



U.S. and Norway

Joint success in advancing
CO₂ capture technologies

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2004 → 2018 →



Focal areas:

1. Large-Scale Testing of Carbon Capture Technologies
2. CO₂ Storage/MVA
3. CO₂-EOR
4. Crosscutting Research



**Energy Secretaries
Steven Chu (U.S.) and Terje Riis Johansen (Norway)
at TCM, 2009**

Norway's CCS approach

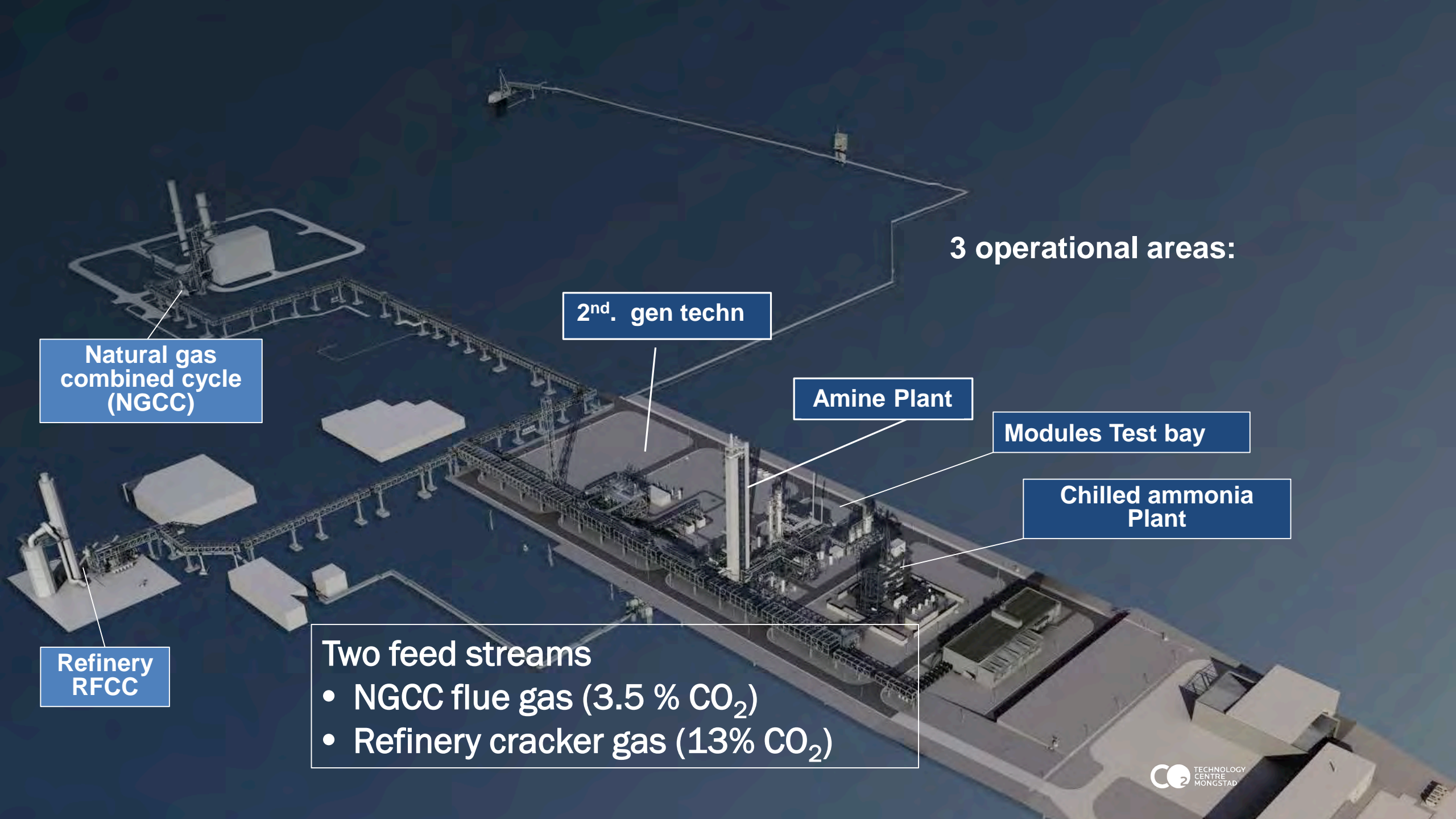




THE NORWEGIAN CCS PROJECT







3 operational areas:

2nd. gen techn

Natural gas
combined cycle
(NGCC)

Amine Plant

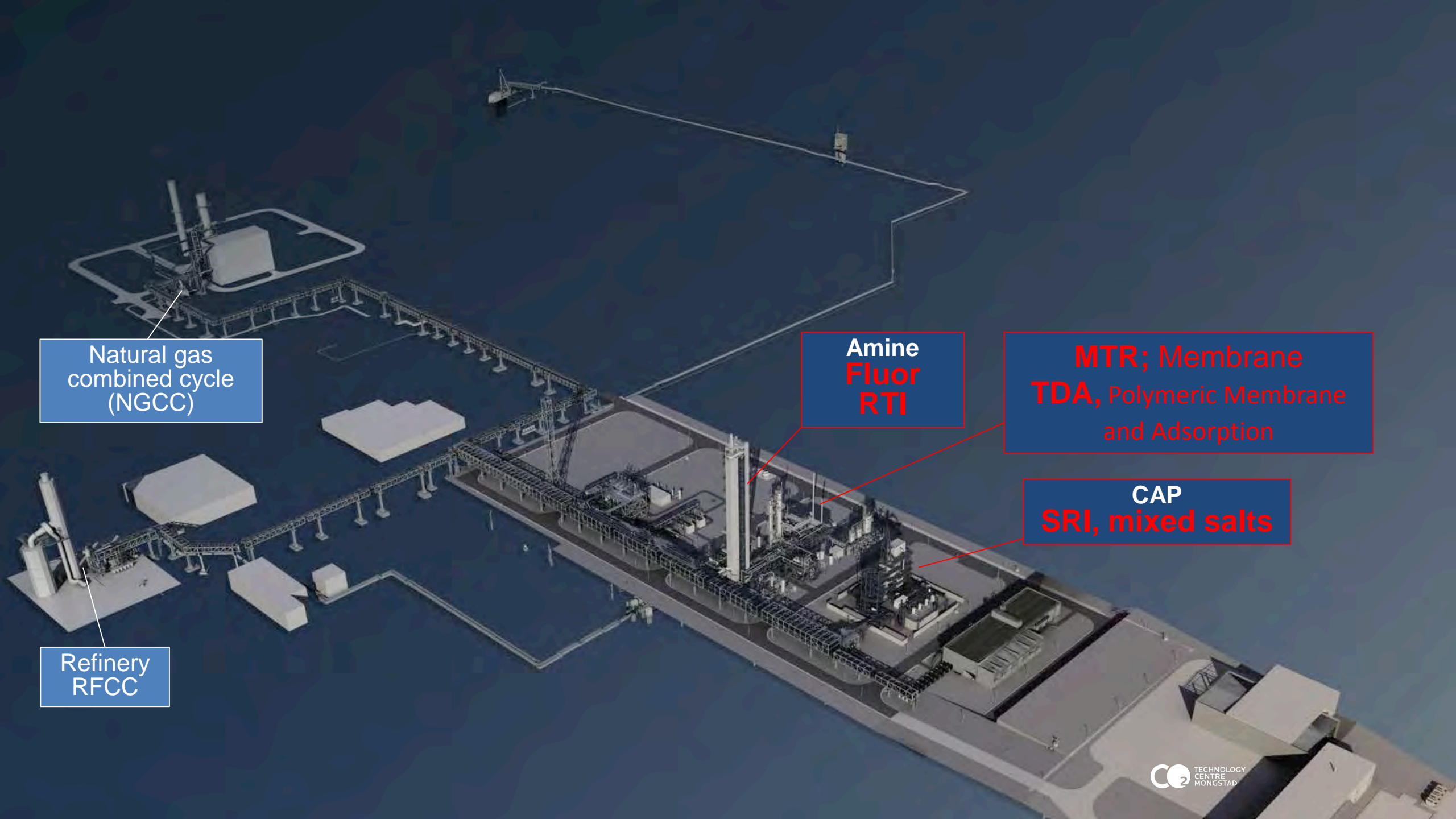
Modules Test bay

Chilled ammonia
Plant

Refinery
RFCC

Two feed streams

- NGCC flue gas (3.5 % CO₂)
- Refinery cracker gas (13% CO₂)



