Oil & Gas
and
Security/Resiliency

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What is O&G

• Oil and Gas is a huge industry with many players, big and small and many different types of operations

• There is not a single type of entity
The American Petroleum Institute (API) divides the petroleum industry into 5 sectors:

1. upstream
   (exploration, development and production of crude oil or natural gas)
2. downstream
   (oil tankers, refiners, retailers and consumers)
3. pipeline
4. marine
5. service and supply
Firms

Supermajors

- BP plc (UK)
- Chevron Corporation (USA)
- ExxonMobil Corporation (USA)
- Royal Dutch Shell plc (Netherlands & UK)
- Total SA (France)
- Eni (Italy)
- ConocoPhillips (USA)

- Supermajors only control 6% of reserves
- 90% OPEC cartel and State-Owned-Nationals

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Midstream Firms

- Midstream is a portion of downstream activity and is typically specialized
- Gathering – connecting wells to processing
- Processing/Refining
- Transportation
- Storage
- Technological Applications – specialty services such as flow controls, leak detection
Midstream Firms

- Enbridge Energy Partners - pipelines
- Enterprise Products Partners – pipelines, storage, drilling, production
- Genesis Energy - storage
- Inergy Midstream - propane
- Kinder Morgan Energy Partners - pipelines
- Oneok Partners – natural gas
- TransCanada – pipelines, gas storage
- Williams Companies - natural gas processing and transportation
O&G economics

• Price of oil is tied to US Dollar, so as the dollar moves, so does the price of oil
• Boom and Bust cycles
• 1980’s bust was devastating
• Firms learned and changed
• Current Bust Cycle
  » 60% price drop
  » 30% employment drop
  » Consolidation
Facts

• The U.S. has over 200,000 miles of oil pipelines within its borders.
• Texas, Louisiana and California account for over half of all domestic refining capacity.
• Numbers are big
Of the total revenues of $259 B generated
- $24 billion, 9.3%, from Upstream.
- $207 billion, 79.9%, from Downstream.
- $28 billion, 10.8%, from Chemical.

Of the total net profit of $16 B generated
- $7 billion, 44.0%, from Upstream.
- $7 billion, 40.6%, from Downstream.
- $4 billion, 27.4%, from Chemical.
- $2 billion net loss, -11.9%, from Corporate and Financing.
What about regulation

- Refinery
- EPA
- State Environmental Quality
- CFATS
- DHS (pipelines)
- Transportation of hazardous materials
- Virtually every aspect of an O&G company is regulated
Electricity

- O&G companies understand electricity
- Most refineries have co-gen facilities
- Refining/processing takes energy
Standards

- Too many to list, but main drivers
- ISA/IEC-62443 (formerly ISA-99)
- NIST 800 series
- CFATS
- Myriad of stovepipe industry specific standards for included services
  - Electricity
  - Gas
  - Pipelines
  - Water
Protocols

• Modbus & Modbus TCP
• DNP3
• ProfiBus/Profinet
• CIP
• Ethernet/IP
• Serial Protocols
  »Encapsulated in IP
• Service Request Transport Protocol (GE-SRTP)
• Hart
• And more (think each vendor)
• And network protocols
Purdue Model

- **Network Model for OT**
  - Enables what is needed
  - Segregates what isn’t
  - Enables network security monitoring
How to think about O&G

- Think of the industry as a community of collective industries working to deal with petroleum and related products
- Bigger than petroleum itself
- Challenges in all aspects of the business
- Big move to do digital energy
Major Concerns

- Safety
- Safety
- Safety
- Economic resilience
- Stability/Efficiency
Questions