International Perspectives on CCS

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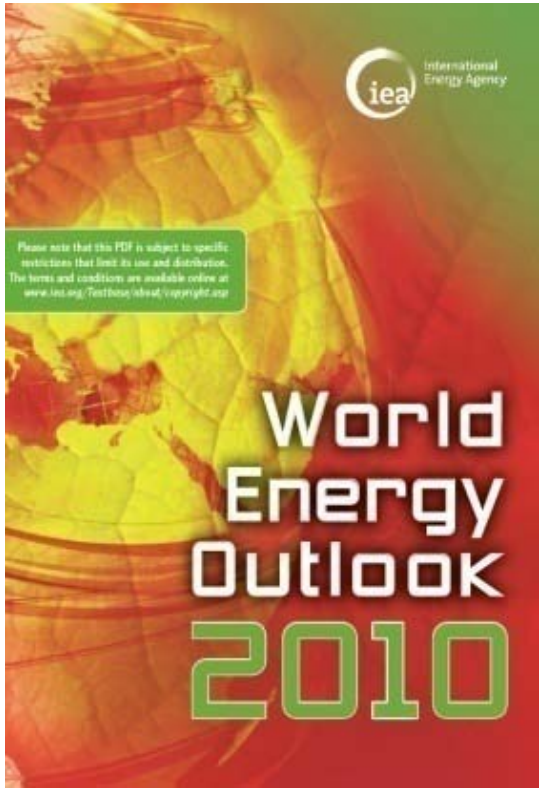
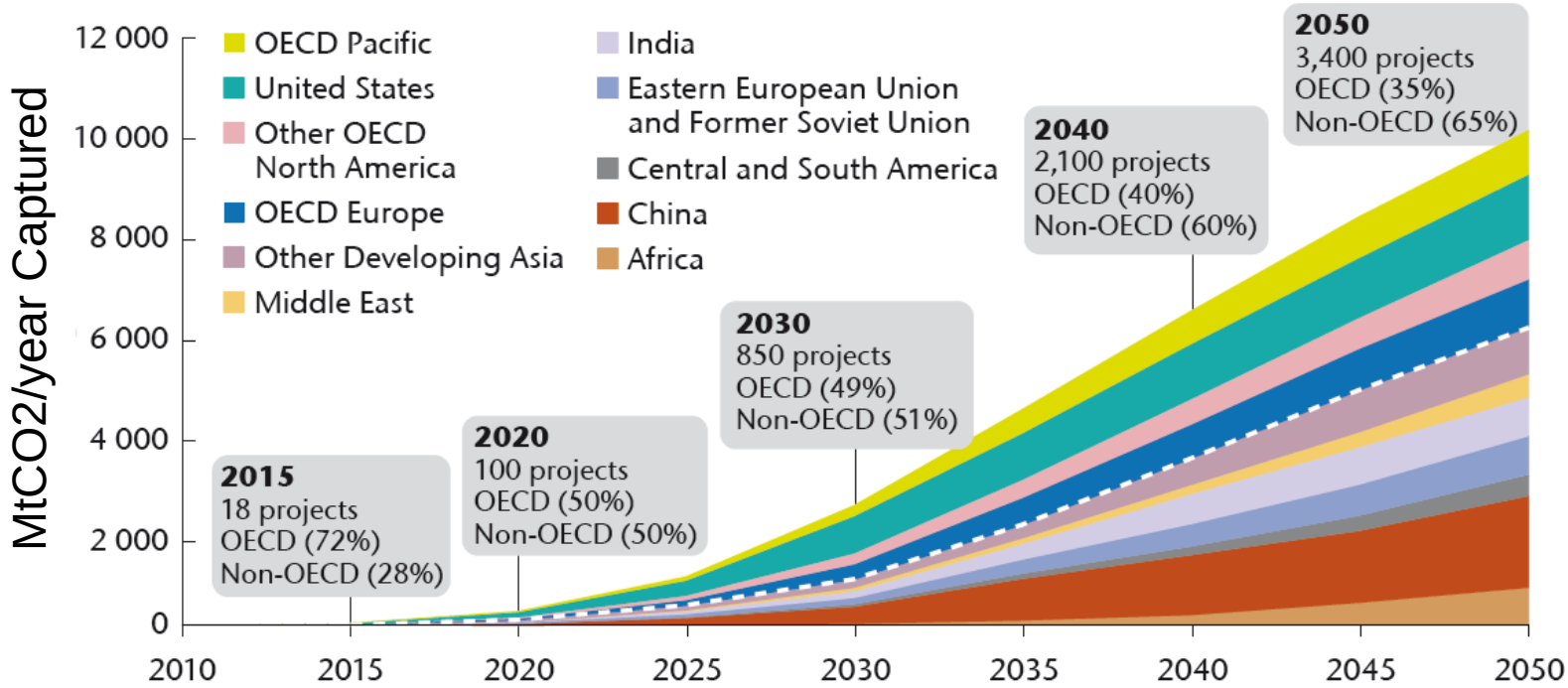
IEA ANALYSIS OF GLOBAL ENERGY TRENDS AND FUTURES

- Energy demand continues to grow: +35% by 2035
- Despite policy action CO_2 emissions continue to grow: 35Gt by 2035
- Current pathway is towards 650ppm
- Role of CCS is very limited under our best known policies…
- …but is absolutely critical under any ambitious climate scenario



An ambitious growth pathway



OECD regions must lead in demonstrating CCS, but the technology must quickly spread to the rest of the world

