

Committee on Gas
Committee on Consumers &
Public Interest
Subcommittee for Supplier and
Workforce Diversity

February 12, 2019

Committee on Gas

February 12, 2019



BE PROACTIVE,
NOT REACTIVE.

BE PROACTIVE, NOT REACTIVE.

THE PROBLEM

With over **\$30 Billion in lost revenue** industry-wide,
The average pipeline company...



suffers **93** leaks,



costing each company **\$18.7** million,

EVERY YEAR.

BE PROACTIVE, NOT REACTIVE

THE ENVIRONMENT

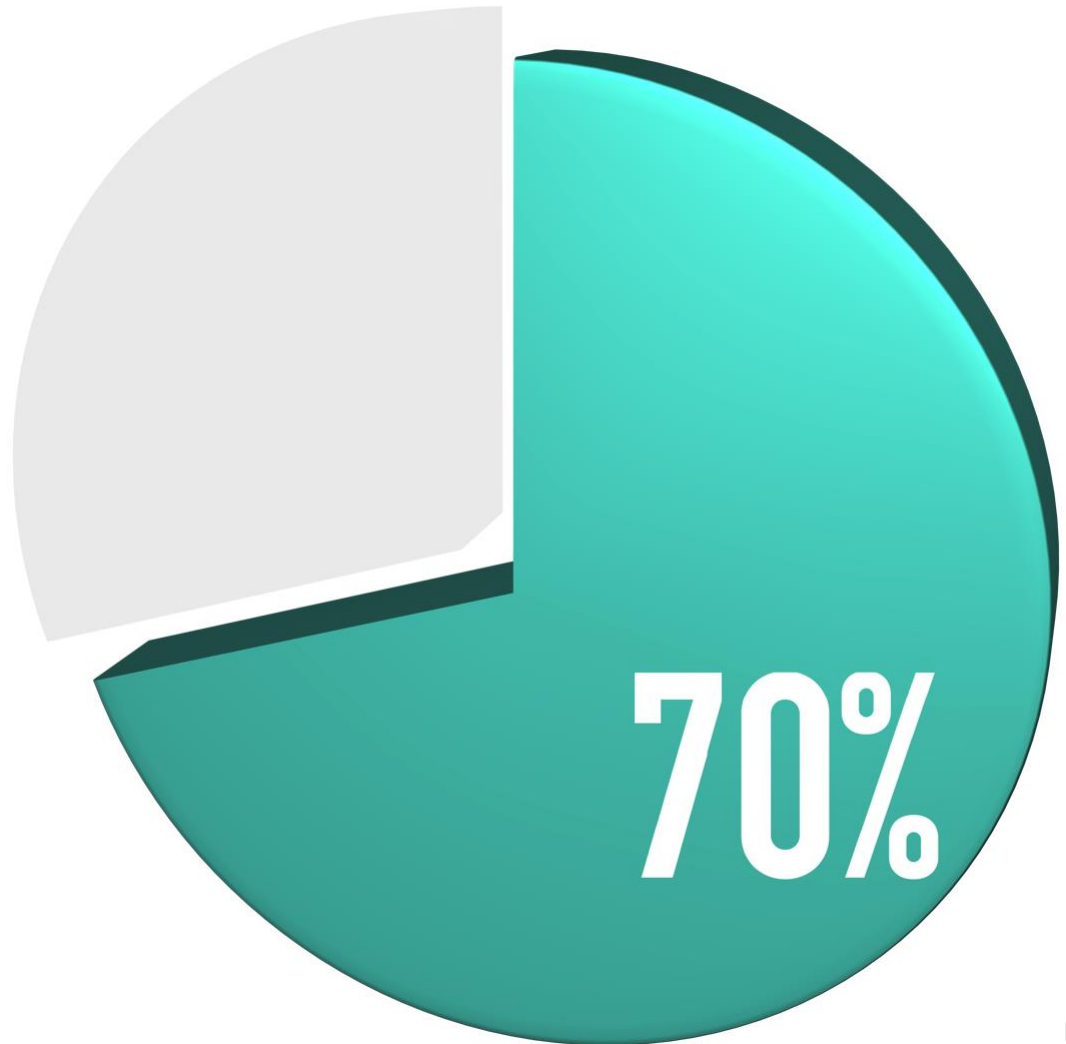


Even massive leaks take **Hours** or **Days** to discover.

