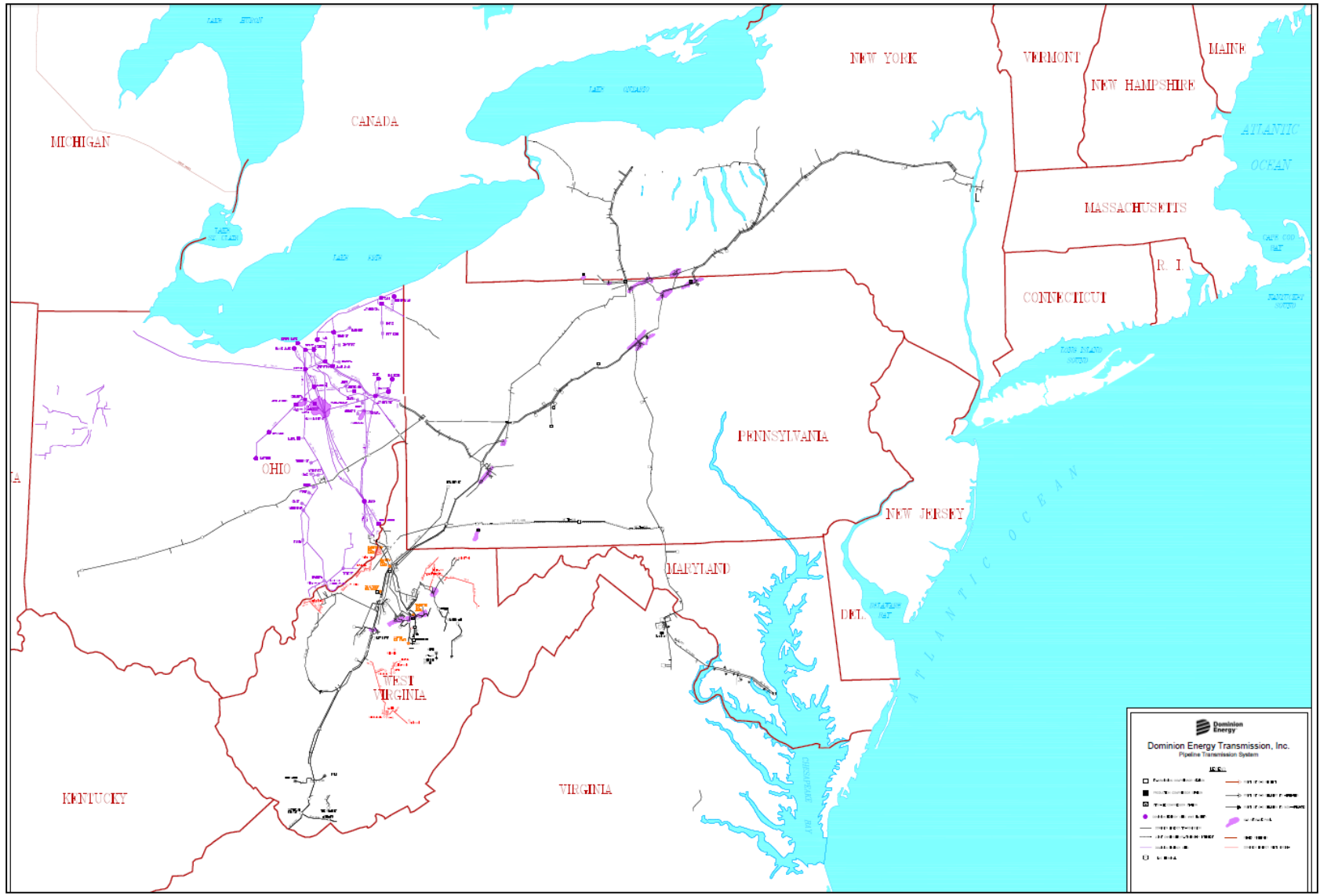


Dominion Energy

EPA Technology Transfer Workshop

June 7, 2018

Who are we?

