Compressor Station Operation and Methane Regulations

Our Speakers

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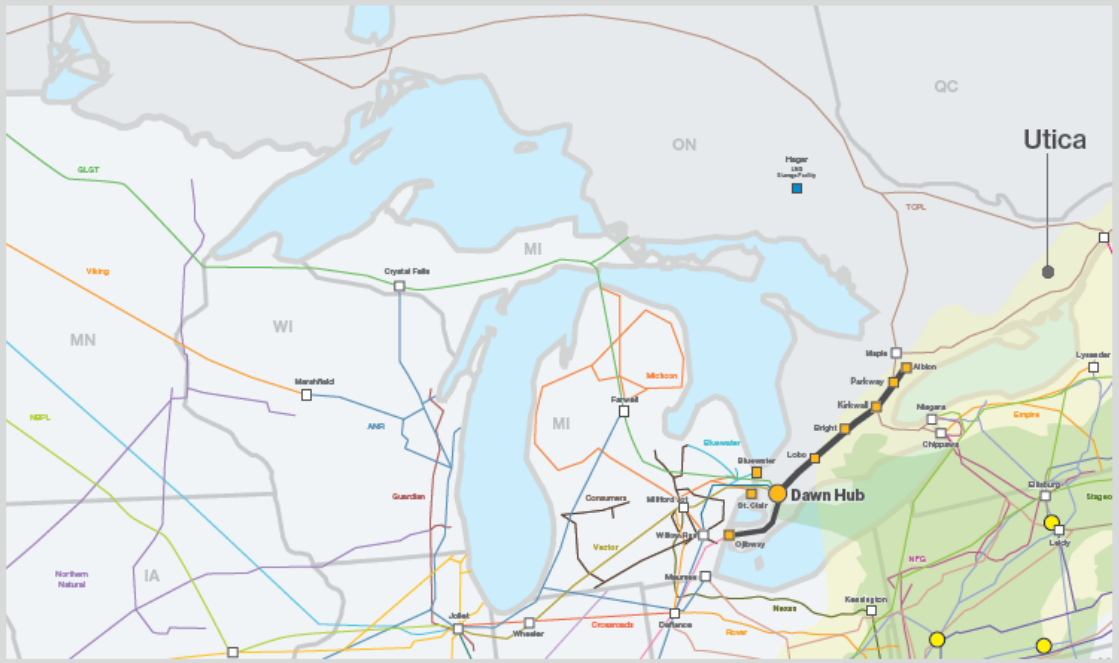
Agenda

- Compressor Station Operation
  - System Operation
  - Purpose of Storage
  - Storage Operations
- Compressor Station Layout
  - Operating Challenges
- Methane Regulation
  - Proposed Amendments
  - Challenges
  - Opportunities

We are Ontario's Energy Advantage

ENBRIDGE
Life Takes Energy



830,700 HP	3.7 million	10 million
compression	in-franchise customers	ex-franchise customers

7.95 BCF	280 BCF	36
design day throughput	storage capacity	storage pools

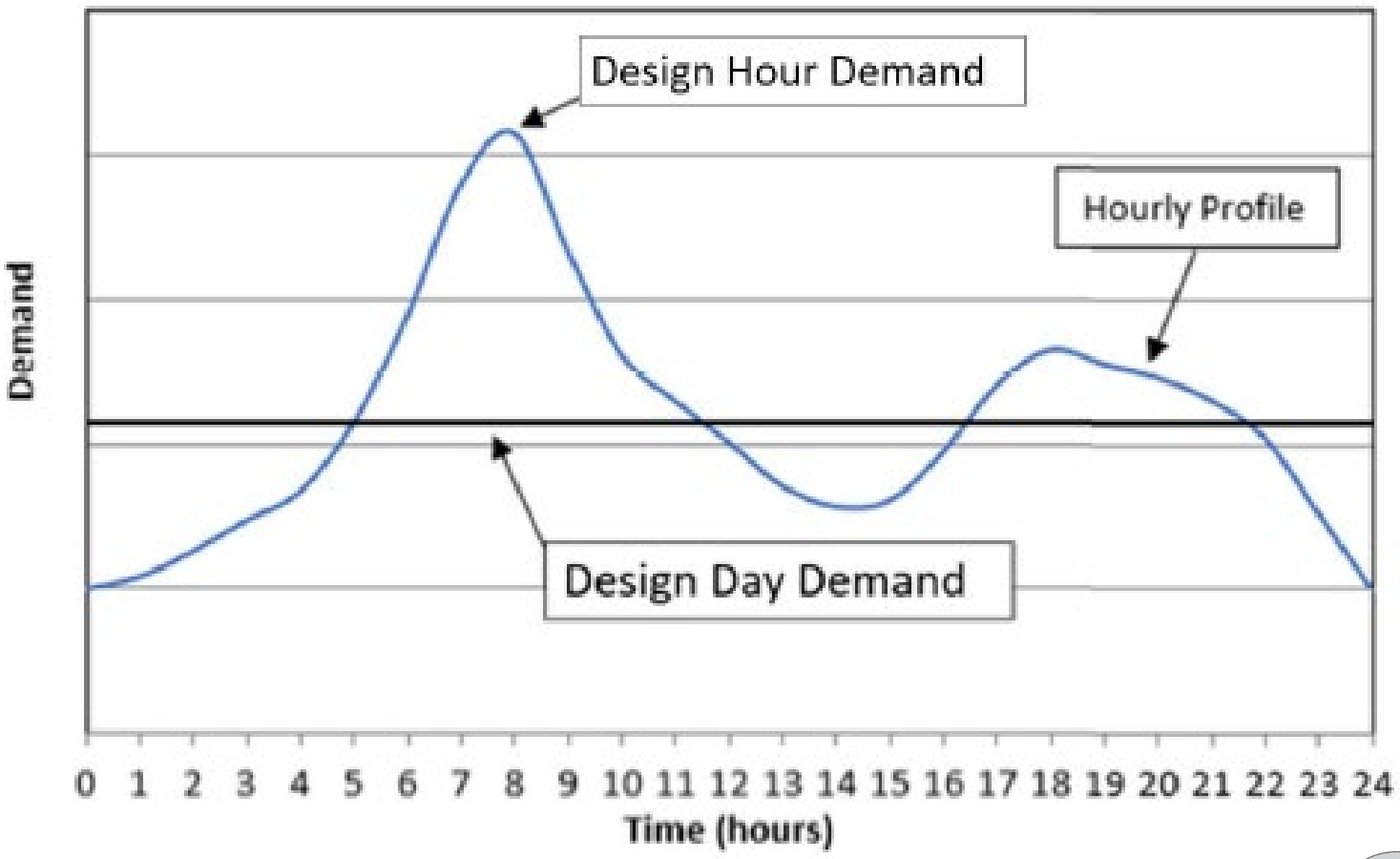
- Dawn is the largest natural gas trading hub in Eastern Canada and second-largest in North America
- Reduces price volatility, increases security of supply
- Diverse upstream connectivity with all major gas producing basins
- Growing connections to Eastern Canadian and U.S. Northeast consumers

