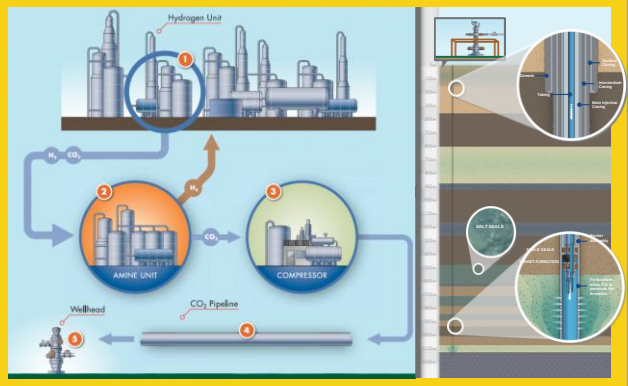
THE QUEST CCS PROJECT



US Energy Association

Washington, DC

September 26, 2012

Shell Upstream International

Bill Spence – Manager Strategic Issues

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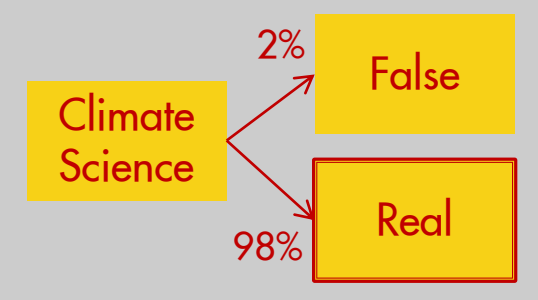
OVERVIEW

- The Corporate Context
- The Shell CCS Programme
- The Quest CCS Project
  - Location, Scope & Funding
  - 'Hardware'
  - Storage
  - Regulator & Stakeholders
- Adding 'Use' to CCS

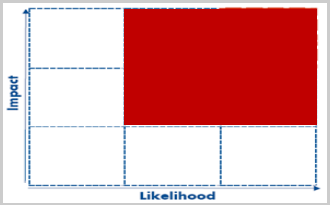
THE CORPORATE CONTEXT



The majority of the science community is in agreement that rising CO_2 levels will result in dangerous climate change

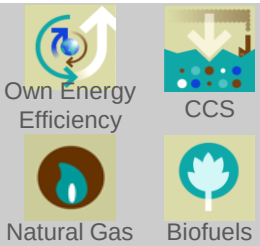
To a 'carbon based' company, this is more risk than opportunity

RDS Risk Matrix



As a result it appears on the corporate risk matrix

Risk Response



We focus upon 4 Pillars in our response to the challenge – Natural Gas, CCS, Biofuels, Own Energy Efficiency

Business Controls

- CO_2 PSVs
- GHGEM Plans
- Control Framework
- Investment Decisions

A short list of business controls have also been implemented

HOW IS THE WORLD MOVING FORWARD?
SHELL ENERGY SCENARIOS TO 2050

SCRAMBLE

Policymakers pay little attention to more efficient energy use until supplies are tight. Likewise, ***greenhouse gas emissions are not seriously addressed until there are major climate shocks***.