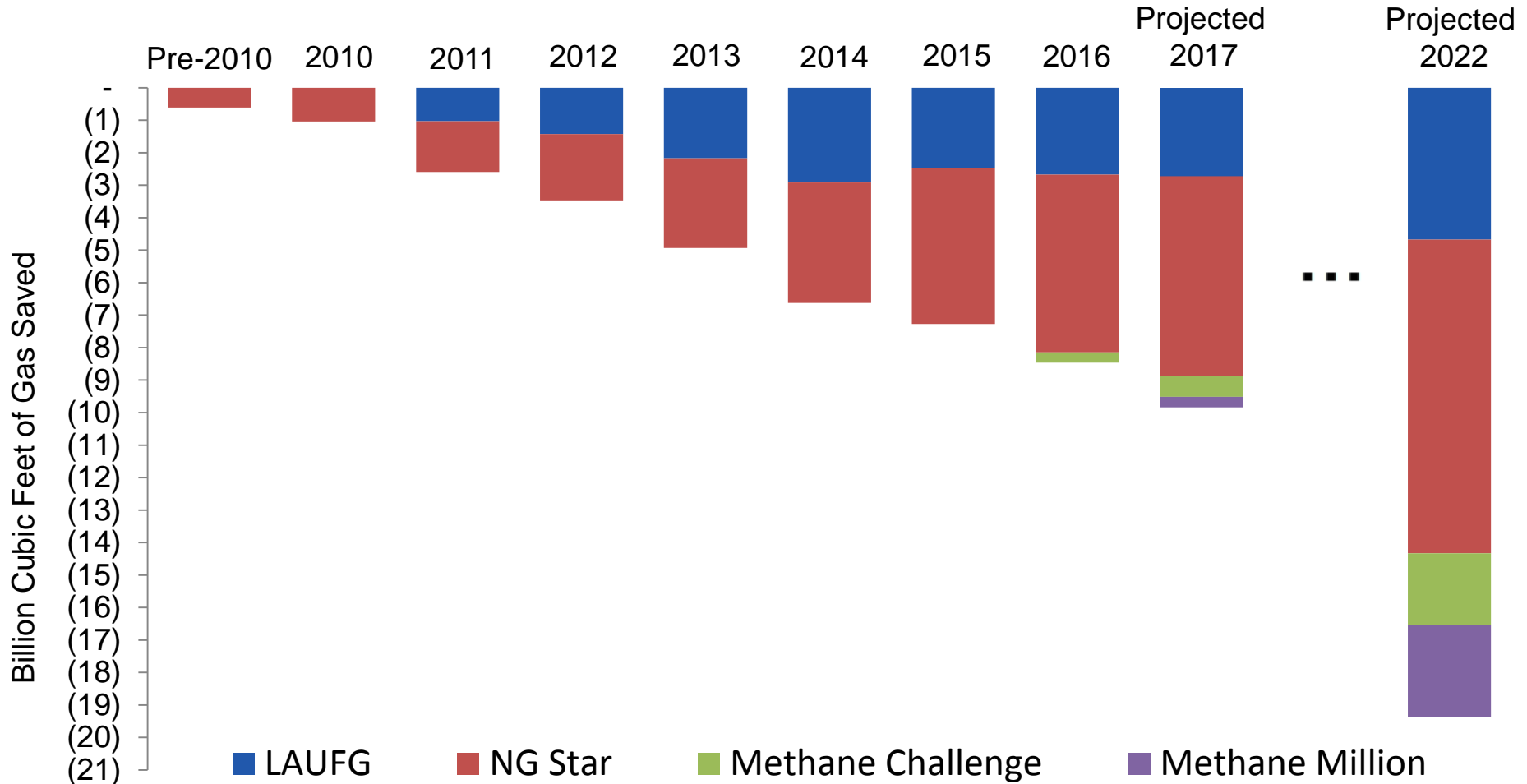


Current Methane Emission Reduction Programs

- Natural Gas Star Initiatives:
 - Conduct AGL Inspections and repair leaks found
 - Identify and replace high-bleed pneumatic devices
 - Installing engine blow down recovery systems in existing compressor stations
 - Replace orifice meters with ultrasonic meters
 - Use YALE enclosures during ESD testing to prevent full station blowdowns and performing capped ESD
- Methane Challenge: Hot Taps and Pipeline Pressure Reductions
- Lost and Unaccounted for Gas (LAUFG) Internal Initiatives
- Methane Million Internal Initiative

GIG Voluntary Methane Savings

Reductions – LAUFG, NG Star, Methane Challenge & Methane Millions



Projected Gas Loss reduction is equivalent to the annual GHG emissions of 3,400 MW of clean gas fired power generation capable of powering ~850,000 homes

Technology Review

- **Extended Pressurized Hold (Centrifugal Compressors)**
- **Pipeline Pressure Reduction**
- **Engine Blow Down Recovery (Reciprocating Compressors)**

Extended Pressurized Hold (Centrifugal Compressors)

