

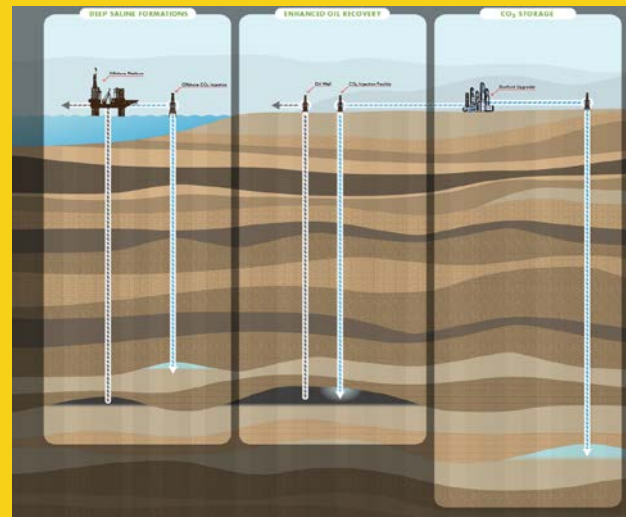
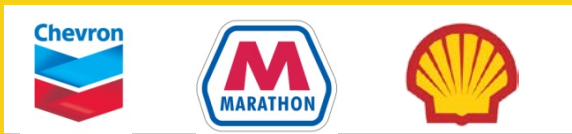


