ONBOARD DYNAMICS

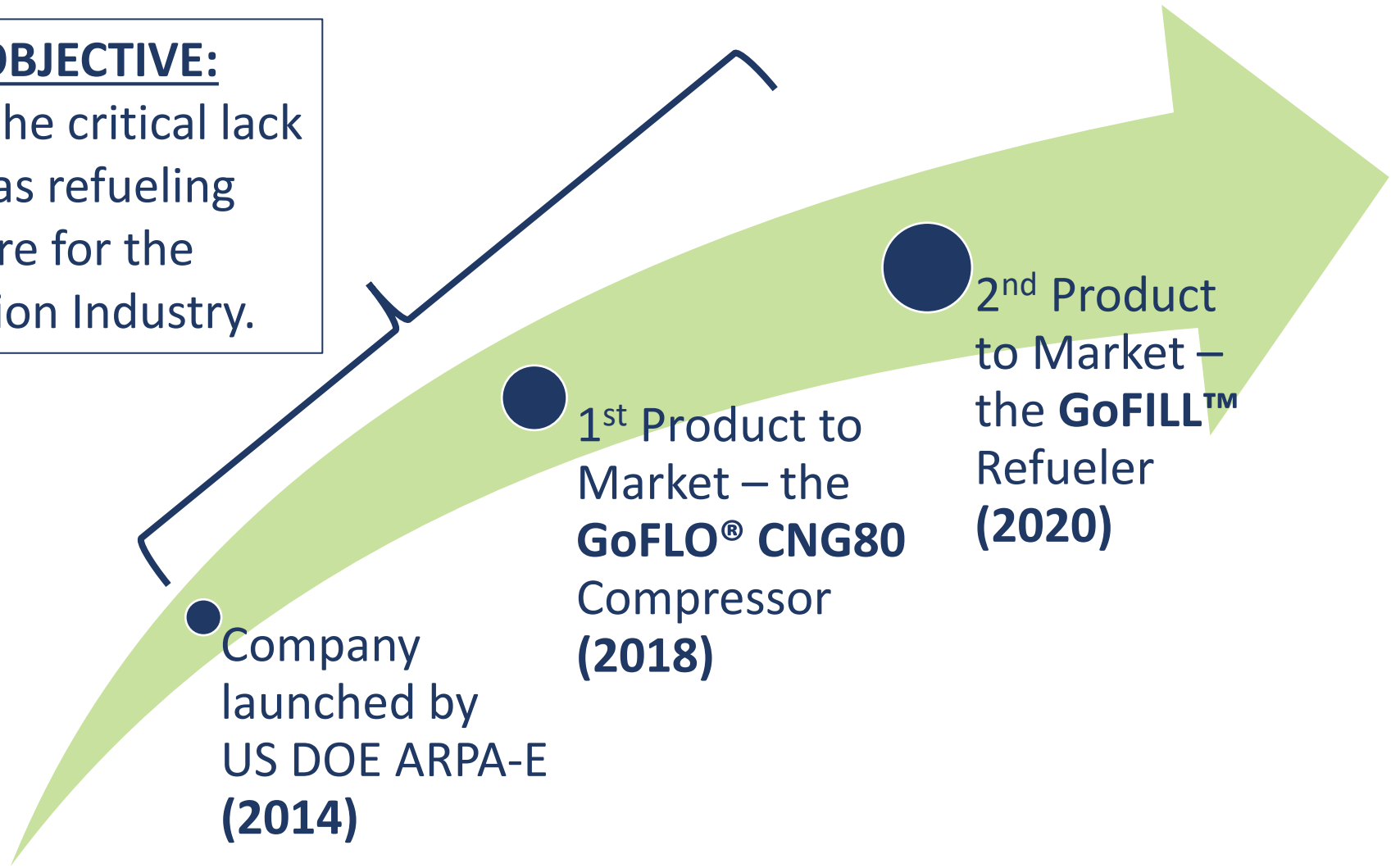
Natural Gas Technology
for Driving Down Emissions

Rita Hansen, CEO

www.onboarddynamics.com

Who is Onboard Dynamics? The Road We've Traveled

ORIGINAL OBJECTIVE:
To address the critical lack of natural gas refueling infrastructure for the Transportation Industry.