Our customers

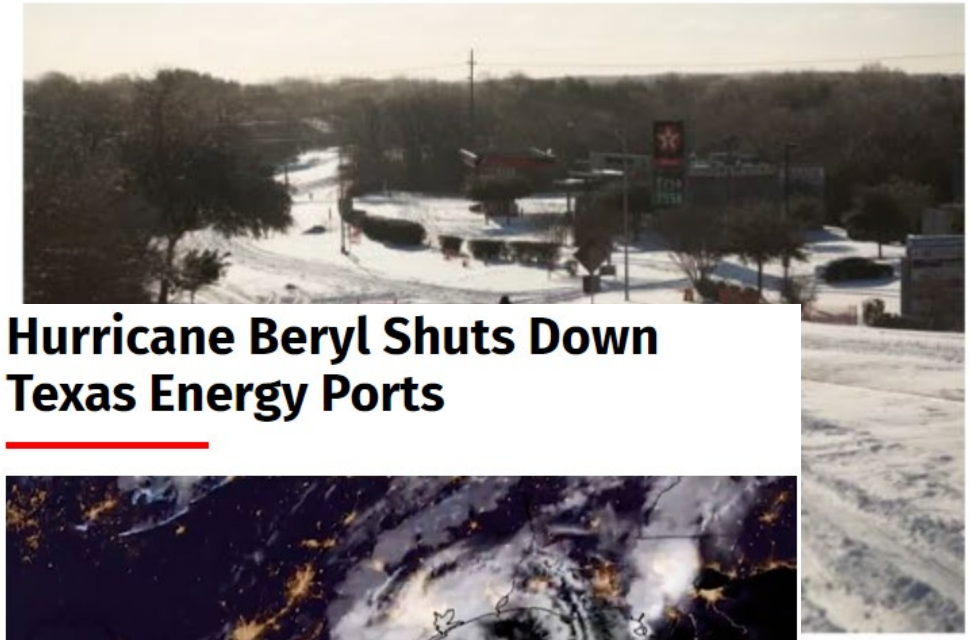
bp, CCI, DTE Energy, EDF, Emera, energir, equinor, freepoint, Goldman Sachs, just energy, KOCH, MACQUARIE, Morgan Stanley, REPSOL, ROVER PIPELINE, Shell, SUNCOR ENERGY, TC Energy, TENASKA, TIDAL, TWIN EAGLE

Typical Daily Gas Usage

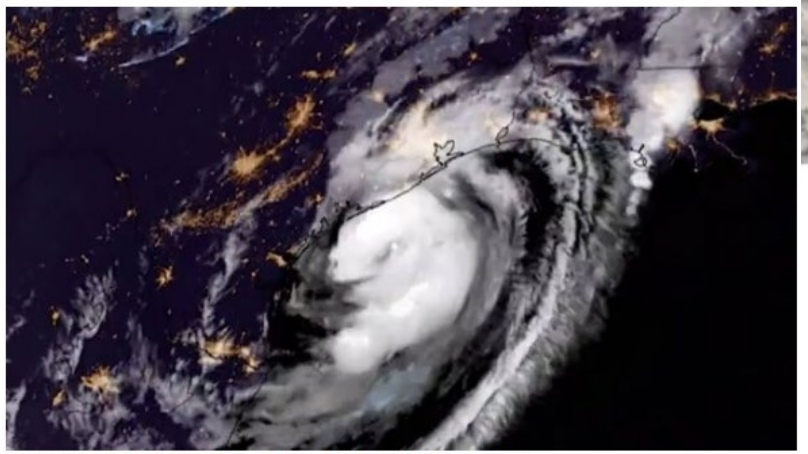
- Morning peak is highest
- Secondary dinner time peak



Dawn Storage Hub



Hurricane Beryl Shuts Down Texas Energy Ports



Hurricane Beryl makes landfall in Texas, July 8, 2024 (GOES East)

"It looked like the end of the world": Listen to the stories of Texans who lived through 2021's historic winter storm

BY JACOB OHARA, A

One year later, doz
memories about ar

Eastern Canada braces for snowfall, strong winds as West deals with extreme cold this weekend

ANALYST INSIGHTS

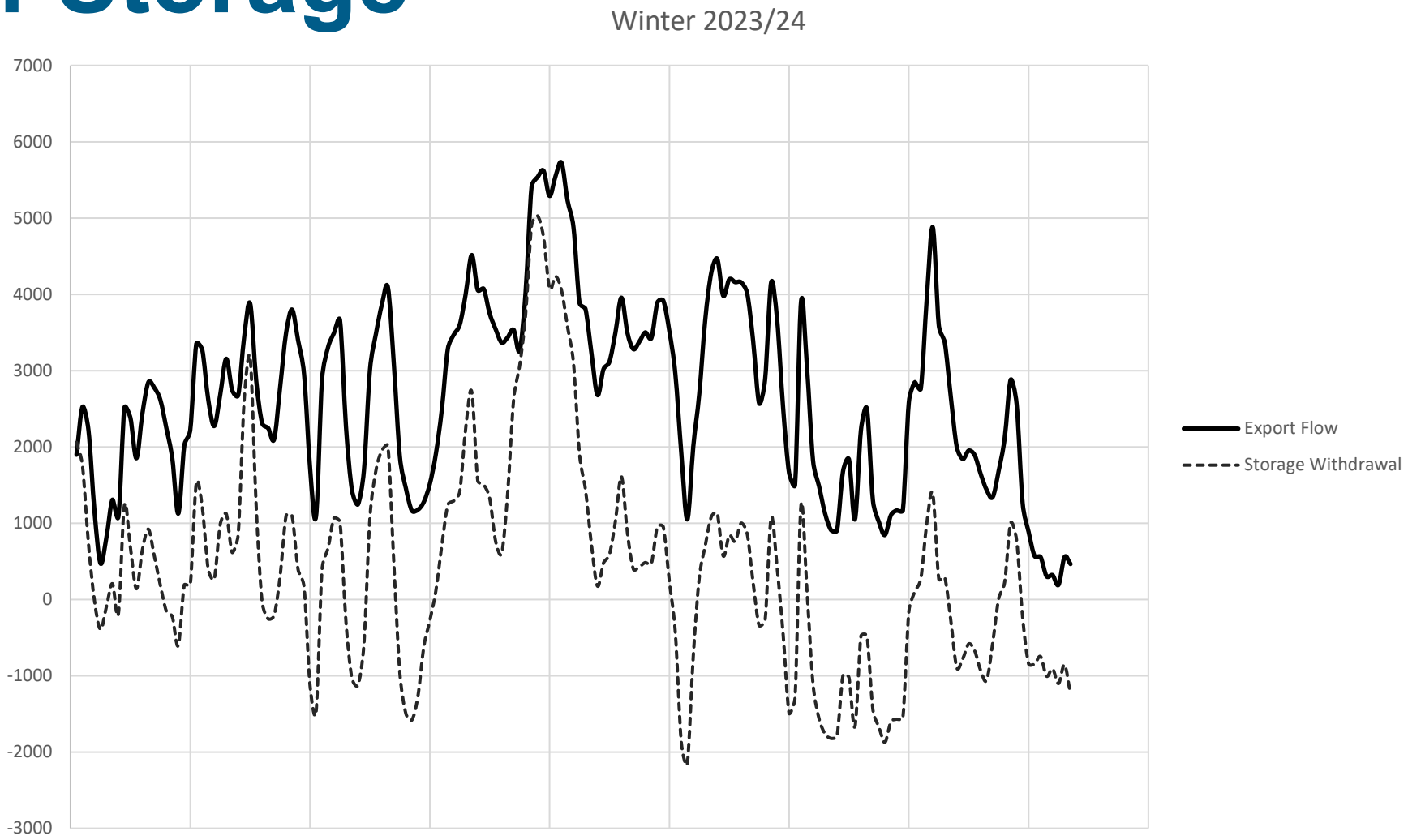
Alberta Gas Demand Reaches Record High In Latest Deep Freeze But Still Plenty Of Gas In Storage

