Fort Nelson Carbon Capture and Storage Feasibility Project

Knowledge Sharing in MVA/MMV in CCS
Demonstration and Large Scale CO_2 Injection Tests

Mobile, Alabama - May 16-17, 2012

Spectra Energy

Safe Harbour Statement

Some of the statements in this document concerning future company performance will be forward-looking within the meanings of the securities laws. Actual results may materially differ from those discussed in these forward-looking statements, and you should refer to the additional information contained in Spectra Energy's Form 10-K and other filings made with the SEC concerning factors that could cause those results to be different than contemplated in today's discussion.

Reg G Disclosure

In addition, today's discussion includes certain non-GAAP financial measures as defined under SEC Regulation G. A reconciliation of those measures to the most directly comparable GAAP measures is available on our website.

Agenda

Introduction to Spectra Energy

Fort Nelson CCS Feasibility Project

Risk Assessment MVA Approach

Current Key Risks and Mitigation

Project Timeline

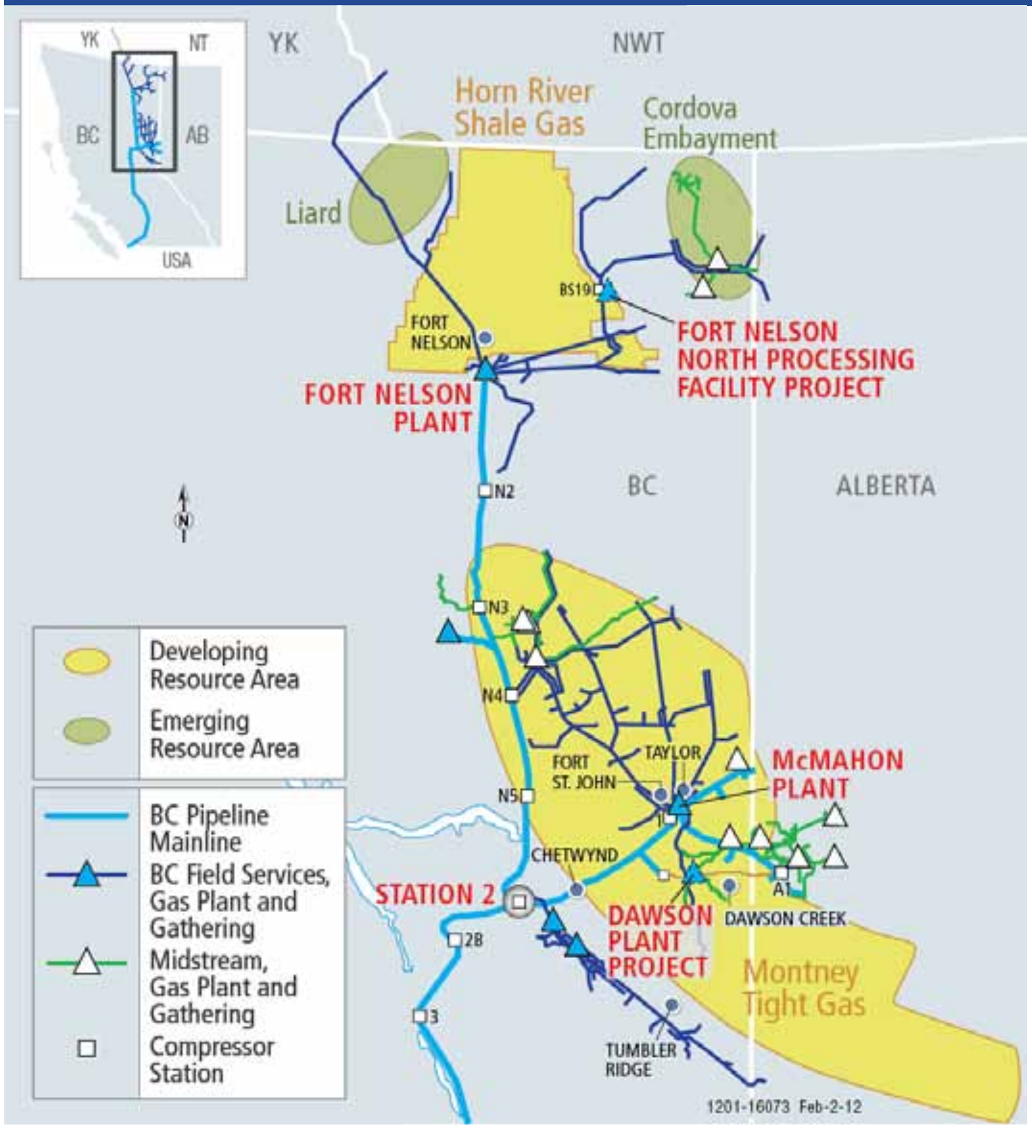
Next Steps

Lessons Learned

Spectra Energy - Strategically Located
Assets vs. Unconventional Basins

2011 Pipeline Throughput:	4.2 Tcf
Transmission Pipe:	19,300 mi
Storage Capacity:	300+ Bcf
Gathering Pipe:	64,800 mi
SE Gas Processing Capacity:	3.3 Bcf/d
DCP 3Q11 G&P:	6.1 TBtu/d
DCP 3Q11 NGLs produced:	392 MBbl/d
Distribution Pipe:	41,900 mi
Retail Customers:	1.3 million