ONBOARD DYNAMICS

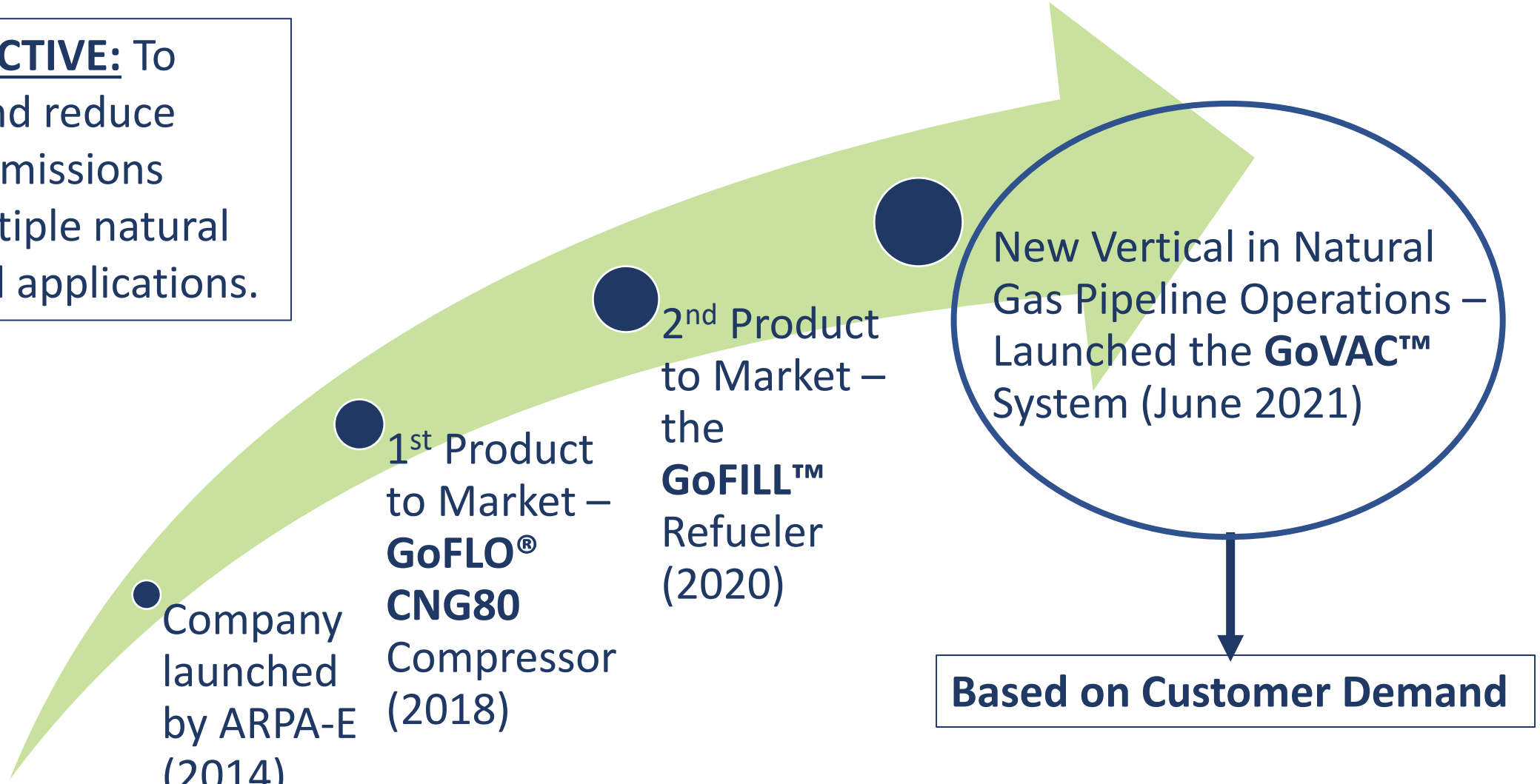
Transportation Refueling Example

Shown above: Transportation refueling of Hyliion Class 8 CNG/EV Hybrid Truck

ONBOARD DYNAMICS

A New Product to Address a New Market

NEW OBJECTIVE: To mitigate and reduce methane emissions across multiple natural gas vertical applications.



ONBOARD DYNAMICS

What is the Problem?

Methane is released into the atmosphere from natural gas pipeline operations.

PIPELINE EMISSIONS

- **~12MMT***(US) and **~14.5MMT*** (EU) of CO_2e* emissions/yr from distribution system
- **~55.7 BCF*** methane released/year
- **$1.6B** potential cost to natural gas utilities/year

CHALLENGES FACING INDUSTRY

- Increasing regulation (Biden Administration, etc.)
- Aging pipeline infrastructure
- Repairing in urban areas
- Costs, time, and permitting issues

ONBOARD DYNAMICS

***Abbreviations:**

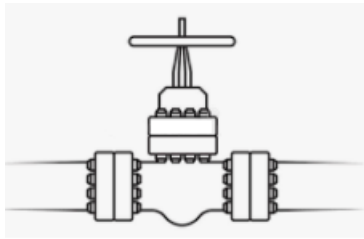
MMT = million metric tons **CO_2e** = carbon dioxide equivalent **BCF** = Billion Standard Cubic Feet

Introducing the GoVAC™ Flex

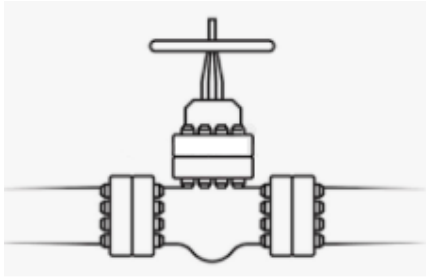
GOVAC FLEX

Recover the gas and either:

1) Transfer into an adjoining pipeline,



The GoVAC Flex can draw a pipeline down to near zero psig using the natural gas in the pipeline as its source of power.



Pipeline inlet

2) Or compress it up to 3600 PSI into a tube trailer for transport.

Successfully demonstrated and validated in field operations for pipeline evacuation.

First Field Demonstration – Vessel to Vessel Transfer

Project Site: NW Natural Sherwood

- **Total volume of gas moved:**
  507 scf
- **Pipeline starting pressure:**
  186 psig
- **Pipeline ending pressure:**
  4.5 psig
- **GoVAC outlet pressure:**
  186 psig
- **Compression time to evacuate:**
  6 mins, 12 seconds

ONBOARD DYNAMICS

Pipe to Pipe Transfer Project

- **Evacuate 2.56 miles of 10” Steel Pipe**
- **Pipeline Starting Pressure:** 108 psig
- **Ending Pipeline Pressure:** 3.4 psig
- **GoVAC Outlet Pressure:** ~380 psig
- **Altitude:** 4,650 ft
- **Temperature:** 96 degrees F
- **Compression Time to Evacuate:** 10 hours, 35 minutes
- **Total Gas Evacuated by GoVAC*:**
  - ✓ 1,876 lbs
  - ✓ 40,791 scf

ONBOARD DYNAMICS

**Does not include gas that was drawn down from pipeline*

Pipe to Tube Trailer Transfer Project

- **Pipeline Starting Pressure:** 199 PSI
- **Ending Pipeline Pressure:** 1.8 PSI
- **GoVAC Outlet Pressure:** 2280 PSI
- **Altitude:** 1500 ft
- **Temperature:** 89 degrees F
- **Compression Time to Evacuate:** 42 minutes run time
- **Total Gas Evacuated by GoVAC:**
  - ✓ 2,606 SCF

ONBOARD DYNAMICS

Solution Benefits

Clean Environmental Profile

- Runs on natural gas
- No external electricity or diesel required
- Low noise pollution when operating in sound sensitive areas

Operational Advantages

- Cost effective, especially for short repair segments
- Portable, self-contained, small footprint
- Easy to deploy and operate
- Remote monitoring and environmental reporting