Friday, 01/19/2024 (2:00 pm)

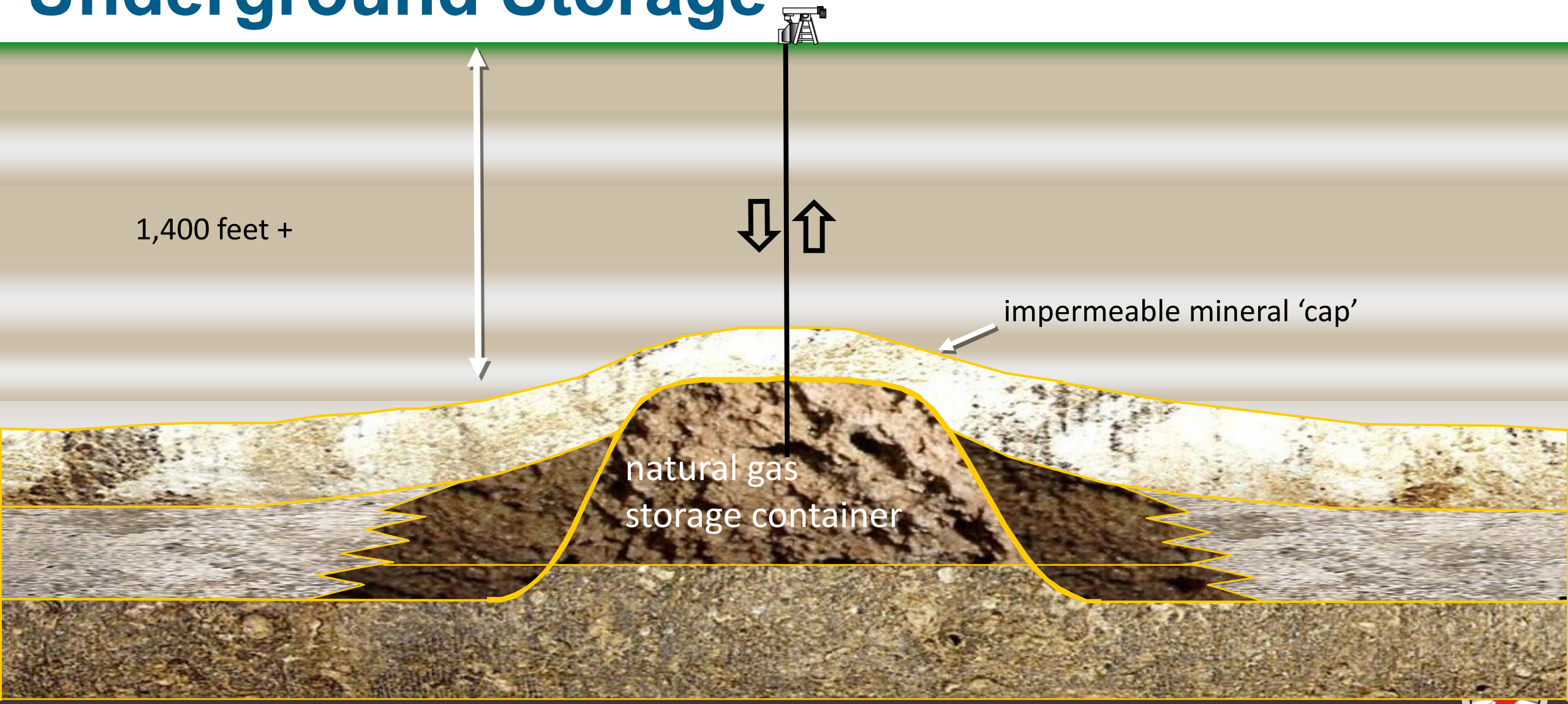
Published by: Martin King

Purpose of Storage

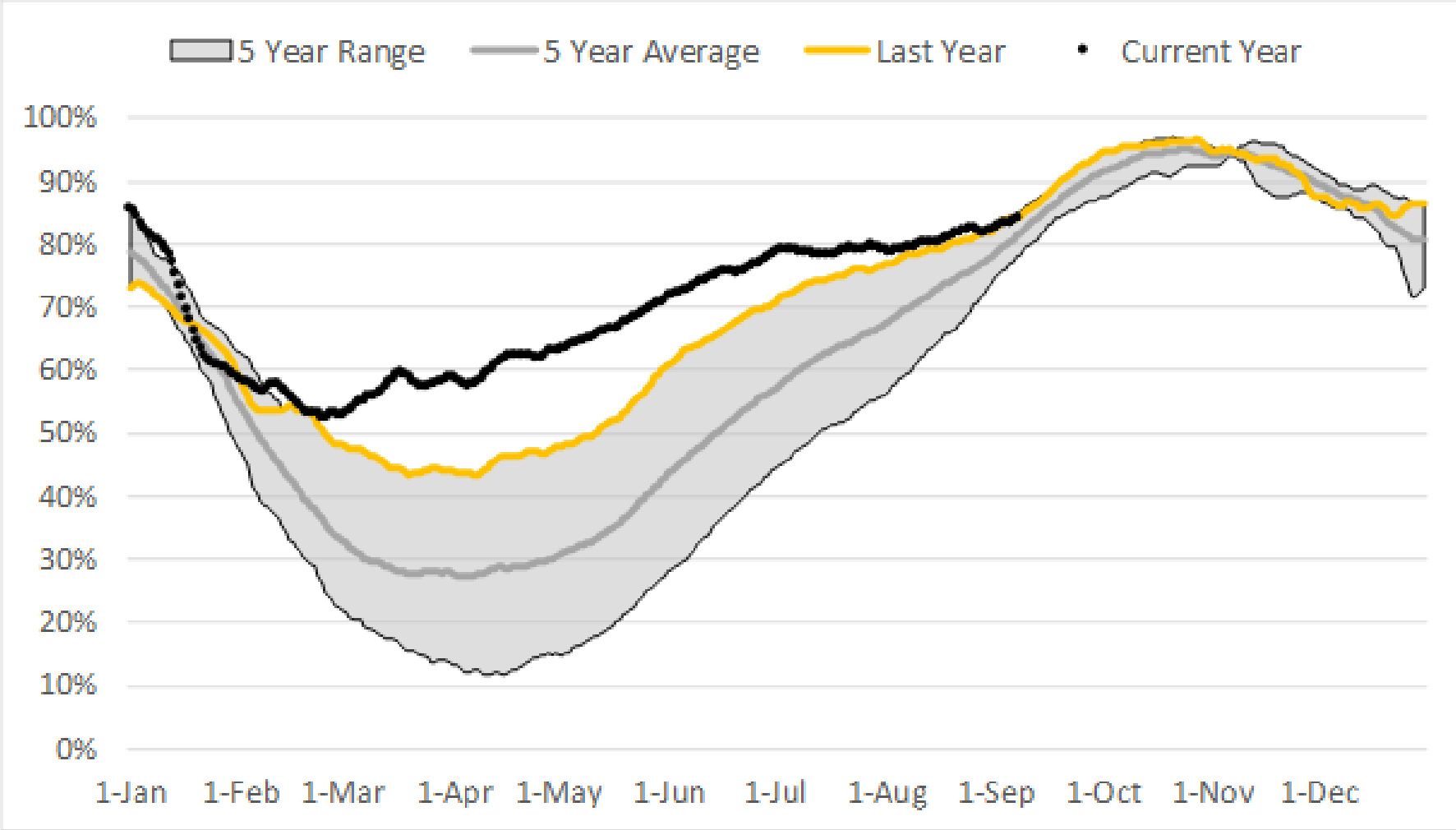
- Storage withdrawals supplement imports
- On warm winter days may reinject
- On cold winter days storage may exceed 90% of export volumes