~~BE PROACTIVE, NOT REACTIVE.~~
THE OVERSEAS THREAT

**The majority of
terrorism funding
comes from black
market oil and gas.**

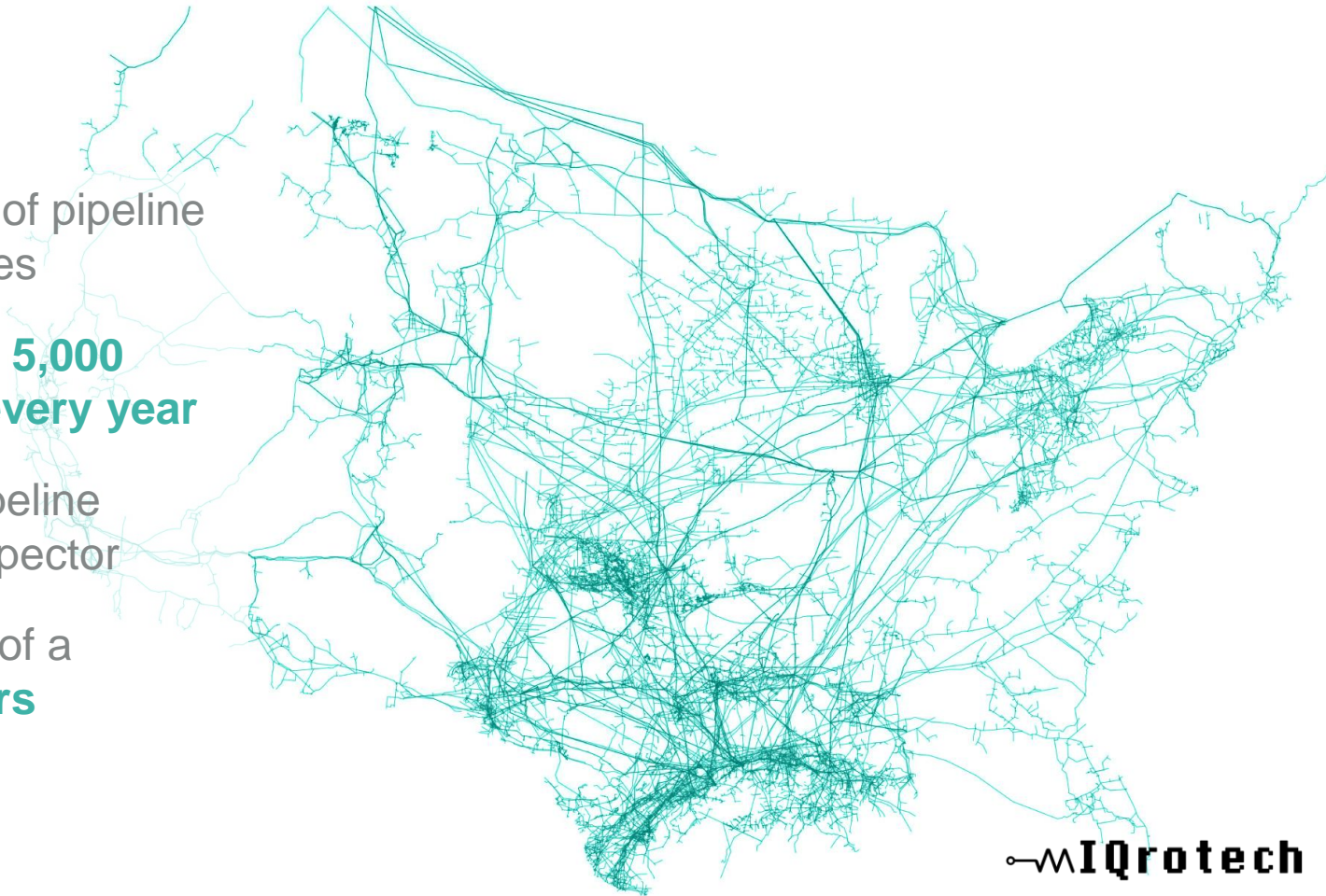
**PROTECT THE ASSET,
DEFUND TERRORISM.**



BE PROACTIVE, NOT REACTIVE.