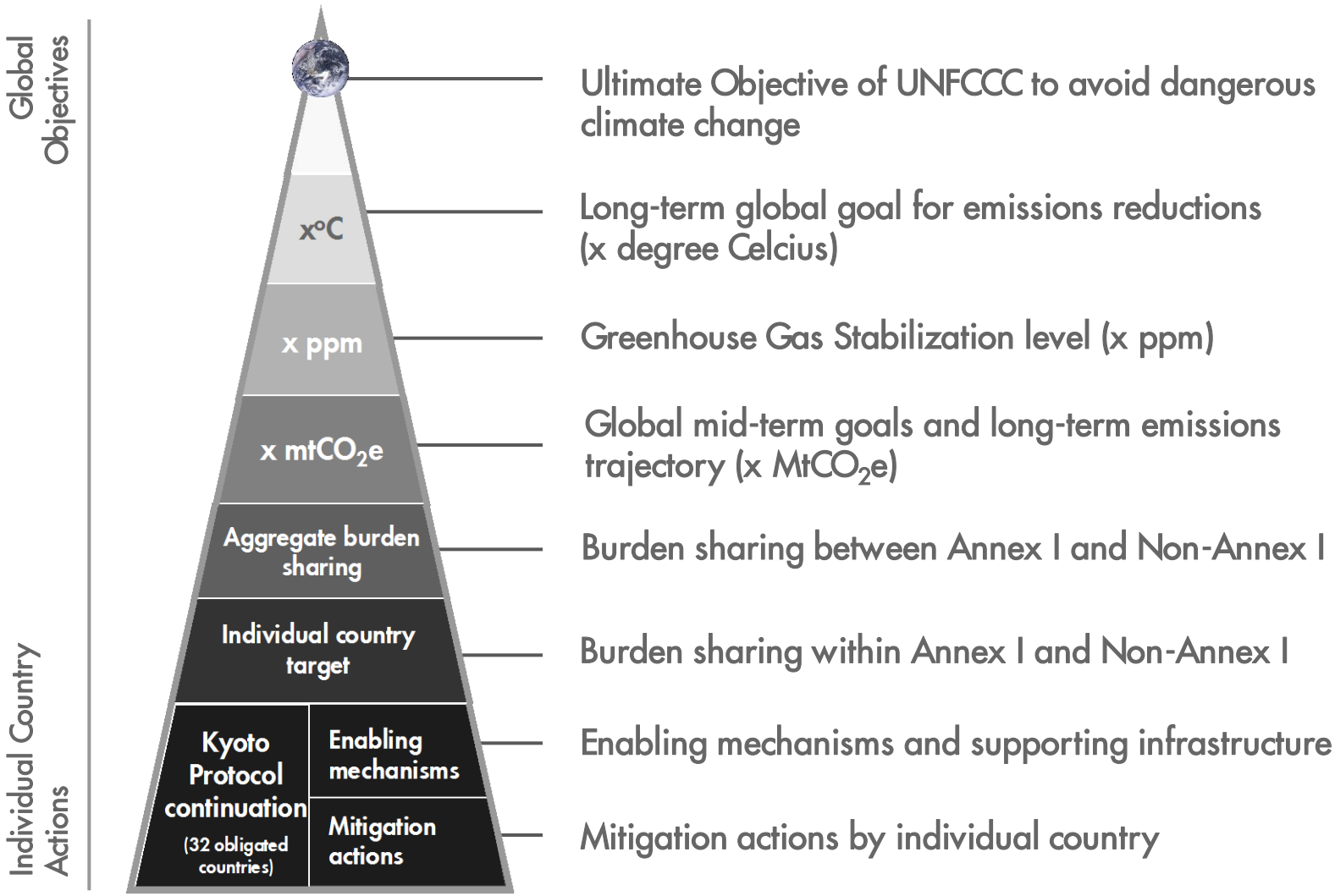
OR

BLUEPRINTS

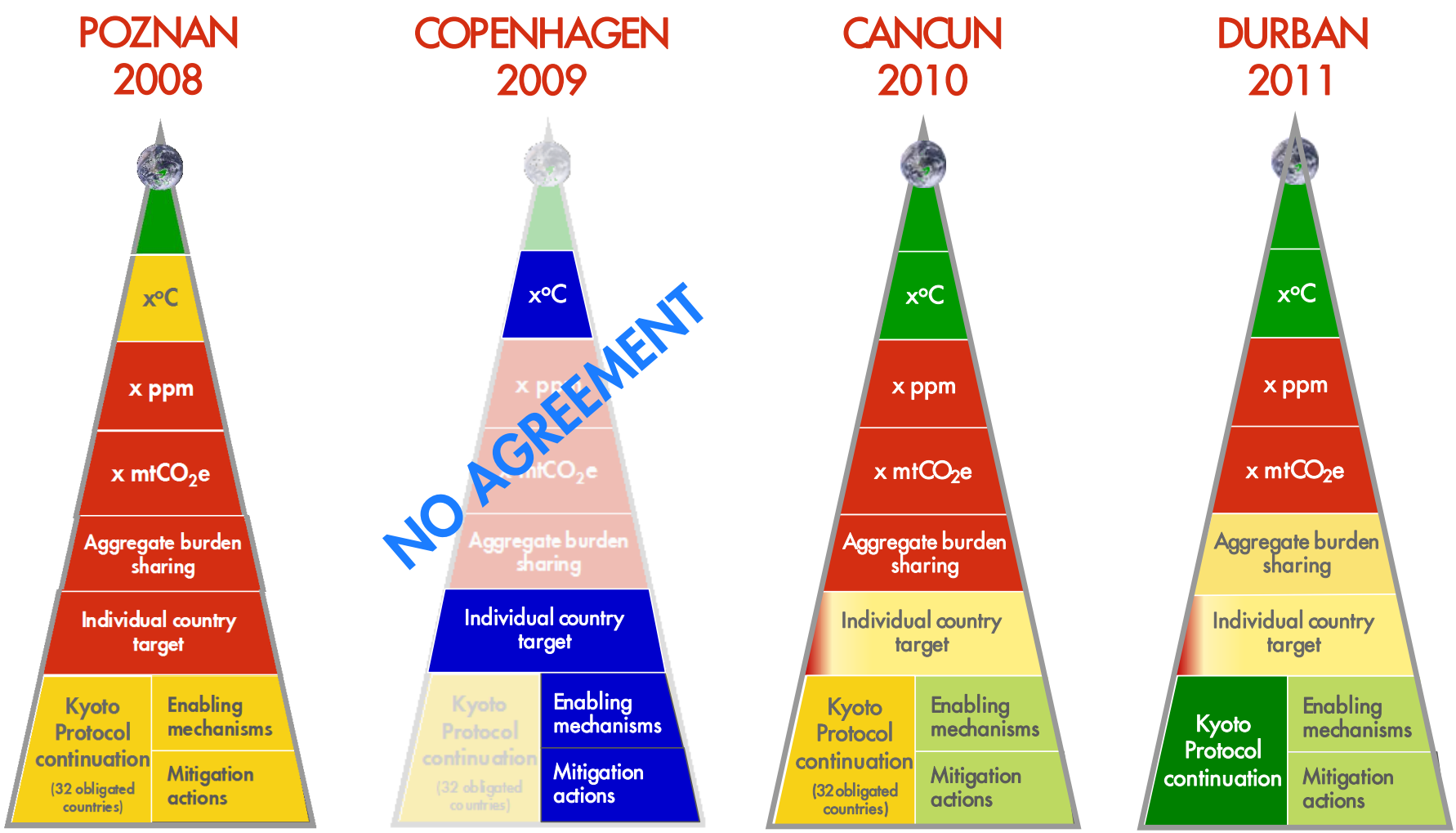
Local actions address the challenges of the economy, energy and environmental. A price is applied to CO_2 emissions giving a huge stimulus to the development of clean energy technologies, such as CCS, and energy efficiency measures. The result is far lower CO_2 emissions.

Regulatory frameworks to encourage lower CO_2 emissions are in place early.