# QUEST Carbon Capture & Storage Project

Carbon Sequestration Leadership Forum

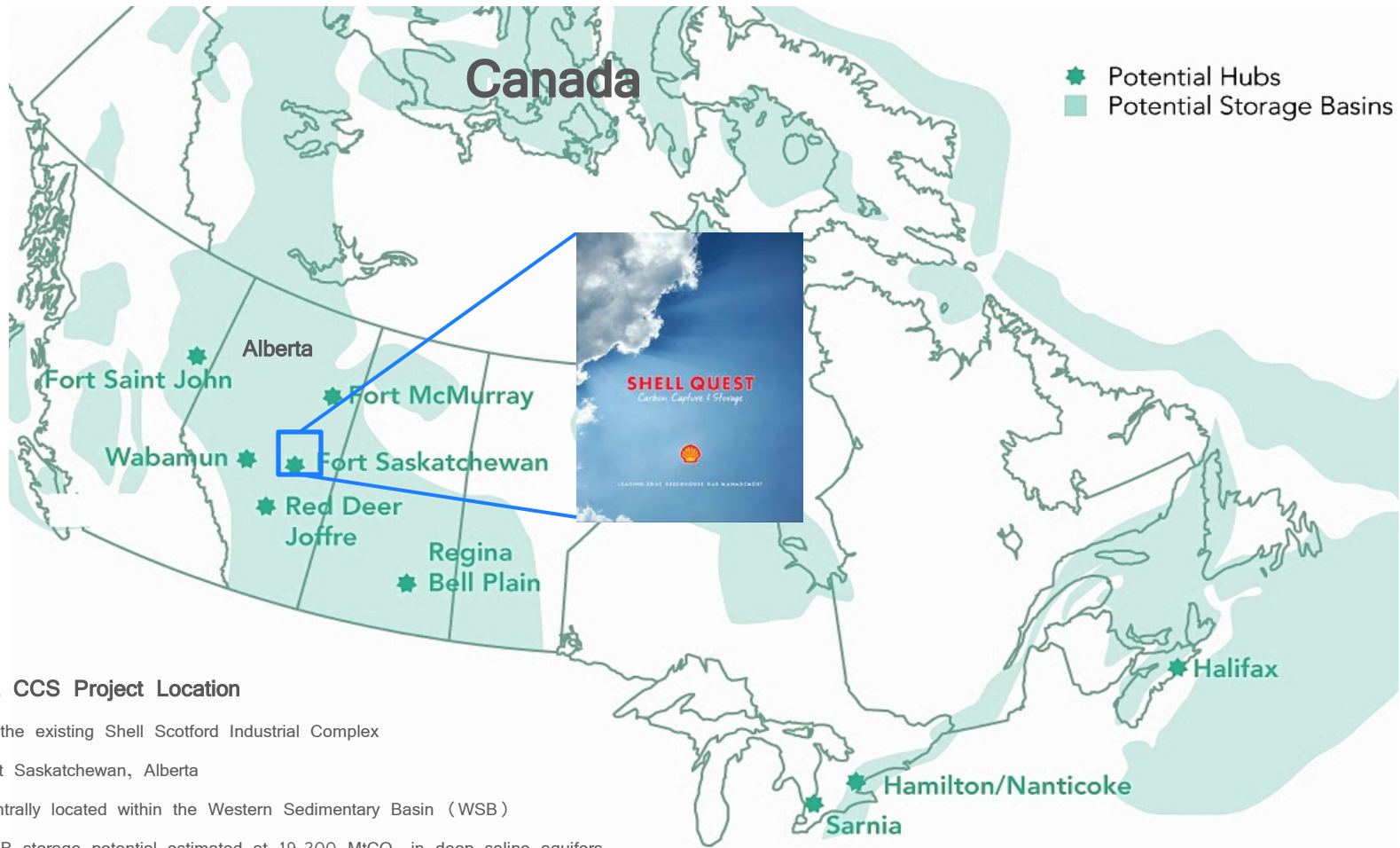
Warsaw

October 2010

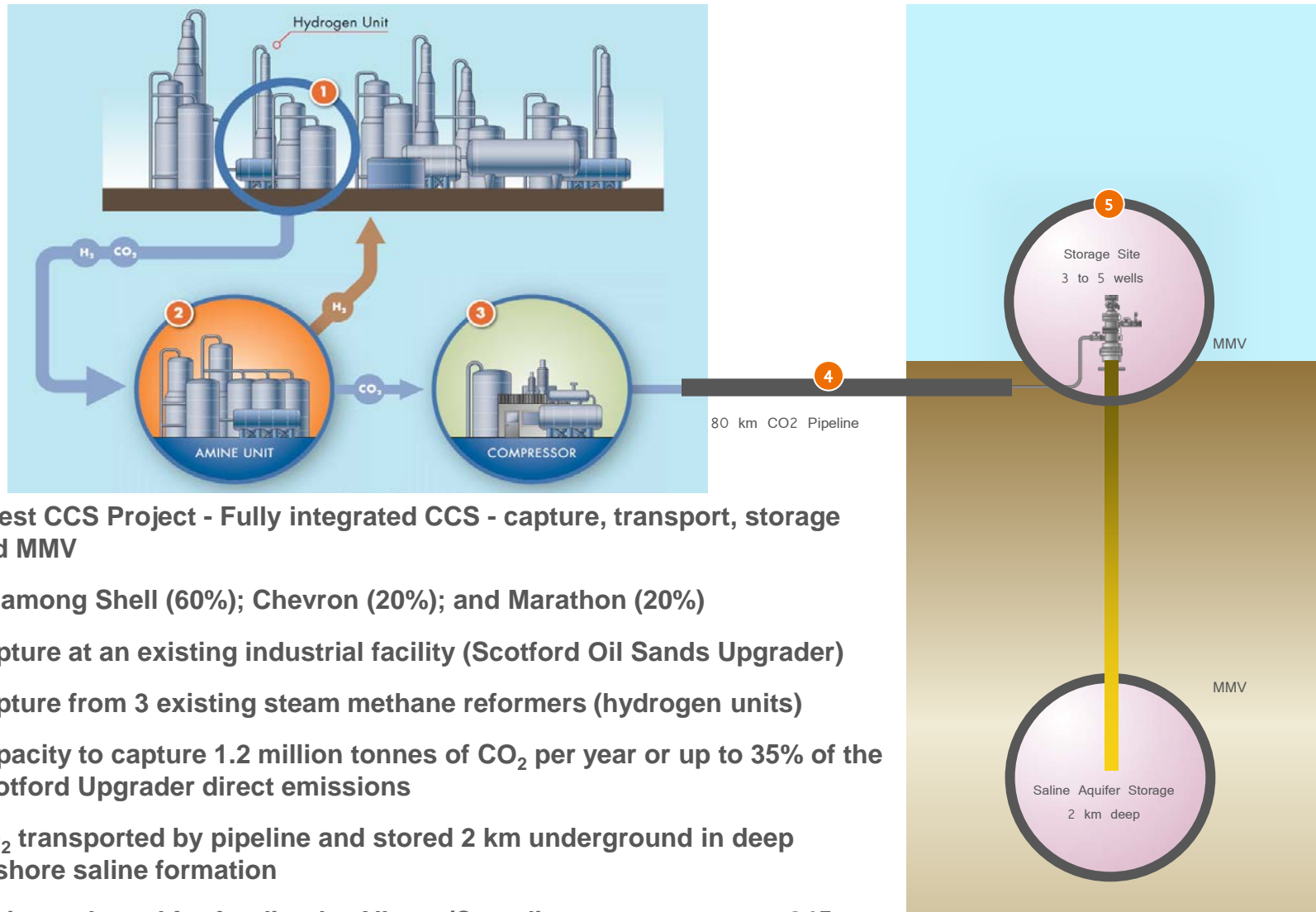


Bill Spence

# Quest CCS Project – Alberta, Canada



# Quest CCS Project – Overview



- Quest CCS Project - Fully integrated CCS - capture, transport, storage and MMV
- JV among Shell (60%); Chevron (20%); and Marathon (20%)
- Capture at an existing industrial facility (Scotford Oil Sands Upgrader)
- Capture from 3 existing steam methane reformers (hydrogen units)
- Capacity to capture 1.2 million tonnes of CO<sub>2</sub> per year or up to 35% of the Scotford Upgrader direct emissions
- CO<sub>2</sub> transported by pipeline and stored 2 km underground in deep onshore saline formation