Regulatory Compliance

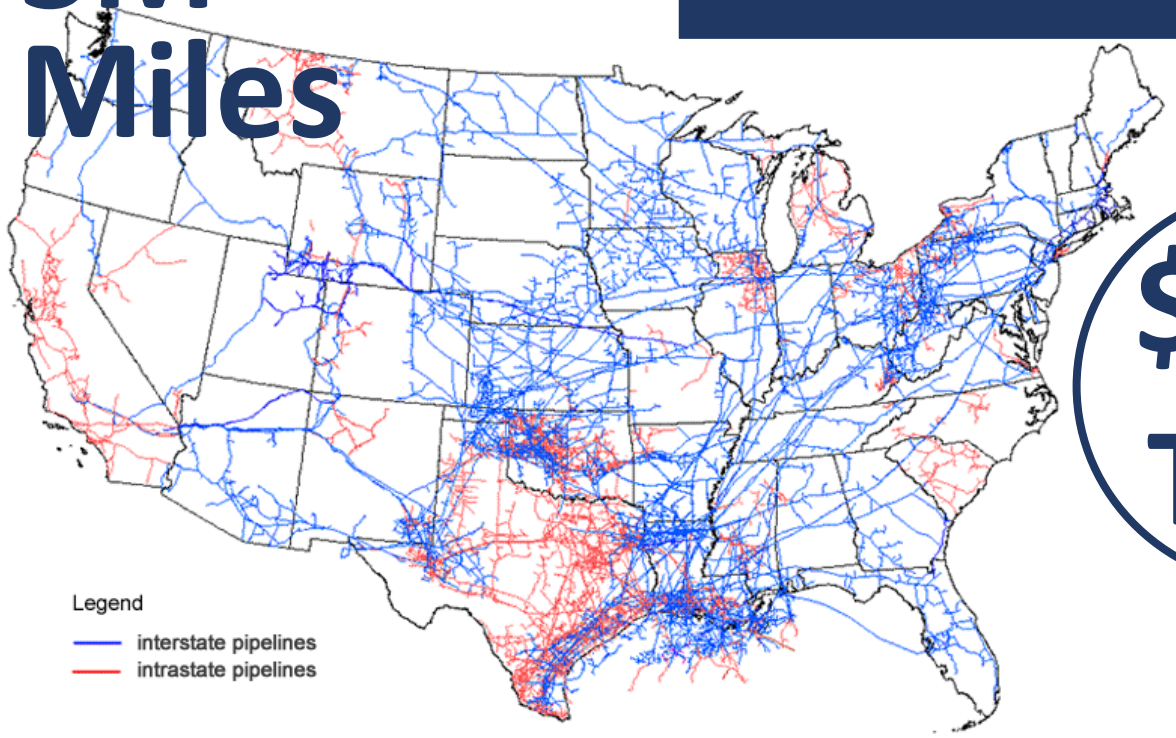
- NFPA, EPA, SCAQMD, CSA (2021)

ONBOARD DYNAMICS

How Big is the Pipeline Operations Opportunity?

NATURAL GAS PIPELINE NETWORK
Transmission and Distribution

3M Miles



Source: U.S. Energy Information Administration, *About U.S. Natural Gas Pipelines*

$24B TAM

3.4M Miles

U.S. & Canada will add 1400 miles of pipeline per year through 2035. (Source: INGAA)
An additional 27k miles of cast/wrought iron pipe will be replaced. (Source: PHMSA)

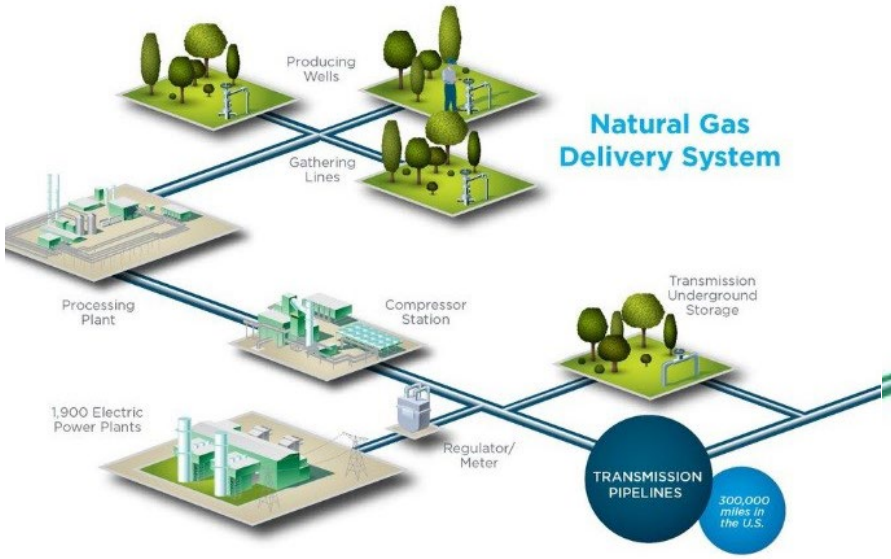
Competitive Analysis against current Market Leader

