



Qualification of injection sites for CO₂

Current status of guidelines and standards

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Why guidelines?

- § They speed up deployment
- § They facilitate knowledge sharing and capacity building
- § They support due diligence at major DGs
- § They help IOC's, NOC's and regulators to get aligned with expectations
- § They build public acceptance through transparency
- § They enable verification of projects



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DNV believes that the ability to perform internationally acceptable verification of CO₂ storage will become increasingly significant in the context of global carbon trading

Verification of storage projects – status overview (1)

§ ISO TC265

- 16 participating countries including China, Japan, Korea, Malaysia, Norway & Australia
- Working Groups for CO₂ i) Capture, ii) Transport, iii) Storage, iv) Quantification & verification, v) Cross-cutting issues
- CO₂ storage is the working group with a head start – based on CSA-Z741-11
- Currently at early stage of development

§ CSA Z741-11

- Bi-national (U.S.A. and Canada) voluntary standard
- Developed by a technical committee and associated working groups comprised of experts from U.S.A. and Canada, with the regulatory environment in these two countries in mind
- Performance based approach, but tends towards prescriptive requirements, especially for wells (USA and Canadian requirements)
- Structured by technical topics that span entire project lifecycle

Verification of storage projects – status overview (2)

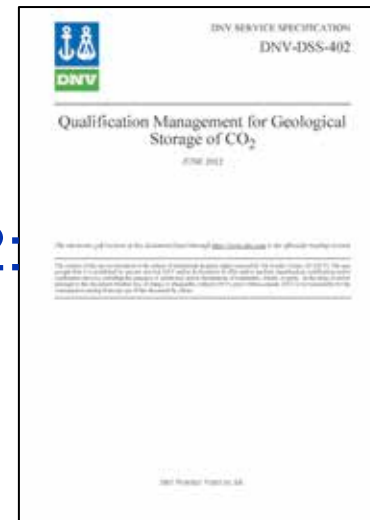
§ DNV-RP-J203

- Evolved from two joint industry guidelines
- Similar approach to CSA741-11 for site characterization and risk management
- Focus on generic permitting process and requirements
- Well integrity guidance purely performance based (also applicable to CO₂-EOR)
- Provides a framework for certification when applied together with DNV-DSS-402, *Qualification Management for Geological Storage of CO₂*
- **Verification or certification can be applied stepwise as a project matures**

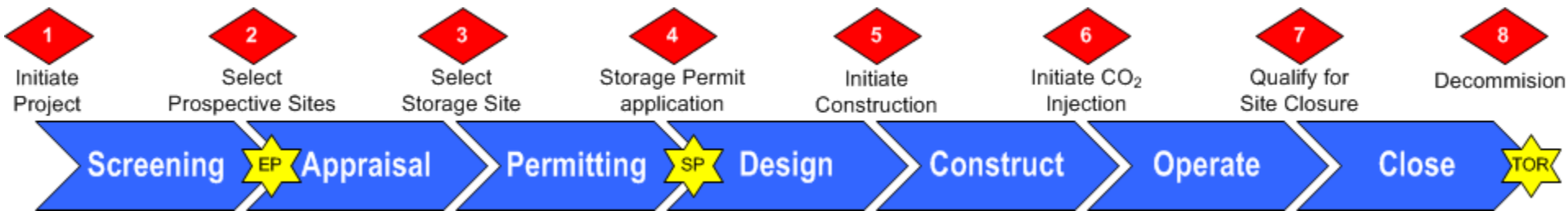
RP-J203:



DSS-402:



DNV Recommended Practice (RP-J203)