UNFCCC - WHAT ARE THEY NEGOTIATING ABOUT
DIFFERENT ISSUES ARE NEGOTIATED IN PARALLEL

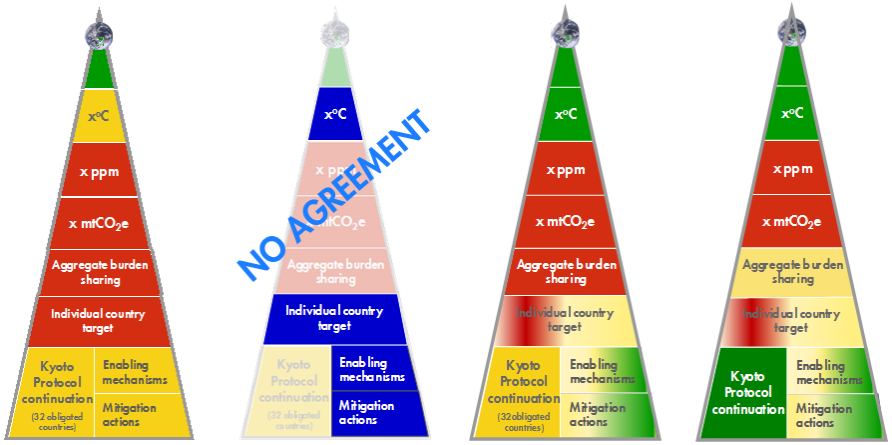


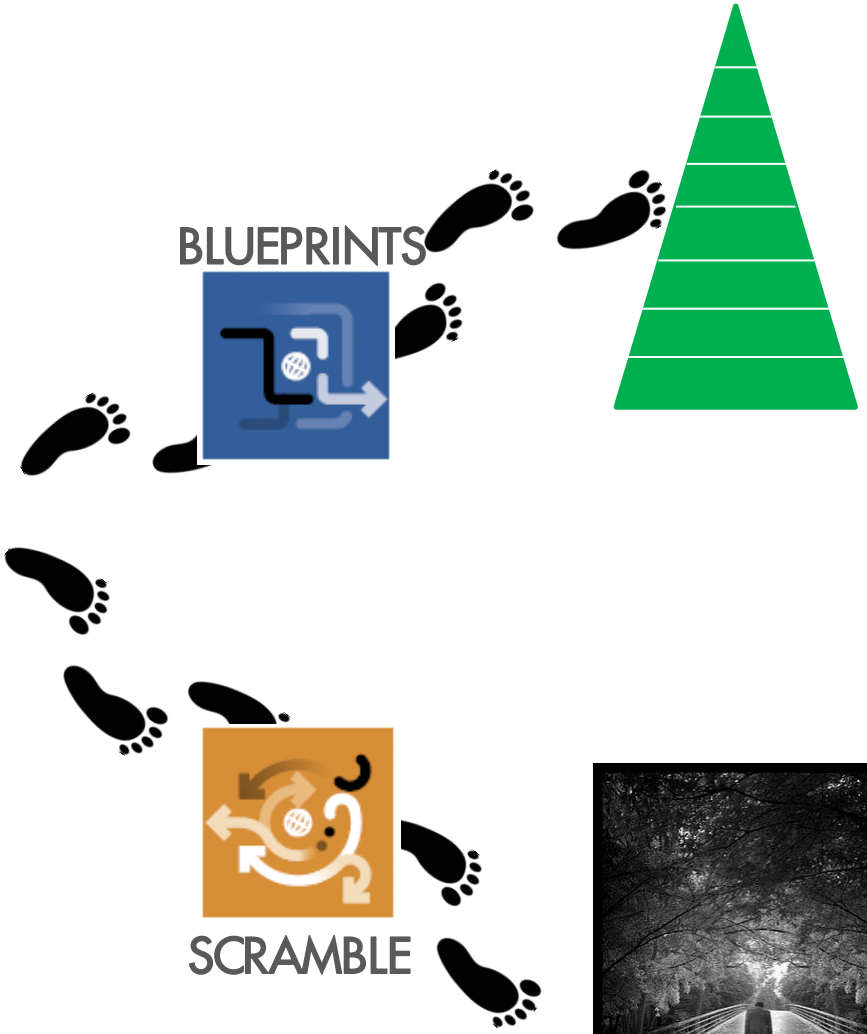
MAPPING PROGRESS?
LITTLE PROGRESS ON THE CORE ISSUE, MORE ON ENABLING MECHANISMS



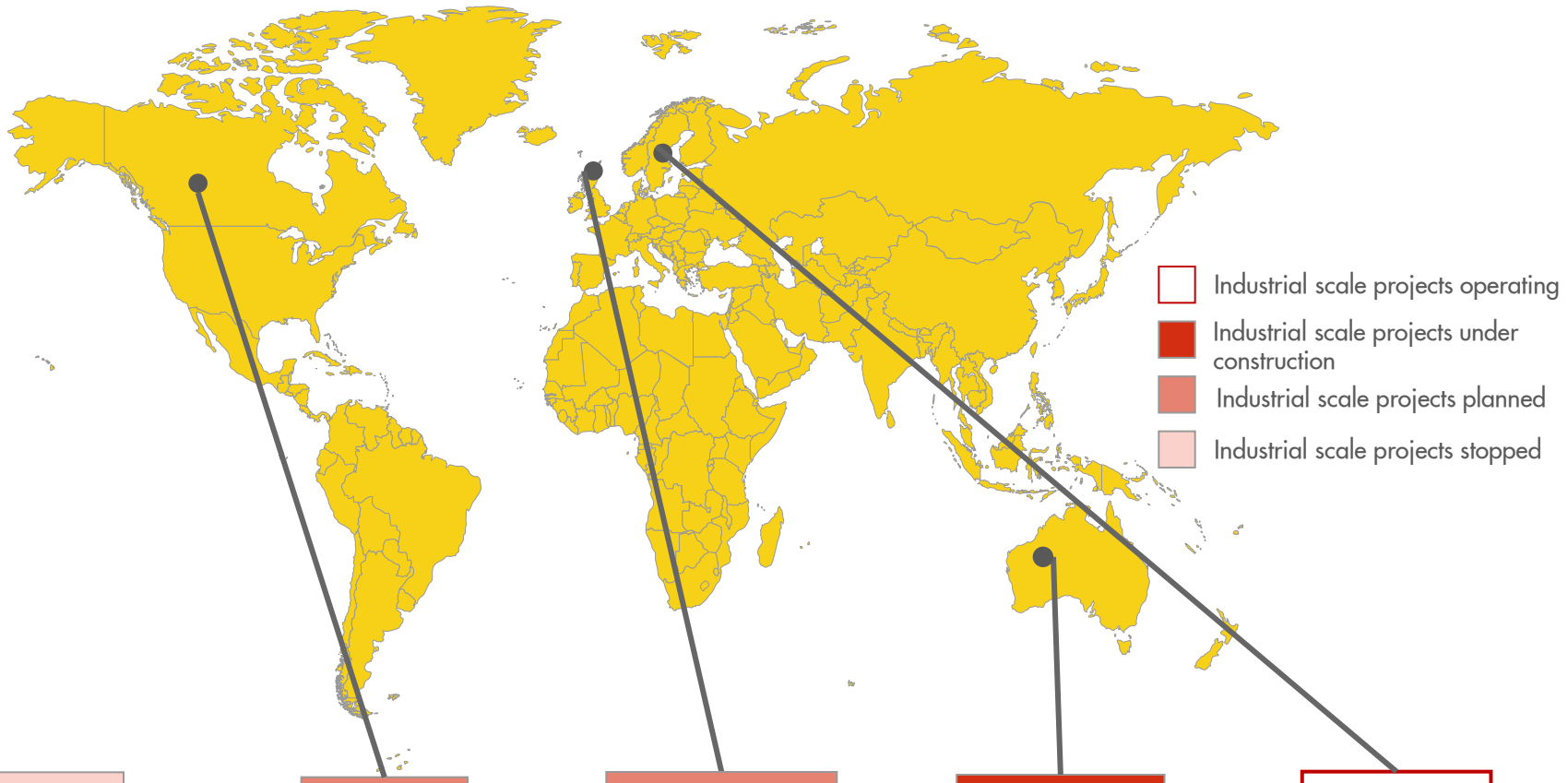
Negotiations still inconclusive Limited progress Agreement in place

SCRAMBLE OR BLUEPRINTS … ?