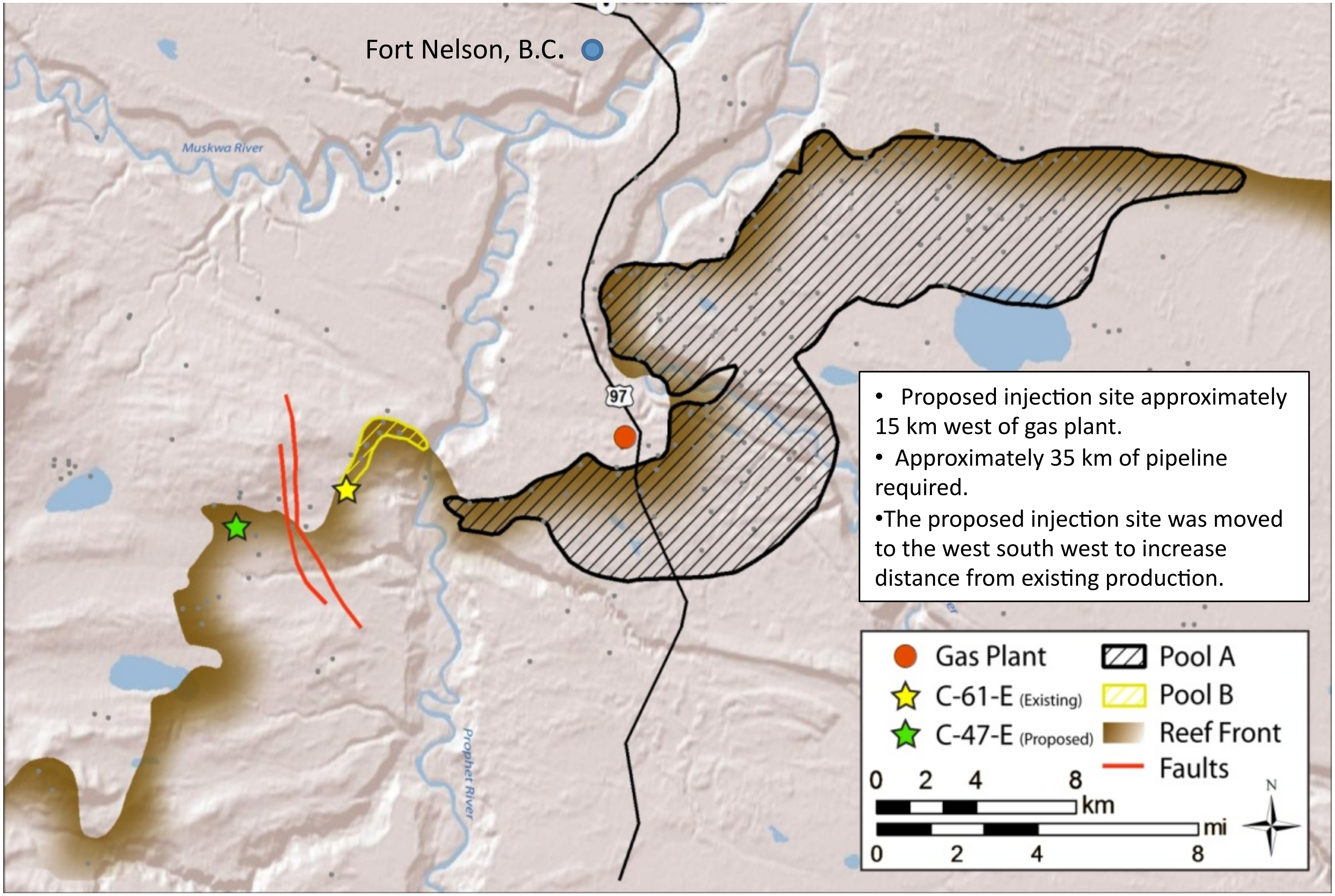
Fort Nelson Gas Plant



- 1 Bcf/d raw gas processing capacity – largest facility of its kind in North America
- Spectra Energy gathering and processing assets are strategically positioned in the growing Horn River Basin, processing both conventional and unconventional shale gas resources
- Horn River recoverable shale gas ~100 Tcf
- Horn River shale gas contains 12% CO_2