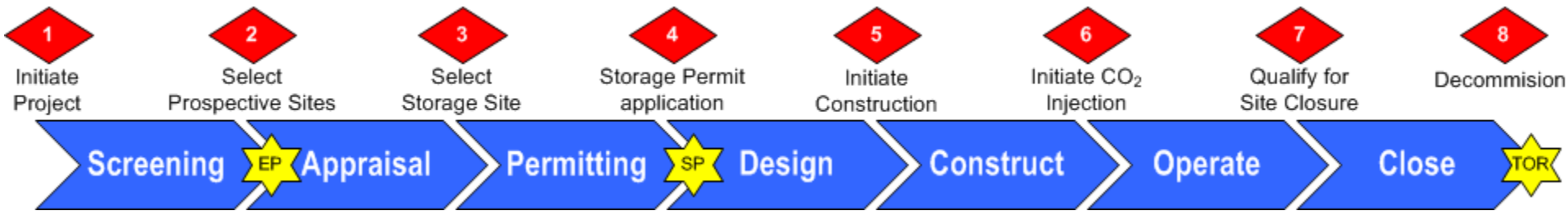
CO2QUALSTORE
 Guideline for Selection and Qualification of Sites and Projects for Geological Storage of CO₂



CO2WELLS
 Guideline for the risk management of existing wells at CO₂ geological storage sites

...not a Euro-centric guideline!!

What is different for an Oil & Gas operator?