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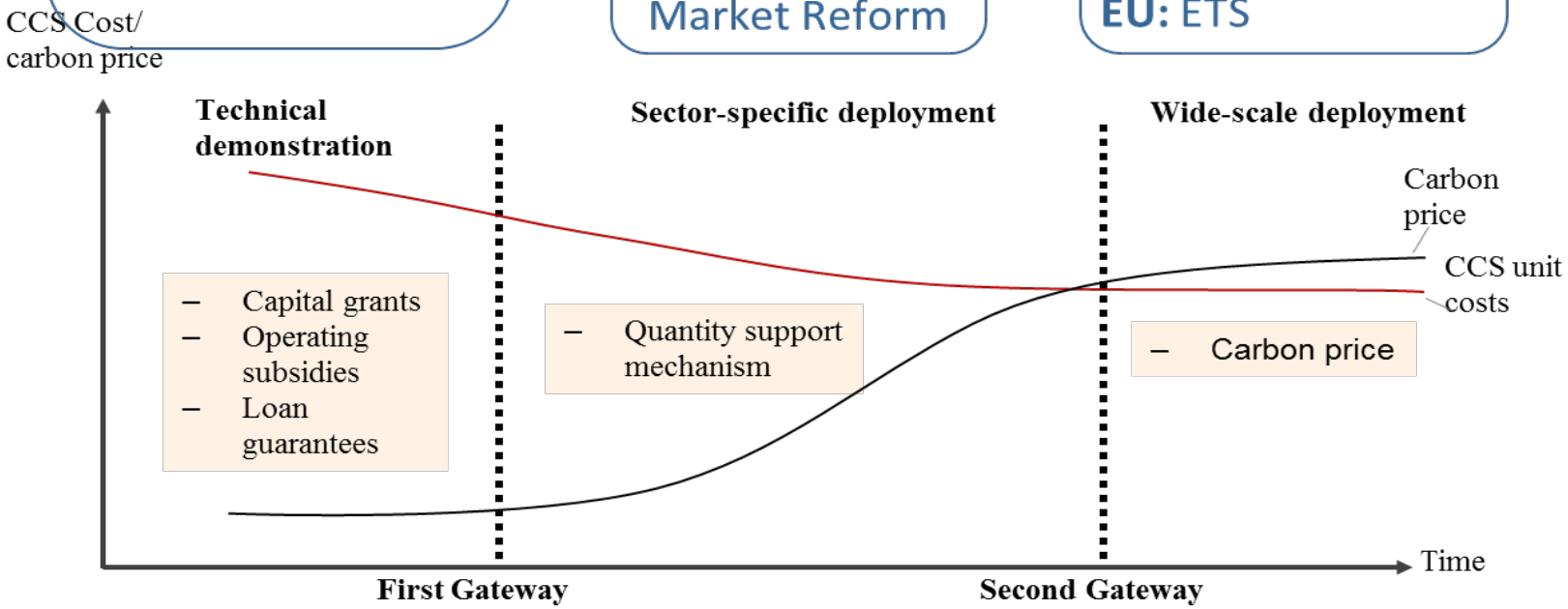
Need to Incentivise CCS

US: Demo funding
EU: NER300, EEPR
AUS: Flagship pr.
UK: CCS competition
NO: Mongstad
Etc..

UK: 2011 Electricity Market Reform

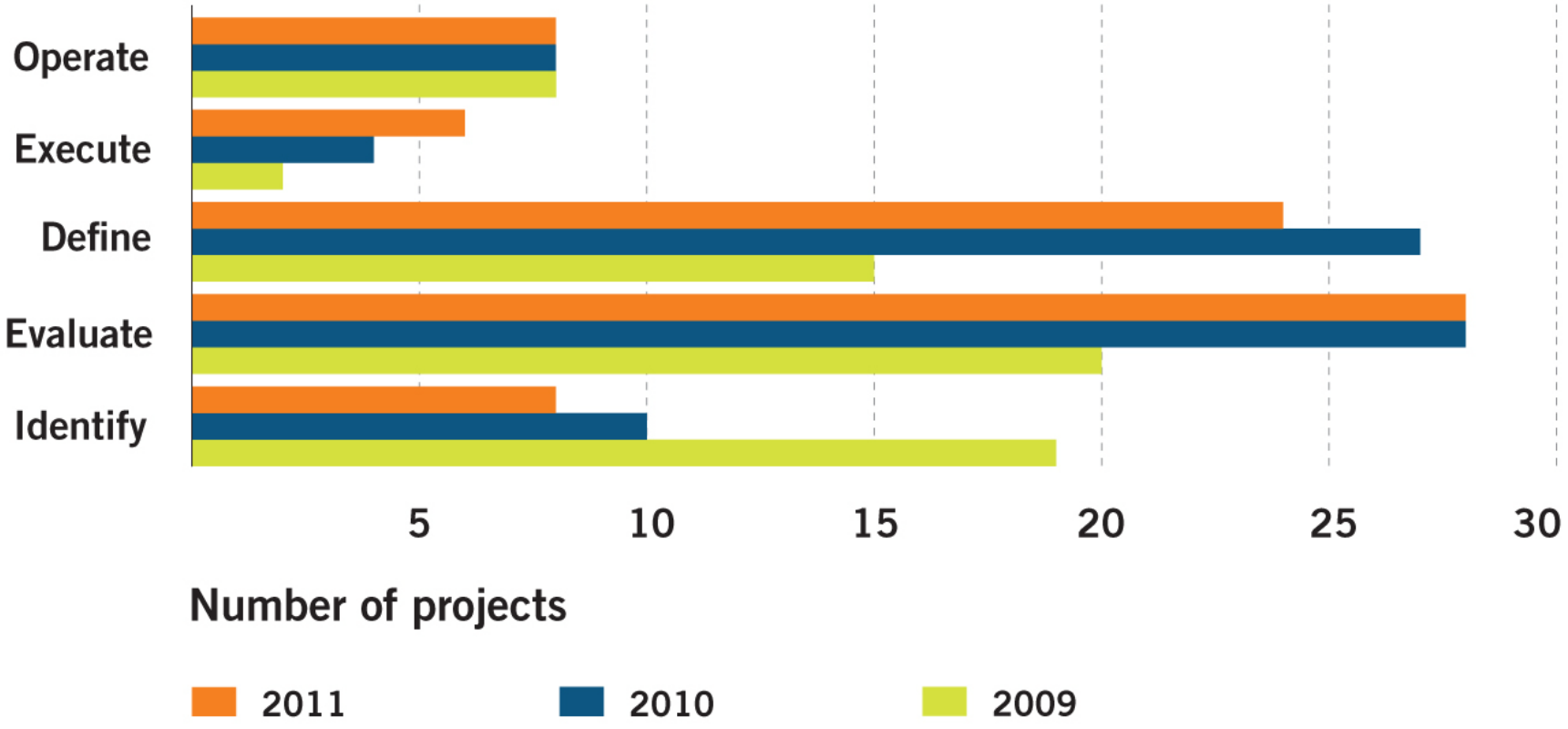
NO/AUS: Carbon tax
US: EOR projects
EU: ETS



