NPC U.S. Oil and Natural Gas Transportation Infrastructure Study

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Williams Companies, Inc.

National Petroleum Council

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Overview of Proposed Study Scope

Analyze the changing dynamics and future needs of oil, natural gas, and NGL transportation infrastructure, existing and future constraints, and technology and policy options to improve siting and permitting, which can improve safety, environmental performance, and resiliency.

Secretary's Request:

- How are the dynamics of U.S. oil and natural gas transportation infrastructure changing
- How can federal and state governments leverage efforts to support U.S. petroleum and natural gas supply and transportation infrastructure capacity improvements
- What are the constraints to energy production growth
- What are the policy recommendations for the future
- What technology developments and future opportunities are emerging

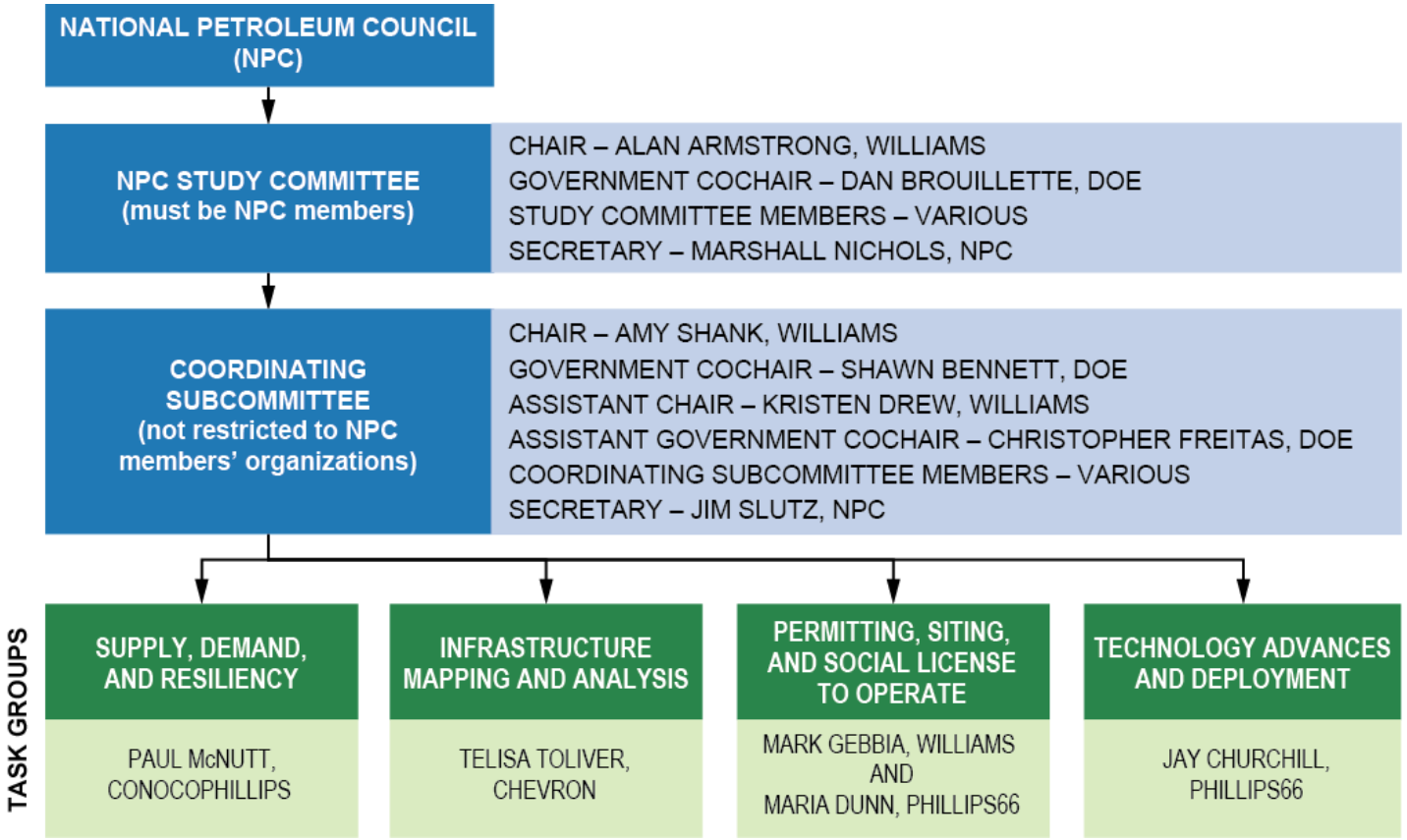
Approach:
For each task group…

- Frame key questions and background context
- Describe current framework
- Offer recommendations to address key questions

Task Groups

- **Supply, Demand, and Resiliency**
- **Infrastructure Mapping and Analysis**
- **Permitting, Siting, and Social License to Operate**
- **Technology Advances and Deployment**

Infrastructure Study Organization



Study Committee

Steering Committee

Alan Armstrong (Williams)
Dan Brouillette (DOE)
Christi L. Craddick (Railroad Commission of Texas)
Ryan Lance (ConocoPhillips)