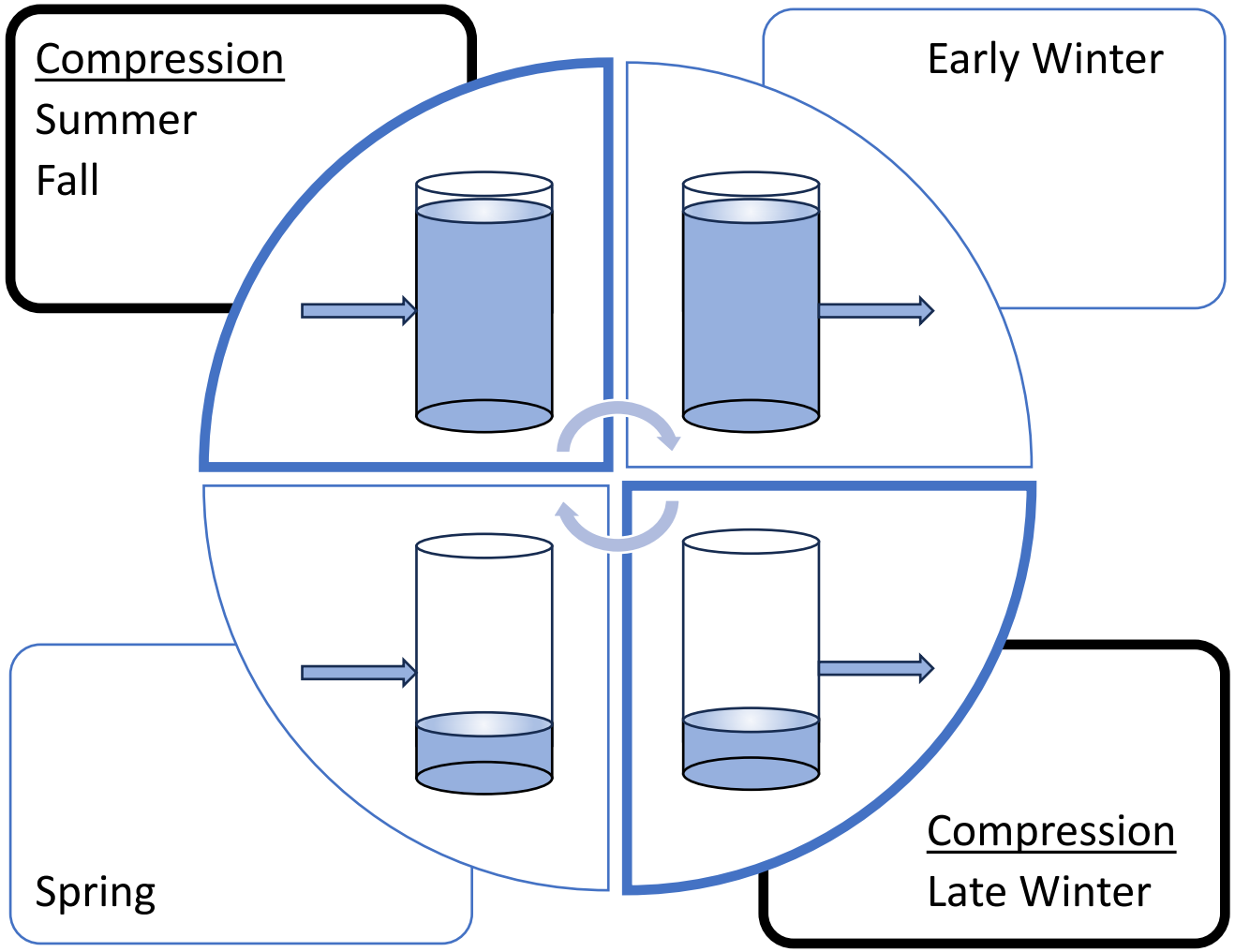
Underground Storage



Annual Storage Operation



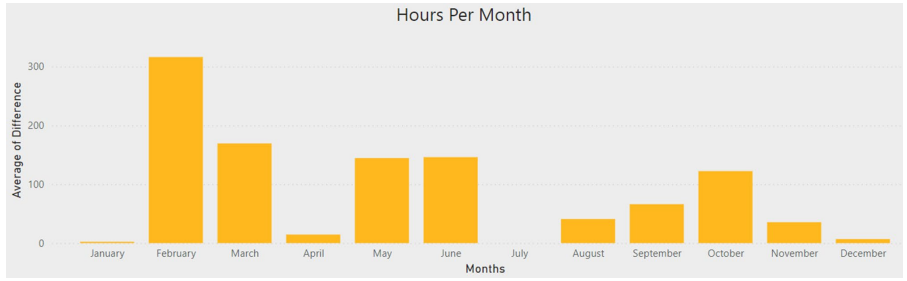
Storage Compression



Operational Differences

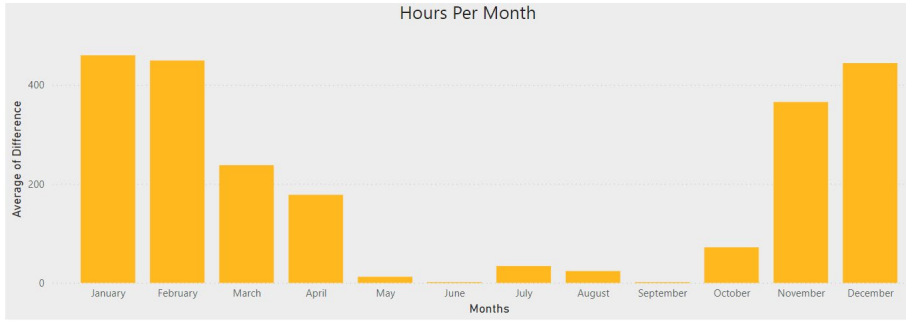
Storage

- Steady suction or discharge
- Summer operation
- High lift
- Swing operation

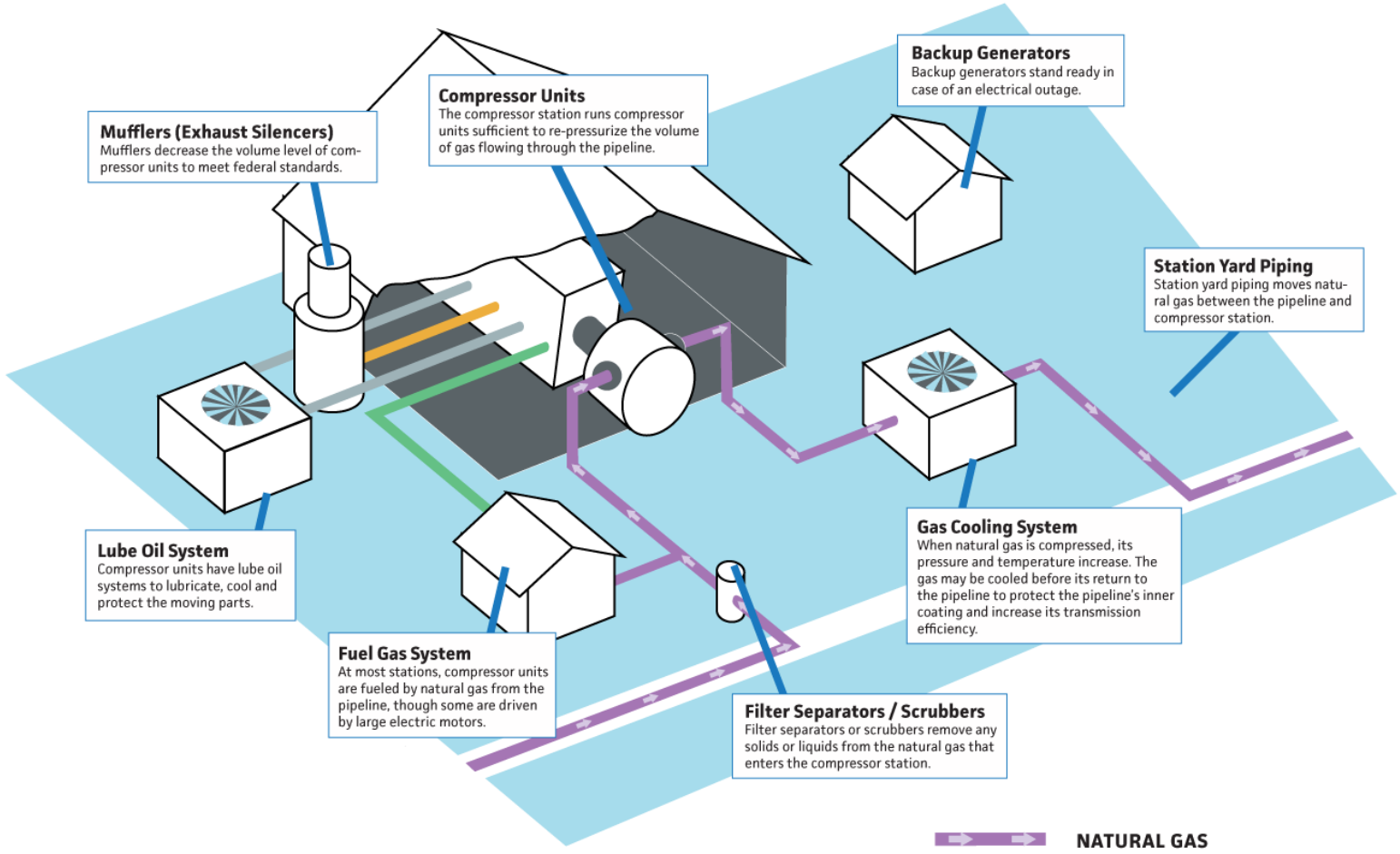


Transmission