Natural gas
combined cycle
(NGCC)

Refinery
RFCC

Amine
Fluor
RTI

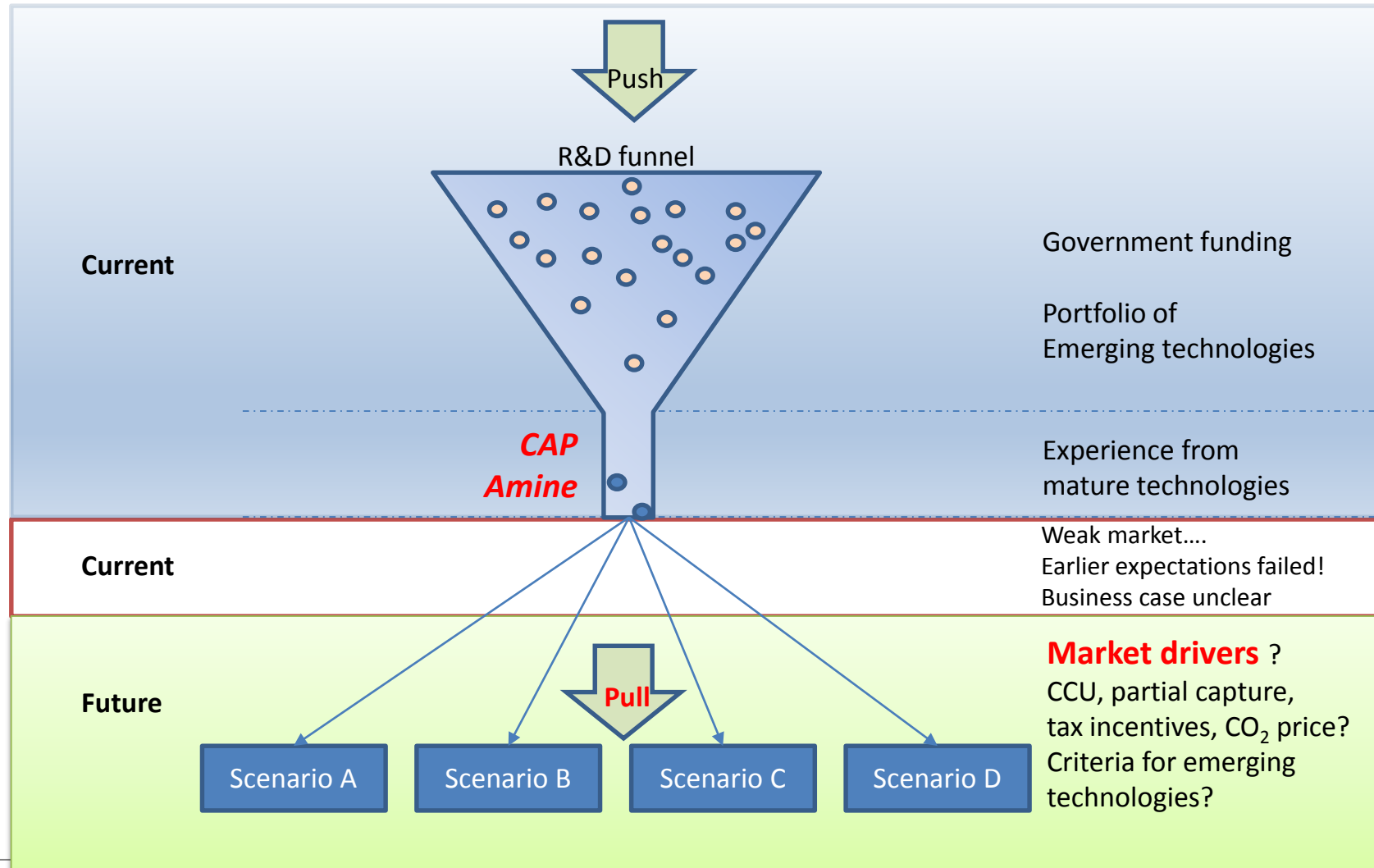
MTR; Membrane
TDA, Polymeric Membrane
and Adsorption