- Project selected for funding by Alberta/Canadian governments ... 845 Million \$ Can awarded

# Quest CO2 Capture – Shell Scotford Complex



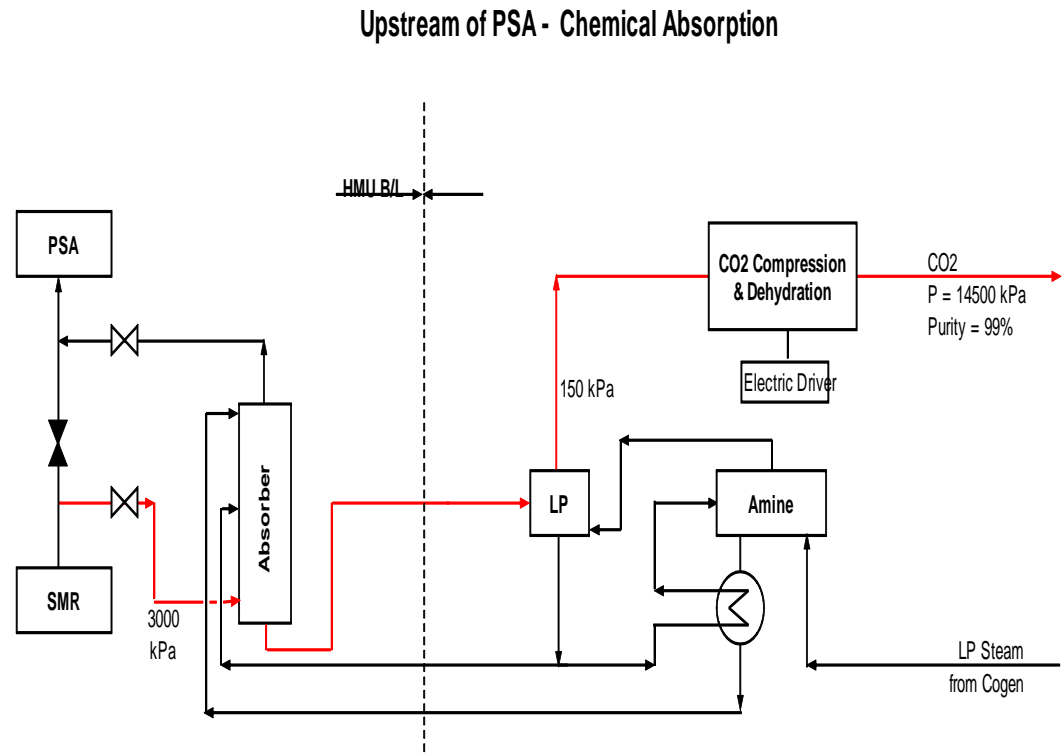
# Quest CO2 Capture

From 3 Hydrogen Units at the Scotford Upgrader



## Quest CO2 Capture Scope – 1.2 million tonnes/yr

- CO2 captured from process gases in 3 Steam Methane Reformers (hydrogen manufacturing units)
- CO2 captured upstream of the H2 purification unit (PSA)
- Raw process gas composition of 17% CO2, 74% H2, 6 % CH4, 3% CO (vol basis)
- Final purity of captured CO2 over 99%
- Commercially proven activated Amine (Shell ADIPX) technology used for absorption
- CO2 drying and multistage compression to 14500 kPa



