FEASIBILITY OF CO_2 STORAGE AND ENHANCEMENT OF HC PRODUCTION IN THE CONDENSATE GAS FIELD Q16-MAAS

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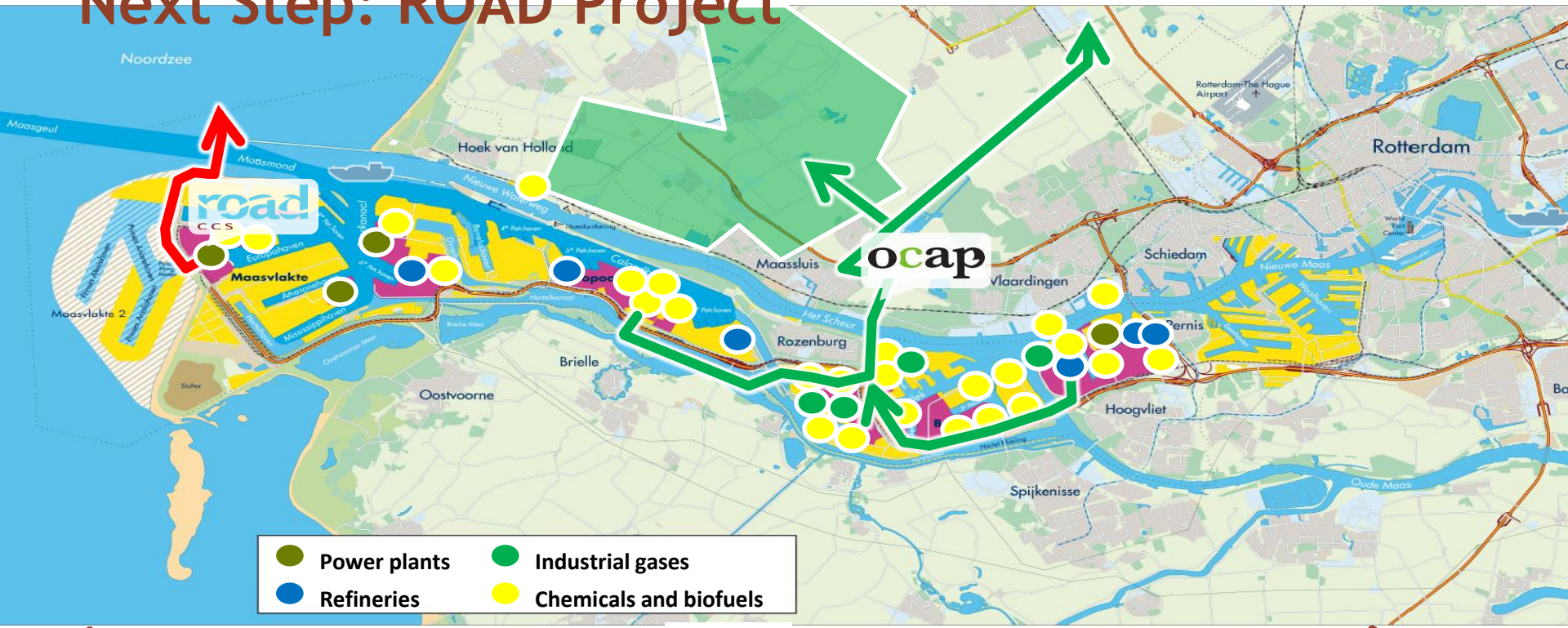
OCAP: Existing CO_2 Supply to Greenhouses
Many Large-scale CO_2 Emitters in Rotterdam harbour
Next Step: ROAD Project