– Technical feasibility
– First cost threshold
– Availability of firm storage capacity

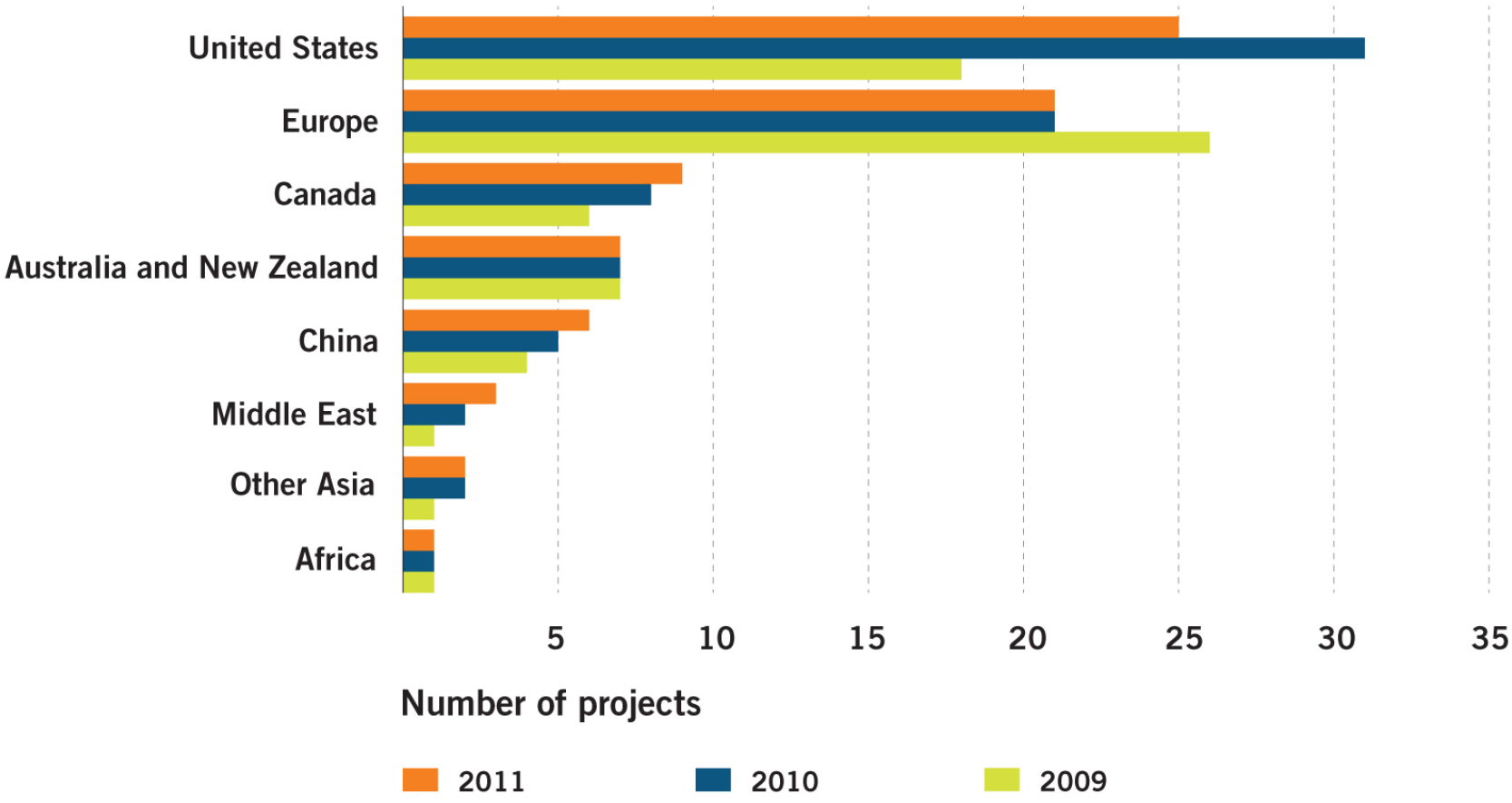
– Further cost reductions
– Infrastructure development
– Availability of firm storage capacity