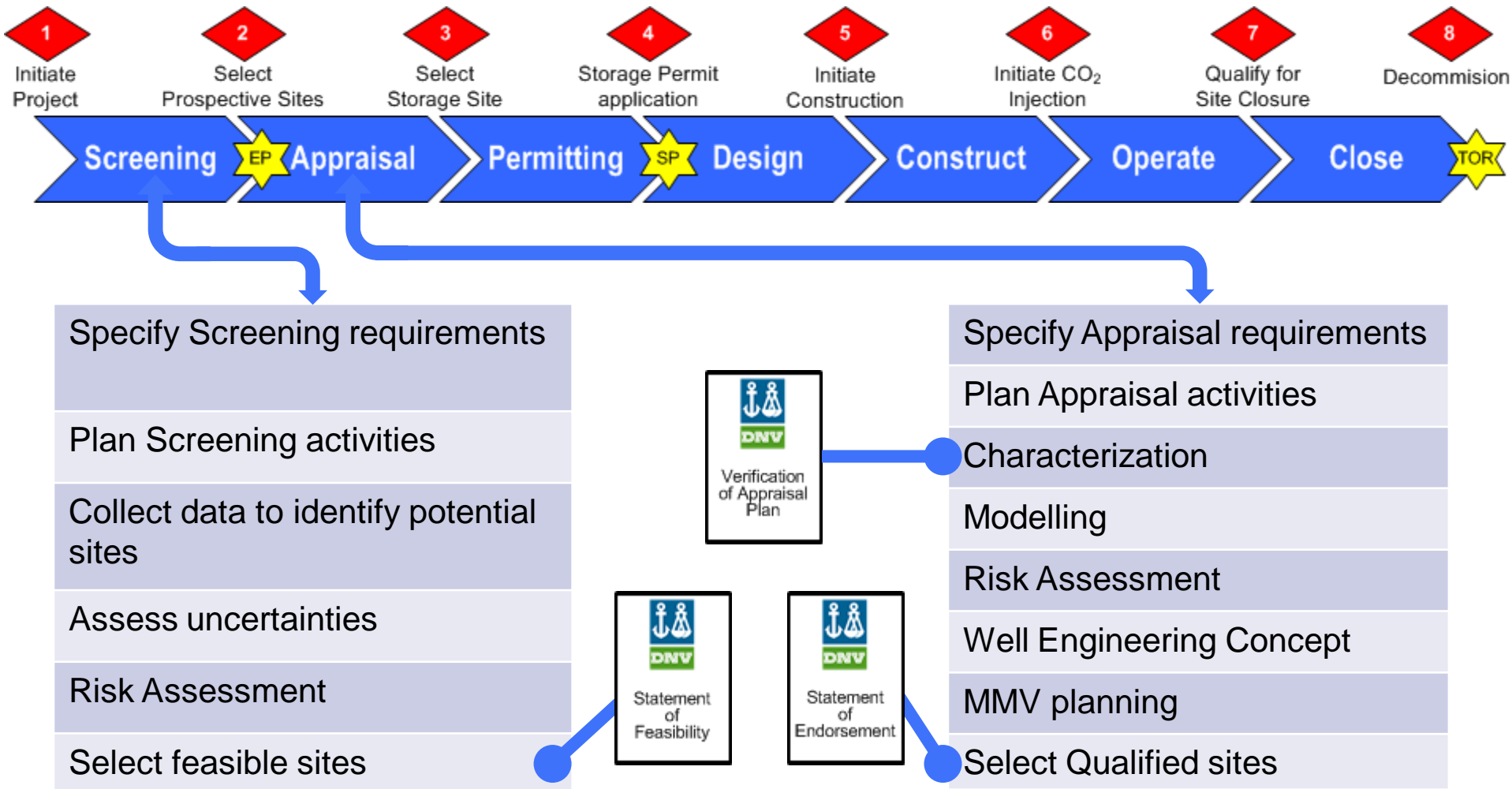


Business as usual: Technical HSE - Cost - Technology R&D - Knowledge Management

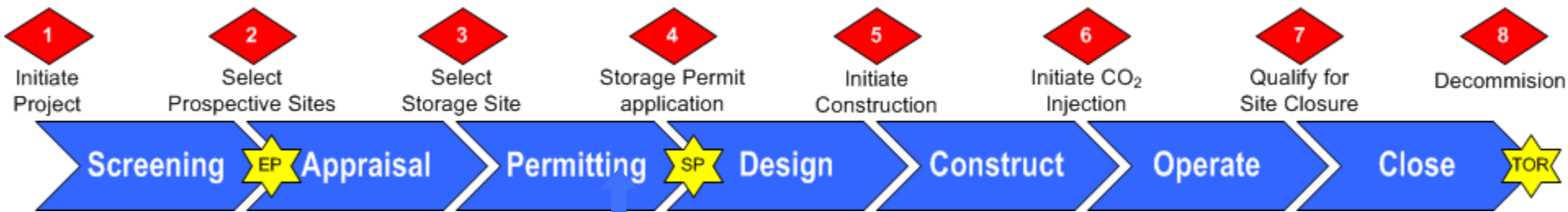
Key differences: Risk Management - MMV - Geochemistry - Geomechanics - Well Integrity



Application of RP-J203 to early stage projects



Guidelines for a CO₂ Storage Permit



Storage Development Plan

- ü Injection & Operating Plan
- ü Environmental Statement
- ü Storage Performance Forecast
- ü Risk Management Plan
- ü Monitoring Plan
- ü Communication Plan
- ü Site closure Plan
- ü Accounting & Reporting Plan



Certification for the QUEST project, Canada

Client

Shell Canada Ltd.

Challenge

Provide assurance to Alberta regulator that the Site Development Plan was fit for purpose and support FID in the JV.

DNV's approach

Two phase verification consisting of facilitated expert peer reviews to assess maturity of five key metrics for the site and the Storage Development Plan.

Value to the client

DNV Statement of Fitness for Purpose helped client communicate that due diligence was applied to ensure that the site and the Site Development Plan was fit for purpose.



Certification for the CarbonNet project, Australia

Client

CarbonNet (Department of Primary Industries, Victoria)

