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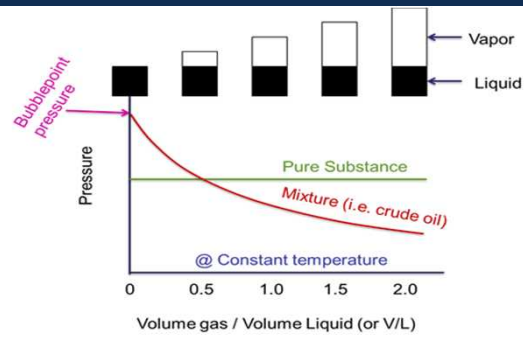

Crude Oil Characterization Research Study Update

Briefing to

Consul General of Canada

Tech Area 5, Bldg. 6585
Sandia National Laboratories
Albuquerque, NM USA
January 27, 2016

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U.S. DEPARTMENT OF ENERGY

NNSA National Nuclear Security Administration

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Outline

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- Problem Statement
- DOE/DOT Project Objectives
- Project Governance
- Project Workflow
- Interface with Transport Canada
- Project Management Contacts
- Liquefied Natural Gas project video

Problem Statement

- Crude transport by rail poses risks recognized by regulators
  - US DOT Class 3 flammable liquid
  - Transport Canada UN1267
- Hazards have been realized in a number of high-profile train derailments leading to oil spills, environmental contamination, fire, property damage, and fatalities
- Open debate on whether the types of crude (tight oil vs. conventional production) have significant bearing on likelihood and severity of transportation accidents

Lac Megantic, Quebec, July 2013 (from: TSBC (2014). "Runaway and Main-Track Derailment Montreal, Maine & Atlantic Railway Freight Train Lac-Megantic, Quebec 06 July 2013." ***R13D0054***. Transportation Safety Board of Canada, Gatineau QC K1A 1K8. Railway Investigation Report.)

DOE/DOT Project Objectives

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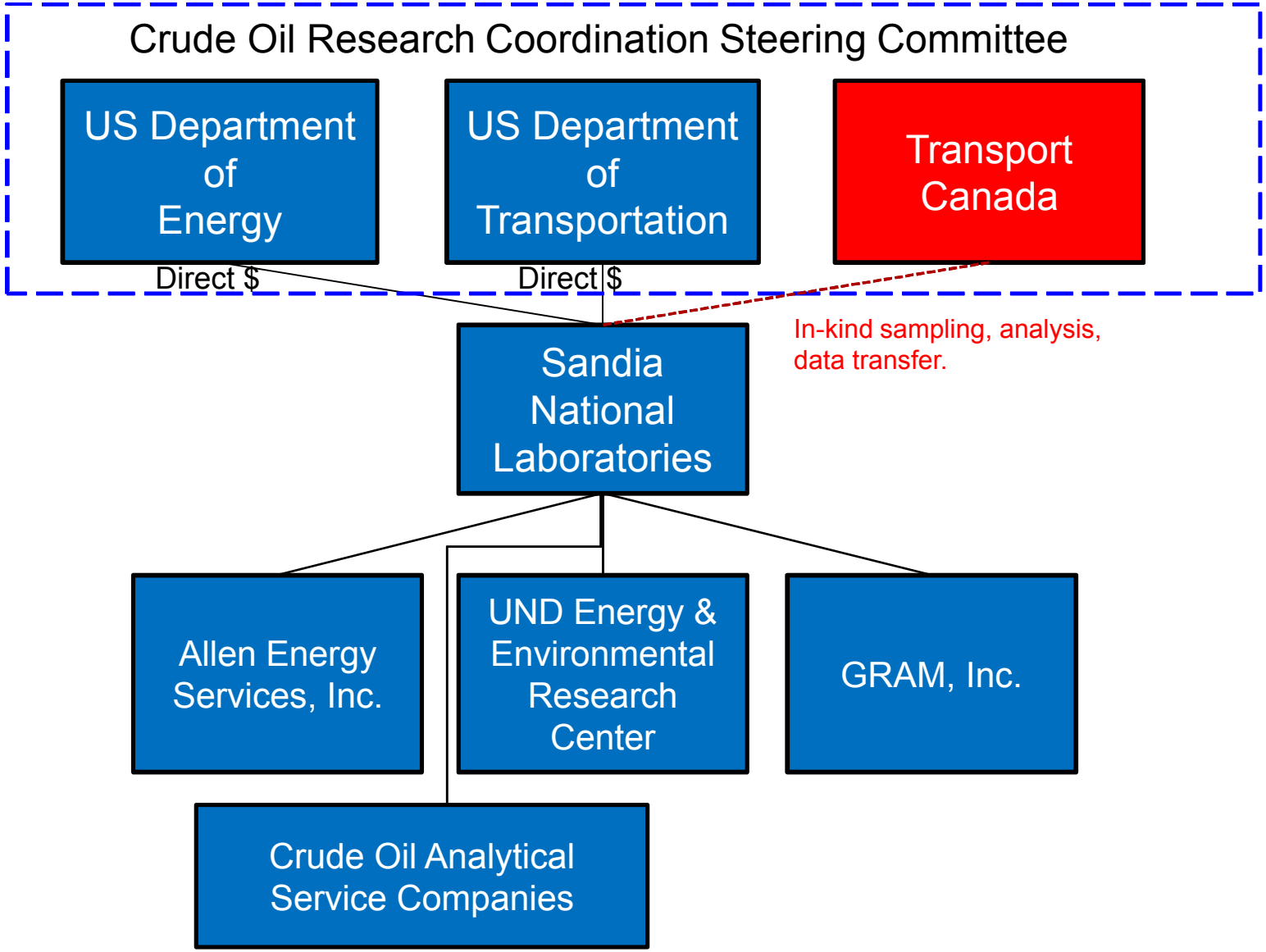
- Evaluate basic physical properties of crude oils (tight vs. conventional production) that are moved within rail transport environment
- Collect objective measured data on combustion properties of selected crude oils in controlled burn scenarios
- Compare these results to existing data on other flammable liquids, including methanol, ethanol, jet fuel, hexane
- Evaluate if selected tight oils exhibit measurably different combustion properties from a conventional crude and the reference fluids tested previously