Measured progress of large-scale integrated Projects SINCE 2009



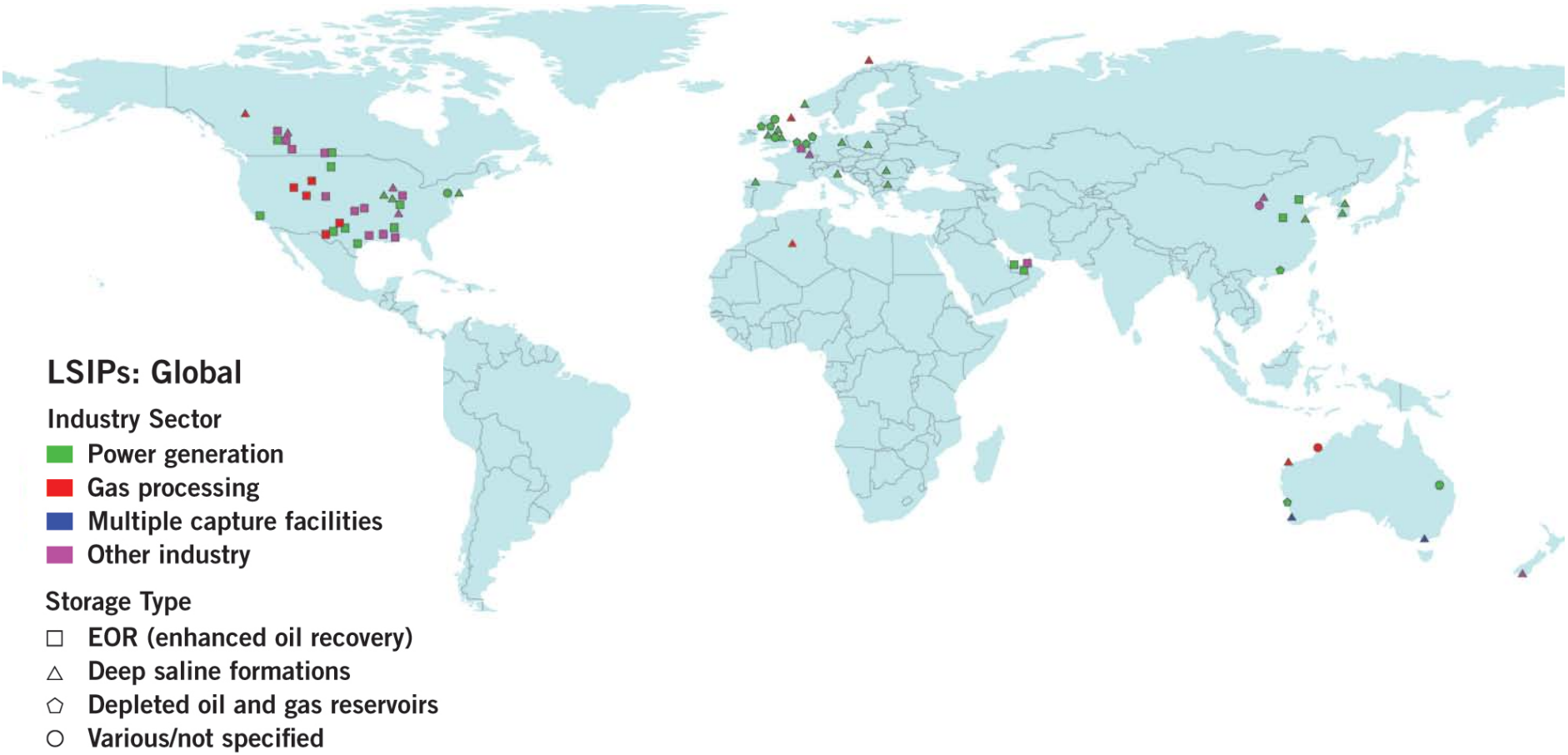
Source: Global CCS Institute, Global Status of CCS, 2011

Project numbers concentrated in the United States and Europe



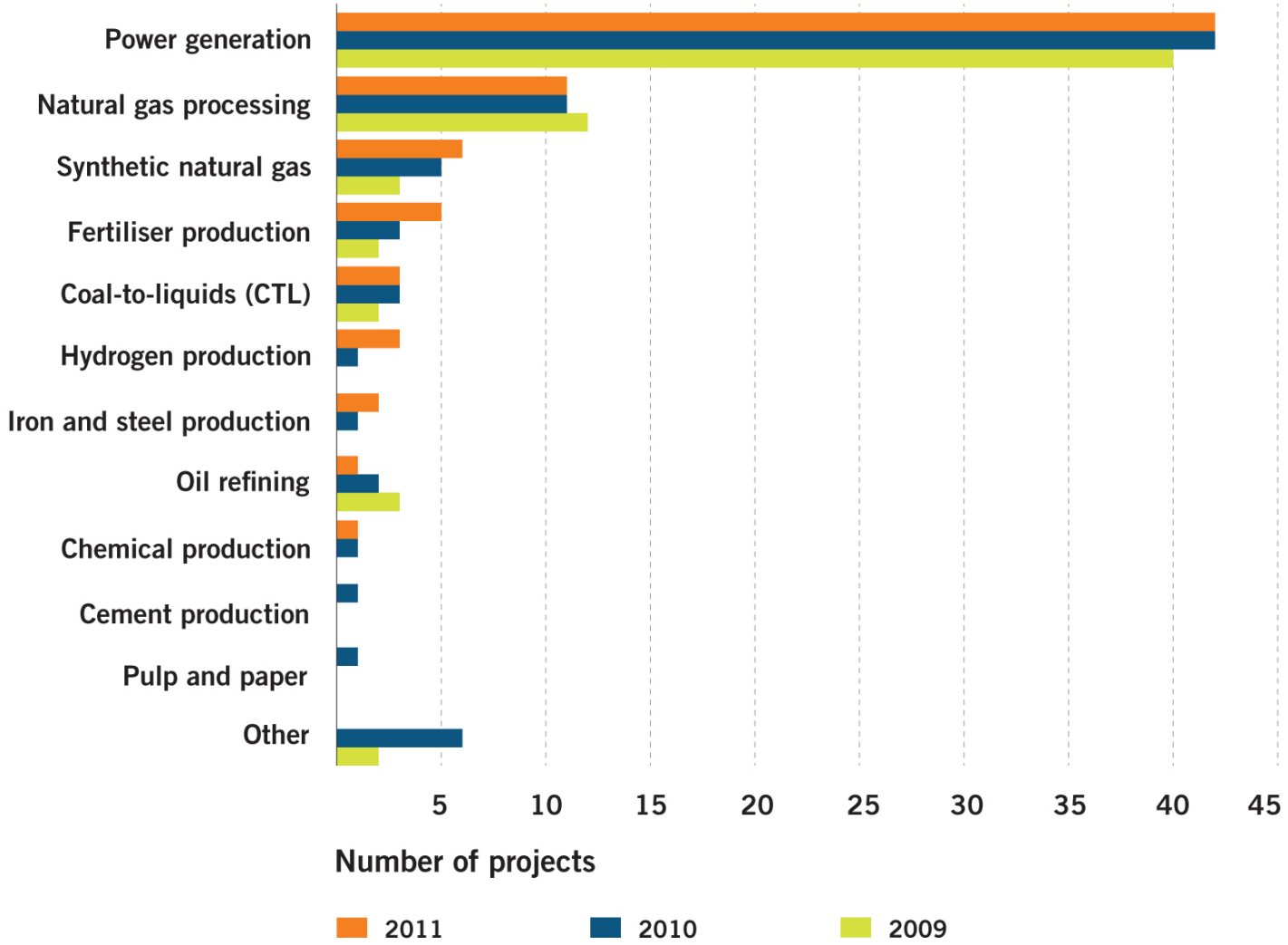
Source: Global CCS Institute, Global Status of CCS, 2011