CAP
SRI, mixed salts





Technology Development



Current view on Technologies

- Execute on technologies supported by DOE/NETL:
 - Fluor: Amine technology
 - MTR: Membranes
 - TDA: Membrane hybrid with sorbent
 - RTI: Non aqueous amines
 - SRI: Mixed salts in CAP plant
- CCSI2-TCM co-operation
- Pursue evolution in amine based technologies
- Assess generic learnings from amines
- Identify emerging technologies, develop TCM capabilities

TCM offering

- **Free plant access**
- **TCM covers operating staff, power, utilities**
 - Available as cost share
- **Technology developer covers:**
 - Own costs
 - 3rd party costs: labs, verification
 - Plant mods to fit his technology
- **Climit funding → subject to Climit criteria**



**Welcome to Norway
- and to TCM!**

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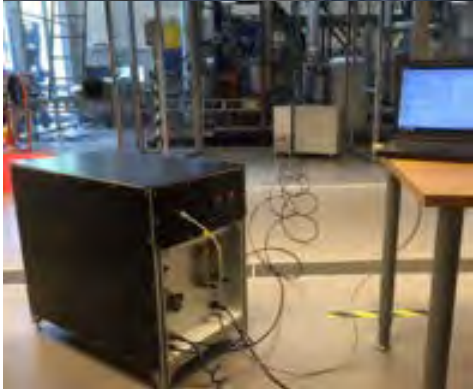
Project Cooperation USA-Norway

Jørild Svalestuen

Pittsburgh, August 2018

CLIMIT

POWERED BY GASSNOVA AND THE RESEARCH COUNCIL OF NORWAY



CLIMIT – The Norwegian National CCS Funding Programme

- Annual budget approx. 24 Million US\$
- Continuous RD&D funding of CCS since 1996

Project examples USA/Norway

RTI/SINTEF & RTI/Norcem

- Non-Aqueous Solvents
- Solid Sorbents

ION Engineering / SINTEF

- Online Process Monitoring

Air Products/NTNU

- Membranes



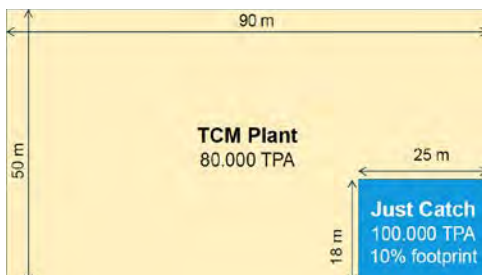
Trends within Technology Development



Just Catch
(18 x 25m)

- Compact
- Cost effective

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➤ Modularization

Event in 2017 at NETL-LL, co-sponsored by NETL and Gassnova

➤ Process Intensification

➤ Solvent/Sorbent Management and Environmental Issues





Requirements to projects with USA - Norway cooperation

High scientific quality
Commercial potential
Value creation in Norway

New funding opportunity; USA part of ACT

International cooperation as a tool for accelerated commercialisation of CCS technology

Established by the European Commission

11 countries cooperating, including USA

Joint calls

Knowledge sharing

8 ACT projects started 2017

New call June 2018 – up to ~35M USD



ACT

www.act.ccs.eu

The image features a close-up of several purple lupine flower spikes on the left side, with the background showing a soft-focus sunset over a building and trees. The text is overlaid on the right side of the image.

Thank you for your attention

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CLIMIT
www.climit.no