Al Monaco (Enbridge, Inc.)
Richard Newell (RFF)
Marshall Nichols (NPC)
Greg Garland (Phillips66)
Mike Wirth (Chevron)

Study Committee

- Committee on U.S. Oil and Natural Gas Transportation Infrastructure appointed.
- Strong support from Steering Committee has resulted in a large contingent of resources being committed from across industry, regulators, and NGOs.
- Membership is composed of approximately 25% of the Council, because of the significant interest in the infrastructure topic.
- The study team welcomes additional participation from the Committee and Council members.

Coordinating Subcommittee

Amy Shank, Chair (Williams)

Kristen Drew, Assistant to Chair (Williams)

Shawn Bennet, Gov't. Cochair (DOE)

Christopher Freitas, Assistant to Gov't. Cochair (DOE)

Jim Slutz, Secretary (NPC)

Jay Churchill, Chair – Technology Advances and Deployment (Phillips66)

Paul McNutt, Chair – Supply, Demand, and Resiliency (Conoco Phillips)

Holly Bamford (National Fish & Wildlife Foundation)

Kevin Book (Clearview Energy Partners)

Rusty Braziel (RBN Energy)

Rich Cain (Chevron)

Chris Chandler (Plains)

Paul Doucette (Baker Hughes, GE)

Ryan Fisher (Army Corps)

Kari French (Texas Railroad Commission)

David Goldwyn (Goldwyn Global Strategies)

Matt Woodruff (Kirby Corp)

Richard Wall (Bechtel)

Kate MacGregor (DOI)

Paul Jones (Cardno)

Anthony Pugliese (FERC)

Rodger Schwecke (Southern CA Gas)

Kevin Hilton (Impact)

Jan Mares (RFF)

Ken Martin (Ohio State)

Brianne Metzger-Doran (Enbridge)

John Miller (BNSF)

Peggy Montana (Shell)

Drue Pearce (PHMSA)