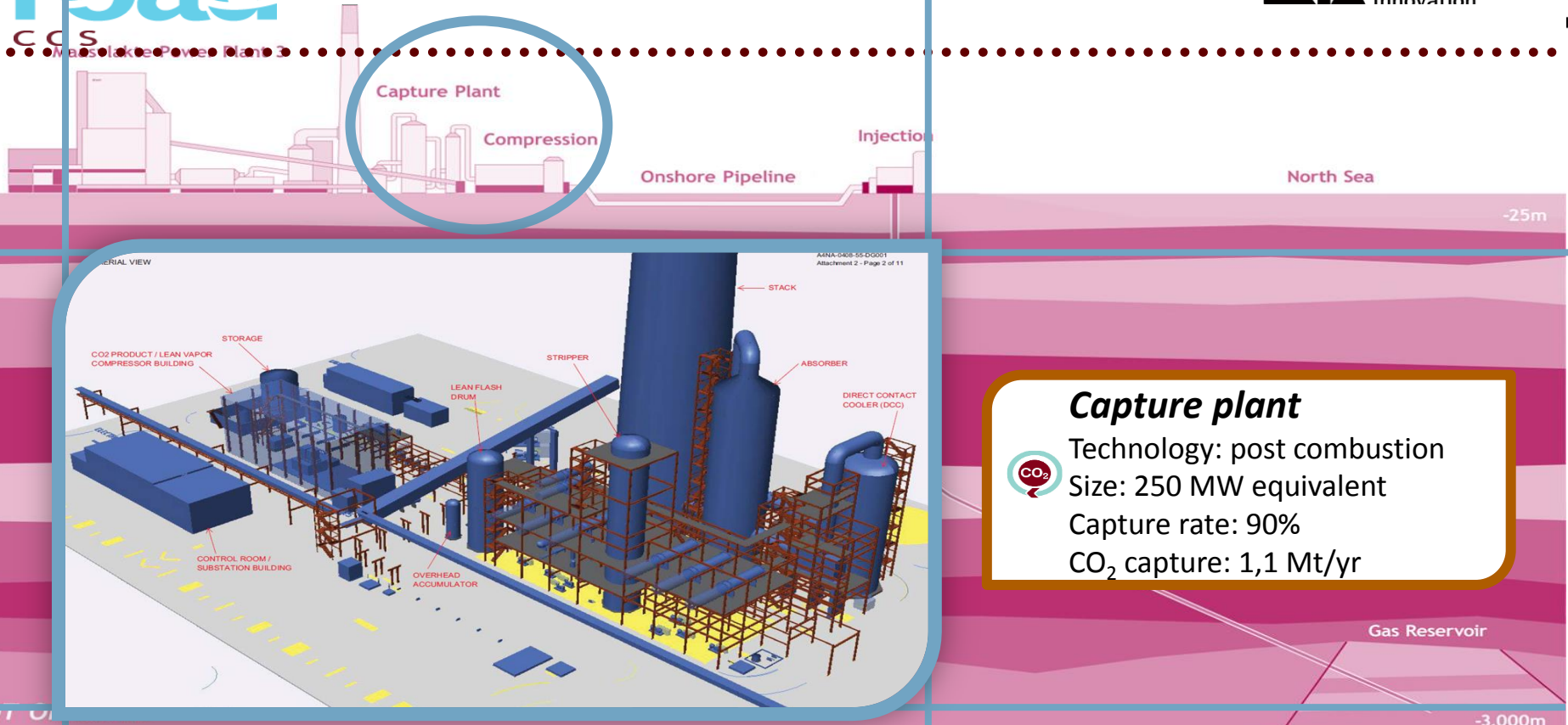


40 km

Power Plant

Output: 1 070 MWe
Efficiency: 46%
Capture ready

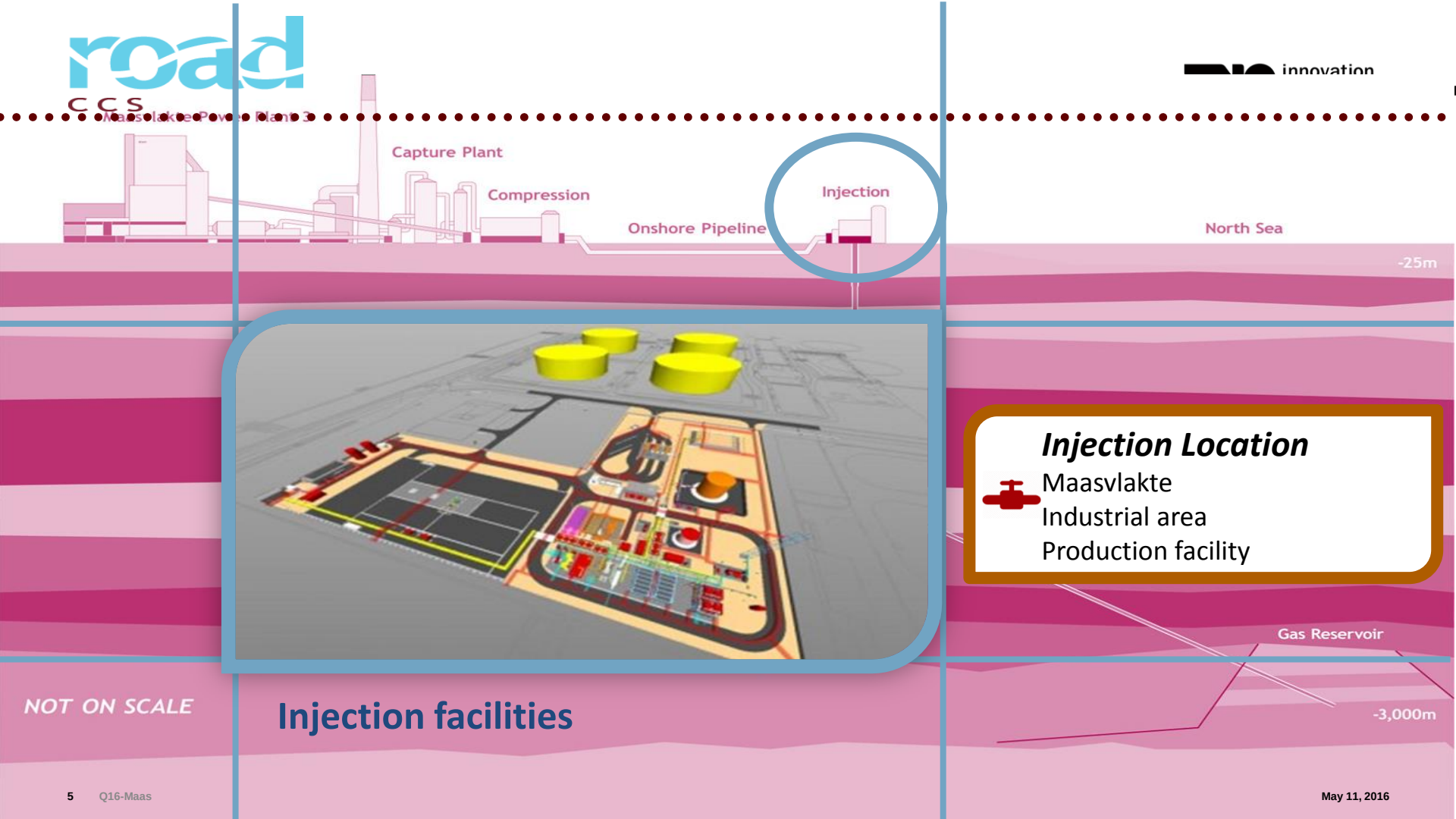
Maasvlakte Power Plant 3



Capture plant

- Technology: post combustion
- Size: 250 MW equivalent
- Capture rate: 90%
- CO_2 capture: 1,1 Mt/yr

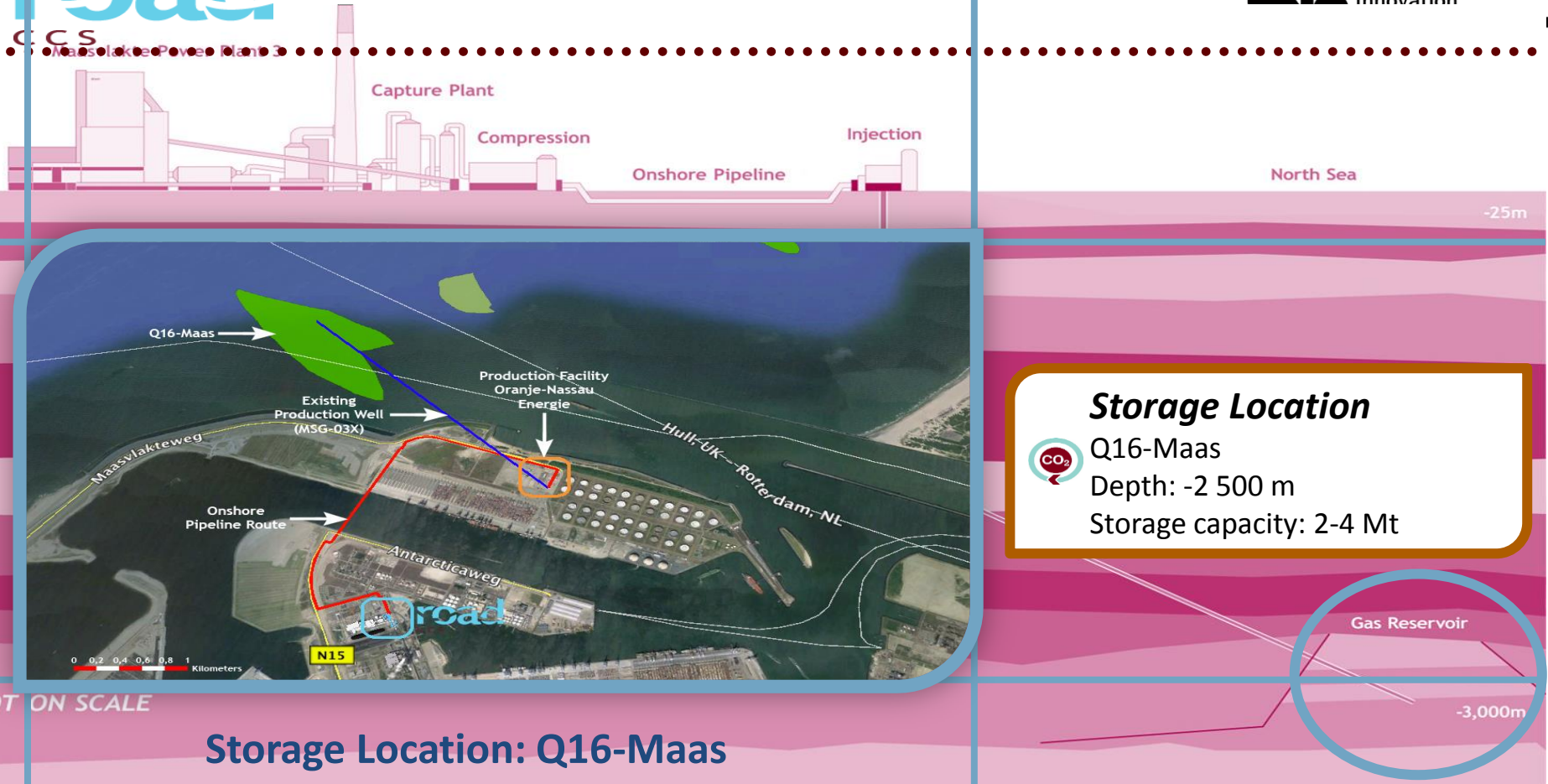
Capture Plant



Injection Location

Maasvlakte
Industrial area
Production facility

Injection facilities



Storage Location

Q16-Maas
Depth: -2 500 m
Storage capacity: 2-4 Mt

Storage Location: Q16-Maas

ROAD CONNECTION TO GREENHOUSES

Westland Area

40 km

NL POLICY

At the presentation of the Energy Report, Minister Kamp (Economic Affairs) said:
" Geothermal energy is vital to replace gas"