- Steady suction AND discharge
- Winter Operation
- Low lift

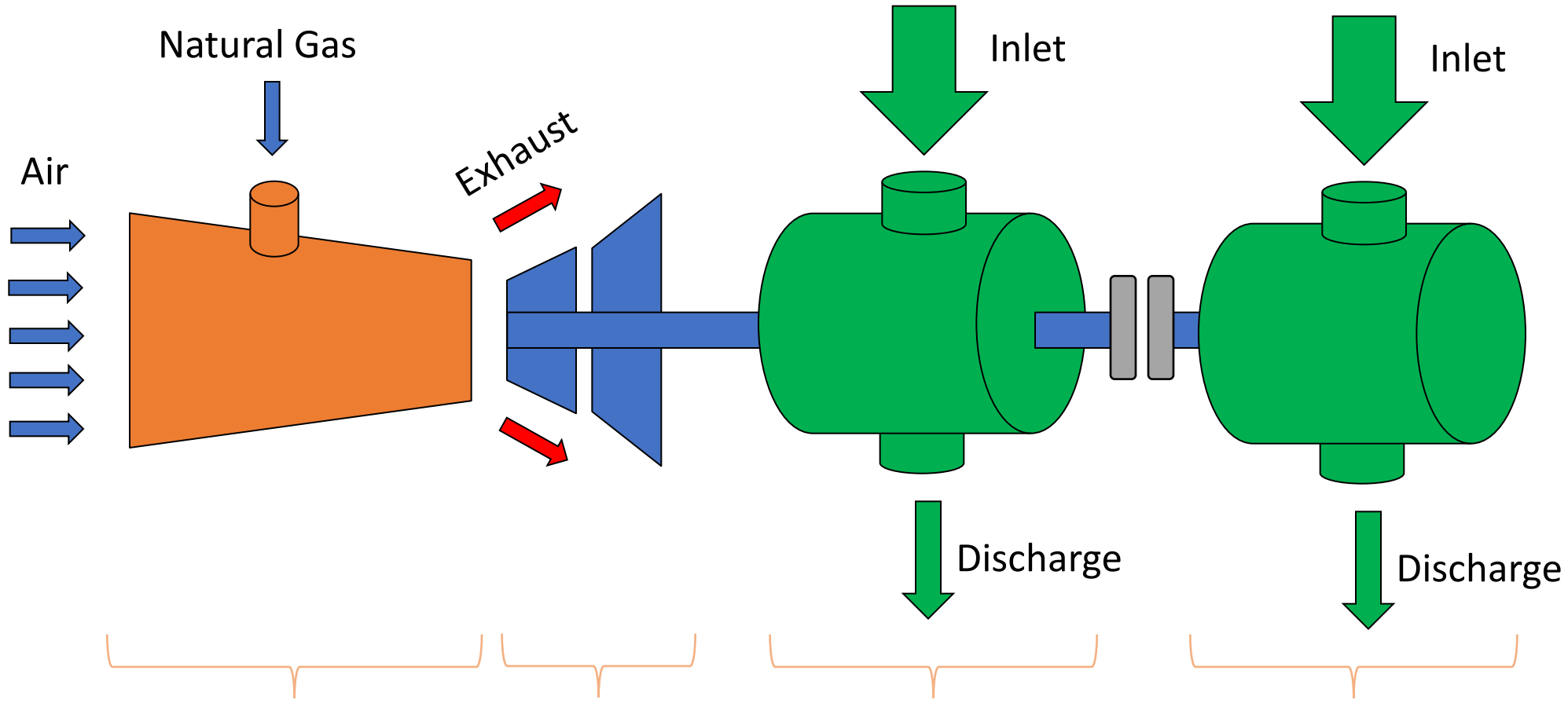


Typical Compressor Station Layout

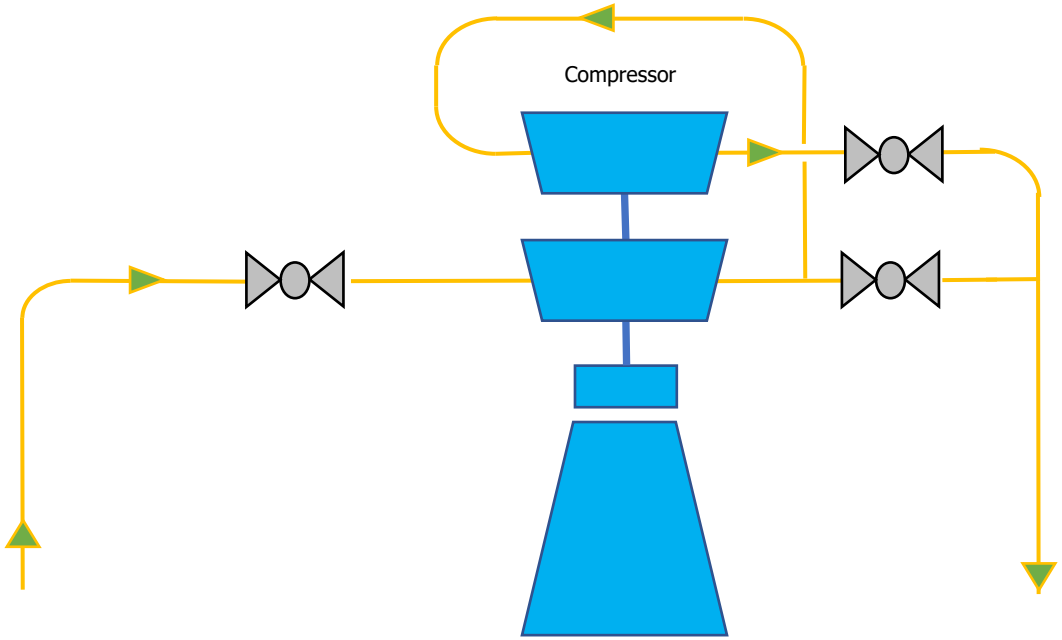


- Inlet
  - Filter/Scrubber
- Outlet
  - Gas Aftercooler
  - Recycle Valve
- Station
  - Valves
  - Fuel Gas
  - Power Gas
  - Back-up Generation
  - Blowdown Recovery
  - Heating