Global Spread of Projects



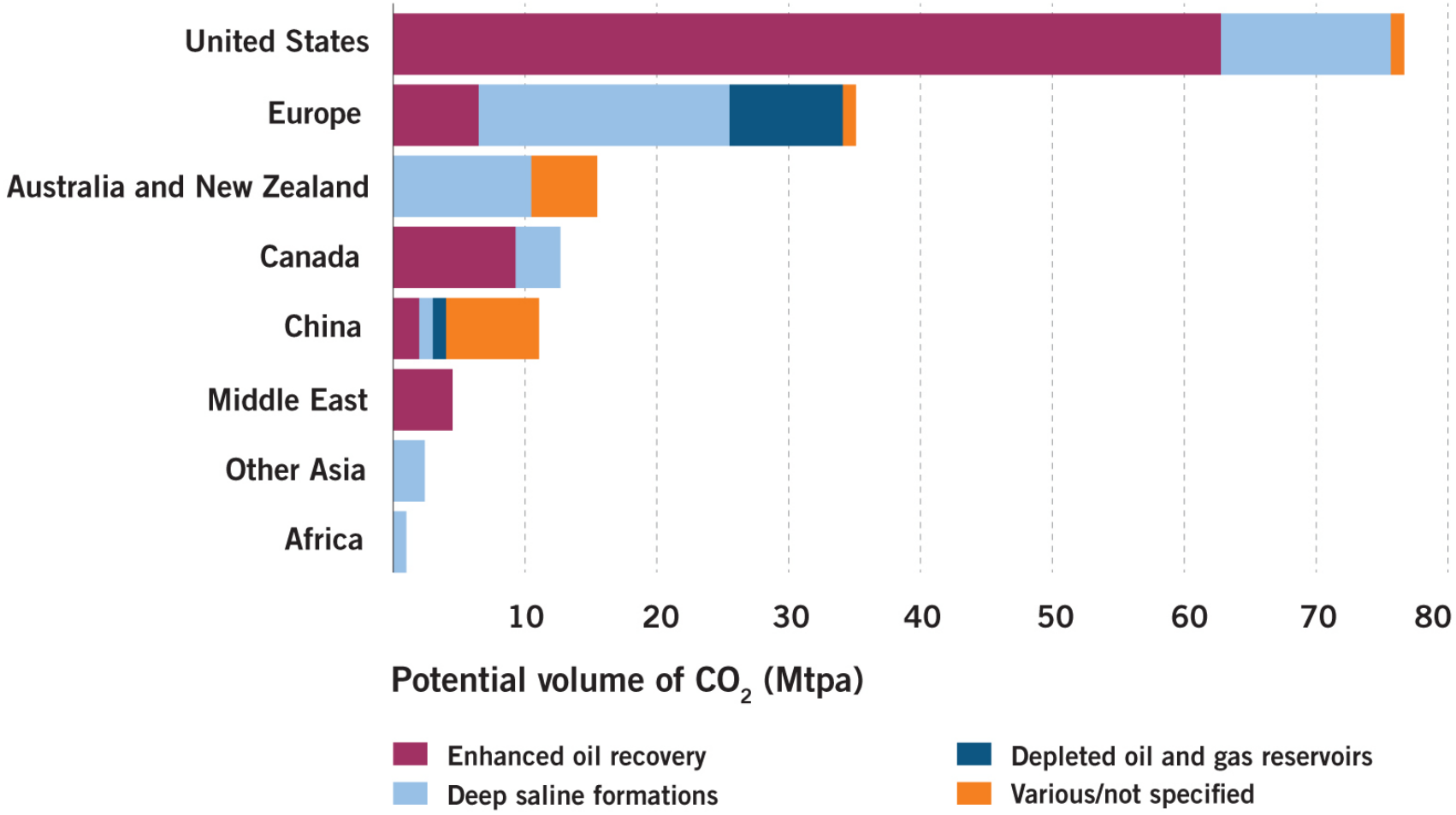
Source: Global CCS Institute, Global Status of CCS, 2011

Concentration on power generation



Source: Global CCS Institute, Global Status of CCS, 2011

Regional bias towards storage selection



Source: Global CCS Institute, Global Status of CCS, 2011

Key messages

- CCS projects are found in a number of applications (often when carbon capture is already part of the industrial process and where already well explored storage locations are available).
- Two power projects are now under construction with the aid of government funding and EOR revenue.
- A number of projects have indicated they could be in a position to decide on a financial investment decision within ~12 months but 'tying a ribbon' around the business case is time consuming and difficult.
- Storage assessments in deep saline formations can have long lead times – needs to be carefully integrated with capture planning.

Why have some projects failed?