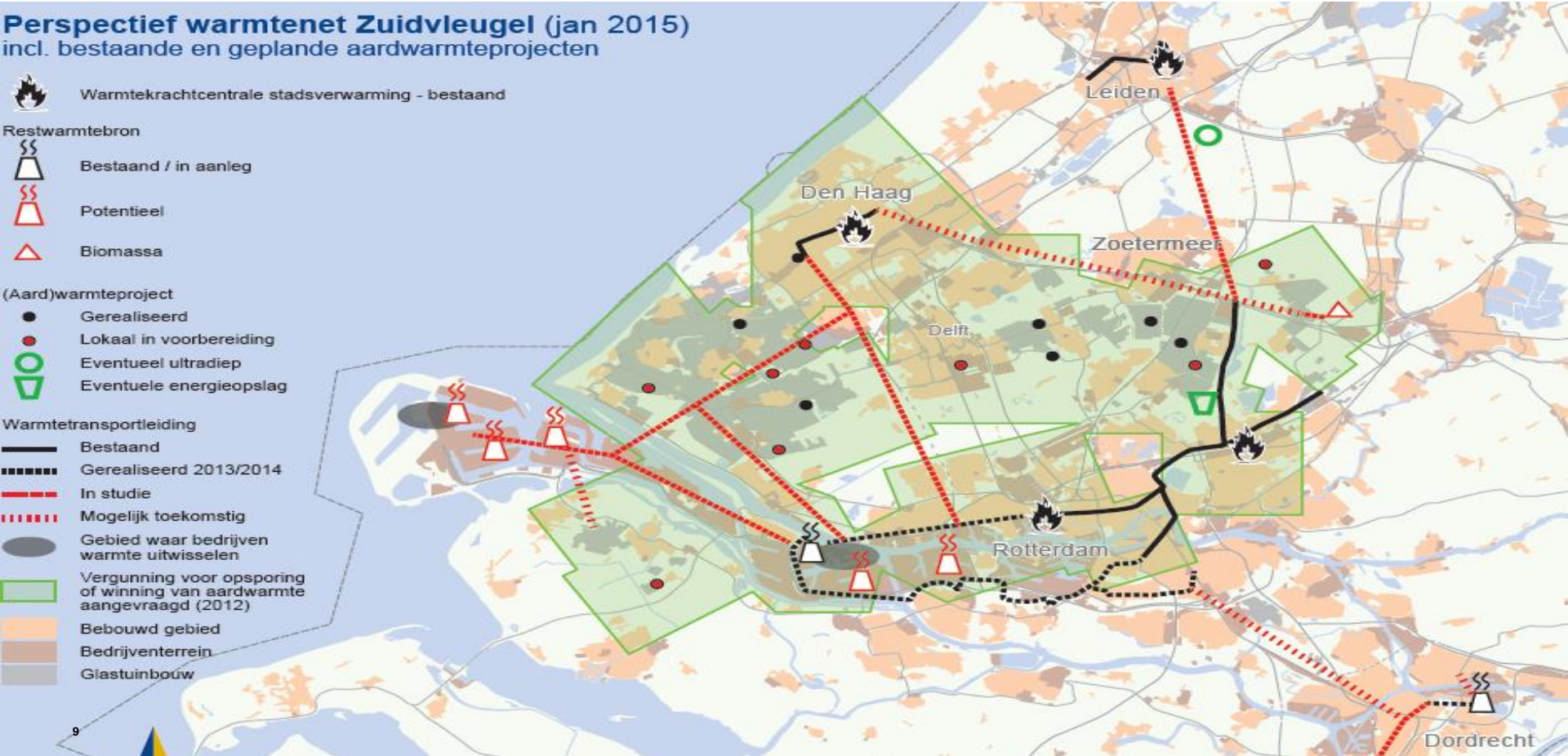
→ **CO_2 delivery to greenhouses is essential for roll-out of geothermal energy projects**

NATIONAL NEWS 18-01-2016

Policy targets:

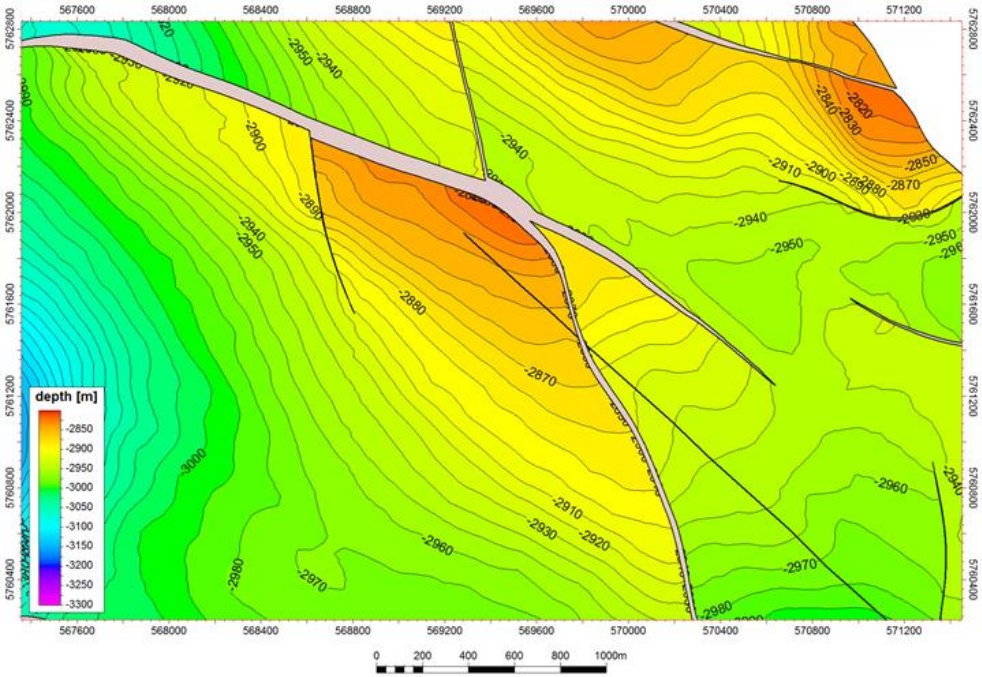
- 2015 3 PJ is realized (13 projects)
- **2020** it needs to be **11 PJ** (~30 projects), and
- **2050** it needs to be 3**00** PJ (>1000 projects)