Fort Nelson CCS Feasibility Project

Location Map



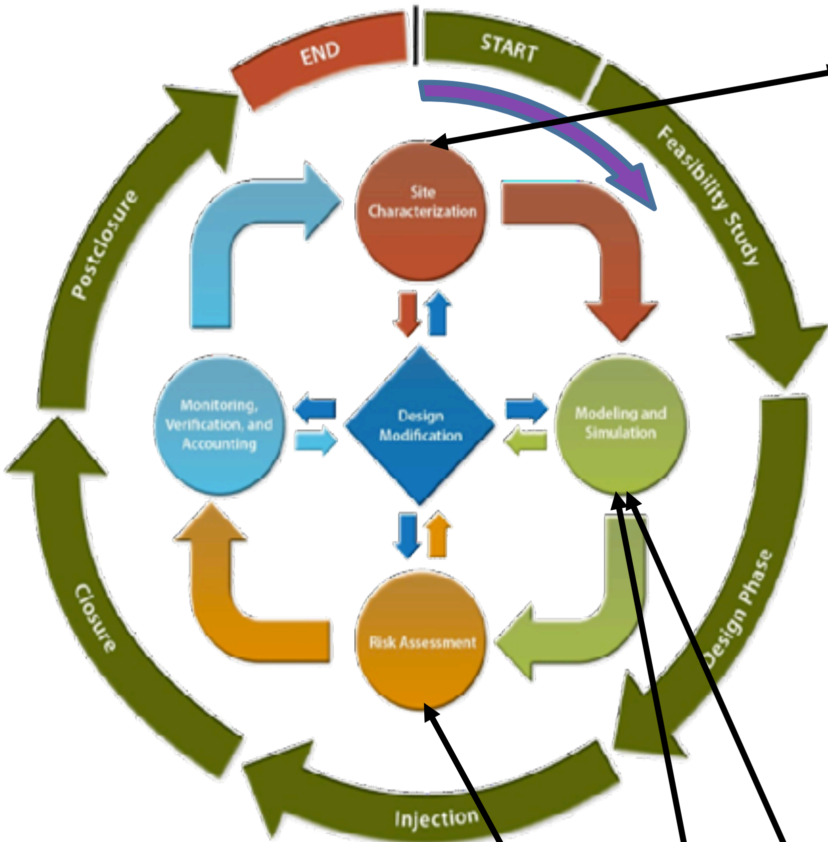
- Proposed injection site approximately 15 km west of gas plant.
- Approximately 35 km of pipeline required.
- The proposed injection site was moved to the west south west to increase distance from existing production.

Geologic Risk Assessment

Modelling, Risk Assessment and MVA

- Objective Statement:
  - To develop a Risk Assessment approach, MVA program and risk management plan that is risk-based and fit-for-purpose using proven techniques that will yield effective management of the sequestered carbon dioxide
- Approach:
  - Gather and analyze data – Seismic, core samples, well logs, production, etc.
  - Utilize Risk Assessment (populated by subject matter experts) to evaluate risk
  - Utilize Modeling and Simulations
  - Utilize History-Matching to validate modeling
  - Select advanced technologies in combination with standard monitoring techniques using a risk-based approach backed up by Bayesian Decision Theory Analysis
  - Iterate, as required, to develop a suitable MVA and Risk Management Plan that will meet the objectives for the project
  - Deploy selected technology, if decision is made to move to Project Execution Phase
- Progress:
  - Risk Assessment Methodology established in 2008 working with EERC, Oxand International, Spectra Energy and its panel of experts
  - RA 2009
    - Completed in 2010
    - Risk Register of 27 events assessed by Expert Panel reflecting geologic knowledge and work up to January 2010
  - RA 2010
    - Completed in 2011
    - Builds upon RA2009
    - Risk Register of 31 events assessed by Expert Panel reflecting geologic knowledge and work up to December 31, 2010
- Next Steps
  - Drill Test Hole #2, shoot new 3D seismic
  - Conduct Geologic Update
  - Conduct Next Risk Assessment Iteration
  - Apply Bayesian Analysis Techniques to select appropriate MVA Technology
  - Implement if Project Approved for Execution

Reservoir & Risk Management Cycle



RA2009

RA2010

Iterative Process

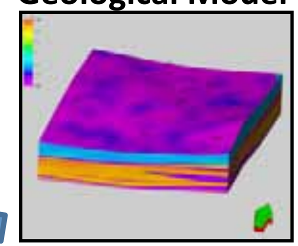
Data Assessment & Analyses: (incl. hydrogeology, geomechanical, DST analyses & petrology)

Known Information:
- Wells
- Seismic
- Production
- Water injection

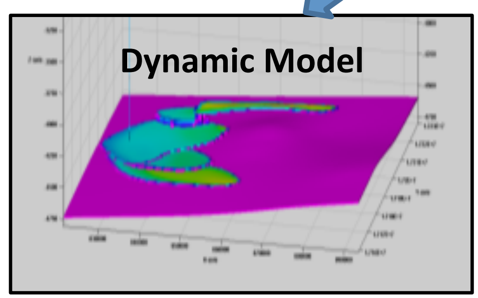
Drill, Seismic & Lab:
- In situ testing
- Well logging
- Core & cuttings
- Fluid samples
- Laboratory tests