Proposed Process Scheme: Absorber, KO drum and gas cooler for each HMU.  
Common flash Drum, CO2 regeneration, dehydration and compression.

# Quest CO2 Pipeline & Storage

## Pipeline

- Approximateley 80 km long ... northeast of Scotford
- 12 inch diameter ... capacity to 3 Mt/yr
- Transported as a dense fluid (critical phase)
- Line break shut off valves at 15 km intervals

## Storage Geology – Basal Cambrian Sand

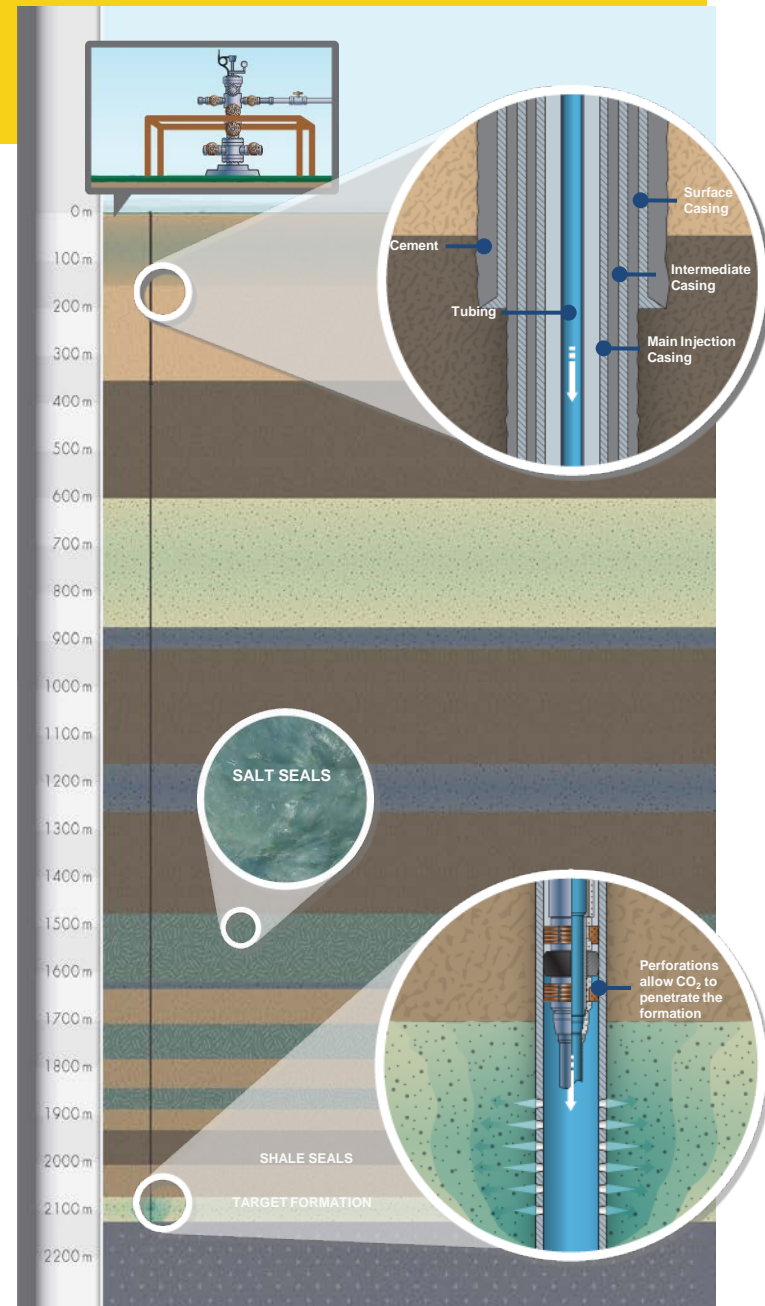
- Saline aquifer (2100 m deep) ... deepest sedimentary layer in the Western Sedimentary Basin
- Porous sandstone rock (basal cambrian sand)
- Multiple caprock and salt seal layers above
- Well below hydrocarbon bearing formations and potable water zones
- Very few penetrations to this depth in the area