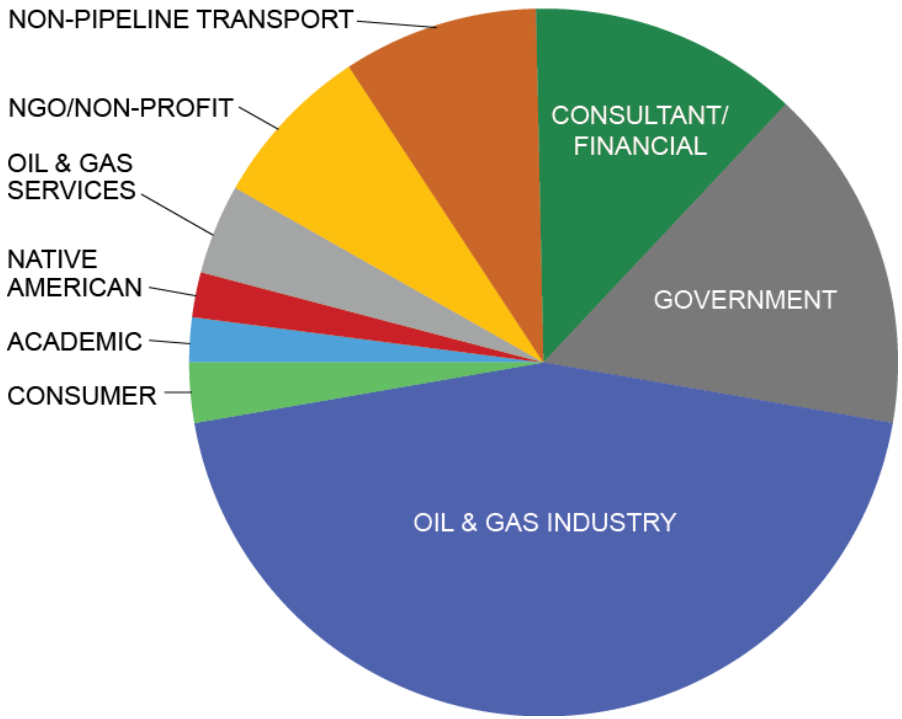
Jonathan Peress (EDF)

Mike Pomorski (Encana)

Jason Grumet (Bipartisan Policy Center)

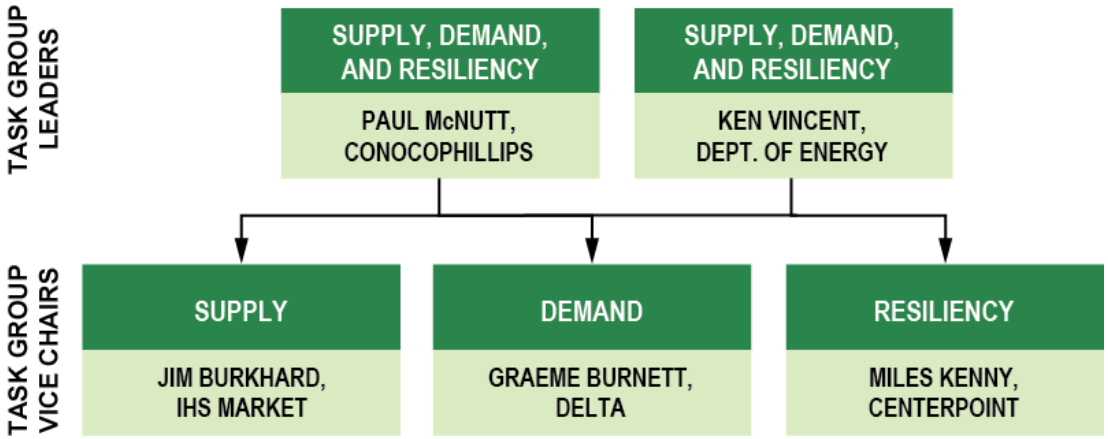
Infrastructure Study Participants

Study Team Composition



- The CSC has a membership of 32 individuals representing all elements of the oil and natural gas value chain, including all transportation modes.
- Members also represent environmental and conservation NGOs, Agriculture, Labor, and Native American interests.
- The overall study team is currently composed of 144 members from 69 different organizations, and growing.