Data Reconciliation

Geological Model

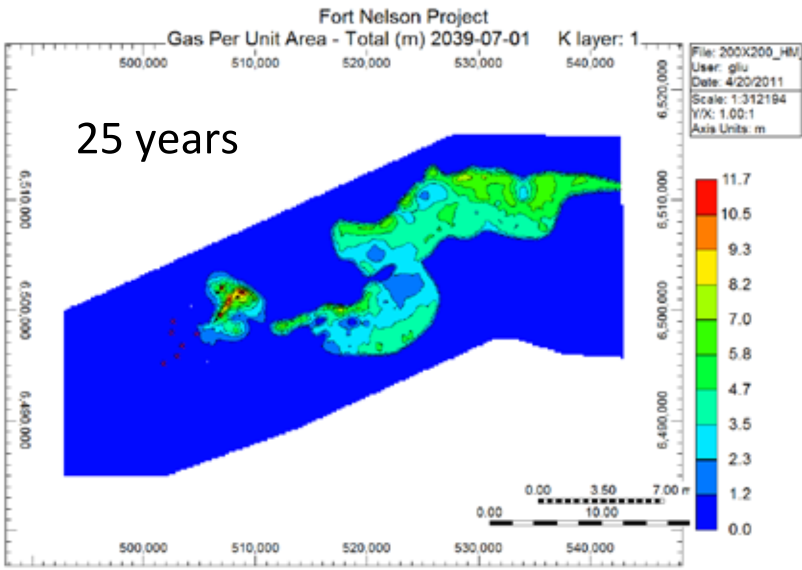


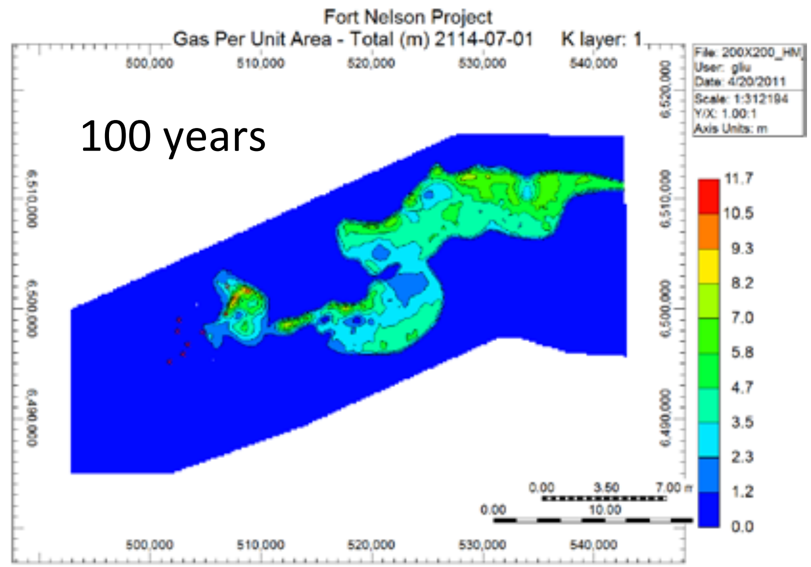
Build Static Model:
Maps are then used to create a petrophysical model of the sink–seal system.



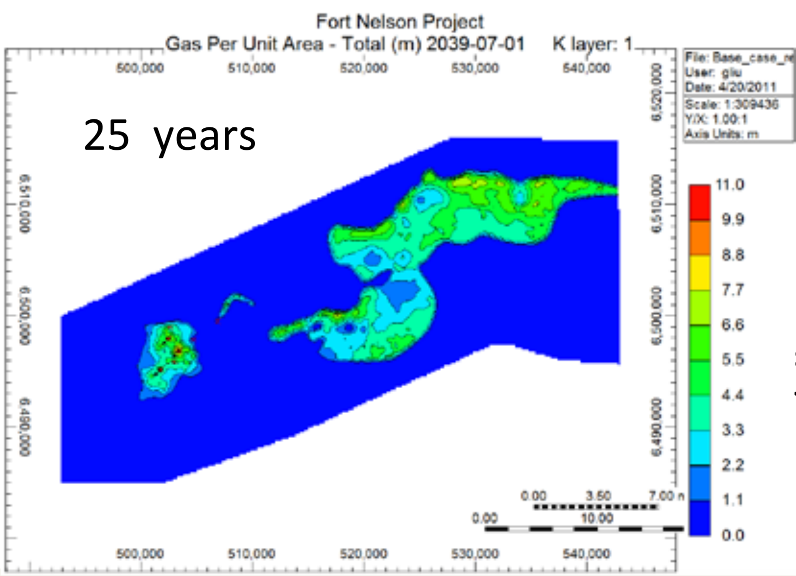
Dynamic Model:
1. Injection and plume behaviour and fate
2. CCS well placement & design
3. CCS scheme management
4. Geochemical & geomechanical