- Minimizes blow downs
- Allows compressor to stay pressurized for long periods of time
- Case pressure managed through installed compression and minimizes vent during start up
- Minimizes the need for purging during start up
- Limits blow down events to maintenance activities



Extended Pressurized Hold (Centrifugal Compressors)



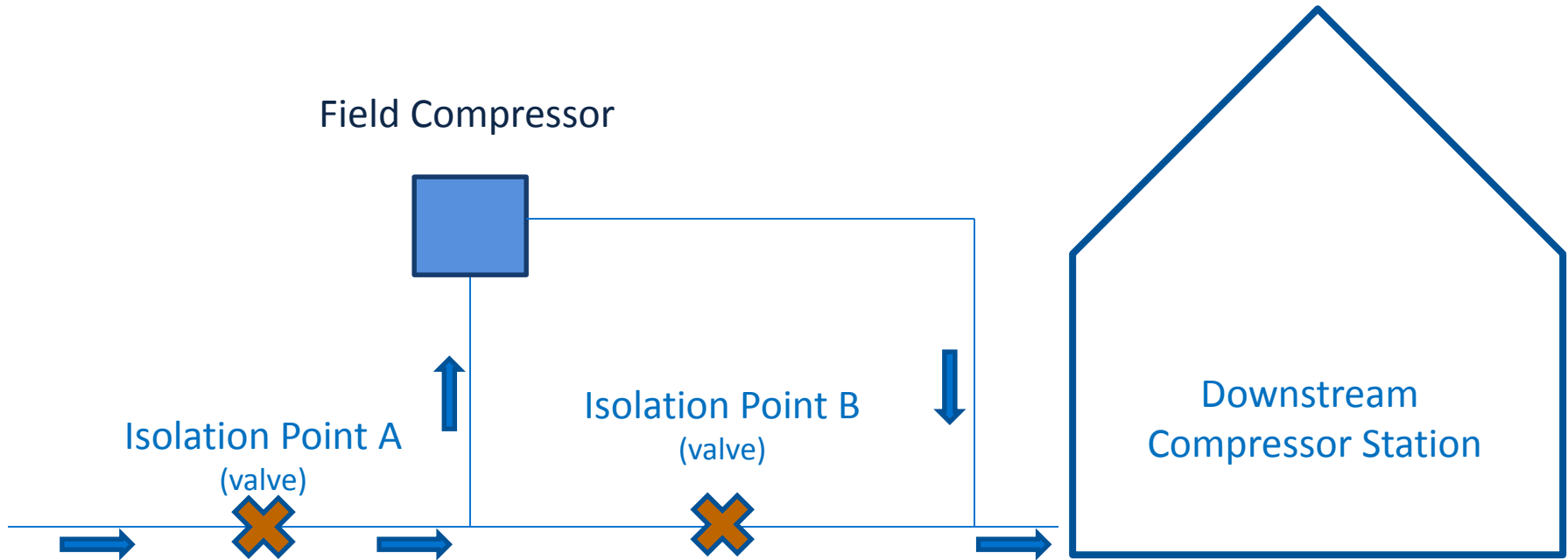
Pipeline Blow Down Options

- Use isolation valves to minimize impact
- Install plugging equipment to shorten segment of pipeline involved in outage
- Lower pressure in the pipeline prior to event
- Stationary compressors that manage pressure
- Portable compressors
- Delivery to customers (LDC, Power Gen., etc.)
- Re-direct into storage vessel (field) or low-pressure header (fuel gas or gathering system)
- Install duct burners, thermal oxidizers or flares

Pipeline Pressure Reduction

- Reduces Methane release through pressure reduction
- Pressure reduced using existing compression to a reasonable pressure
- Pressure further reduced using temporary equipment.
 - *Detailed processes and procedures are developed and put in place prior to utilization to ensure compliance with pipe line safety rules and regulations.*