SHELL PARTICIPATION IN LARGE SCALE CCS PROJECTS



Others

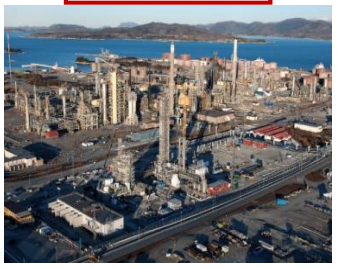
- Barendrecht
- Draugen
- Zerogen
- Monash
- Longannet

Quest

Peterhead

Gorgon

Mongstad



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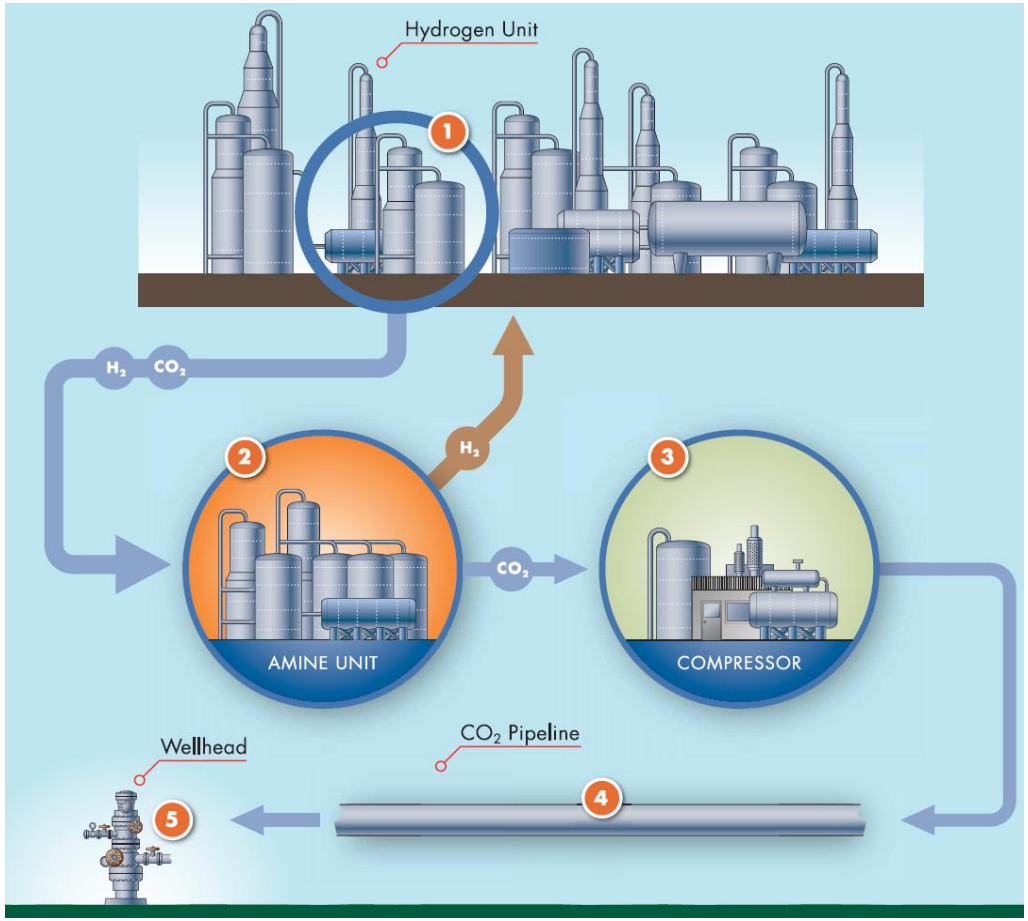
QUEST - LOCATION

GENERAL FEATURES

- Quest CCS Project - fully integrated CCS (capture, transport & storage)
- JV among Shell (60%); Chevron (20%); and Marathon (20%)
- Located at Scotford Upgrader Complex
- 35% reduction of Upgrader CO_2 emissions
- Uses existing technology
- Capacity to capture over one million tonnes of CO_2 per year for 25 years
- Equiv to emissions from175,000 cars