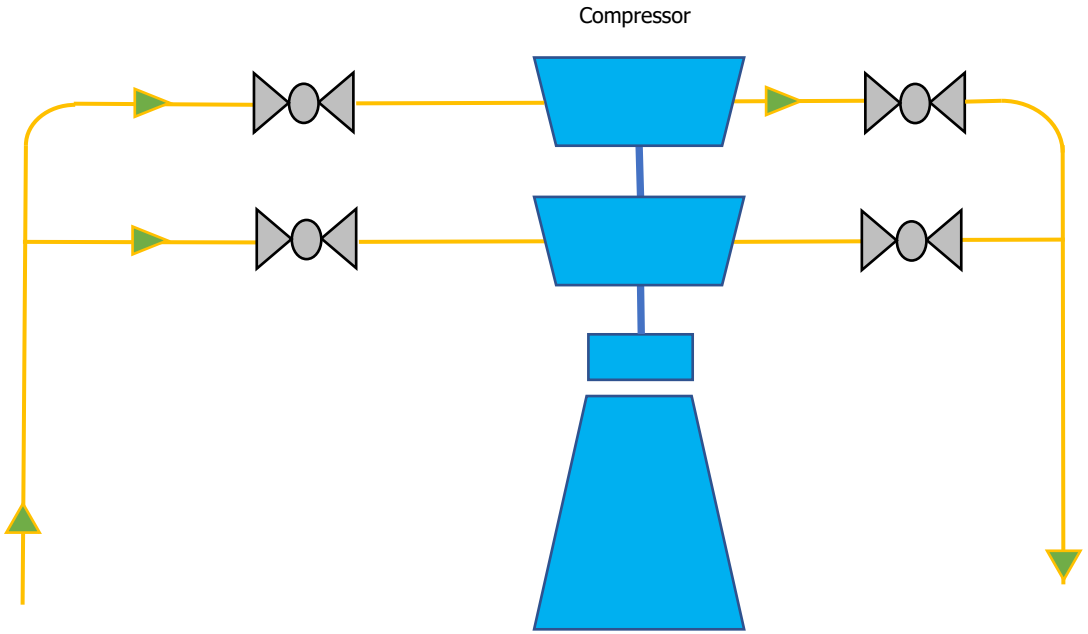
Compressor Train Overview



Series
High Lift/Low Flow



Parallel
High Flow/Low Lift



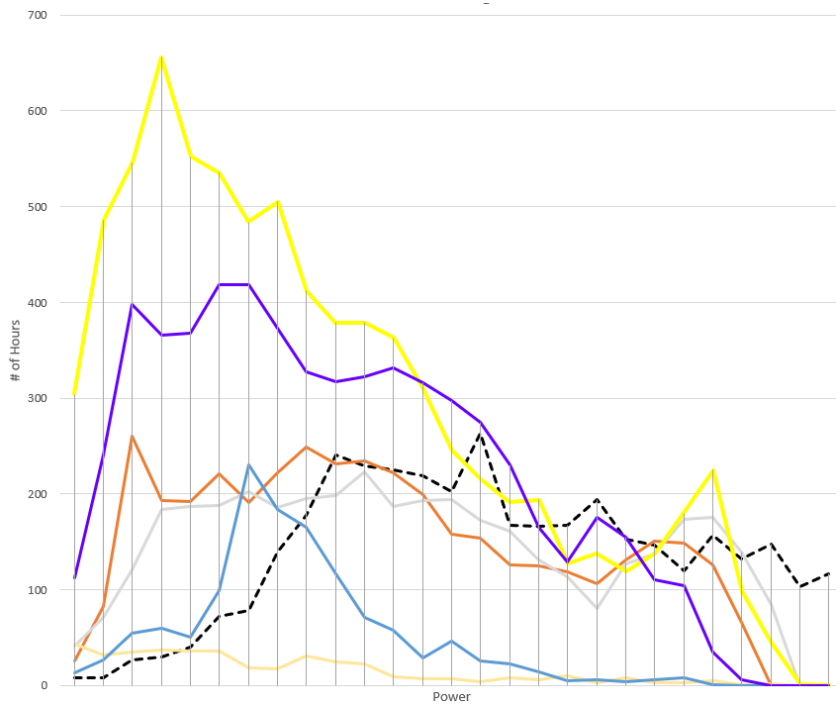
Dehydration

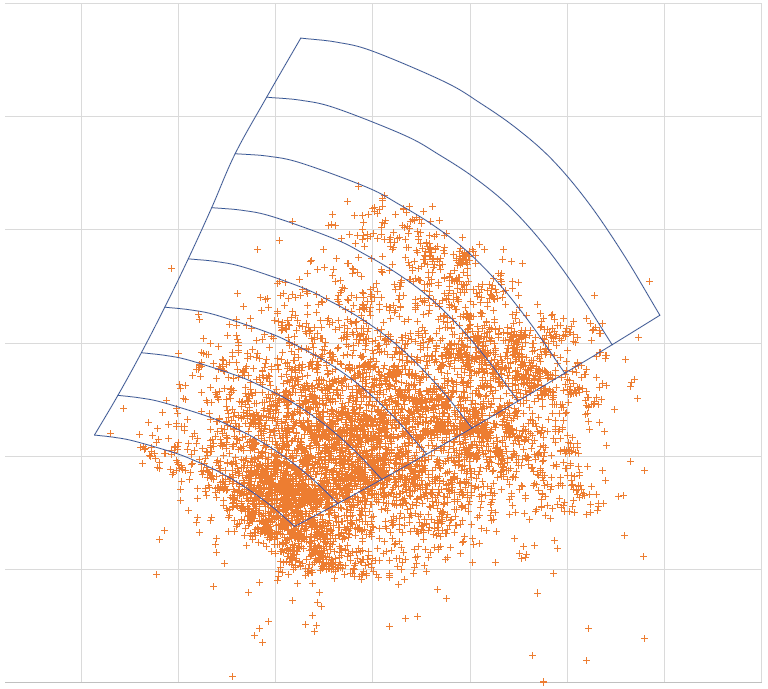
Operational Challenges

- System demand and variation
- Operating restrictions
- Pipeline/compression changes
  - Temporary
  - Permanent
- Off peak performance

Off-peak Performance

- Control Techniques