Reducing Pipeline Pressure Prior to Blowing Down



DETI Benefits from Pressure Reductions

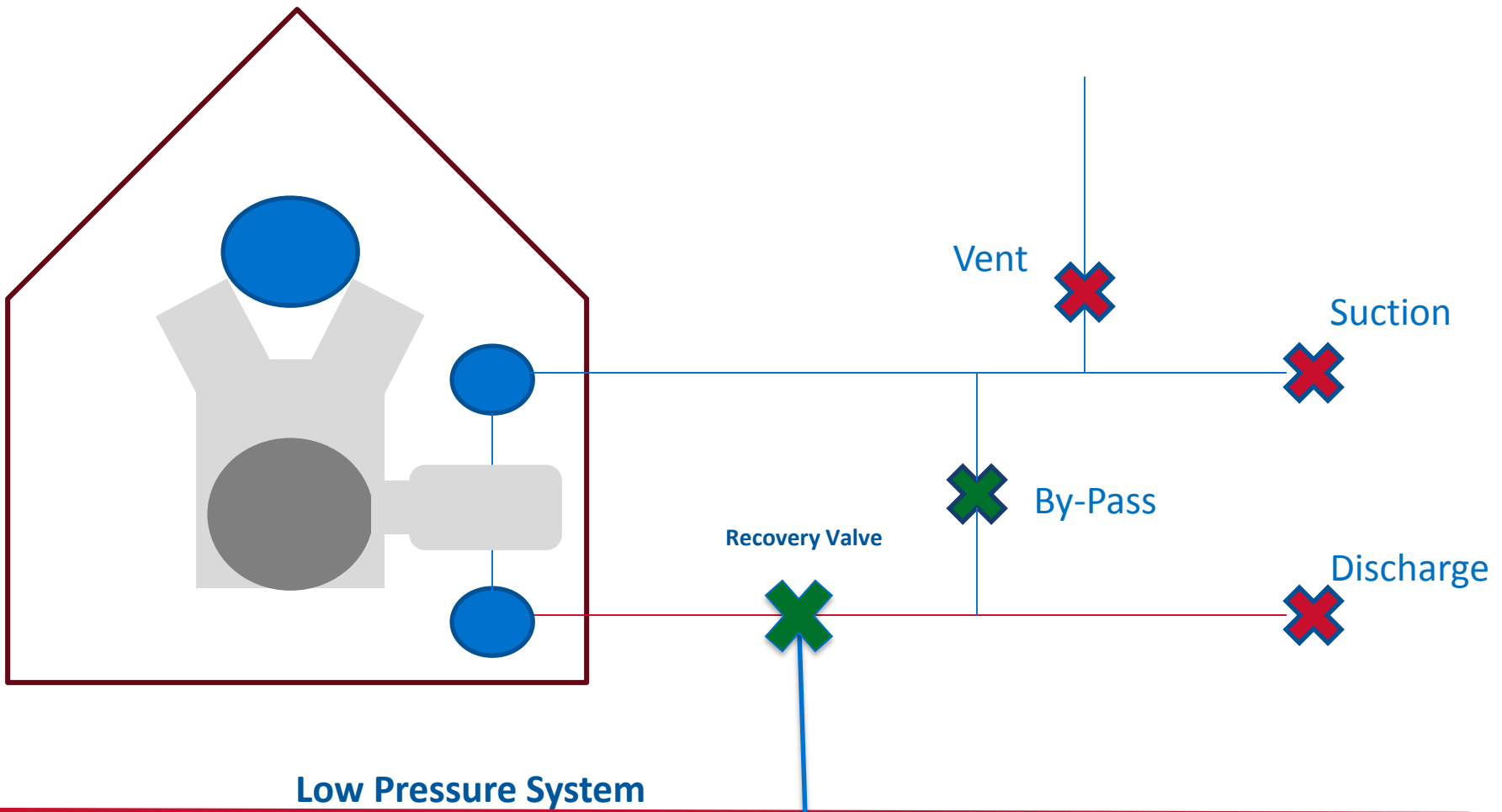
Year	Opportunities to Reduce Pressure	Total Volumes Not Released to Atmosphere (Mcf)	Average Savings per Opportunity (Mcf)
2012	116	109,650	945
2013	47	175,142	3,726
2014	45	177,096	3,935
2015	19	177,919	9,364
2016	38	264,045	6,949
TOTAL	265	903,852	3,411

Engine Blow Down Recovery

(Reciprocating Compressors)

- Reduces methane release by 77% on average
- Minimizes blow downs during start up
- Recovered gas is regulated and fed into lower pressure source.

Engine Blow-Down Recovery System



DETI Engine Blow-Down Recovery System Benefits

Year	Potential Blow Down Volumes (Mcf)	Total Volumes Recovered (Mcf)	Percent Recovered
2010	22,004	16,829	76%
2011	30,397	25,031	82%
2012	102,162	74,175	73%
2013	122,159	98,899	81%
2014	84,686	56,781	67%
2015	135,464	104,915	77%
2016	163,265	129,290	79%
Total	660,137	505,920	77%

Questions?