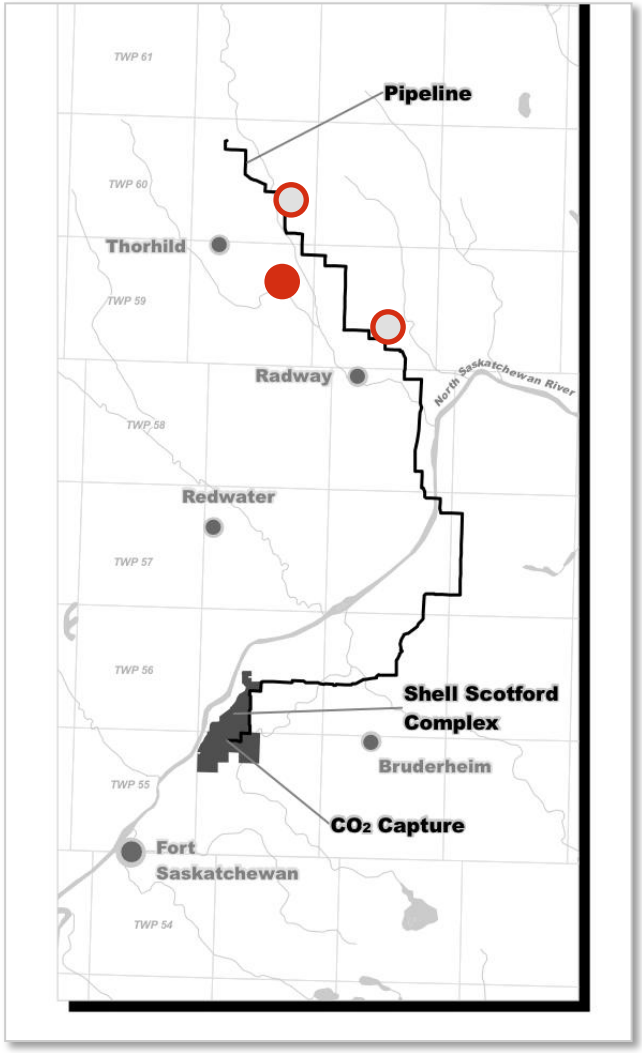


COSTS/REVENUES AND FUNDING AGREEMENTS

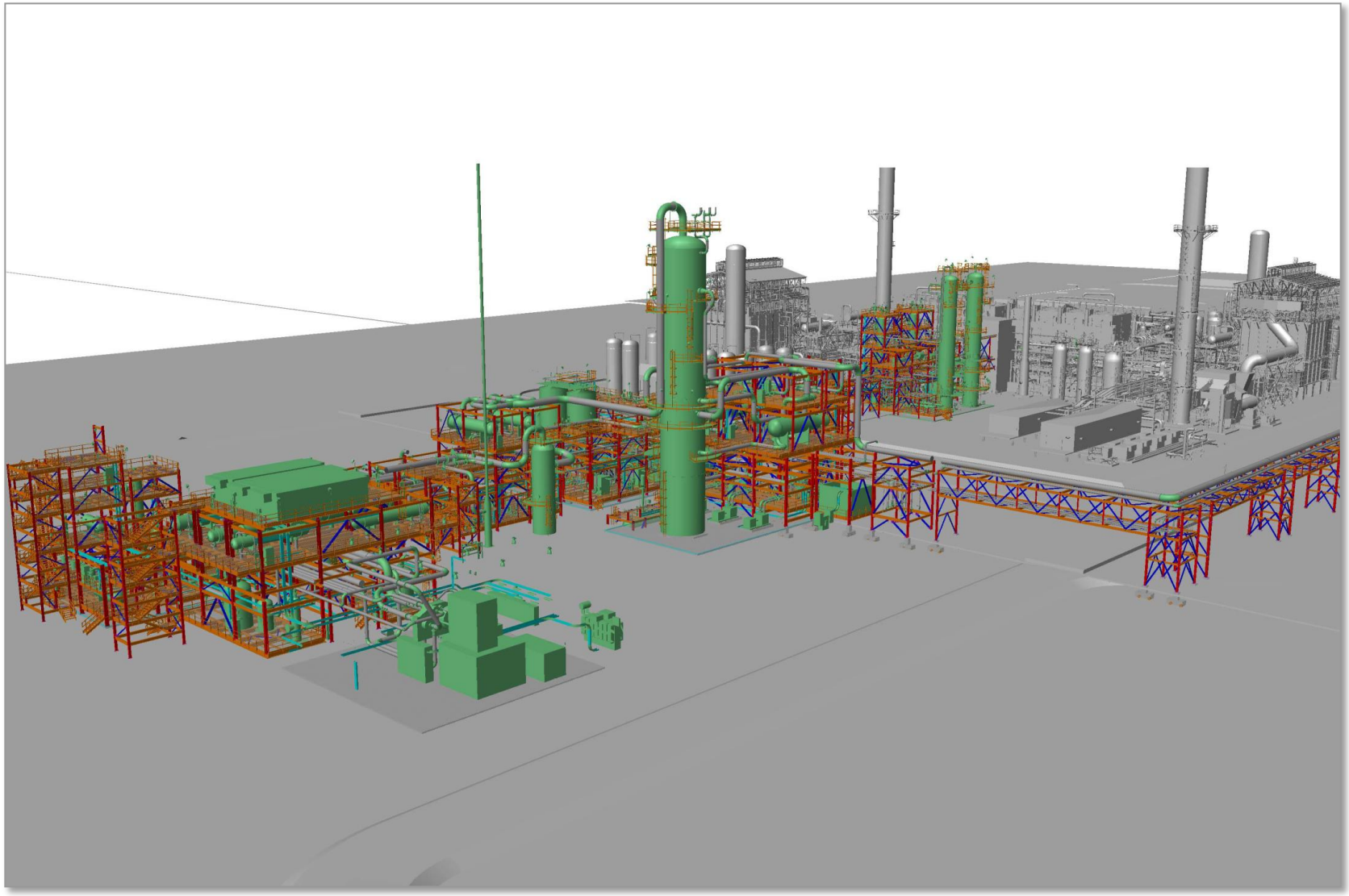
- Revenues – GHG offsets (credits)
  - Net amount – stored CO_2, less direct and indirect emissions
  - Multiple credits assigned as a demonstration project
  - Credits to be used by Shell's Alberta assets for regulatory compliance
- Government Funding Support – Cdn$865 million
  - Cdn$120 million Canadian Federal Government (Pre FID)
  - Cdn$745 million Alberta Province (Construction, Startup and 10 years operation)
  - Extensive knowledge sharing
  - Stringent monitoring (MMV) plan
  - NPV Zero commitment

HARDWARE

- Quest CCS Project CO_2 capture plant located in Fort Saskatchewan, approx 50 km N.E. of Edmonton, Alberta
- Capture at the Scotford Upgrader from 3 Hydrogen Units (SMR), Amine system
- CO_2 transported by 12 inch pipeline to storage, with 6 inch laterals
- The pipeline will travel approx. 65 km north of the Scotford Upgrader to the chosen injection locations
- Route selected to meet stakeholder requirements:
  - 28 km follows existing ROW
  - Drilled under North Saskatchewan River
  - 30+ re-routes to accommodate landowner wishes
- 3 injection wells