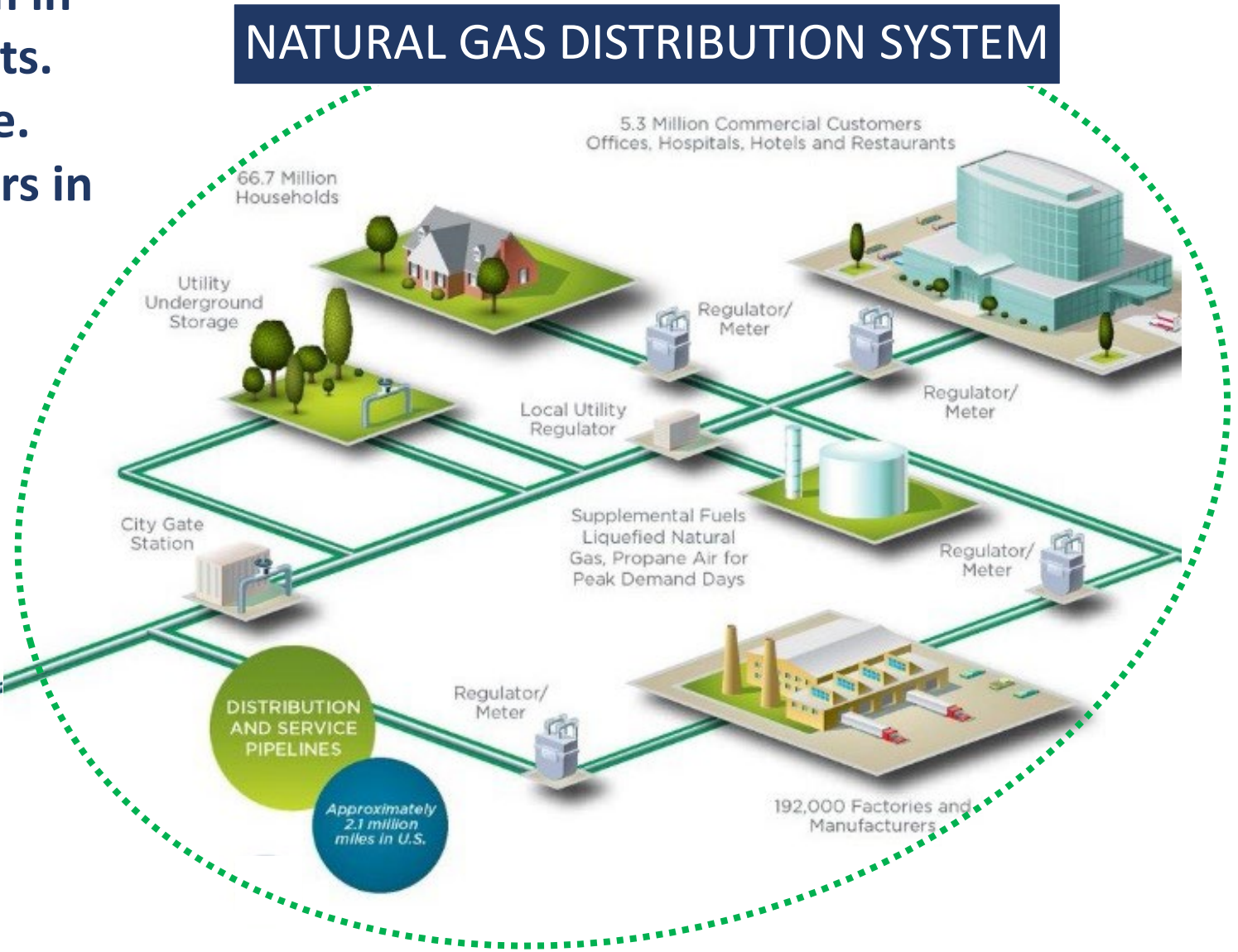
Customer Benefits	Top Competitor	GoVAC™
No Diesel or Electricity	X	✓
Inclusive Integrated Package	X	✓
Ease of Installation (& redeployment)	X	✓
Mobile, Trailer-Mounted, Self-contained	X	✓
Environmental Impact	~190 lbs of CO_2e emissions/hr	~30 lbs of CO_2e emissions/hr

ONBOARD DYNAMICS

Go-To-Market Strategy for GoVAC™ System

- ✓ **Summer road show with system in multiple field trials/paid projects.**
- ✓ **Validating metrics/performance.**
- ✓ **Focusing on our existing partners in natural gas distribution.**
- ✓ **Participating in conferences.**





ONBOARD DYNAMICS

Our Traction in the Field

Filling Tube Trailers

Pipeline Evacuation

Remote Fueling (GoFLO + GoFILL)

Waste Haulers

Natural Gas Utility Operations

Fueling Station Backup

Southern California Gas Company

PG&E

NW Natural

Southern Company

FORTIS BC

Fleet Refueling Projects

Refueling from Tube Trailer

ONBOARD DYNAMICS

Our Product Offerings

- **Direct Sales:**
  - GoFLO® Compressor
  - GoFILL™ Refueler
  - GoVAC™ System
  - Add-ons
- **XXX-as-a-Service/Leasing***
- **Service & Support Contracts**
- **Installation & System Integration**
- **Data Offerings & Reporting**

**Company not currently capitalized to offer but this is a preferred business model for the future.*

ONBOARD DYNAMICS

Environmental Impact & Value Prop with Customers

Natural Gas Utilities

- Meeting Environmental, Social, Governance goals
- Enabling responsible pipeline operations
- Tube trailer refilling
- Backup of CNG stations

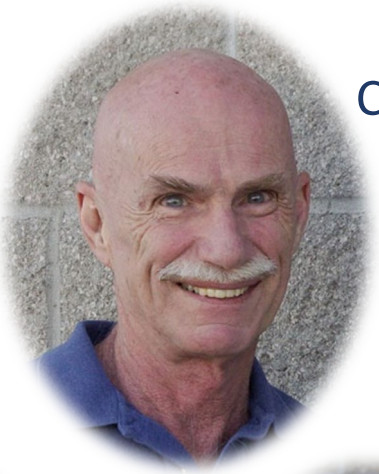
2019 - 2020	2019 - 2020	2021 - 2024
10,864 hours	1,720 MT CO_2e reduced	93,320 MT CO_2e projected
Total Actual Hours of operation	***Total Actual*** CO_2e emissions reduction (in metric tons)	***Projected*** CO_2e emissions reduction (in metric tons)

ONBOARD DYNAMICS

Team

Rita Hansen
CEO, Co-Founder & BoD
Serial Entrepreneur in Energy Startups

Rick Kay
COO
Leader in Bringing Products to Market & Managing Teams



Dr. Jeff Witwer
Chief Product Strategist
Co-Founder & BoD
Energy Technologist & Visionary

Dan Pedersen
Director of Engineering
Natural Gas Systems Product Development Expert

Alan Hansen
Director of Projects
Execution, Operations, Field Service & Support

Heather Smercina
Business Development
Expertise in pursuit of strategic opportunities

Todd Pendexter
Director of Sales
Marketing, Business Development & Closer

Karen Anderson, CPA
CFO
Experienced Financial Executive & Leader

ONBOARD DYNAMICS

Capital Scale-Up Strategy and Ask

Current Raise

Bootstrapped 2013

- Founders
- In-Kind Contributions

$50K

ARPA-E Award 2014-2017

- Non-Dilutive (ARPA-E + Others)
- Matching funds
- Prototype Built

$6.6M

Seed Round 2017-2019

- Convertible note
- Angel Groups & Individuals
- Pilot & Launch
- Early Adopters

$2.5M

Bridge Round 2020

- 6M CAP, 8% interest, 20% discount
- Extend runway
- Increase Sales

$500K

Series A 2021

- **Equity-based Round**
- **Growth & Scale of GoVAC system**
- **Pursue service model**
- **Build out Team**

$7-10M

Bridge Round completed – May 2021
Series A Kickoff – Summer 2021

Use of Funds:

- **Scaling of GoVAC Product Line**
- **Major Sales & Marketing campaigns**
- **Operations & Field Service**
- **Hybrid sales & pipeline evacuation model**

ONBOARD DYNAMICS

Smart technology for a transition to clean energy

1. GHG emissions reduction has world focus.
2. Practical, scalable, and economical options are limited in the natural gas industry.
3. Our disruptive technology is the smart answer.
4. We are the seasoned team that knows how to execute.

