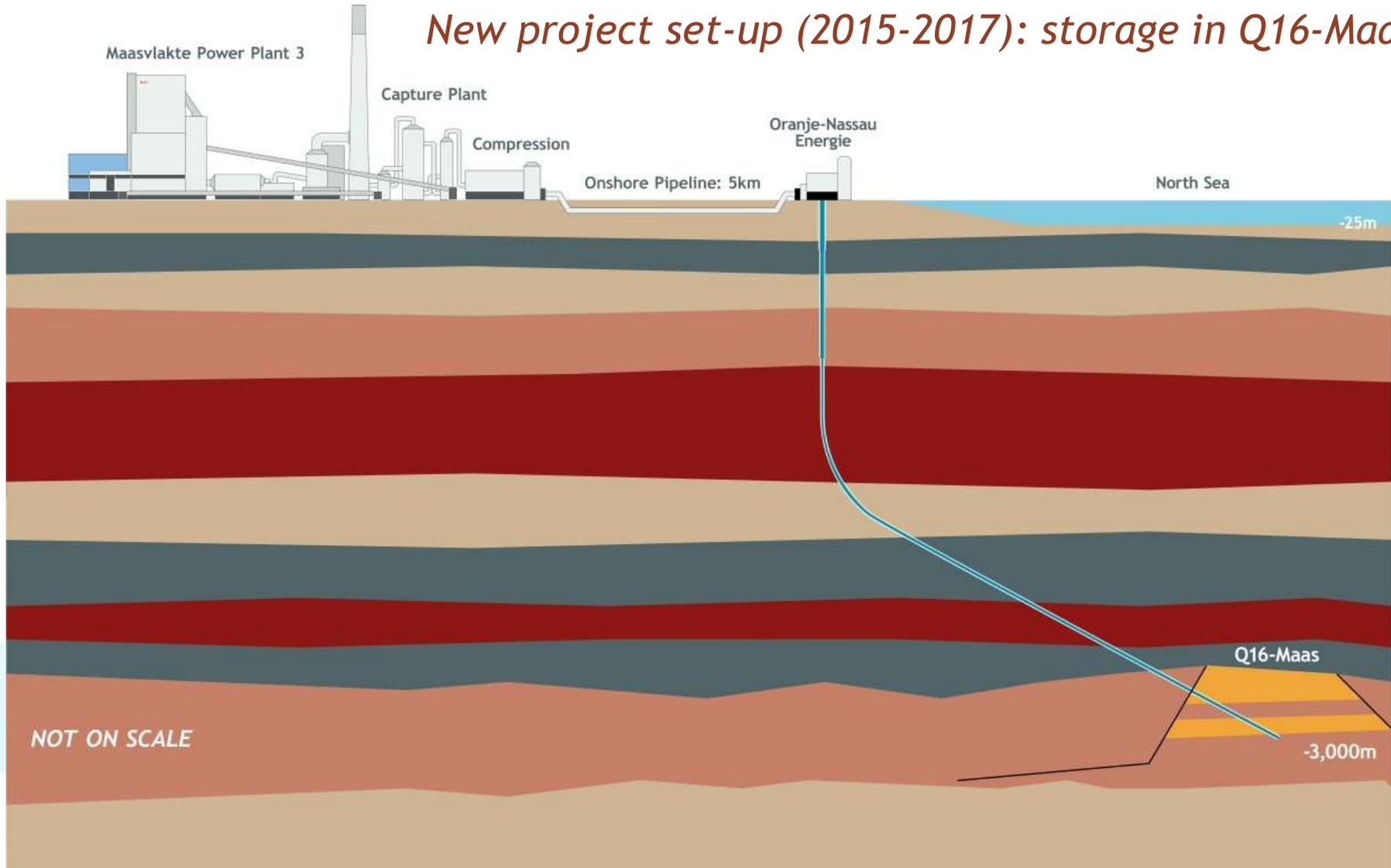


Co-financed by the European Union  
European Energy Programme for Recovery

*Initial project set-up (2010-2015): storage in P18-4*



## *New project set-up (2015-2017): storage in Q16-Maas*



## Highlights on Capture, Transport & Storage (1)

### Capture

- Proven capture technology available on market:
  - Multiple suppliers offering robust designs
- Some technical unknowns due to limited experience:
  - Design of 2012 would have needed some modification
  - Wise to allow for some contingency and some ‘teething’ problems
  - ... but engineers can solve all the engineering problems
- **Conclusion: the technology is available and will work**

## Highlights on Capture, Transport & Storage (2)

### Transport

- Some remaining technical uncertainties:
  - How to predict and manage two-phase flow behaviour (including transients)
  - QRA modelling for (onshore) CO<sub>2</sub> transport pipeline needs further development (e.g. “domino effect”)
- But the pipeline is largely conventional technology.
- **Conclusion: the technology is available and will work**

## Highlights on Capture, Transport & Storage (3)

### Storage

- Some remaining technical uncertainties:
  - Transients and two-phase flow in the well
  - Tolerance of the well to repeated temperature changes
- But a safe design was developed.
- Major regulatory barrier: Storage Liabilities.
  - The costs of long term storage liabilities are largely controlled by regulators and/or Government, and are largely out of the control of the operator. These liabilities need to be carried by the Government.
  - Especially true for large-scale or long-term projects.
- **Conclusions:**
  - The storage technology is available and will work,
  - But storage regulation is not (yet) fit for purpose.