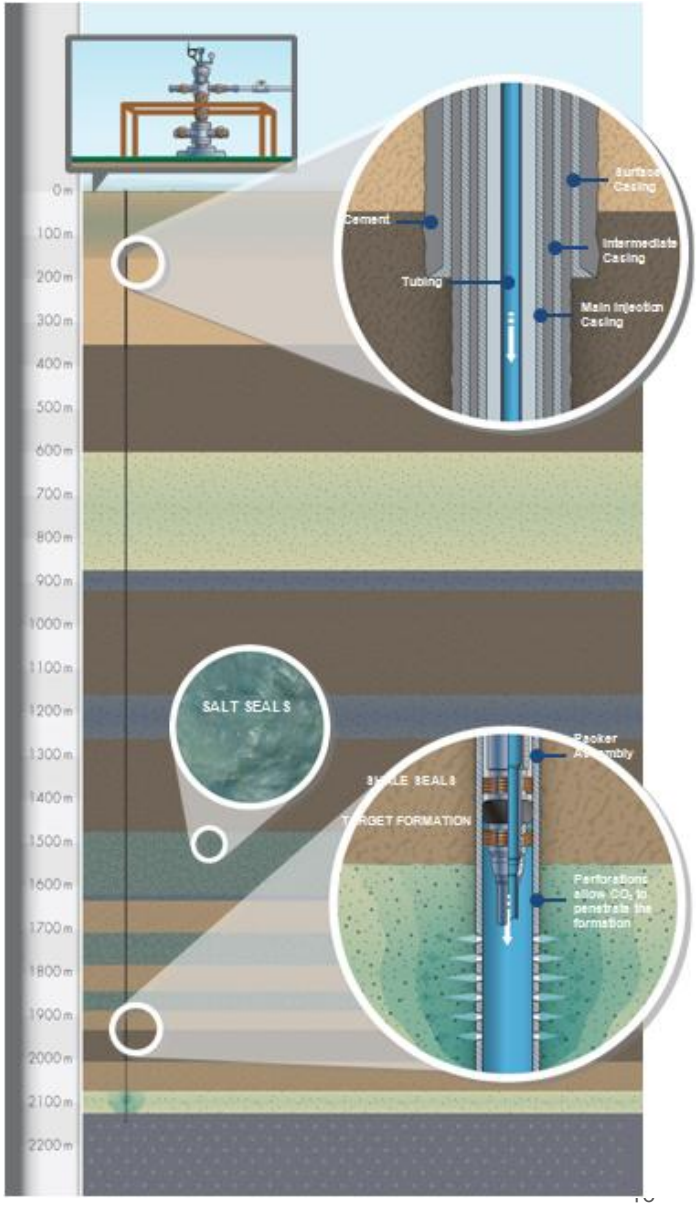


CAPTURE 3D MODEL – HMU 1&2

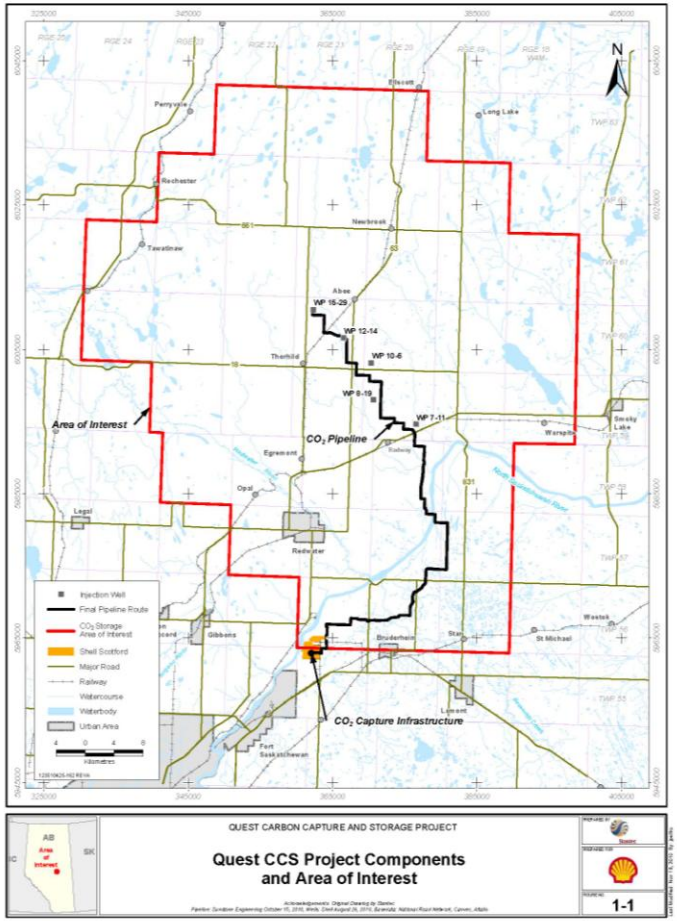


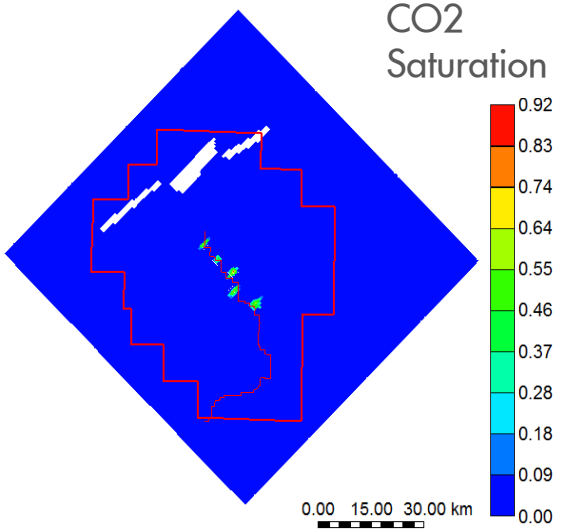
STORAGE

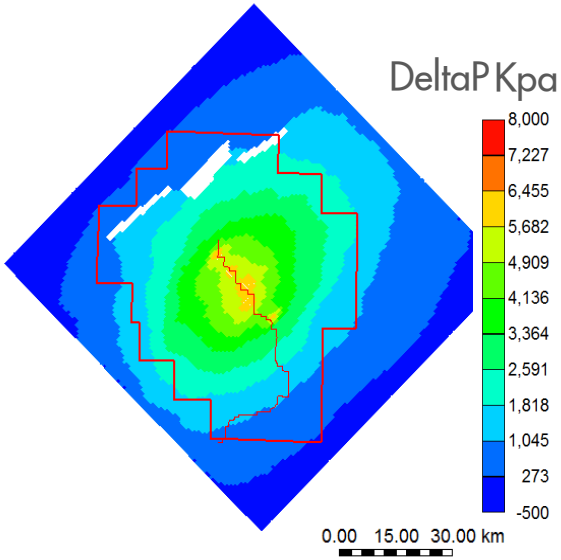
- Saline aquifer storage
- Basal Cambrian Sands (BCS) selected
  - Storage zone is a formation called Basal Cambrian Sands (BCS) 2,300 m, Prairies deepest sandstone
  - Multiple caprock and salt seal layers, no significant faulting visible from wells or seismic
  - The BCS is well below hydrocarbon bearing formations and potable water zones in the region
  - Relatively few wells drilled into the BCS, none within 10 km of the proposed storage site
- Wells and Drilling
  - 3 well plan, 5 more if required
  - Conventional drilling methods
  - Multiple steel casings for wells, 3 in freshwater zone, all cemented to surface



GEOLOGICAL FORMATION AREA OF INTEREST (AOI)