SYSTEM INTEGRATION HEAT NETWORKS



Q16-MAAS

- Wet gas field, just offshore Rotterdam
- GIIP 1.6 bcm
- Depth almost 2900 m
- Initial conditions: p, T: 300 bar, 111 °C
- Discovered 2011
- Start of production April 2014
- End of production: end of 2022



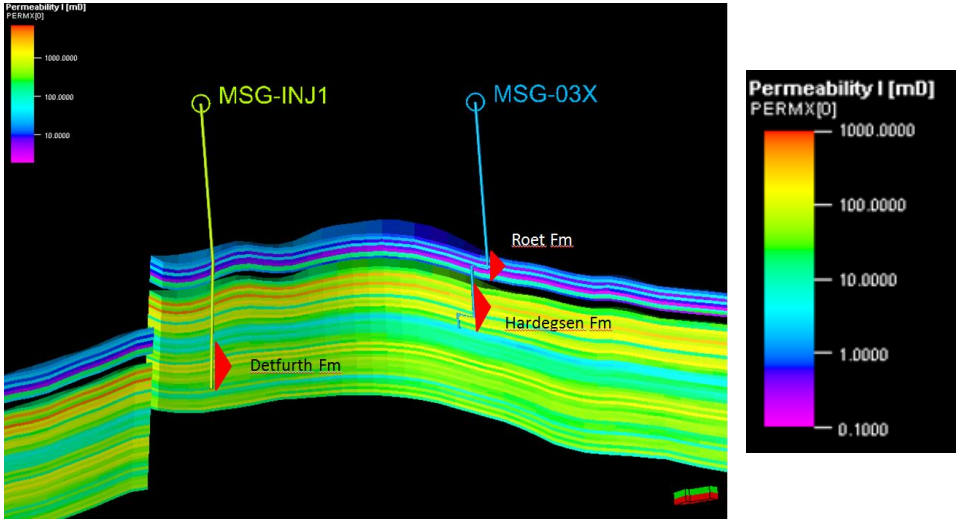
Top main reservoir

INJECTION SCENARIO (2)

- Stacked reservoir:
- Highly permeable reservoir formation (Solling/Hardegsen) divided in two by a low permeable zone

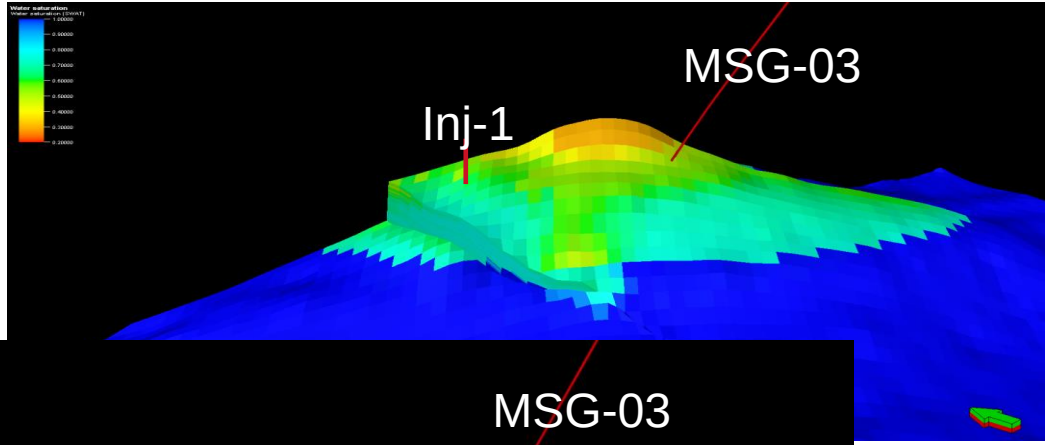
- Injection scenarios to study effect of:
  - Start time of injection
  - Location of injector
  - Perforations in upper / lower layer

