

# BRAINSTORMING SESSION

## Life cycle Assessment of North American Crude oils

### Phase II

AERI LCA Workshop

15 June 2009



# What's Next?

- **Finalize and Post Reports:** Both LCA reports will be posted on the AERI website - [www.aeri.ab.ca](http://www.aeri.ab.ca) - probably within 2-4 weeks
- **Reconciliation:** The differences between the two studies need to be reconciled - and other studies (GHGenius, UofC/UofT, industry)?
- **Model Access:** Have yet to finalize how the modified GREET model would be accessed
  - ❑ TIAX response:
    - ❖ Have built an interface to modify GREET to match TIAX's results and will be available
    - ❖ Was based on prior version of GREET
  - ❑ Jacobs Consultancy response
    - ❖ Production model - Jacobs will discuss internally and respond - strong interest from audience
    - ❖ Refining model - will get results but not model due to proprietary embedded information
    - ❖ GREET - will provide aggregation model
- **Model Updating & Maintenance:** Who would do this and how could it be done? Ongoing data improvement? - see last slide
- **Phase II:** How do we maintain the momentum?

# #1: Add Technology Pathways

- **Oil Sands:** Nexen Long Lake, Ivanhoe, ETX, Slurry Phase HC and others
- **Conventional Oil:** Others
  - ❑ 1
  - ❑ 2
- Ed Koshka - wants to see more on coke / co-product treatment in Phase 2 and comments on it in Phase 1 report

## *#2: Detailed Analysis of SAGD Cogen and Exports to the Alberta Grid*

- **SAGD Power Demand:** Develop rough balance of existing and planned SAGD power generation, use and “export”
- **Current Grid:** Review against current grid supply and demand - consider sources of peak and base load supply (coal, natural gas cogen and hydro)
- **Emissions Credits:** Develop a sound basis for potential emissions credits
  - ❑ 1
  - ❑ 2

# #3: Scenario Analysis

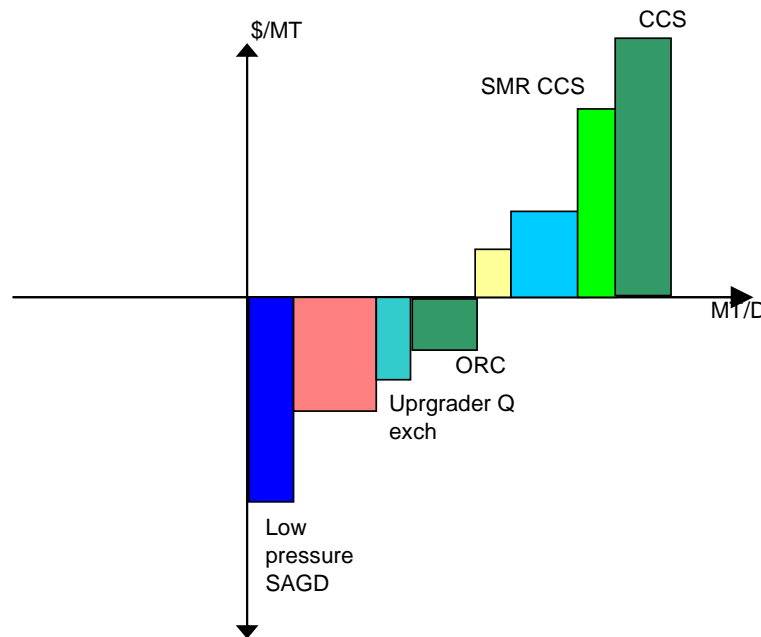
- **Increasing Emissions from Depleting Conventional Oil Reservoirs:** Impact of transition from primary to secondary to tertiary; deeper reservoirs, higher water-oil ratios etc.
- **Decreasing Emissions from New Oil Sands Technologies:** Impact of the Steam-Oil ratio changing from 3 to 2.3 to 1
  - ❑ 1
  - ❑ 2
- Unknown - fed gov. NRCAN - report circulated to group on future energy sources - what are fuels in 5, 10, 15, 20 years from now
- Eddy Isaacs - Look at fuels of the future - electrification pathway on LCFS LCA basis - hybrid electrics

## #4: Evaluate CO<sub>2</sub> Mitigation Options

- **SAGD Energy Optimization:** SAGD energy reduction via ideal heat cycle benchmarking and new technology
- **CO<sub>2</sub> Avoidance:** Alternate treatment of co-products such as pet coke; coke as a “permanent” sequestration option
- **Carbon Capture and Storage:** with gasification, circulating fluidized bed; economies of scale
  - ▣ 1
  - ▣ 2
- Joule
  - ▣ Looking at options to reduce SAGD energy consumption

# #5: Develop CO<sub>2</sub> Abatement Curves

## Oil Sand CO<sub>2</sub> Abatement Curve Example



## #5: *Develop CO<sub>2</sub> Abatement Curves* (Continued)

- **Options, in Alberta, include:** Production; production & partial upgrading; production & upgrading to SCO; production, upgrading and refining
  - ❑ 1
  - ❑ 2
  - ❑ 3

## #6: *Further Delineate Technologies*

- **SAGD, CSS, Mining:** Develop more detailed models for each production type
- **CCS versus other Mitigation Options:** Compare for each technology
- **Emerging Technologies:** Assess new technologies that would reduce emissions
  - ❑ 1
  - ❑ 2

# #7: *Expand Boundary Conditions*

- **Land Use Management:** Impact of other factors, such as land use management
- **Renewable Energy:** Add biofuels and other renewable energy pathways
- **Water Management:** Address water-related issues
- **Natural Gas Production:** LCA natural gas pathways
- *Len Flint*
  - ❑ *Need to be very clear about treatment of co-products and coke*
  - ❑ *Need more pathways other than using / relying on natural gas*
  - ❑ 4
  - ❑ 5

## *#8: Expand Phase II Membership*

- **Industry:** associations, companies
- **Government:** regional, national, international
- **Research Community:** provincial, national, international
- **NGOs:** organizations, individuals
  - ❑ 1
  - ❑ 2

# Priorities

## ➤ WHAT'S NEXT? \$ REQUIRED? WHO'S IN?

### ❑ Chris Holly - next step priorities

- ❖ Alternate crudes LCA (Columbia), alternate fuels LCA (ethanol, natural gas, etc.), economies of scale, etc.

### ❑ David Stachniak

- ❖ Need common, consistent, updated model to use - needs to be maintained. Joule agreed. Comment - work with Argonne as they own model & maintenance

### ❑ Jason Switzer

- ❖ Treatment of coke, cogen credit, other types of offsets, payments to technology fund

### ❑ Surindar

- ❖ Energy efficiency, etc

### ❑ Jim Hughes

- ❖ What is right tool to determine emissions and policy?
- ❖ Eddy response - if there is LCFS - we need a tool to measure with

### ❑ Unknown - federal government

- ❖ Can we link / use Jacobs production model to fix the large divergence between GREET and GHGenius
- ❖ What efficiency gains can be made - use these tools to help guide policy

# *Further Discussions?*

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