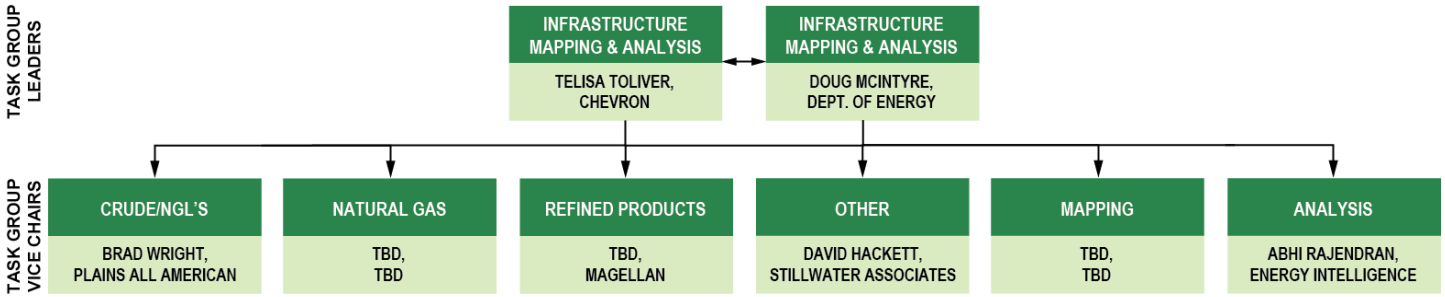
Supply, Demand, and Resiliency Task Group



Develop a shared understanding of oil, natural gas, and NGL supply and demand outlooks.

- Review North American energy forecasts under a variety of different scenarios and understand the factors (demographics, policy, technological change) that can drive different outcomes.
- Estimate the infrastructure needs for the future in coordination with the Infrastructure Mapping Task Group.
- Assess the robustness and resiliency of the current system, including areas most at risk, and recommend options for improving optionality.

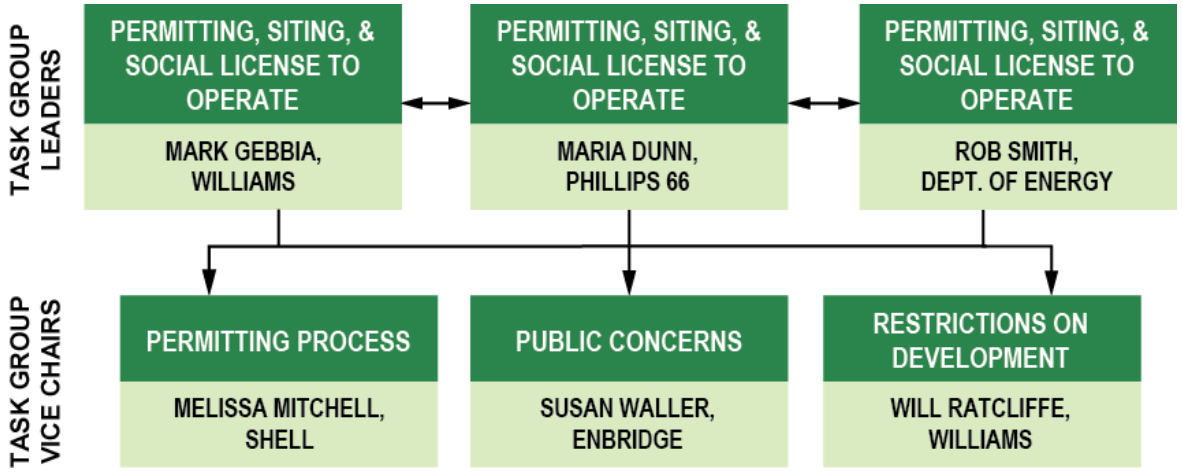
Infrastructure Mapping and Analysis Task Group



Analyze the state of the nation's oil and natural gas infrastructure.

- Provide the historical context and description of the oil and natural gas transportation system.
- Assess the value of infrastructure to the U.S. consumer and its impact on affordable and reliable supply of energy. Develop necessary maps and graphics to communicate findings.
- Identify the infrastructure needs of the future, including the role that market structure plays in infrastructure decisions and development.
- Analyze critical infrastructure characteristics including age, miles traversed, and capacity, followed by the other infrastructure critical to energy: processing plants, refineries, storage, LNG terminals, waterways, ports, railroads, and highways.
- Address the physical interdependencies between related markets (power and industrial) and geographical markets (domestic, North American, and global).