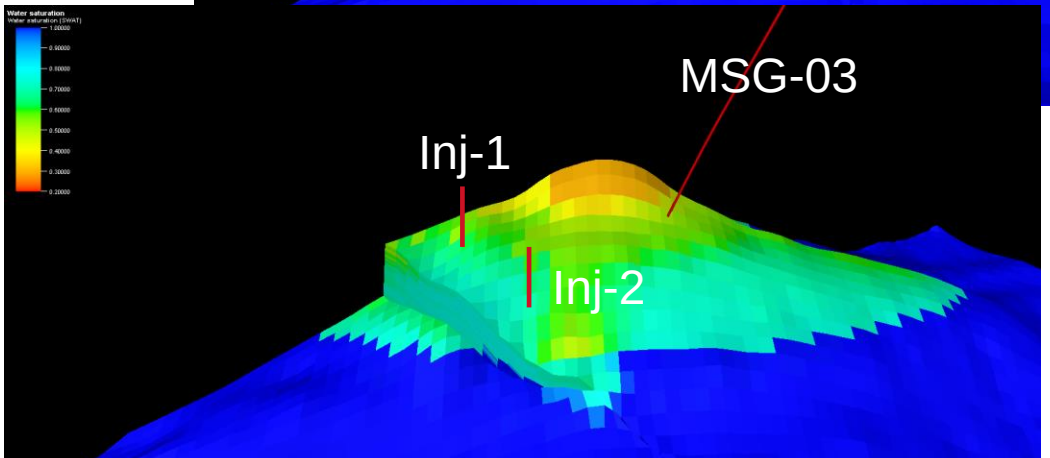
- Optimise:
  - Condensate production
  - Water production



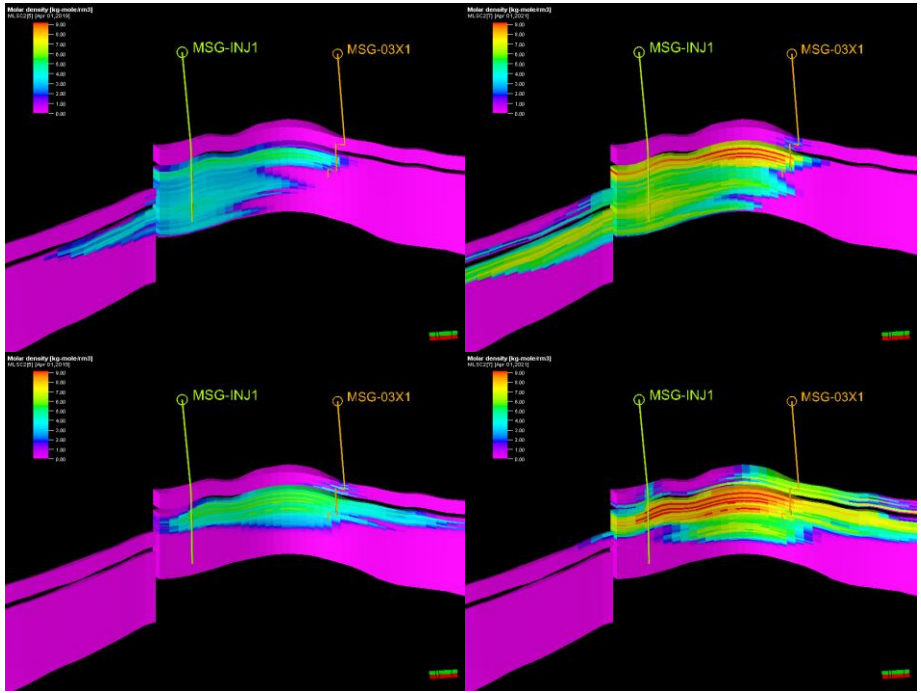
INJECTION SCENARIO (1)

- Use new, second well for injection
- Start injection *after* primary production is completed
- Injection for 2 – 3 years, ~1 Mtpa