- Regulatory uncertainty – in early days
- Investor uncertainty
  - Overcome by Government support for demonstrations
  - Additional support; ETS and EOR price
  - Remains for post demonstration deployment
- Storage resource
  - Availability of suitable local geological resource
  - The “Achilles heel” for CCS
- Stakeholder resistance
  - Perceived or real
  - Affecting Government thinking & creating uncertainity

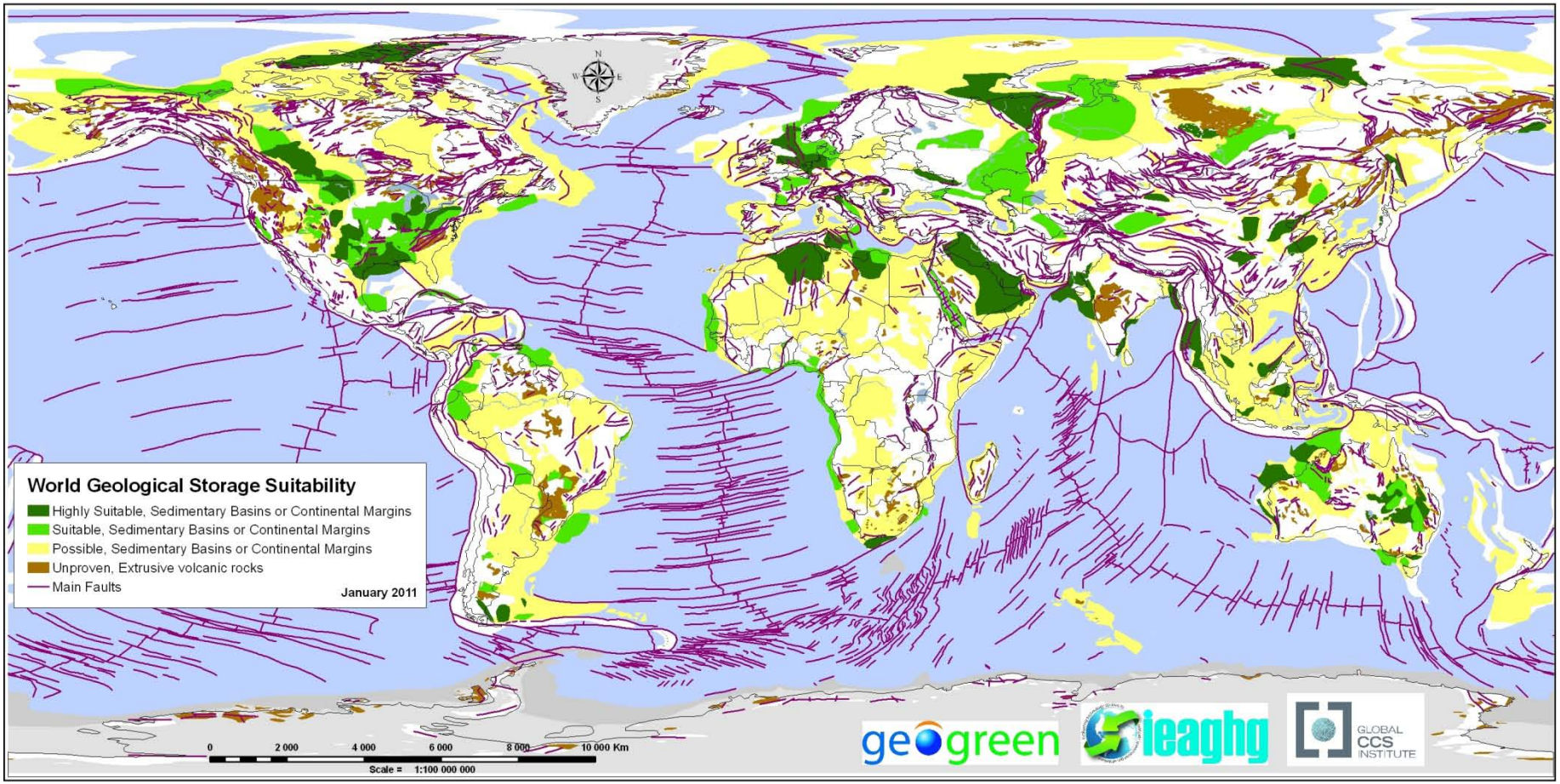
Are we giving ourselves a chance?

- Are funding targets too tight to allow successful project delivery?
  - Feedback from ZeroGen project in Australia
    - To meet Government targets for funding had to following three planning tracks in parallel
    - Storage path failed due to lack of suitable storage resource
    - Whole project failed
  - Advice:
    - Stagger planning
      - » Start storage exploration early
        - – Upfront cost with high risk
        - – Longer project leads times (6-12 years)
        - – But overall decreased project risk
    - Keep a second option - added cost burden