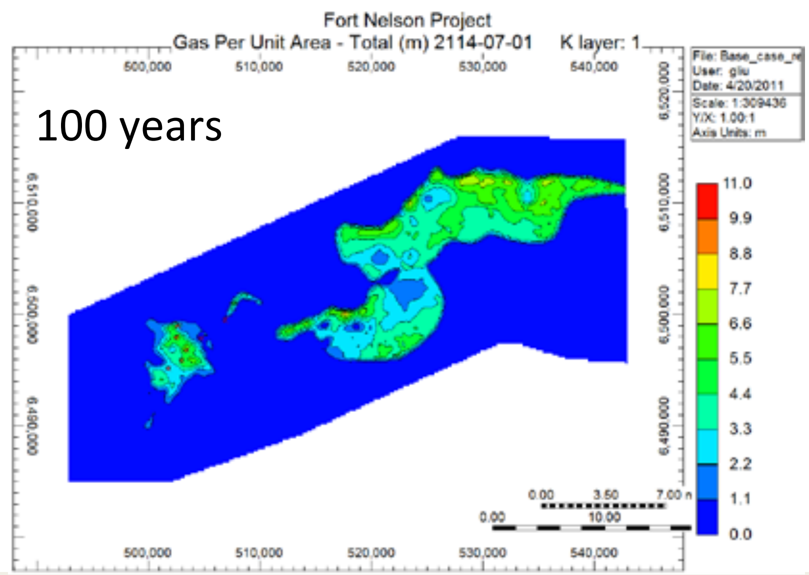
Application of Risk Management





Initial injection location around test well





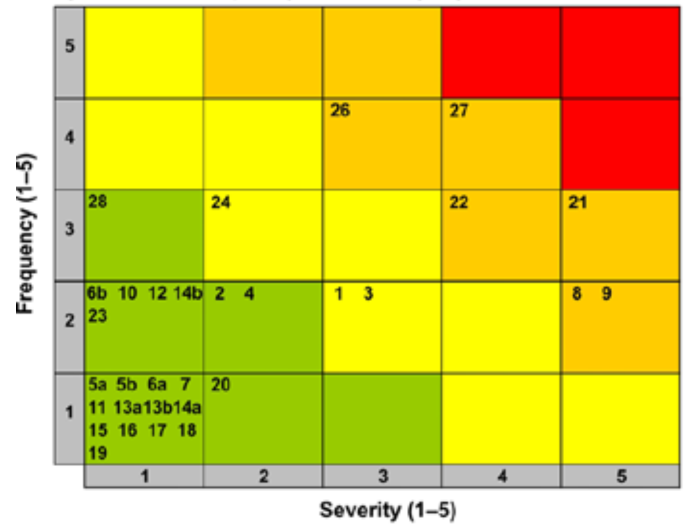
New proposed injection location shifted west of test well

Geologic Risk Assessment

Key Risks and Mitigation as at January 2012

- Loss of Injectivity
  - Site Selection, Characterization, Well Placement, Monitoring
  - Utilize all redundant (reliability) injection capacity including drilling additional wells
- CO_2 migration and adverse pressure effects on existing production
  - Site Selection, Characterization, Well Placement, Monitoring
  - Maximize distance, structural barriers and distribution to mitigate effect on existing production
  - Acquisition of reserves if necessary
- Loss of Containment – Brine to groundwater via old wells
  - Well Integrity Assessment , Monitoring and Management Plan
- Lack of Capacity – Restriction by regulation
  - Site Selection, Characterization, Well Placement, Monitoring
  - Maximize distance, structural barriers and distribution to mitigate effect on existing production
  - Acquisition of reserves if necessary
- Next Steps
  - Gather more data, as required, to improve reservoir characterization combined with reservoir sensitivity modeling - next RA report
  - MVA Technology Screening – Risk-based and assessed (Bayesian Analysis Techniques) to optimize selection and confidence in risk management

50-yr Minimum Frequency and Severity, Injection Location c-47-E



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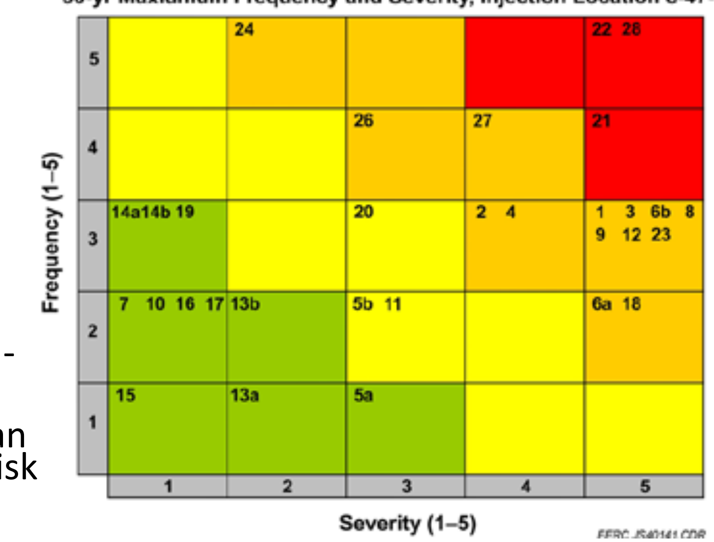


Available Monitoring Technologies

Atmospheric Monitoring

- CO_2 Detectors
- Eddy Covariance
- Advanced Leak Detection System
- Laser Systems and LIDAR
- Tracers (Isotopes)

Near-Surface Monitoring

- Ecosystem Stress Monitoring
- Tracers (Co-Injected)
- Groundwater Monitoring
- Thermal Hyperspectral Imaging
- Synthetic Aperture Radar (SAR & InSAR)
- Color Infrared (CIR) Transparency Films
- Tiltmeter
- Flux Accumulation Chamber
- Induced Polarization
- Spontaneous (Self) Potential
- Soil and Vadose Zone Gas Monitoring
- Shallow 2-D Seismic