CROSS SECTIONS



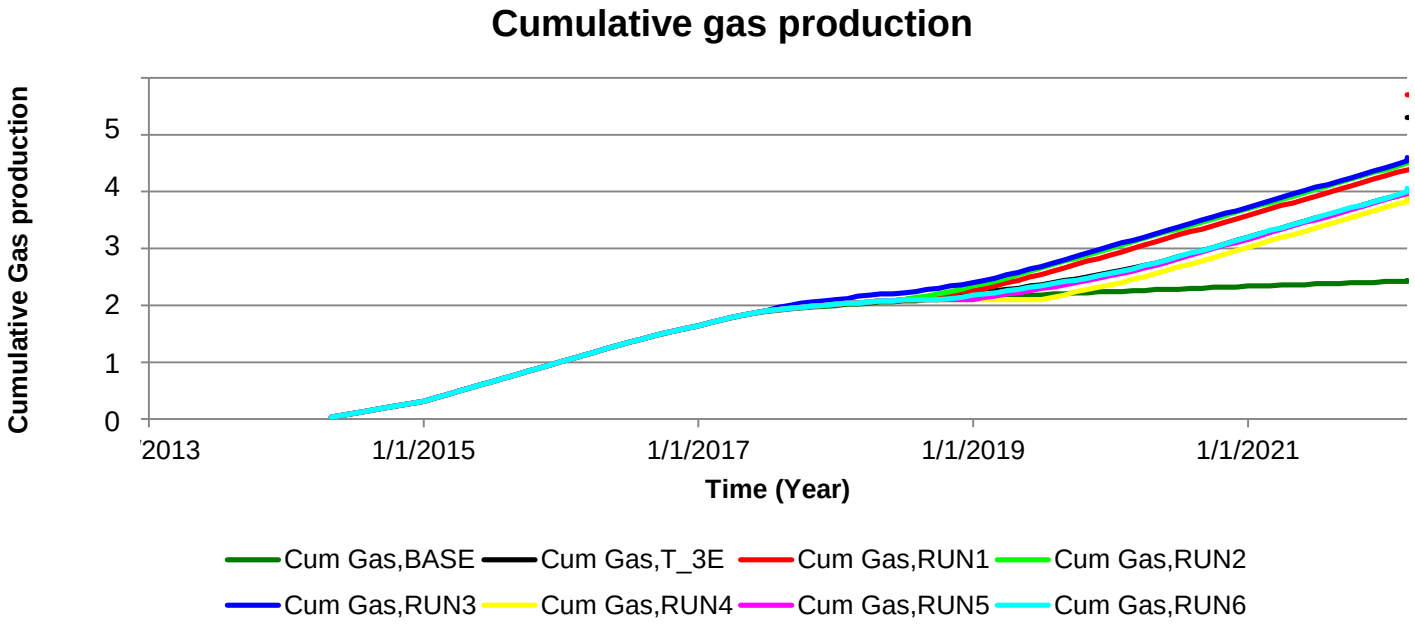
Scenario 1

Scenario 2

2019

2021

SUMMARY OF SIMULATIONS



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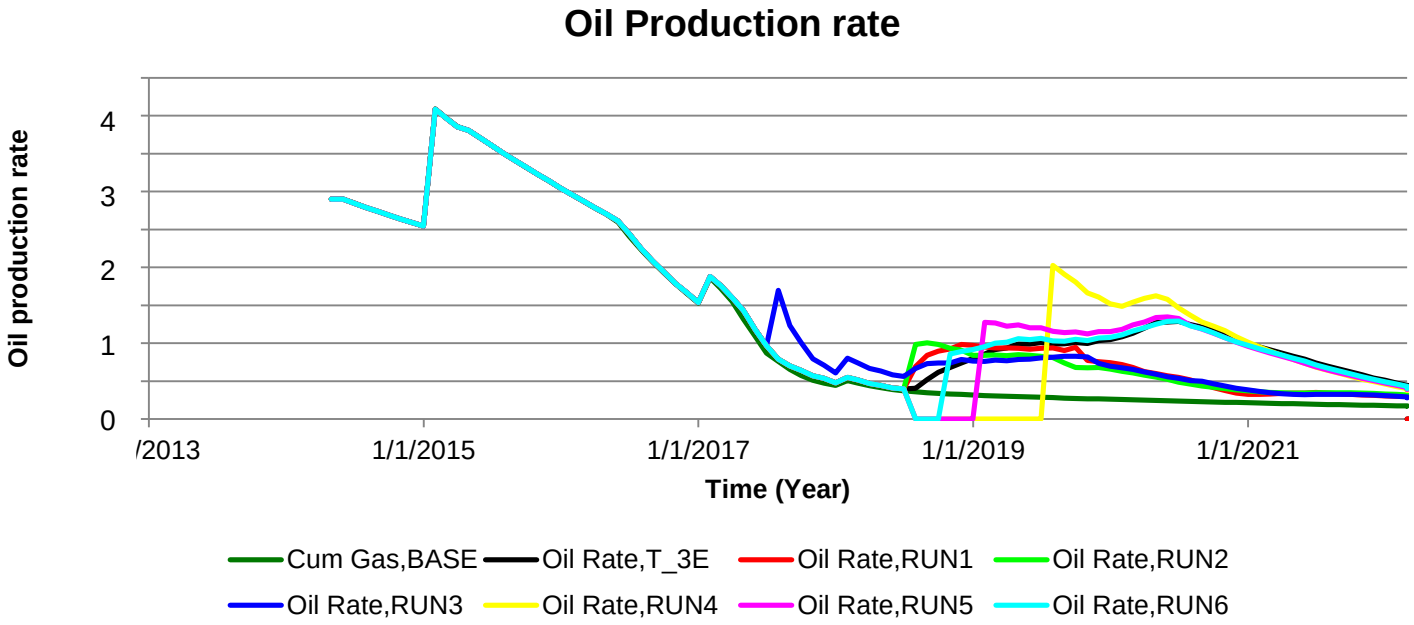