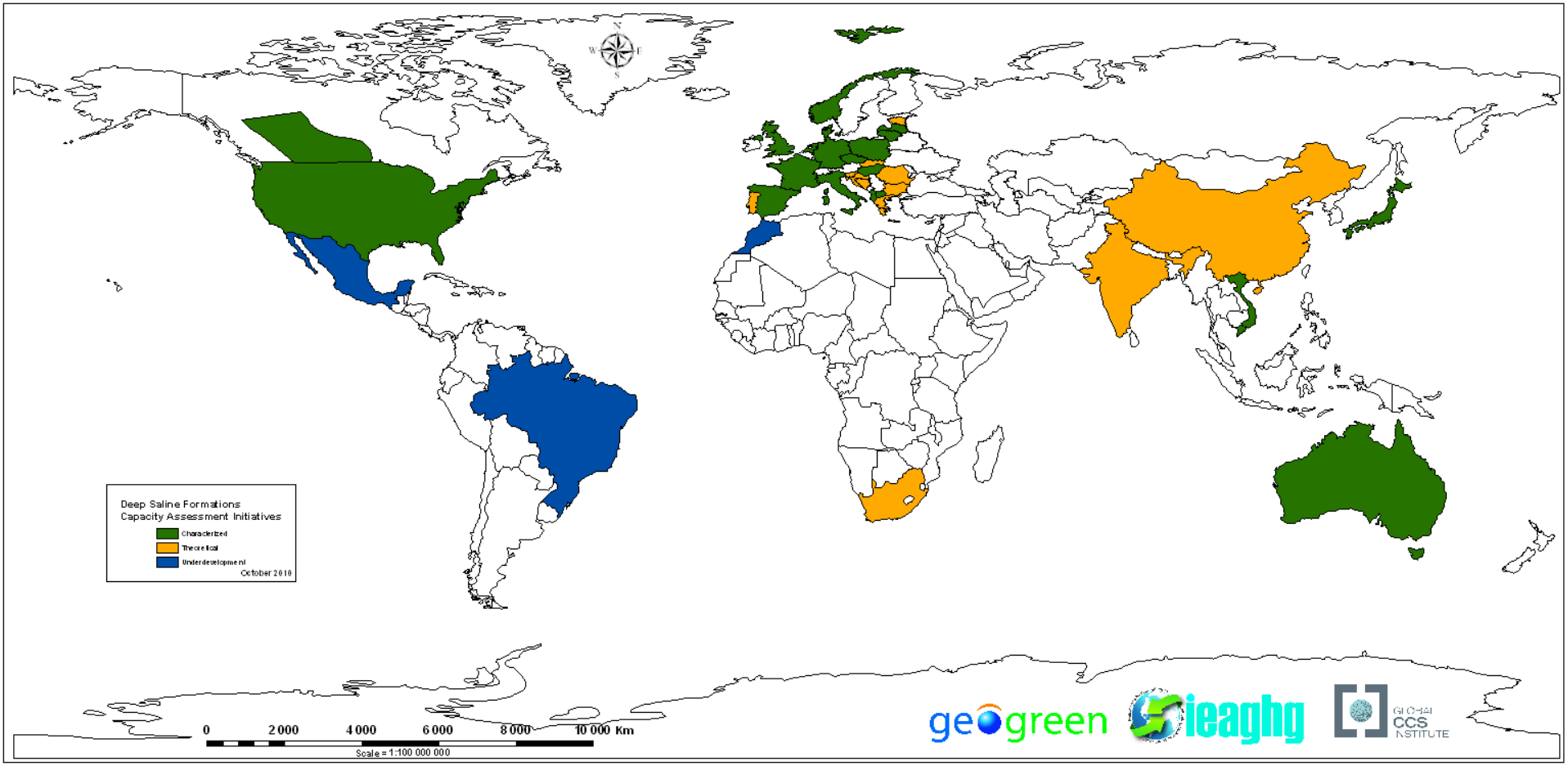
Storage Resource Gap Analysis for Policymakers

- **IEAGHG/GCCSI study**
- Aim of study:
  - Alert policymakers to the scale, cost and timing of the storage resource assessment, required to enable deployment of commercial-scale CCS projects by 2020: 20 projects envisaged by G8 Leaders, and 100 projects in IEA CCS Roadmap

Suitability Map



Capacity assessment initiatives

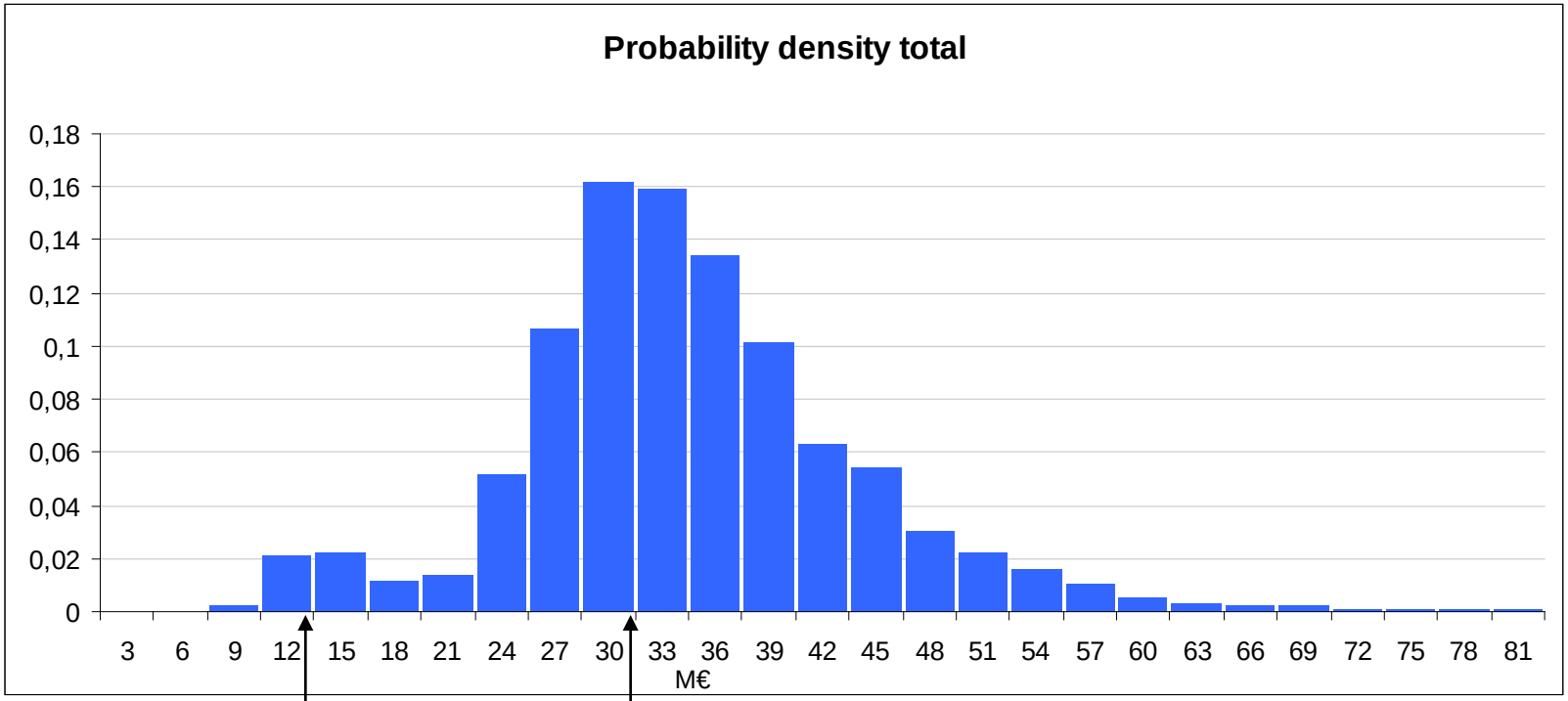


Costs

- Cost models were considered for onshore and offshore storage options both in Deep Saline Formations and Depleted Oil and Gas Fields
- Take account of failed storage sites
- Numerous possibilities for each site to reach a successful path
- Cost models included an assessment of the economic uncertainties of project bankability