Permitting, Siting, and Social License to Operate Task Group



Analyze government, stakeholder, and public processes and concerns around developing new and replacement infrastructure.

- Assess how the U.S. federal, state, and local governments can create a predictable and efficient regulatory environment to facilitate infrastructure development over the next 10 years that is appropriately sited and developed to support reliable, economic, efficient, environmentally responsible, and safe supplies of energy for the future.
- Understand the roles of federal, state, and local agencies in permitting energy infrastructure; including successful examples, challenges, regulatory overlaps, uncertainties, and public engagement in the siting processes across all commodity types and modes of transport.

Permitting, Siting, and Social License to Operate Task Group (continued)

The review will

- Provide recommendations to the public and private sectors for addressing inefficiencies in the permitting process, improving stakeholder engagement, and implementing lasting improvements to permitting and siting processes that enables secure, reliable, environmentally responsible, and safe energy infrastructure.
- Develop an understanding of stakeholder concerns regarding the impacts related to infrastructure, including: response, emissions, land use, and other environmental impacts for all transportation modes. This may also address land owner issues such as eminent domain. Identify potential regulatory, best practice, or technology solutions for stakeholder concerns not addressed through current permitting processes.
- Discuss adequacy of existing permitting processes to address climate concerns, including in a low carbon scenario.

Public Outreach

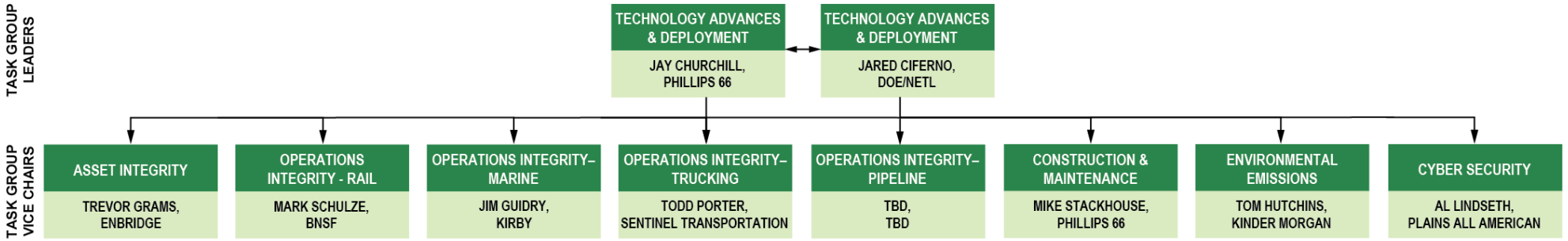
Outreach Process

- Three listening sessions with about 25 participants from ENGOs, agriculture, and local government officials
- Separate discussions with Native Americans and unions
- Literature search and review by industry and other study participants

Major Concerns Identified

- Safety and health Issues
- Impacts on plants, land, water, habitat, and community valued lands and vistas
- Impacts on farm/ranch land, short and long term
- Commitment to involvement with affected communities from concept to decommissioning
- Transparency and collaboration with affected stakeholders regarding routing design and monitoring during construction
- Climate change impacts from upstream and downstream emissions
- Infrastructure needed in a low carbon scenario
- FERC process adequacy regarding need for gas/oil or climate change impacts of energy use