# Long and Winding ROAD: 10 Years on CCS

1

EU CCS

## Ambition

- Pilots operating
- 12 demonstration plants
- Commercial plants
- EU 20/20/20 objectives

2

Start

## EU CCS Deployment

- Rationale: decarbonisation
- ROAD 1 of 10
- Carbon price to cover costs

3

Implement

## EU CCS

- ROAD 1st
- No technical
- ROAD "Fill"

4

## Crash of carbon price (EU)

- No business case
- Uncertainty
- New projects

*Strategic direction*

5

## Renewables vs. CCS?

- Fossil fuel phase-out?
- No level playing field
- Lack of long term political direction and support

*No customer for CCS!*

## Highlights on Public Engagement

- Framing on CCS
- Local Context
- Trust
- Communication and Engagement Process
- Information
- Risk Perception
- Governance

- **Main Conclusion**

Projects require clearly defined processes for communities and other key stakeholders to provide input into project decisions - helping to develop a partnership approach toward shared outcomes

## Why did ROAD fail?

- **Nobody was prepared to pay for it**
- Industrial partners do not have a business case:
  - Neither short-term nor long-term (CO<sub>2</sub> price doesn't work on its own)
  - Perception that “industry must contribute” was not shared by industry!
- Public funders did not have sufficient public and political support:
  - CCS perceived as extending life-time of coal plants
  - CCS “competes” with investments in renewables
  - CCS positioned as (optional) measure of ‘last resort’
- **In summary: ROAD was a project without a customer**

# Why did other European Projects Fail?

White Rose (UK)



**"Too expensive"  
and too much  
cross-chain risk**

Don Valley (UK)



**No UK Govt  
funds**

ROAD



**Not enough  
funds**

Porto Tolle (Italy)



**No Govt funds and  
no permit**

Compostilla (Spain)



**No Govt funds**

Mongstad (Norway)



**Environment?,  
cost?, doubts  
over source?**

Peterhead (UK)



**"Too  
expensive"**

Bełchatów (Poland)



**No Govt  
support**

Jämschwalde (Germany)



**Public  
opposition to  
onshore storage**



## Key lesson learnt

- Government has to fund CCS:
  - There is no other customer
- To succeed the projects must be designed and run to maximise long term Government support.
- Therefore do things which make it easy for the Government to support you, and hard for them to stop.

## Personal recommendations for a new project

- Start small - if expensive, it's too tempting to cut the budget
- A “no regrets” first step:
  - No implied lock-in to follow-on projects - that scares people
  - But scalable - support the long term decarbonisation vision
- Select non-controversial capture and storage sites
  - e.g. waste incinerator (avoid fossil fuel if possible) and off-shore gas storage
- Create a local (public) value proposition and local supporters - e.g. supporting jobs, local industry, CO<sub>2</sub> use if possible (e.g. greenhouses)
- Avoid large profits for private parties (politically inexplicable)
  - Therefore Government / public bodies must carry long term risks (e.g. storage liabilities)
- Create / support an active pro-CCS political lobby
  - Publicly, proactively advocate the project and CCS in general

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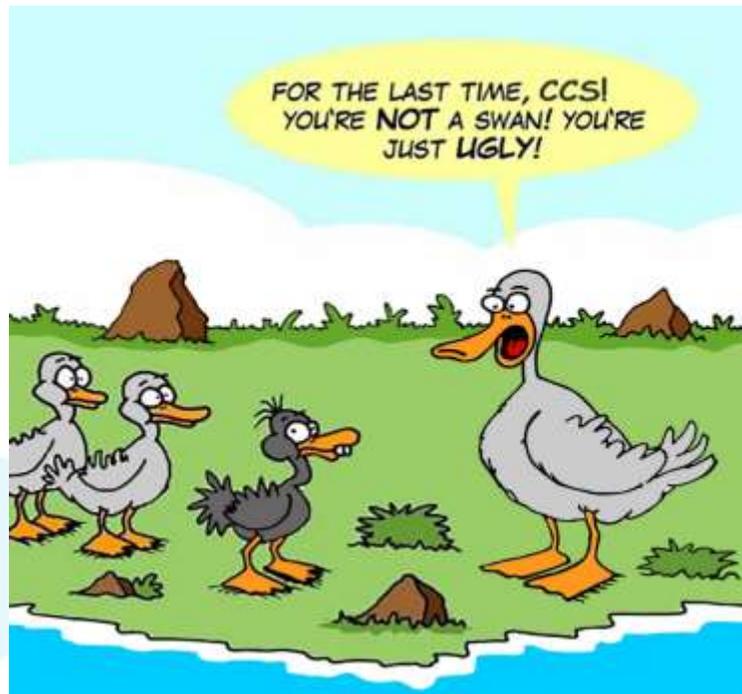
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## A very personal statement

- Furthermore I will stay convinced ROAD had to be built, not like Carthago (as Cato the Elder was convinced of).
- And for all: the thoughts from and around the ROAD project will live on in near future.
- Not like this
- But.....



# Rotterdam CO<sub>2</sub> Hub: Vision 2030, now to a EU PCI