Sub-Surface Monitoring

- Multi-component 3-D Surface Seismic Timelapse Survey
- Vertical Seismic Profile (VSP)
- Magnetotelluric Sounding
- Electromagnetic Resistivity
- Electromagnetic Induction Tomography (EMIT)
- Injection Well Logging (Wireline Logging)
- Annulus Pressure Monitoring
- Pulsed Neutron Capture
- Electrical Resistance Tomography (ERT)
- Sonic (Acoustic) Logging
- 2-D Seismic Survey
- Time-lapse Gravity
- Density Logging (RHOB Log)
- Optical Logging
- Cement Bond Log (Ultrasonic Well Logging)
- Gamma Ray Logging
- Microseismic (Passive) Survey
- Crosswell Seismic Survey
- Aqueous Geochemistry
- Resistivity Log

NETL (2009) *Monitoring, Verification, and Accounting of CO_2 Stored in Deep Geologic Formations*

MMV/MVA Plan Approach

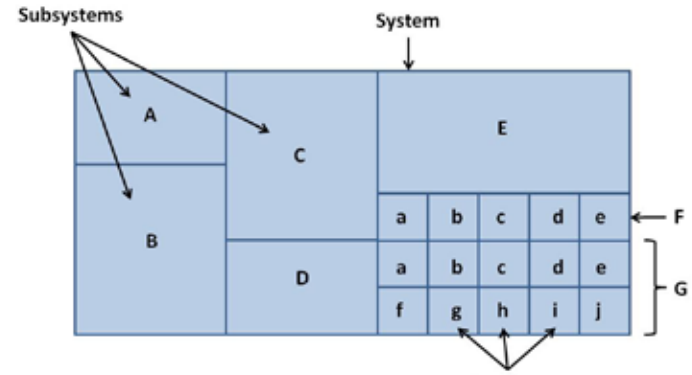
- Standard Monitoring (Given):
  - Certain selected standard monitoring techniques will be a given or assumed components of the MVA Plan. These include but are not limited to:
    - Injection wells - Well Head Pressure, Temperature, Mass and Composition at Wellhead, Casing pressure
    - Gas Detection (H_2S, CO_2) at Well head
    - Ground water Monitoring – Baseline, In-service, post-injection
      - » *Pressure, Temperature*
      - » *Composition*
    - Monitoring Wells - formation water composition, Pressure and Temperature
    - Well Integrity – Annual Packer Tests, periodic casing, tubing and cement bond logs
- Advanced Technologies (To Be Determined):
  - Working with the EERC, Spectra Energy intends to develop the balance of the MVA Plan using a risk-based approach supported by Bayesian Analysis, in order to ensure the Advanced Technologies combined with the given technologies will give the best value and highest confidence information to the operator.

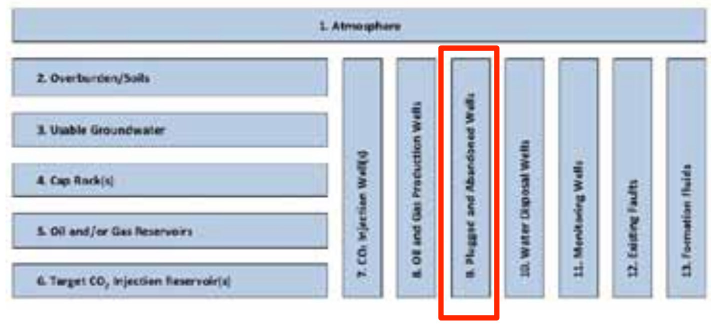
Application of Bayes' Theorem

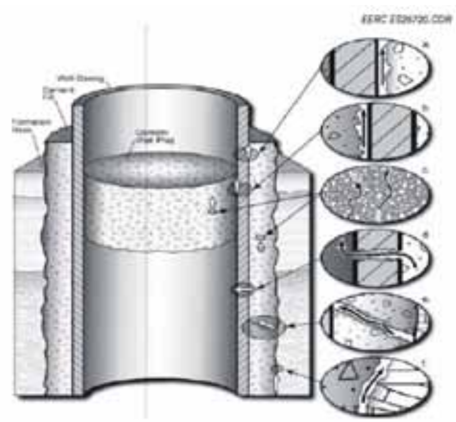
Bayes' Theorem

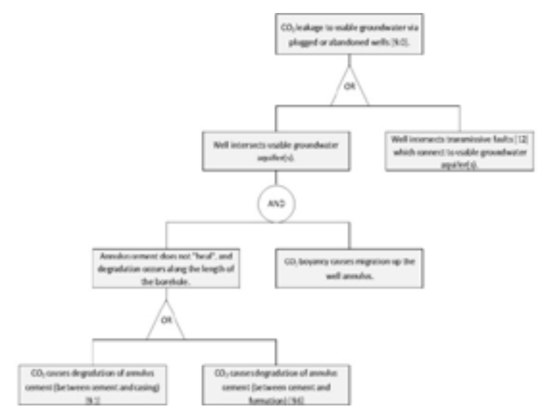
$$p(A|X) = \frac{p(X|A)*p(A)}{p(X|A)*p(A) + p(X|\sim A)*p(\sim A)}$$