DSF European project cost

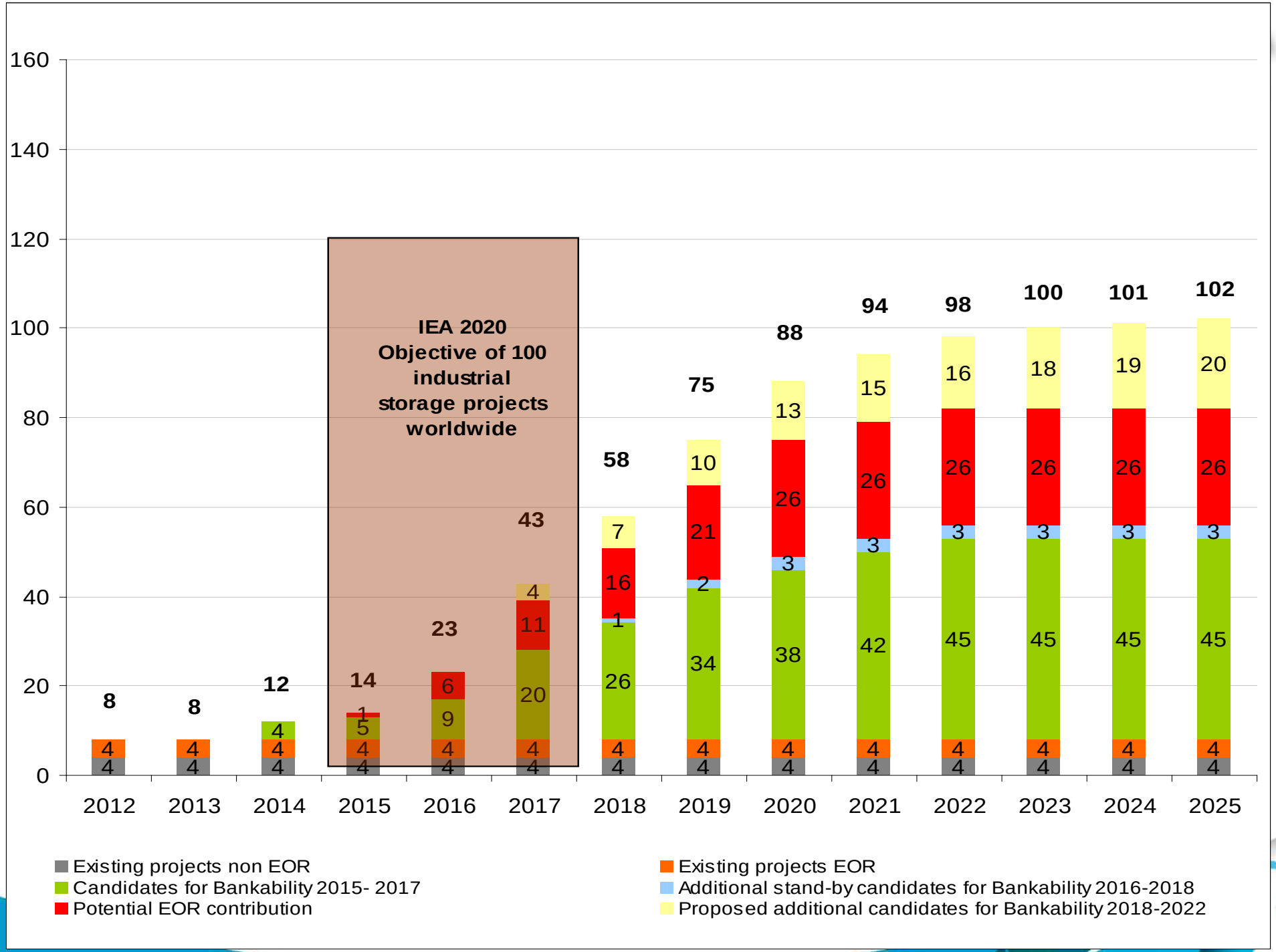
Total cost distribution for onshore bankability for an intensely explored area



Cost of failure

Mean cost

The distributions includes estimated failure costs of data acquisition, wells…


160
140
120
100
80
60
40
20
0
IEA 2020
Objective of 100
industrial
storage projects
worldwide
8
8
12
14
23
43
58
75
88
94
98
100
101
102
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Existing projects non EOR
Existing projects EOR
Candidates for Bankability 2015- 2017
Additional stand-by candidates for Bankability 2016-2018
Potential EOR contribution
Proposed additional candidates for Bankability 2018-2022

Key Conclusions

- G8 objective (20 by 2020) achievable
- IEA desire (100 by 2020) impossible
- IEA desire could be achievable by 2028
- 100 bankable storage projects target require up to €6/$8 billion of investment
- CO2-EOR makes a vital early contribution.

Summary

- The storage resource issue is a primary issue that needs to be resolved
- To ensure CCS projects go ahead we need:
  - More up front investment on stage resource assessment
  - Longer project lead times
- Only if Governments recognise this issue can we make significant progress on CCS deployment globally.

GHGT-11

- Call for papers now open
- http://www.ghgt.info/index.php/Content-GHGT11/ghgt-11-submit-paper.html
- Deadline for abstract submission: 10th Feb 2012

GHGT-11

18th – 22nd November 2012

Kyoto, Japan.

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Thank you

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