Onboard Dynamics – an ESG investment

ONBOARD DYNAMICS

Contact Us:

Rita Hansen, CEO and Co-Founder
1-206-291-3206
rita.hansen@onboarddynamics.com

Rick Kay, COO
1-503-702-3415
rick.kay@onboarddynamics.com

Heather Smercina, Business Development
312-320-8923
heather.smercina@onboarddynamics.com

Onboard Dynamics, Inc.

62958 Layton Avenue, Suite 2
Bend, OR 97701
USA
1-541-550-3632
info@onboarddynamics.com

Stay Connected:

onboarddynamics.com/

Onboard Dynamics, Inc

@OnboardDynamics

@onboarddynamicsinc

ONBOARD DYNAMICS

Backup Slides

ONBOARD DYNAMICS

Intellectual Property Status

Mobile Compressor IP generated and filed by company:

1. Six PCT Applications on the mobile compressor – all in national phase(s)
   - ✓ Purging natural gas compressor (methane recovery) ***– ISSUED APRIL 2021***
   - ✓ Crankcase ventilation – ***ALLOWED JUNE 2021***
   - ✓ Combined hydrogen generator/compressor
   - ✓ Skipping stages of compression
   - ✓ Dual zone cooling
   - ✓ System with Dead Space Alignment Sleeves
2. Oregon State University IP (onboard vehicle compression):
   - ✓ 1st Patent issued on April 19th, 2016 – US 9,316,178
   - ✓ 2nd Patent issued on December 27th, 2016 – US 9,528,465
   - ✓ Company has exclusive worldwide license

GoVAC™ System Specifications

Clean Environmental Profile

Operational Benefits and Advantages

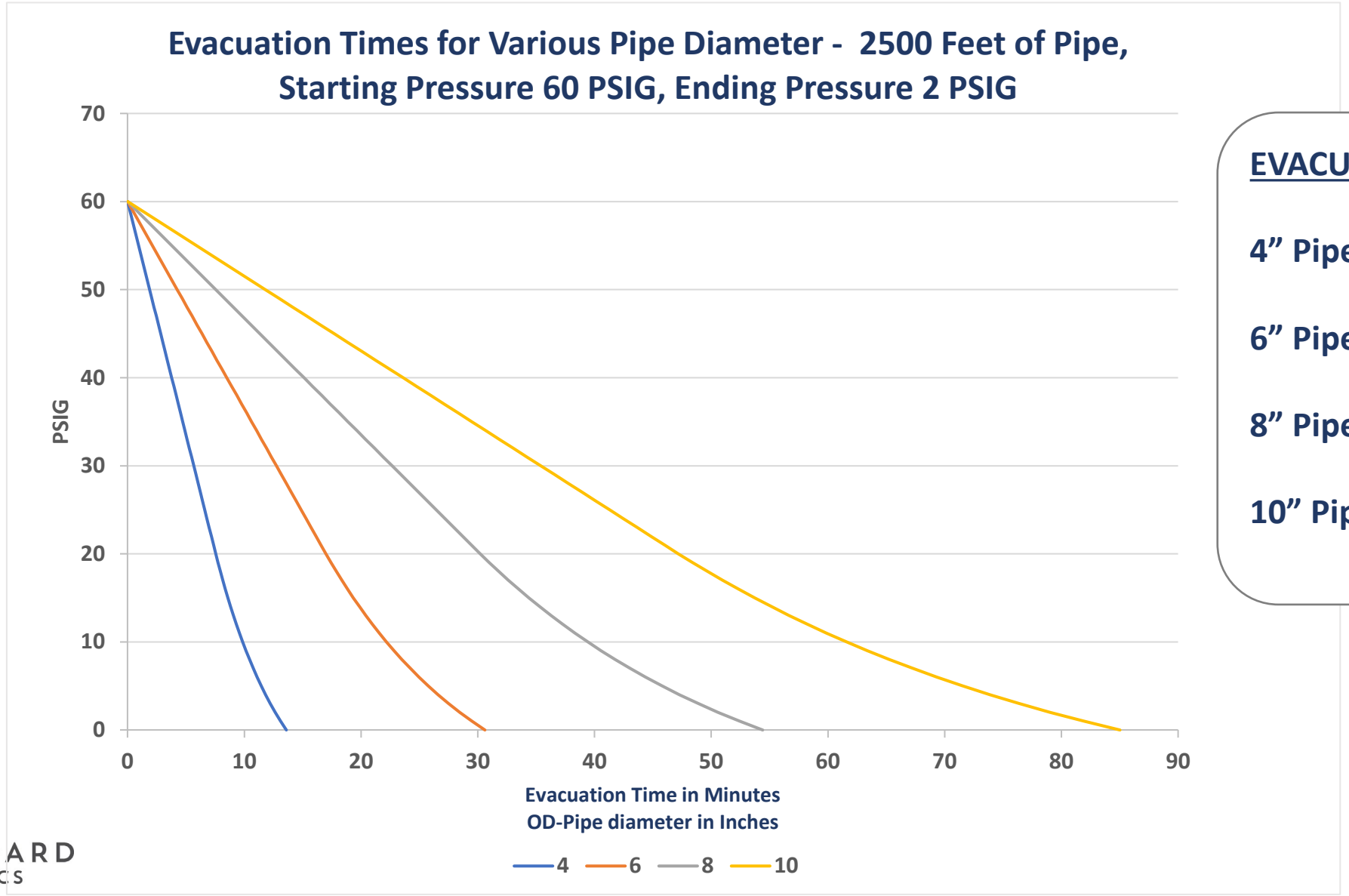
Regulatory Compliance and Standards Met

- **GAS INLET PRESSURE:**
  Selectable drawdown to 0 PSI
- **GAS OUTLET PRESSURE:**
  Selectable up to 3600 PSI
- **NO ELECTRICITY REQUIRED**
- **FUEL CONSUMPTION:**
  ~8% of natural gas consumed
- **OPERATIONAL CONTROL:**
  Ease of use with LED display
- **PIPELINE DIAMETERS:**
  Accommodates 2” and up
- **REMOTE MONITORING:**
  Cellular Communications
- **OPERATIONAL WEIGHT:**
  <4,500 pounds
- **SOUND RATING:**
  < 85 dba @ 10 feet