THE U.S. INFRASTRUCTURE

- ▶ **2.6 Million miles** of pipeline in the United States
- ▶ Between **2,000 to 5,000** miles are added **every year**
- ▶ **4,521 miles** of pipeline between each inspector
- ▶ The average age of a pipeline is **50 years**



BE PROACTIVE, NOT REACTIVE.

THE SOLUTION



ALL-IN-ONE DEVICE

Our IoT Product finds critical variables to pipeline health.

7 VARIABLES

- ▶ Corrosion
- ▶ Pressure
- ▶ Density
- ▶ Vibration
- ▶ Temperature
- ▶ Location
- ▶ Sonic Boom



PATENTED TECHNOLOGY STACK

One patent approved.
Six more pending.

BE PROACTIVE, NOT REACTIVE.
THE SOLUTION



ALL-IN-ONE DEVICE

Our IoT Product finds critical variables to pipeline health.



WIRELESS

Our product is attached to the pipeline and starts collecting data immediately.

BE PROACTIVE, NOT REACTIVE.

THE SOLUTION



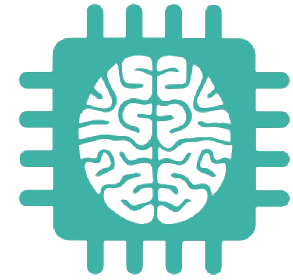
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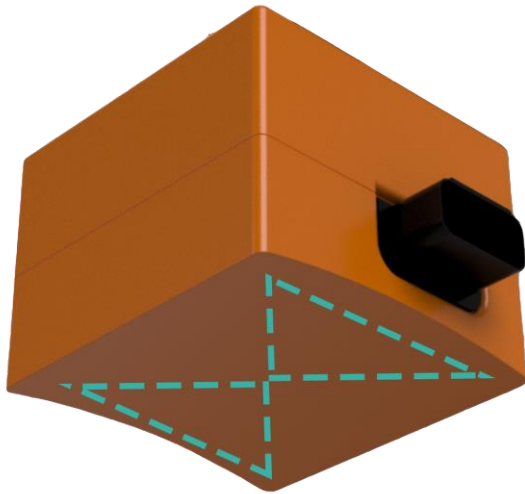
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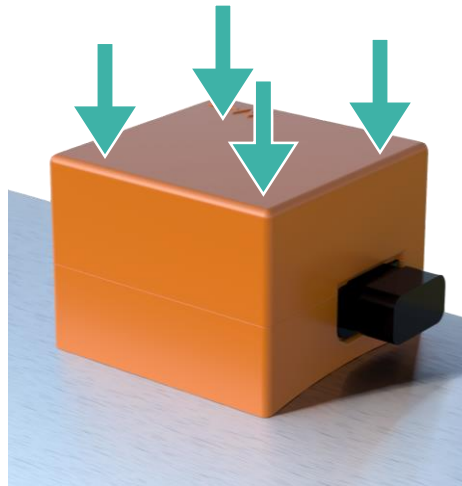
ARTIFICIAL INTELLIGENCE

Neural networks analyze the data to see what humans can't.