Challenge

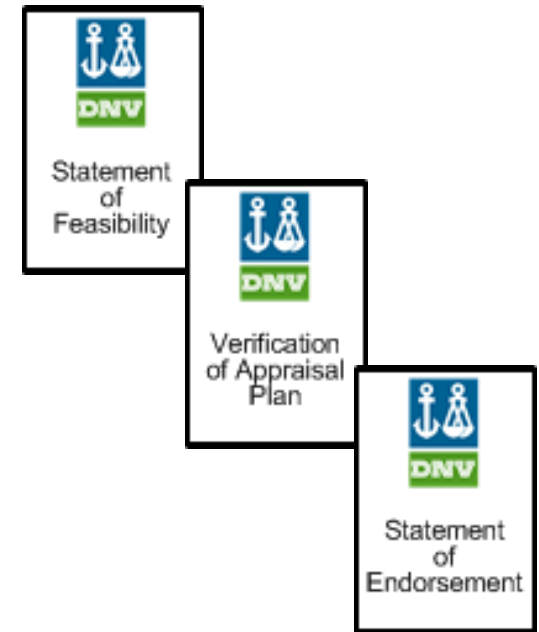
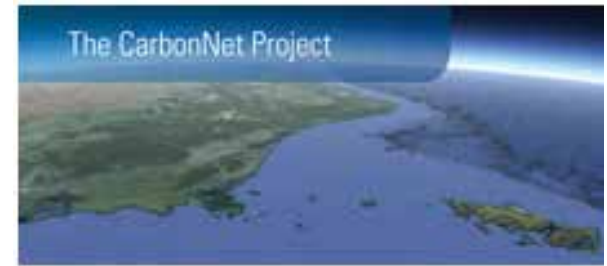
Support application for Greenhouse Gas Injection License by technical due diligence and certification of the storage site qualification process.

DNV's approach

Ongoing certification of Screening and Appraisal activities. Introduced "Verification of Appraisal Plan" step to support investment decision for drilling of appraisal wells.

Value to the client

Independent verification the process used by the CarbonNet project team in the selection of storage sites. Strengthen case for further investment, ensure transparency in process.



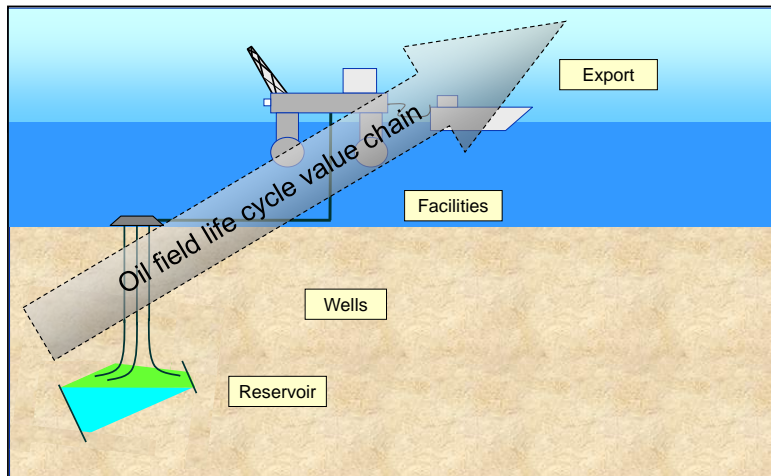
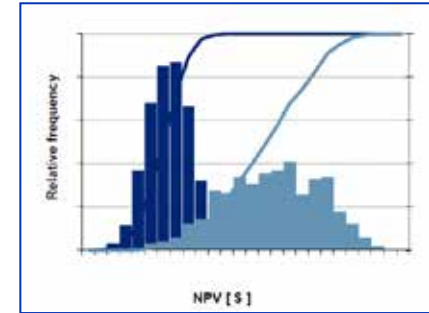
Verification of CO₂ economics

Challenge

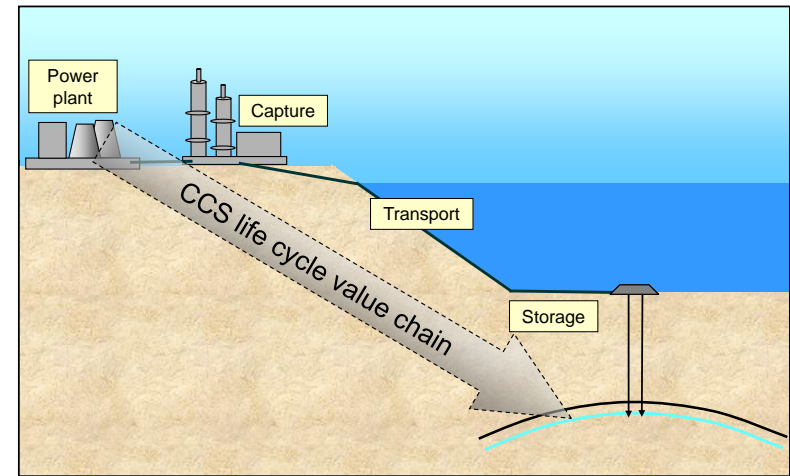
Uncertain future value of CO₂, a lack of cost data for CCS and CO₂-EOR projects, regulations are in flux.