GOVAC™ FLEX

ONBOARD DYNAMICS

GoVAC Performance Graph - Validated



EVACUATION TIMES

4” Pipe: 13 mins

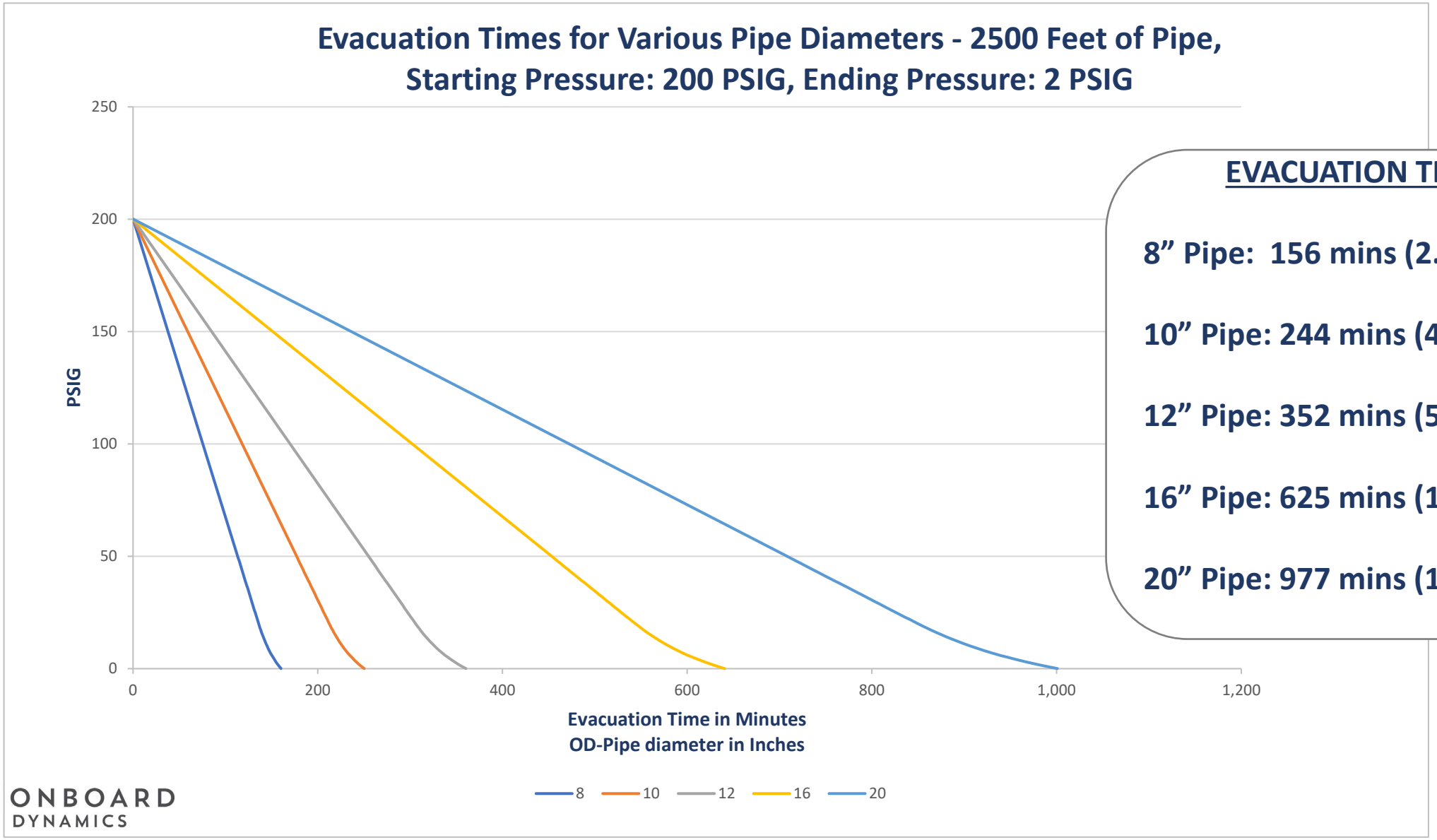
6” Pipe: 28 mins

8” Pipe: 51 mins

10” Pipe: 79 mins

ONBOARD DYNAMICS

GoVAC Performance Graph - Validated



EVACUATION TIMES

8” Pipe: 156 mins (2.61 hrs)

10” Pipe: 244 mins (4.07 hrs)

12” Pipe: 352 mins (5.86 hrs)

16” Pipe: 625 mins (10.42 hrs)

20” Pipe: 977 mins (16.28 hrs)

ONBOARD DYNAMICS

US and EU Leading on Methane Emissions Regulation

- April 2021: “Congressional Review Act” passed
  - Reinstated Obama-era goals to reduce methane emissions from the oil and gas industry by 45% by ?? against 2012 levels. (Originally by 2025)
    Source: NPR
  - Industry supporting:

NG Industry Self-Regulation

Top 20 NG Utilities in the US and their Net Zero Goals

	Utility Name	US Market Share % by NG Volume (Residential + Commercial)	US Market Share % by NG Transmission pipeline mileage	US Market Share % by NG Distribution pipeline mileage	Has declared an emission reductions or "net zero" goal? (yes/no)	Year of Completion for Goal	Notes:	Link to Goal	Methane Challenge/NG STAR/ONE Future Member? (Yes/no)
1	Southern California Gas Company	3.86%	1.11%	3.89%	Yes	2045	Net zero	Southern California Gas Company Sets Bold Net Zero Emissions Pledge | Sempra Energy	Yes
2	Atmos Energy	3.68%	1.85%	5.35%	Yes	2035	50% reduction in methane emissions specifically	Atmos Energy Releases 2019 Corporate Responsibility and Sustainability Report | Business Wire	Yes
3	CenterPoint Energy	3.42%	2.68%	5.78%	Yes	2035	70% reduction	Carbon-Policy.pdf (centerpointenergy.com)	Yes
4	Nicor Gas (Southern Company)	3.11%	0.40%	2.58%	Yes	2050	Net zero	Southern Company releases plan on net zero carbon emissions goal	Yes
5	Xcel Energy	2.98%	0.73%	2.70%	Yes	2030	85% reduction	Xcel Energy - Xcel Energy announces 2030 Clean Energy Plan to reduce carbon emissions 85%	Yes
6	Consumers Energy Company	2.72%	0.53%	2.12%	Yes	2040	Net zero	News Release | Consumers Energy	Yes
7	Pacific Gas & Electric Company	2.55%	2.22%	3.28%	Yes	2030	40% reduction	Climate Change - PG&E Corporate Responsibility and Sustainability Report 2019 (pgecorp.com)	Yes
8	Public Service Electric & Gas Company	2.29%	0.02%	1.37%	Yes	2025	25% reduction from 2005 levels	PSEG Holds One of Lowest Carbon Emissions Rates Among Largest U.S. Power Producers	Yes
9	DTE Gas Company	1.58%	0.70%	1.52%	Yes	2050	Net zero	DTE Energy Company - DTE Gas announces 2050 net zero goal; unique and comprehensive plan addresses greenhouse gas emissions and invites customers to participate	Yes
10	Dominion Energy	1.58%	1.73%	2.46%	Yes	2050	Net zero	Dominion Energy Sets New Goal of Net Zero Emissions by 2050 - Feb 11, 2020	Yes
11	Spire Missouri	1.51%	0.08%	1.34%	Yes	2025	53% reduction	Protecting Our Environment | Spire (spireenergy.com)	Yes
12	Southwest Gas Corporation	1.46%	0.17%	2.42%	Yes	2025	20% reduction	Southwest Gas: Environmental Efforts (swgas.com)	Yes
13	Consolidated Edison	1.28%	0.03%	0.33%	Yes	Ongoing	No set target amount or date - see link for initiatives to reduce emissions	Our Climate Action Commitment | Con Edison	Yes
14	Piedmont Natural Gas	1.21%	0.03%	1.81%	Yes	2050	Net zero - All methane emissions by 2030	Earth Day Sponsor Highlight: Piedmont Natural Gas | Piedmont Environmental Alliance (peanc.org)	Yes
15	Peoples Gas Light and Coke Company	1.15%	0.11%	0.35%	No - none published	na	Has stated infrastructure modernization program and a vague statement to reduce GHGs	Environmental policy	Yes
16	Puget Sound Energy	1.12%	0.01%	0.98%	Yes	2045	Net zero	PSE | PSE sets Beyond Net Zero Carbon goal	Yes
17	Northern Indiana Public Service Co	1.04%	0.23%	1.34%	Yes	2028	90% reduction from 2005 levels	Emissions goals show utilities continue to move slow | Energy and Policy Institute	No
18	Washington Gas Light	1.01%	0.06%	1.06%	Yes	2050	Net zero	Washington Gas | AltaGas | Delivering on a Low Carbon Future (washingtongasdcclimatebusinessplan.com)	Yes
19	Black Hills Energy	0.95%	1.39%	2.28%	Yes	2035	50% reduction from 2005 levels	Black Hills Corp. Announces Clean Energy Goals | Nasdaq	Yes
20	Ameren	0.95%	0.41%	1.31%	Yes	2050	Net zero	Ameren (AEE) Announces Net-Zero Carbon Emission Goal by 2050 | Nasdaq	Yes

Service & Support Offerings

1. 12-month parts and labor warranty in standard package.
2. Service and Support contracts available.
3. Telematics capability with 2-way communication provides remote monitoring and control of units in field.
4. Company provides 24-hour x 7 days, 1-800 support.
5. Customers have option to perform regular maintenance.
6. Company has engaged 3rd party providers for national service and support.
7. Company has established Certification Program.