  - Speed control
  - Recycle valves
  - Line pack
  - System balances
  - Storage





Emission Upgrade Potential

- Waste Heat Recovery
- DLE Conversions
- C to G Conversions
- Compressor Upgrades
- Electric Drive

Methane Regulations

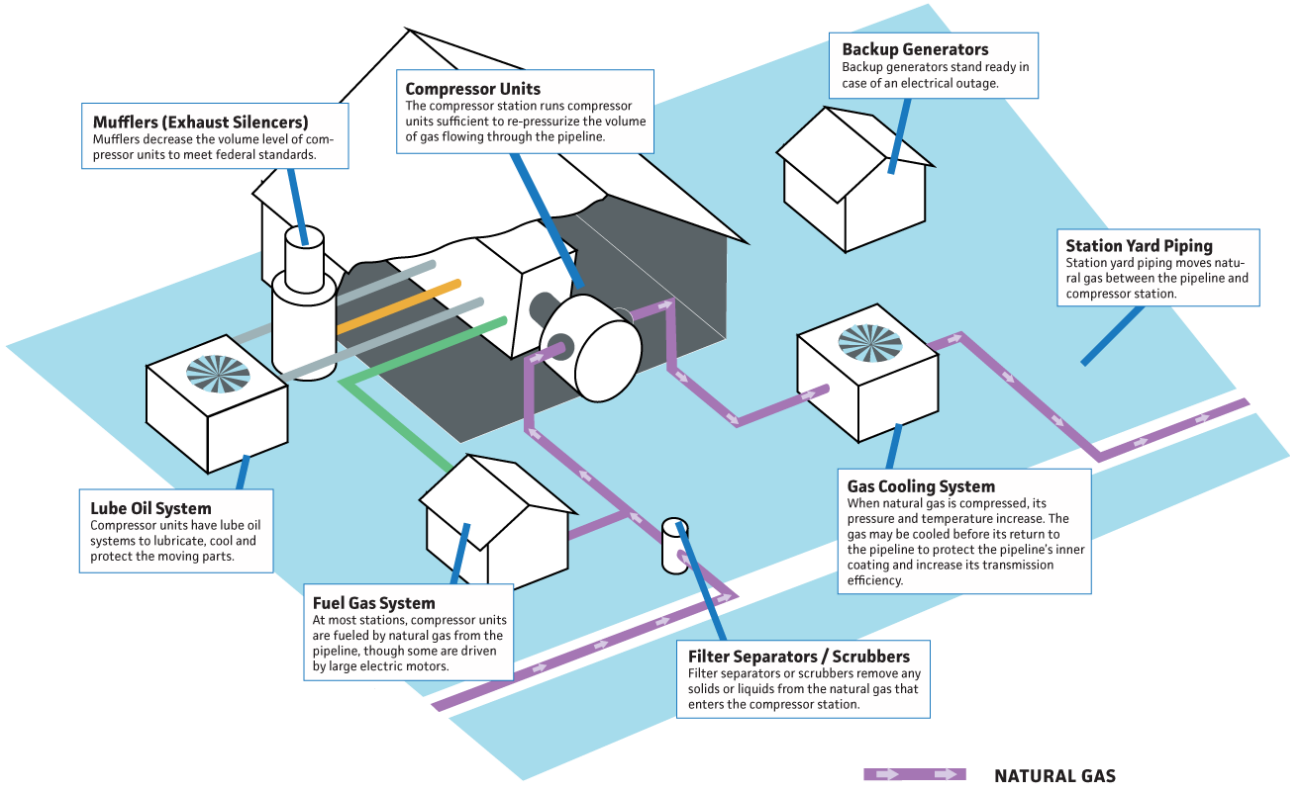
- Topics
  - Federal Methane Regulation Amendment
    - Current reg vs amendments
    - Biggest challenges
  - Problems and Solutions/Alternatives