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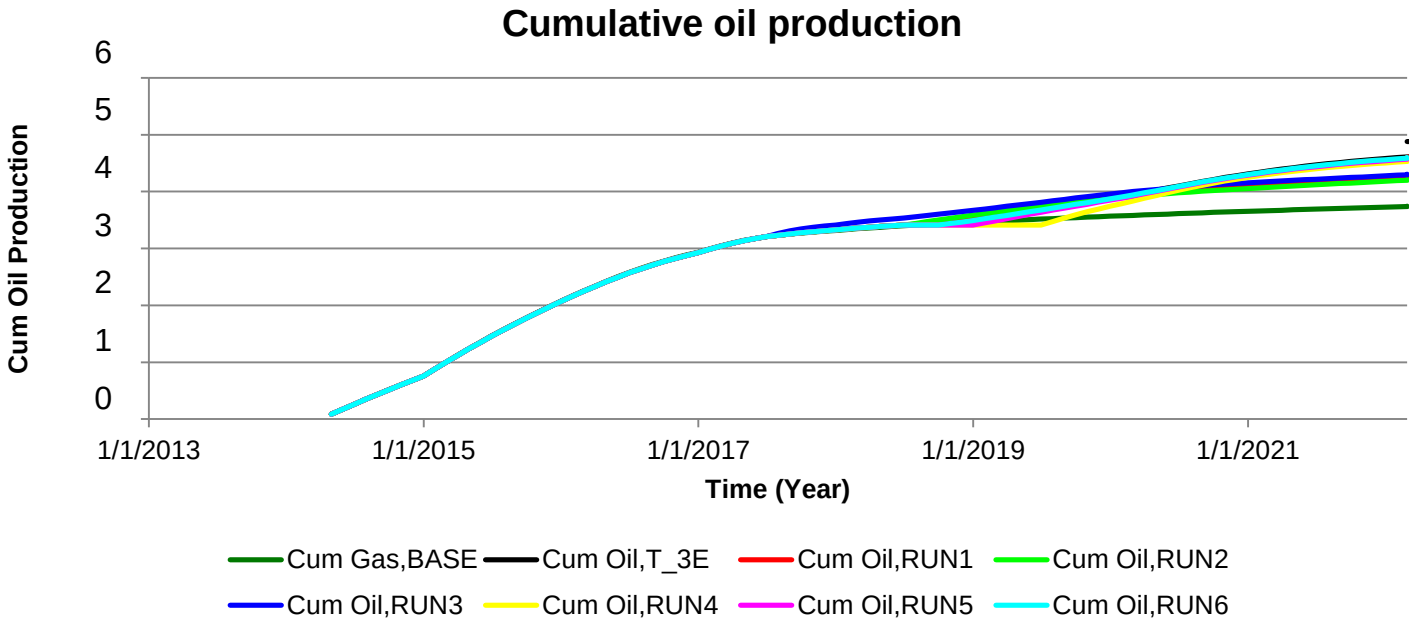

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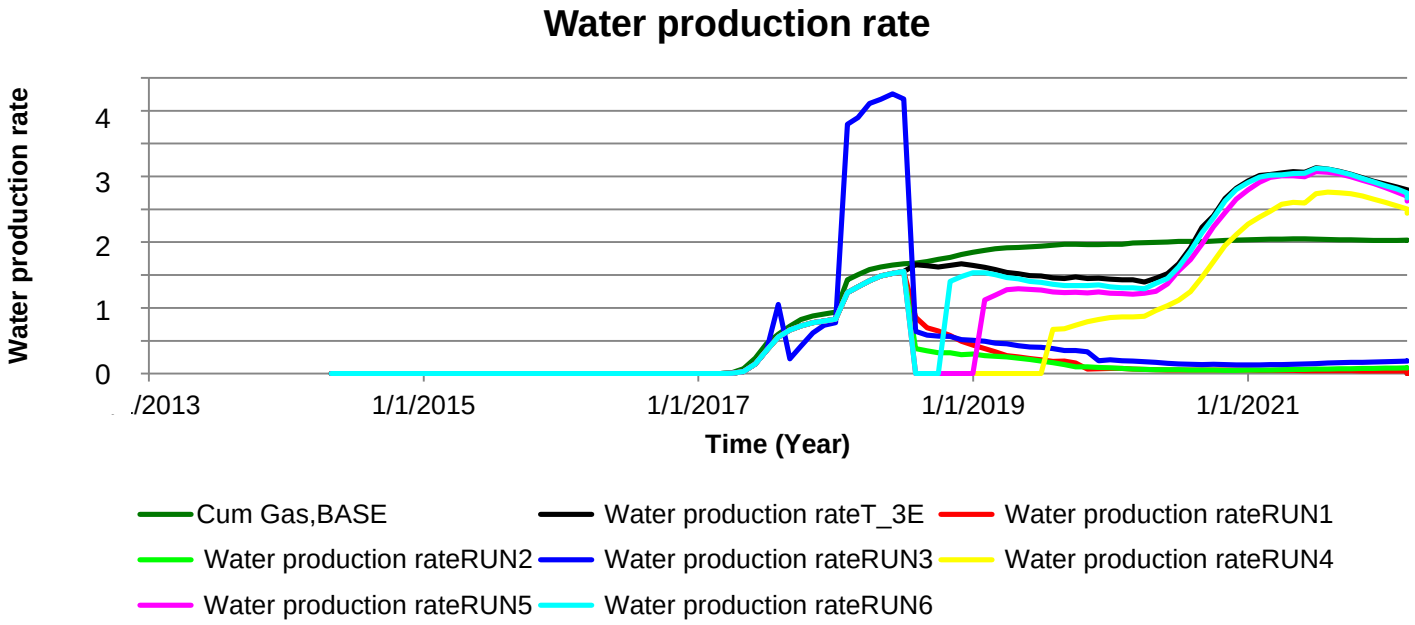

CONCLUSIONS

- CO_2 injection to start *after* primary production is completed
  - After injection starts, ‘immediate’ breakthrough of CO_2
  - High cost of separating CO_2 – CH_4
  - Earlier start of injection: loss of sales gas
- Additional volume of condensate produced ~20%
  - Compared to regular production

- After ROAD project completes demonstration phase, Q16-Maas potential buffer for delivery system to greenhouses

THANK YOU FOR YOUR ATTENTION

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