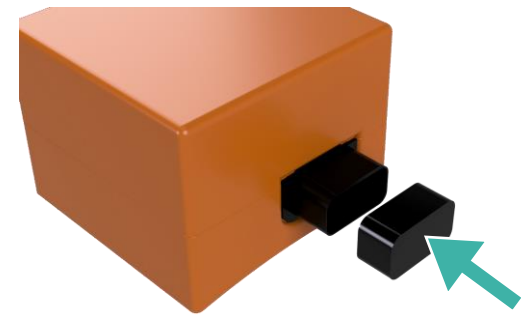
BE PROACTIVE, NOT REACTIVE. THE INSTALLATION



STEP 1: Apply Epoxy



STEP 2: Apply Pressure



STEP 3: Attach cables

Place **One** device every **One** to **Five** miles.
Above or **below** ground.
100% external from pipeline.

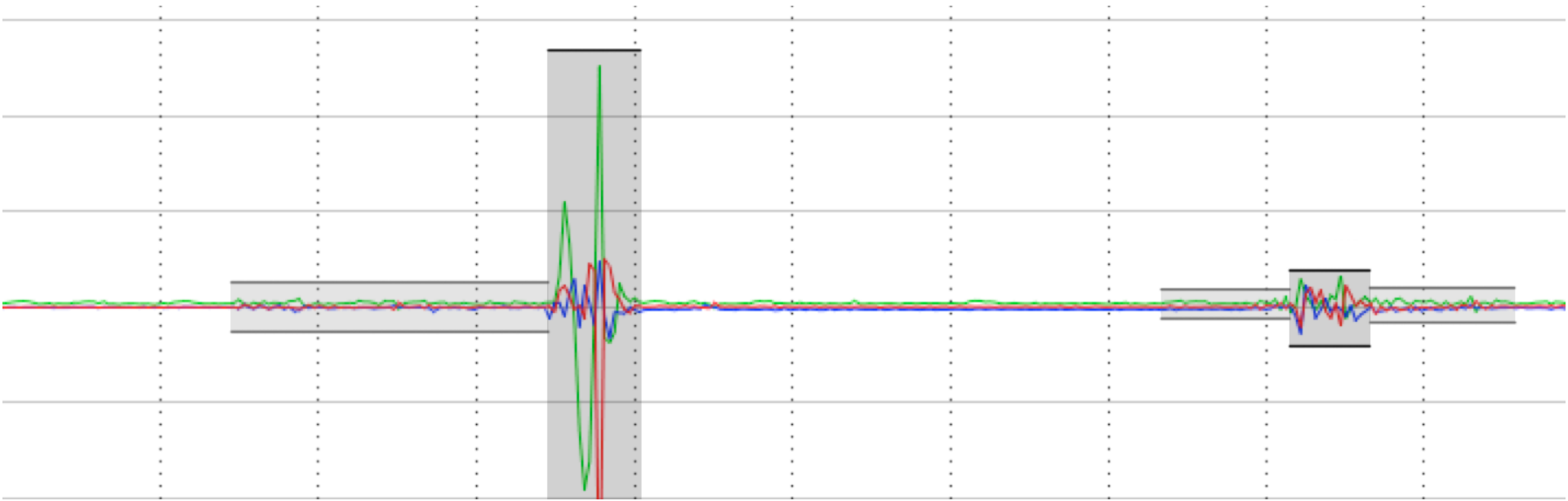
BE PROACTIVE, NOT REACTIVE.
THE LIVE DATA



What is detected, **Email** and **Text** are

BE PROACTIVE, NOT REACTIVE.

THE ARTIFICIAL INTELLIGENCE



be predicted **Days, Months,** even

OUR TECH CAN PREDICT LEAKS WITH A PROJECTED

96% ACCURACY

 **IQrotech**

BE PROACTIVE, NOT REACTIVE.

THE USER INTERFACE

DASHBOARD



ADD ALERTS PROFILE



Example Loca...	MIQT Office
Corrosion	0.357mm/yr.
Density	0.92kg/m³
Latitude	40.822115
Longitude	-77.888753
Pressure	120.57 PSI
Sound	55.2 dB
Temperature	71.012° F
Vibration	1.567m/s
Last Read	11:56 AM

IQrotech

BE PROACTIVE, NOT REACTIVE

THE CUSTOMERS

Partnered with over
32,000 miles
already!