Technology Advances and Deployment Task Group



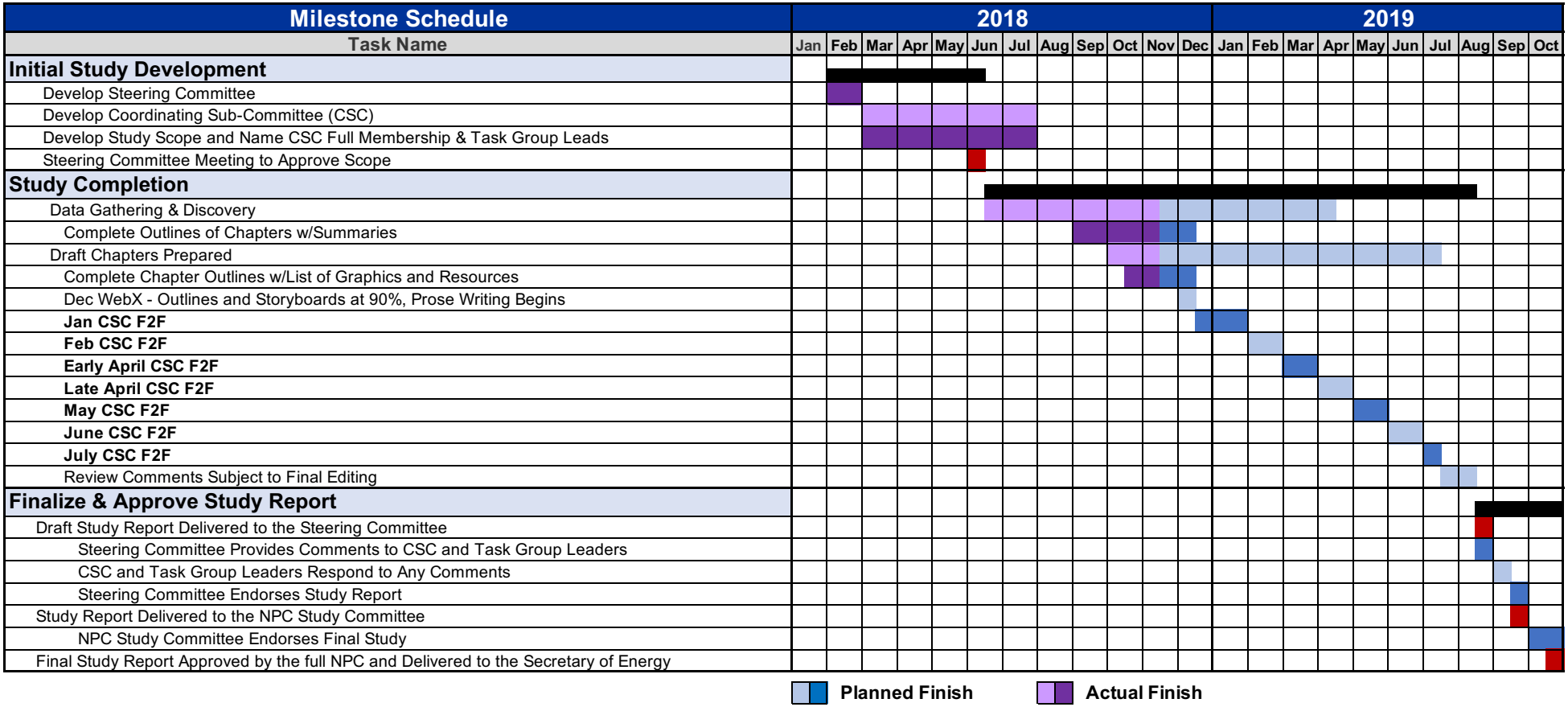
Examine the role of existing, emerging, and future technologies to address supply and demand, safety, reliability, and environmental concerns.

- Evaluate safety and environmental performance of each mode of transportation.
- Identify technologies to improve pipeline and storage facility integrity, environmental monitoring, construction and maintenance techniques, navigational safety systems, railcar safety, and waterborne transportation.
- Assess how industry and government can partner to help accelerate priority technology developments.
- Identify regulatory opportunities that accommodate and/or promote adoption of emerging technologies.
- Review cyber security threats to the operating control/safety systems and advance recommendations for improved protection of existing and emerging control technology.

Study Schedule

NPC ENERGY INFRASTRUCTURE STUDY

REV 4 LAST UPDATED: November 8, 2018



Questions/Discussion

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