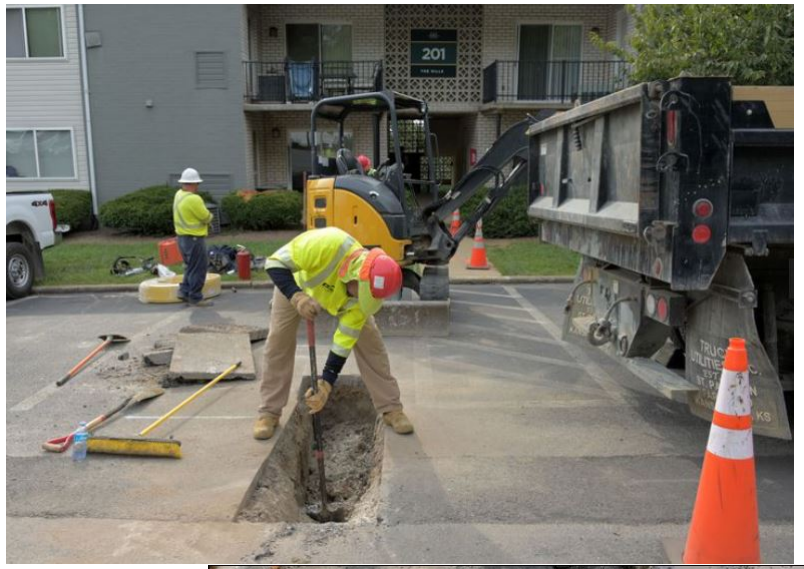
Data Offerings and Emissions Reporting

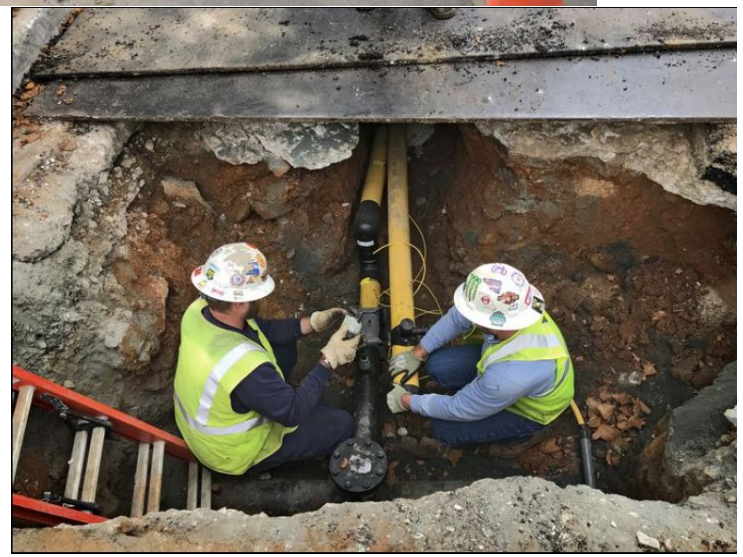
Options for connectivity, alerting and analytics services	Packages		Add Ons		
Features	**Basic Package**	**Advanced Package**	**Enhanced Diagnostic Package****	**Staffed Monitoring Package***	**Custom Integration Package***
Cellular Data Connectivity	X	X			
Text Message Alerting	X	X			
Weekly Performance Reporting	X	X			
2-way online remote communication		X			
Event Log Archive		X			
Graphical Performance Charts		X			
Data Downloading		X			
Dashboard Reporting		X			
Coriolis Meter Data Integration*			X		
24 Hour Staffed Monitoring				X	
Custom Integrations (interfaces/integrations)					X

* Requires Basic Package
** Requires purchase of Coriolis Meter Hardware Add On and Advanced Package

ONBOARD DYNAMICS

Additional Pictures of Pipeline Repairs





Current Process

- Evacuate the gas line as low as possible and vent the rest to atmosphere
- Little to no records of intentional methane releases during pipeline repair & maintenance

Board and Advisors

Board of Directors, including Rita Hansen & Jeff Witwer:

- William (Jeff) English, CEO, Natural Gas Utility
- Jim Huston, Portland Seed Fund, Managing Director
- Dr. Rod Ray, former CEO Bend Research, Entrepreneur & Leadership Expert

Advisory Board:

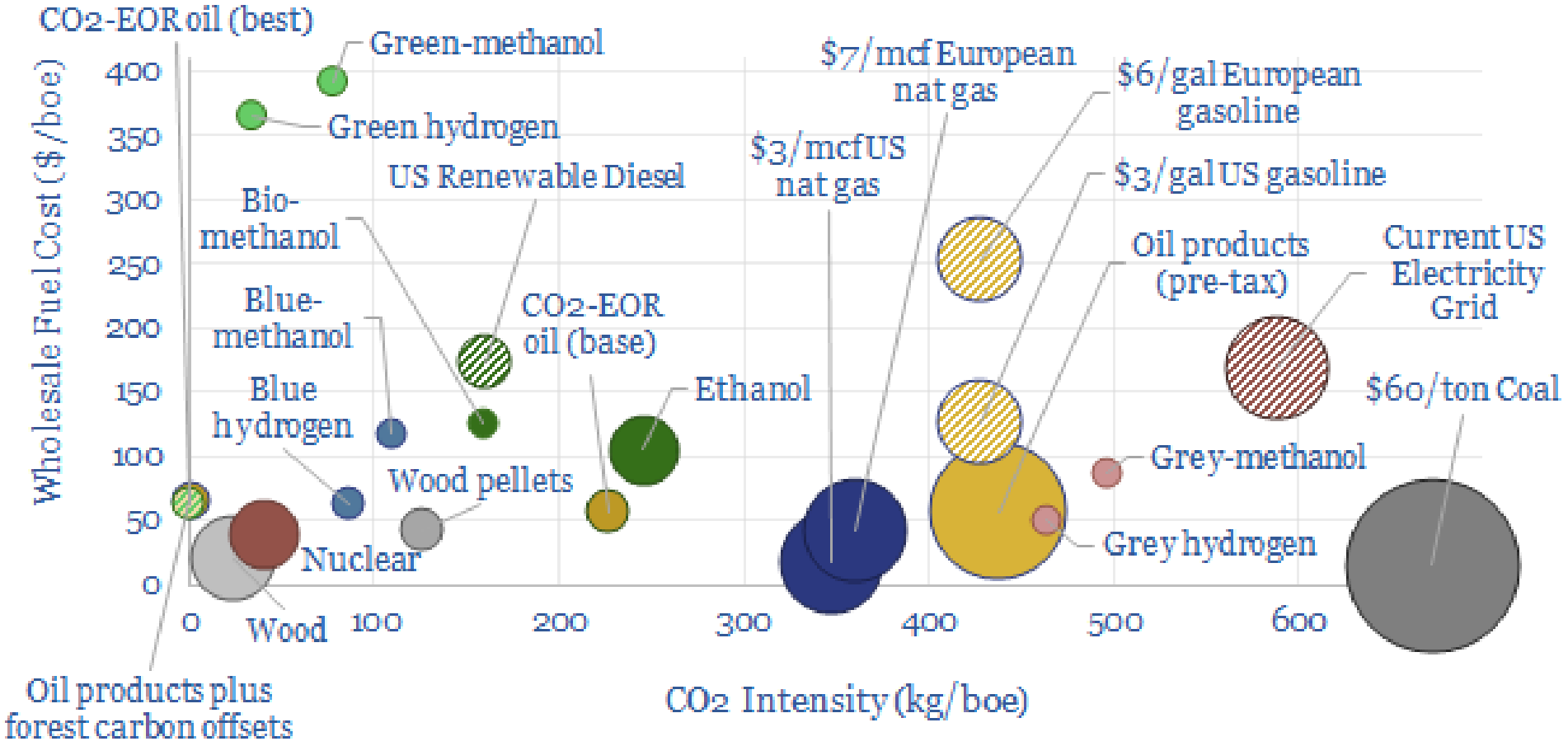
- Richard Gallio, former Toyota exec, Customer Service & Support Expert
- Rebecca Kauffman, exec in Environmental & Sustainability Stewardship
- Dick Kauling, former GM exec, Alternative Fuels Technologist & Strategist
- Brian Wawro, Managing Director Treeline Cap

Fuels for an Energy Transition

Costs and CO_2 Intensity of fuels: a cross-plot

Key Takeaways:

- Green hydrogen is expensive.
- US electrical grid is dirty.
- Blue hydrogen is a bargain.
- Natural gas is cheap.
- Nuclear is cheap and clean.
- *Where is renewable natural gas???*



Note: circle size denotes market size (logarithmic)

Costs and CO2 Intensity of fuels: a cross-plot? - Thunder Said Energy