- Define the System Components
- Develop Risk Event Logic Trees based upon the system components
- Develop an MVA Plan with respect to:
  - What to measure
  - How to measure
  - Where to measure
  - When to measure
- Gather information (data values and expert opinions) with respect to the system components in the logic tree and measured values from MVA/MMV technologies.
- Using Bayesian techniques combine this knowledge to derive the probability that any measured value indicates that a risk event has occurred.
- Optimize confidence through technology selection
- The expected results:
  - Confidence in the MVA/MMV Plan. The right technologies are deployed and the value of the information from those technologies well understood.
  - Confidence in the conclusions derived from the measured values. Mitigates potential to be misled by false positives.
  - Helps to analyze the value of added technology.
  - Documents the beliefs and assumptions that inform the confidence in the MVA/MMV Plan.









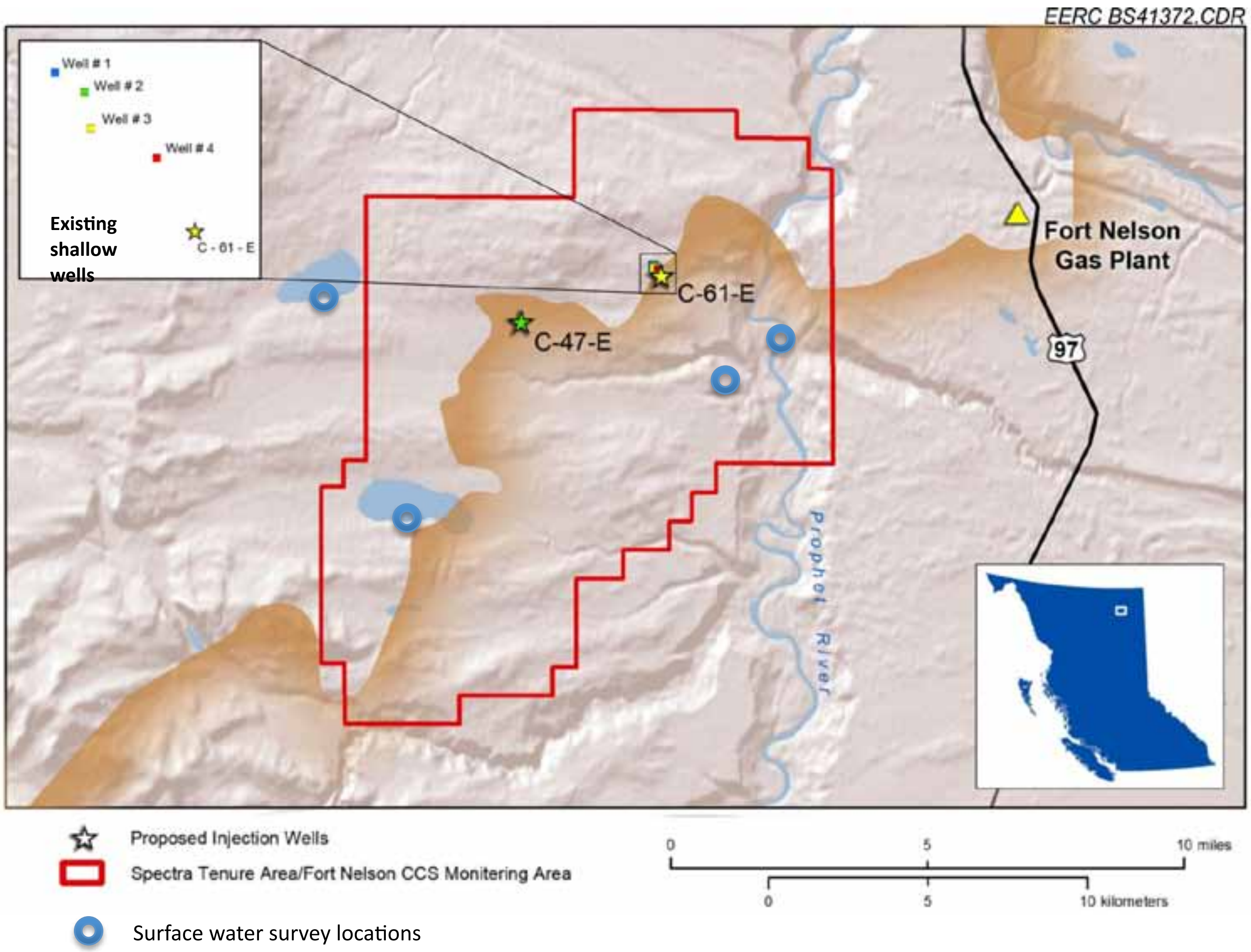
Surface and Shallow Subsurface MVA Planning

<u>Activities to be Done</u>

Additional shallow groundwater monitoring wells drilled near c-47-E.