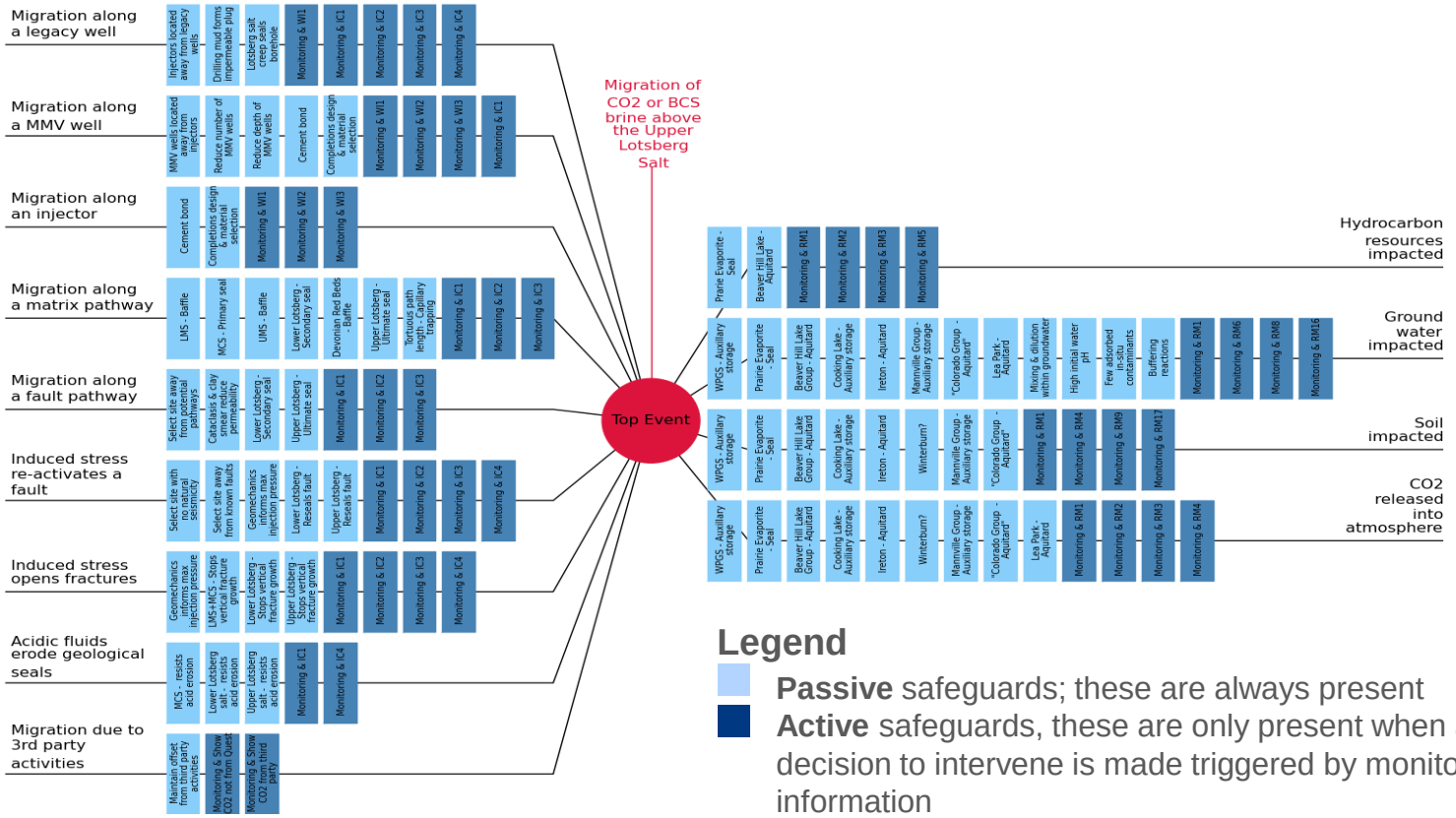


- Pore space area required to ensure no pressure front interference

CCS RISK MITIGATION
PLAN FOR THE WORSTE BUT OPERATE TO YOUR BEST

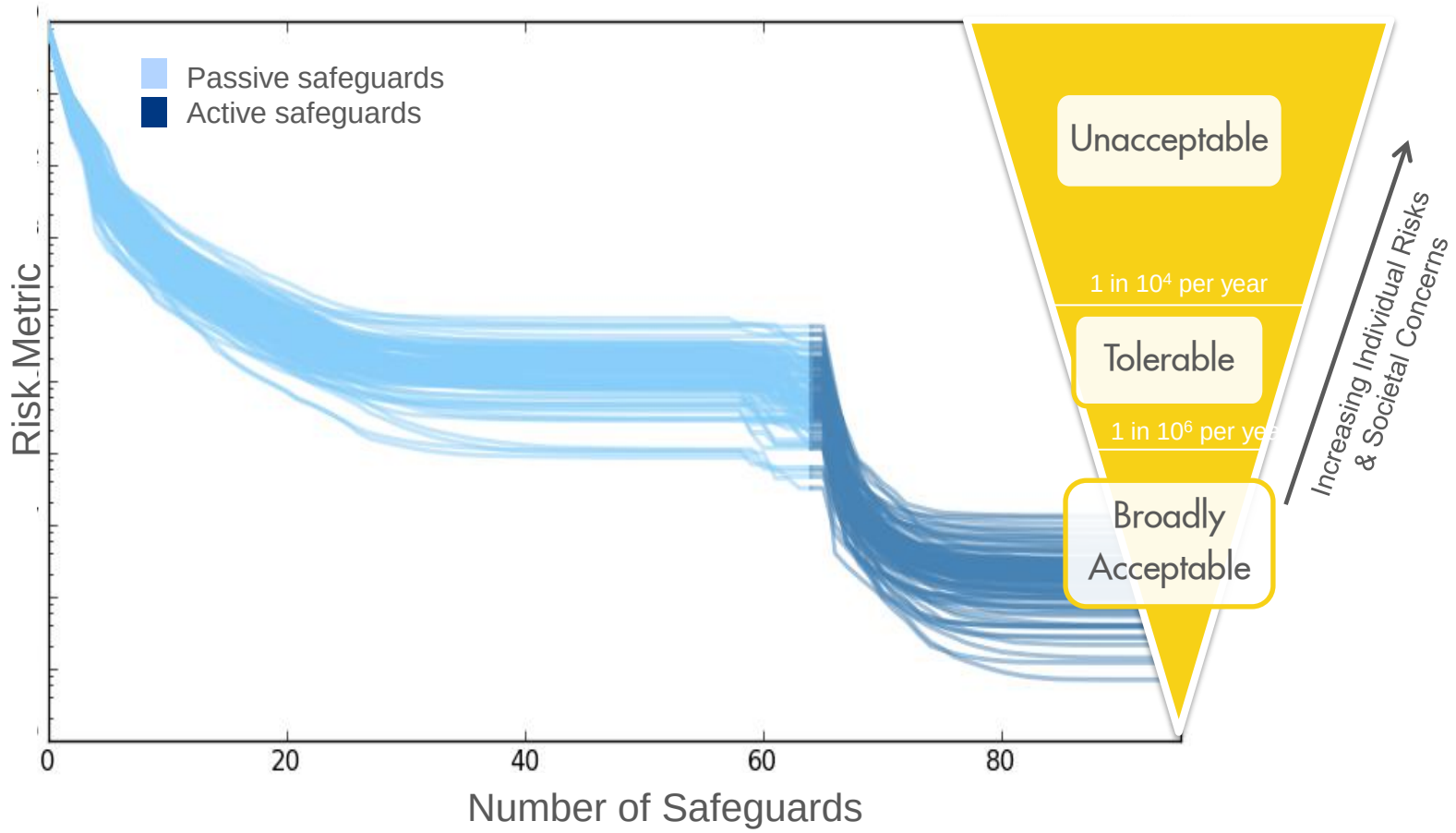
Measures to <u>avoid</u> a loss of containment