Approach

Value Chain Assessment (VCA) models the complete value chain from CO₂ source to storage, helps to assess alternative development concepts and manage economic uncertainties and risks.



DNV has adopted the established oil field Value Chain Assessment (VCA) approach and methodology.....



.... and developed a VCA tool for decision support services to the CCS and CO₂-EOR industry

Verification of CO₂ safety

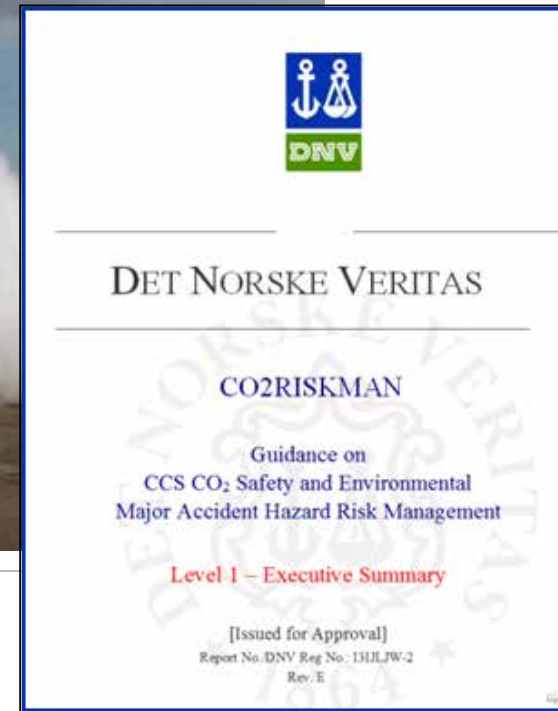
Challenge

Major accident potential, regulations are in flux, there is a lack of reliable reference sources to assist CCS and CO₂-EOR projects.

Approach

Joint Industry Project to specify best practice for hazard management for each part of the CO₂ value chain.

Air Liquide / AMEC / Chevron / Environment Agency / E.ON / Gassco / Gassnova / Global CCS Institute / Health & Safety Executive / IEAGHG / Institute for Studies and Power Engineering / Maersk Oil / National Grid / Petroleum Safety Authority / Scottish Environment Protection Agency / Shell



Verification of CO₂ safety

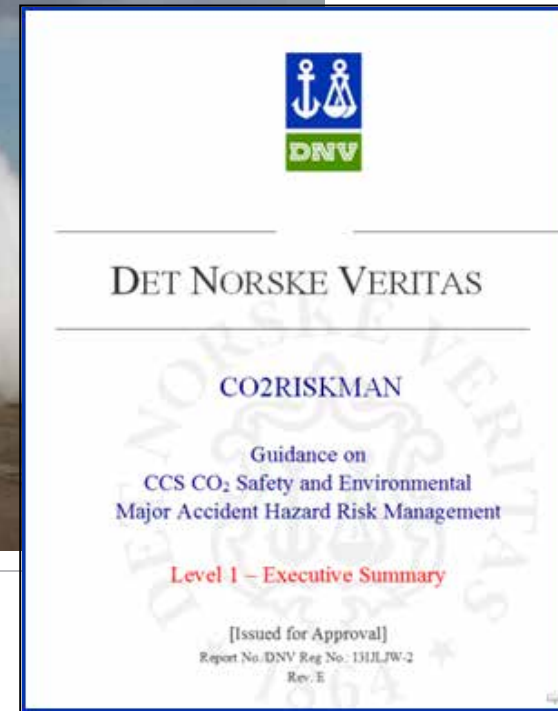
Challenge

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Approach

Joint Industry Project to specify best practice for hazard management for each part of the CO₂ value chain. [New JIP for CO₂+HC mix.](#)

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