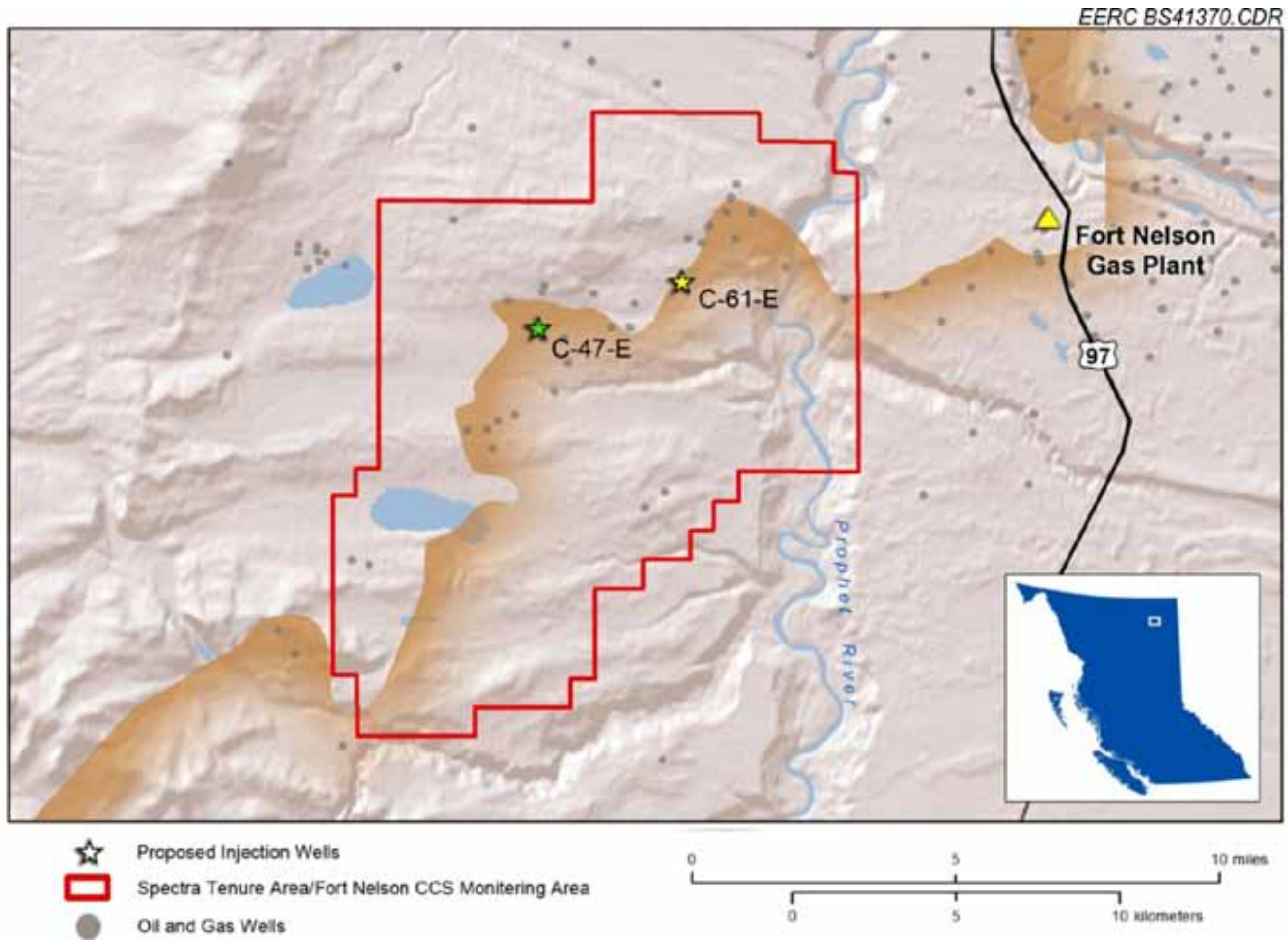
Baseline soil gas survey, specific locations to be determined.

Baseline surface water survey at Prophet River, creek near ice bridge, and Klowee and Milo Lakes.



Deep Geological System MVA Planning

- MVA Plans are being developed for Injection at c-47-E
- c-47-E is further from gas pools, but has more geologic uncertainty.
- Drilling the second Test Hole and acquisition of remaining 3D Seismic is critical to finalizing the site characterization, Risk Assessment and MVA/ MMV Planning



Fort Nelson CCS – Project Timelines

Spectra Energy

Project Timeline

Critical Short Term Deliverables

Project Milestones	Area	Start	Finish
Commercial Agreements in place	Commercial	2012 Q1	2012 Q3
Tenure Negotiations with BC Completed	Liability	2012 Q1	2012 Q3
SET Approval Winter Ops AFE	Reservoir	2012-05-01	2012-07-15
Winter Operations – 3D Seismic and Second Test Hole	Reservoir	2012 Q4	2013 Q1
Geological Update 2013	Reservoir	2013 Q1	2013 Q3
SET BOD Approval	Project	2013-09-01	2013-10-31
Commence Injection	Project	Q3 2016	

Lessons Learned

- Site Selection is the most important step in Risk Mitigation. Avoiding interference with stakeholder interests and finding proper geology enables project risk reduction.
- Engaging Stakeholders early has been a benefit in terms of building friends of the project. Stakeholders are asking us when will you start and how can we help.
- Don't underestimate the time and effort required to advance such a project beyond the feasibility stage.