1% of miles in
America

BE PROACTIVE NOT REACTIVE.

THE EXECUTIVE TEAM



Meade Lewis

Founder & C.E.O.
Former CITO of multiple oil
and gas firms. Successful “big
data” and O&G startup exits.

IRON-PRO (Acquired by DFW Heavy Duty)
ADVANCED UPSTREAM SOLUTIONS (Acquired by IOT-eq)



Tony Park

Chief Operating Officer

Bloomberg



Dom Colosimo

Chief Scientific Officer



PennState

+ 8 additional engineers and team members

We are dedicated to being a lean, green, innovation machine!

 **mIQrotech**

BE PROACTIVE, NOT REACTIVE

THE BOARD OF ADVISORS



Brigham McCown

Industry Advisor
Former Acting Administrator



U.S. Department
of Transportation
**Pipeline and
Hazardous Materials
Safety Administration**



Rich Eggers

Strategy Advisor
Former Director of Global
Strategy



Don Bortniak

Technology Advisor
Former Director of HRIT



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Migrotech



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urb}int

Plan for what's next.

Why do we do what we do?

AT URBINT, OUR MISSION IS TO

**Help infrastructure operators
make communities
safer and more resilient.**



Our partners

Energy Impact Partners.

The world's leading coalition of utilities investing a new energy future.

TransCanada

FORTIS INC.



 **evergy**

nationalgrid



OG+E



TEPCO

AVISTA

urb}int

Core message

Our world is changing.
The only way utilities can keep up
is with technology.

New era of weather.



ACRES BURNED BY WILDFIRES



Urbanization.



64%

Increase since 1950

U.S. POPULATION LIVING IN URBAN AREAS - **82%**



4-6%

Annual growth rate

CONSTRUCTION ACTIVITY

Aging Infrastructure.

HIGH PRESSURE
GAS PIPELINE

\$177B

Investment gap
2016 - 2025


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Replacement cost for
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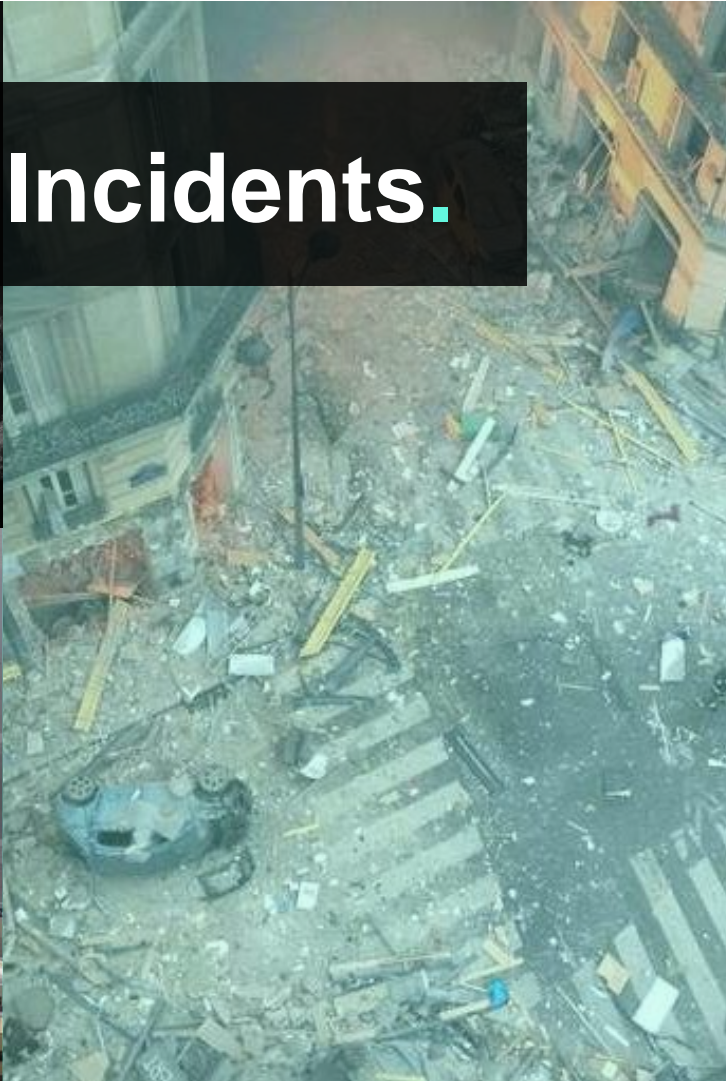
GAS INFRASTRUCTURE