Methane Regulation Amendments

- Apr 2018 – Environment and Climate Change Canada (ECCC) published the existing "Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector) (the federal Methane Regulation)
- Dec 2023 – Gov't of Canada released proposed amendments to the federal Methane Regulation
  - Focus on maximizing emissions reductions and removing some exclusions
  - More frequent leak surveys
  - Shorter repair timelines
  - More stringent venting and flaring requirements
- End of 2024 – target for publishing of amendments

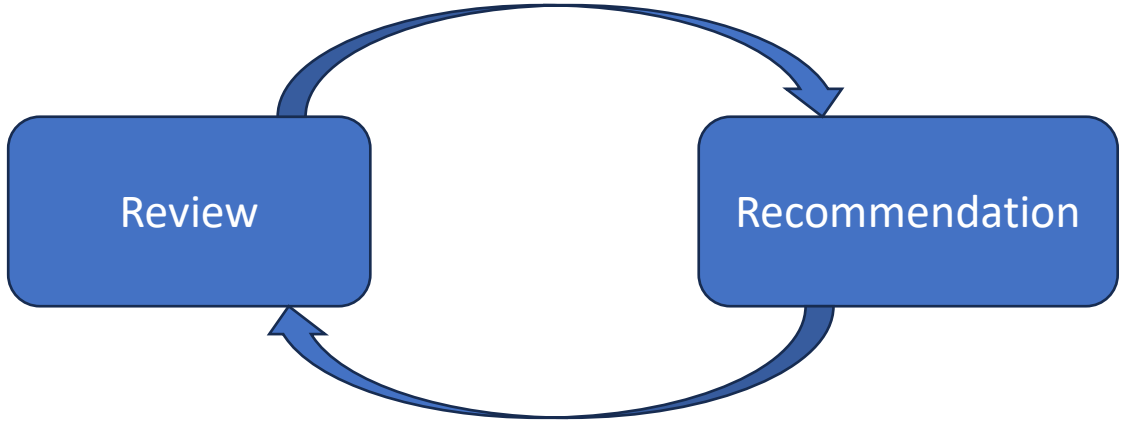
Methane Regulation Amendments

- Type 1 Facility
  - Compressor Stations
  - Storage Metering Stations
  - Metering/Recept Stations
  - Containing
    - Natural Gas Compressor
    - Storage tank for produced liquids
    - A flare or;
    - Gas-liquid separator
- Type 2 Facility
  - All other upstream oil and gas facilities



Methane Regulation Amendments

- Currently in Review and Recommendation Phase



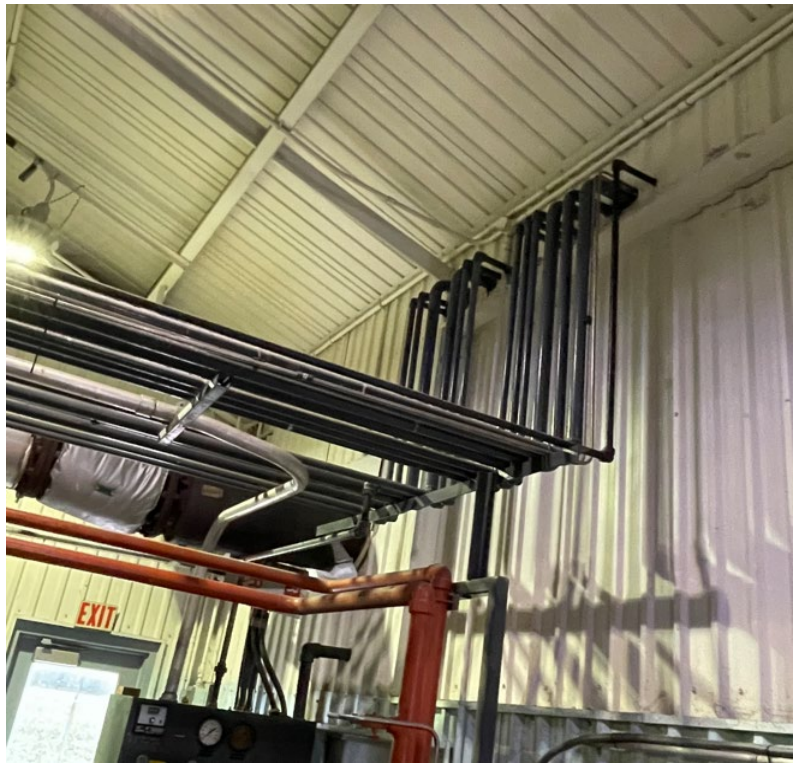
- Fugitive Emission Detection and Repair Program – in effect Jan 1 2027
  - Repair timelines/extensions
  - Regulatory vs Performance Based approach

Methane Regulation Amendments

- **Venting prohibited**, with a few exceptions. In effect Jan 1, 2030.
  - Planned maintenance with measures taken to minimize volume vented
  - ESD
  - Insufficient to sustain stable combustion (low heating value or flow)
  - Destruction and/or conservation would prolong an interruption to the public
- Conservation of at least 95%
- Destruction with minimum carbon conversion efficiency of 98%
- Venting limits for pneumatics repealed
  - For ex; low-bleed controls
- Flaring prohibited unless supplemented with engineering study

Methane Regulation Amendments

- Biggest challenges
  - Interpreting regulation with consistency across industry
    - Sharing methodology with other companies
  - Blowdown recovery for transmission pipelines
    - Integrity, class location, inspection etc
    - Existing turbine horsepower vs electric recip
    - Portable blowdown recovery horsepower
      - Rent vs own
      - Service vs asset
      - Quantity
      - Etc.
    - Repurpose obsolete units (Payne)
  - "Dirty" venting
    - Crankcase vents with potential for air, combustion products and oil blended into emissions
  - Pneumatic controls
    - High-bleed to low-bleed to no-bleed



Methane Regulation Amendments

Turbine Related	Not Turbine Related	Out-of-scope
• Dry gas seals • Wet gas seals • Blowdown Recovery (station and pipeline) • Connection points for BDR • Gas Chromatographs	• Moisture analyzers • Odourant pumps • Level transmitters • Rod packing • Crankcase/Distance piece venting • Dehy blanket gas • Flares	• Gas starters • Gas pre/post lube pumps • Gas/hydraulic operators • Gas powered louvers

Questions?