## Wells and drilling

- Conventional drilling methods
- Triple steel casing for groundwater protection

## Measurement, Monitoring & Verification

- Subsurface and surface monitoring program



## Quest CCS Development Activities

- Approximately 85 Million \$ spent on Quest development activities to date

### Capture and Pipeline

- Capture technology and design selection complete ... front end engineering ongoing
- Pipeline routing and sizing complete
- Landowner consents in place ... land acquisition underway for pipeline

### Storage

- Storage appraisal program ongoing since 2008
- Analysis of existing well and seismic data in 2008 complemented by 2 new test wells in 2009
- High resolution aero-magnetic survey completed in Q1, 2010
- 3D seismic survey completed in Q1, 2010 to supplement existing 2D seismic and well data
- One additional test well completed in 2010 and water injection test planned in Q4, 2010

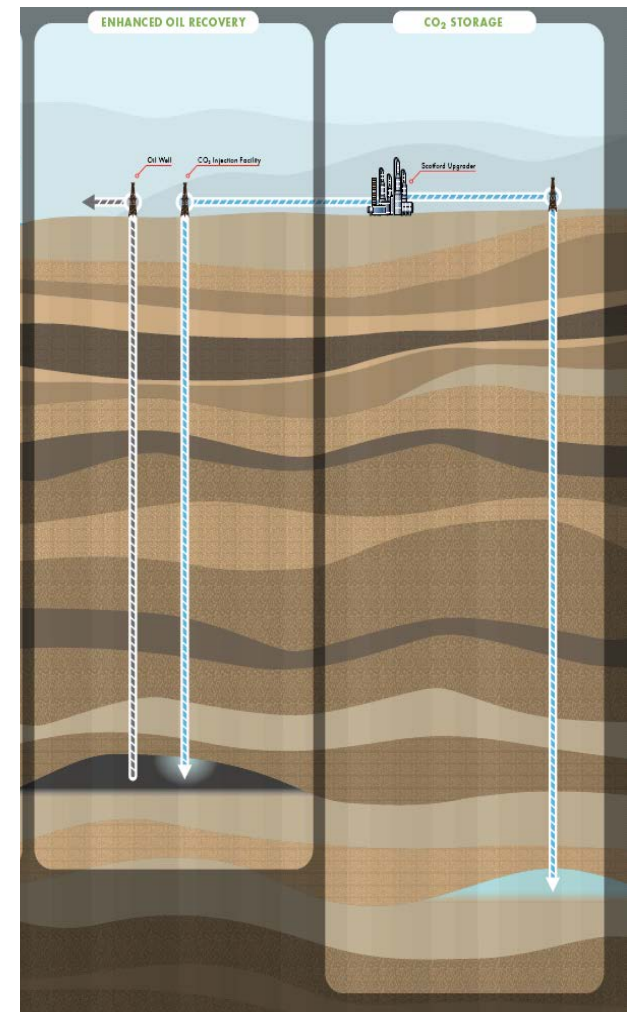






## Quest CCS Project – Contribution to CSLF

- Demonstration of a fully integrated, commercial scale CCS project ... implementation and operating by 2015
- Pre-combustion capture in an industrial application (steam methane reforming) ... applicable to refineries, chemical plants, heavy oil upgrading worldwide
- Deep saline aquifer storage in an onshore consolidated sandstone formation (BCS) characteristic of North America
- Storage site characterization, well spacing and pattern, caprock and salt seal integrity
- Optimum injection rates and capacity for consolidated sandstone formation
- Full MMV program designed for temperate climate in North America, with four distinct seasons
- Public outreach and stakeholder engagement program for a large scale, fully integrated CCS project in Canada
- Global capability, capacity and project management processes for successful implementation





Thank You !

[www.shell.ca/quest/](http://www.shell.ca/quest/)