Measures to <u>manage</u> a loss of containment

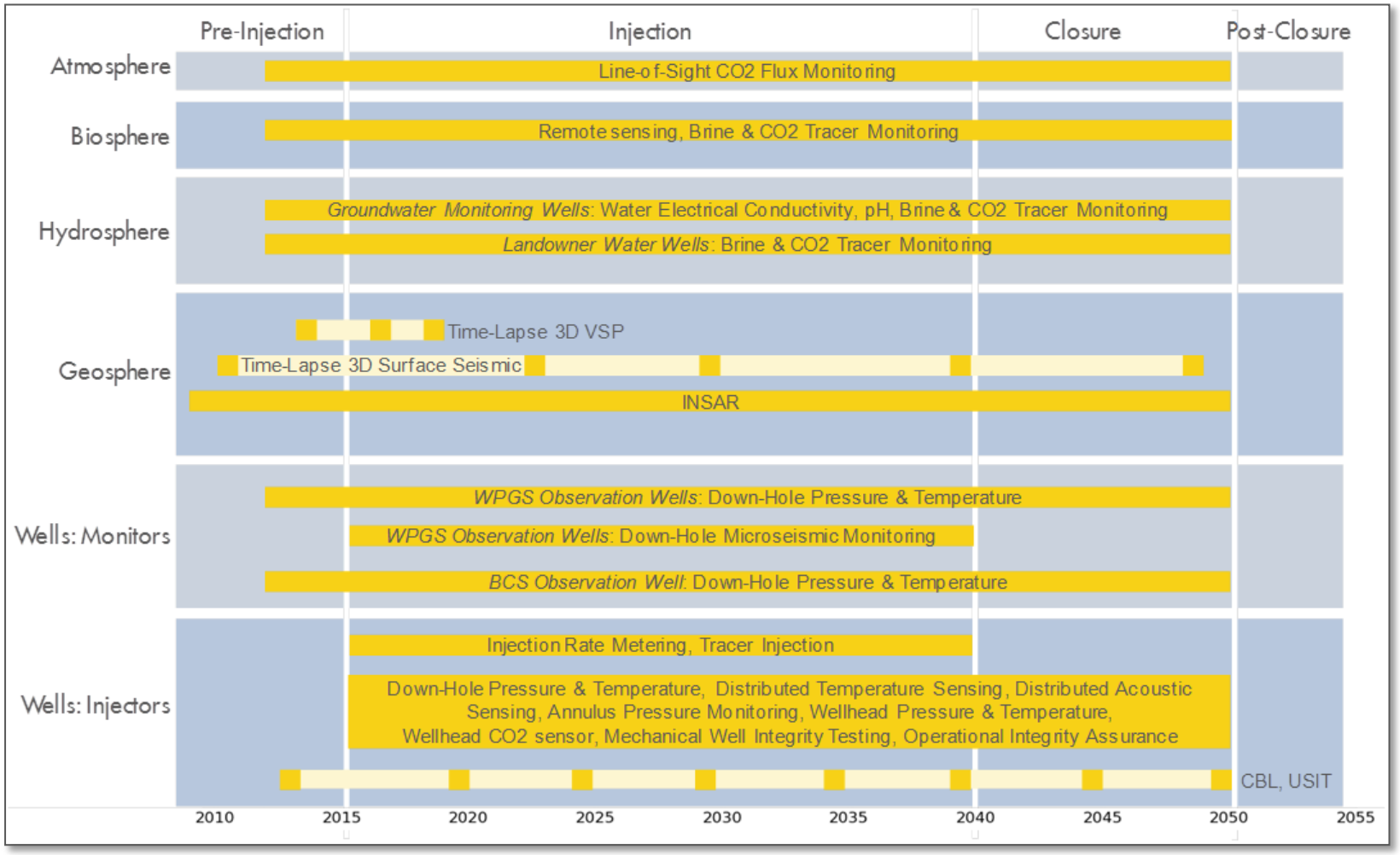


CCS RISK MITIGATION
WHEN HAVE YOU DONE ENOUGH

- Based on collective expert judgement
- Informed by appraisal data and feasibility studies



MEASUREMENT, MONITORING AND VERIFICATION (MMV PLAN)



- Comprehensive plan developed – entire biosphere and lifecycle
- Independently (DNV) certified MMV and storage plan

REGULATORY FRAMEWORK

- Provincial GHG framework established
  - CCS Act passed in Nov 2010, establishing overall structure
  - Pore space regulations in place with Quest successfully acquiring required area in May 2011
  - Participation in Regulatory Framework Assurance (RFA) process and GHG Offset Protocol revisions
  - No Federal framework to date – possible 2013
- Regulatory approvals near complete
  - Federal compliance required – EIA submitted, completed internal and public review
  - Bundled provincial application submitted – Upgrader amendment, Pipeline, Well and Storage
  - 3 rounds of Information Requests (200+) by provincial regulator, the ERCB
  - ERCB public hearing March 2012
  - Regulatory approval Q3 2012

STAKEHOLDER ENGAGEMENT

- Extensive and continuous public engagement
  - 1st public project disclosure: Oct 2008 (booklet, news release and open house)
  - Stakeholder consultation program initiated Jan 2010
    - All landowners within 450 meters of either side of pipeline right of way
    - All landowners in storage AOI
    - All Landowners within 5 km of Scotford
    - Municipal districts/local authorities
    - Industry stakeholders
    - Provincial / Federal regulators
    - Aboriginal communities
  - Open Houses: March, November 2010 and September 2011
  - Quest Café's: June, October 2011
  - Bi-annual County and Town Council updates
  - Quest phone line, e-mail address and web site available for project questions

STAKEHOLDER ENGAGEMENT RESULTS

- General positive public response
  - Large majority of open house visitors and comment cards positive
  - Minimal public objections to project at ERCB hearing
- Issues management
  - Issues raised by stakeholders:
    - Pipeline /well / storage failure
    - Pipeline routing
    - Containment / leakage
    - Groundwater contamination
    - Perception; relatively new technology, unknown in the area
    - Land use conflicts/ value
    - Incident Management / emergency preparedness and safety
  - Face to face resolution where possible with concerned stakeholders
  - Project adjustments where possible (>30 pipeline re-routes)
  - All issued addressed at ERCB hearing

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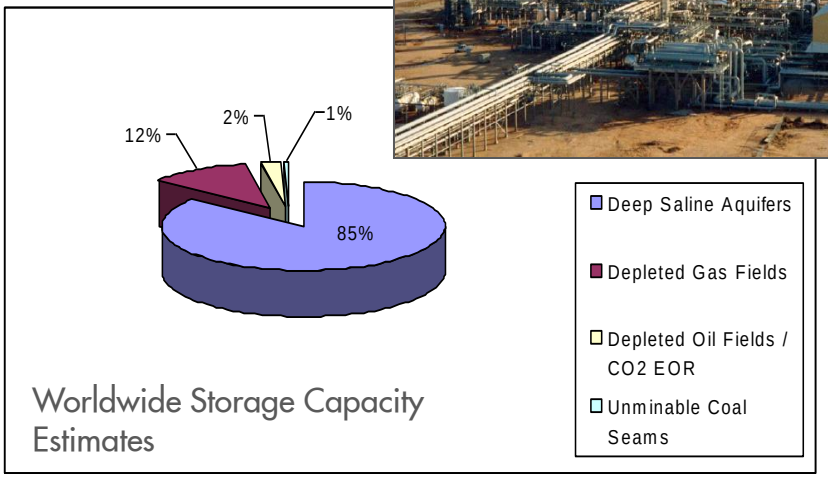
CARBON CAPTURE USE & STORAGE (1/2)
CO_2 EOR – TAKING A GAME WE KNOW INTO THE FUTURE

- Proven Technology
  - 30+ years experience
- Difference for the Future:
  - CCS support/integration
  - Use CO_2 from industry
  - Recovery improvements
  - Maximise CO_2 sequestration
- CO_2 EOR = storage ;
  - Pursue where possible
  - Note: significant upfront testing and capital required, especially offshore
  - Storage space limited compared to alternatives



CARBON CAPTURE USE & STORAGE (2/2)

Shell Pernis Refinery CO_2 is captured and piped to green houses in The Netherlands.

Mineralisation technology combines CO_2 with natural minerals create stable marketable products.