Project Governance



Overall Project Workflow

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Phase I | **Phase II** | **Phase III**

Problem Definition Phase
Completed

Literature Survey

Sampling and Analysis Plan

Peer review

Experimental Phase
Current/future SNL future work scope

- Task 1: Analyze existing data
- Task 2: Sampling method evaluation
- Task 3: Combustion experiments and modeling
- Task 4: Crude characterization, tight vs. conventional
- Task 5: Railcar combustion testing and modeling
- Task 6: Comprehensive oil characterization

Peer review

Implementation Phase
All stakeholders

- Utilize knowledge gained during prior phases to inform decisions on:
  - Industry best practices
  - Standards
  - Regulations

Public outreach

API: American Petroleum Institute
COQA: Crude Oil Quality Association
CCQTA: Canadian Crude Quality Technical Association

ASTM: ASTM International Standards
GPA: Gas Processors Association
SPR: Strategic Petroleum Reserve

} Phase III

Sandia Interface w/Transport Canada

- SNL and TC interface every 1-2 months through the Crude Oil Research Coordination Steering Committee
- SNL and TC co-developed sampling and analysis plans for the current DOE/DOT study where TC will provide in-kind, parallel analysis on Canadian oils and share the data with DOE/DOT/SNL for use in project technical reports (Nov 2015-current)
- SNL gave TC a ROM estimate for FY16-17 large-scale combustion tests on selected crude oils of interest to Canadians (Dec 2015)
  - TC may try to do small-scale parallel work in FY16-17 and re-visit large-scale work with Sandia later
- TC points-of-contact managing work with Sandia
  - Barbara diBacco, Tagenine Alladin, Christopher Kirney, Nathalie Belliveau

Project Management Contacts

- US DOE funding agency point-of-contact
  - Evan Frye
    - U.S. Department of Energy, Office of Fossil Energy, Office of Oil & Natural Gas
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- US DOT funding agency point-of-contact
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Sandia LNG Project Video

- Unclassified Unlimited Release SAND2010-4433P
- Summarizes a Liquefied Natural Gas combustion study done at Sandia for the U.S. Coast Guard
- ~ 6 minutes long

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END OF PREPARED SLIDES

Phase II Preliminary Schedule

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		Year 1				Year 2			
Task	Description	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1	Review new & emerging data								
2	Evaluate sampling and analysis methods								
3	Large sample acquisition, combustion tests, modeling								
4	Tight vs. conventional crude characterization								