Workforce Turnover.

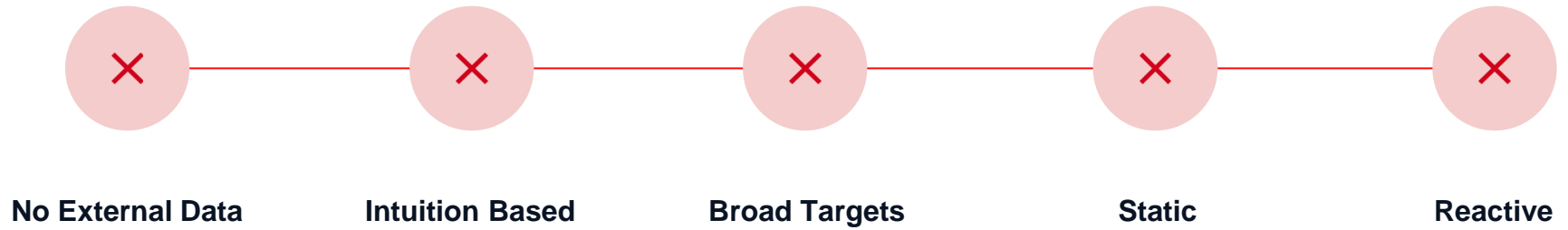


Nearly half of the utility workforce will be nearing retirement age.

High-risk Incidents.



Traditional Process.



External Data.

EXTERNAL DATA

PREDICTIVE INTELLIGENCE

DECISION INTELLIGENCE



Vegetation



Contractors



Pollution



Topography



Coastal Effect



Weather

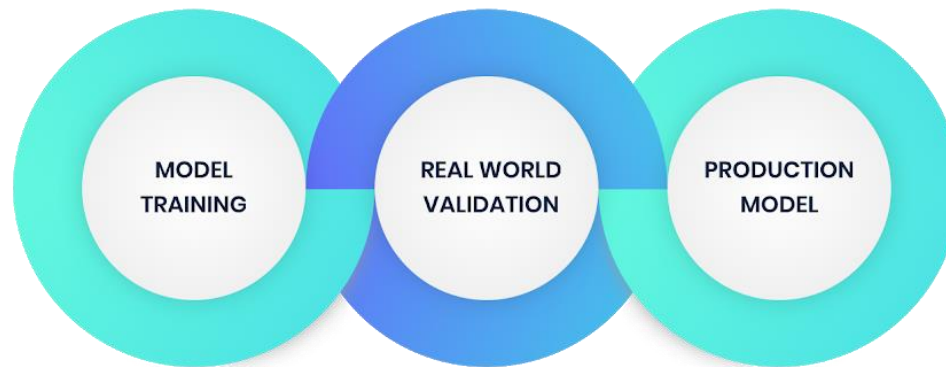


Permits



Building

Predictive Intelligence.

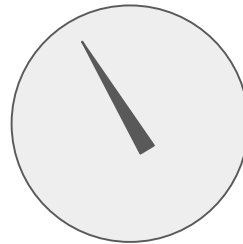


Decision Intelligence.



Interventions

6



Leaks Prevented

3.45





No External Data



Intuition Based



Broad Targets



Static



Reactive

AI helps utilities keep pace with change.



External Data



Empirical



Pinpointed



Dynamic



Proactive

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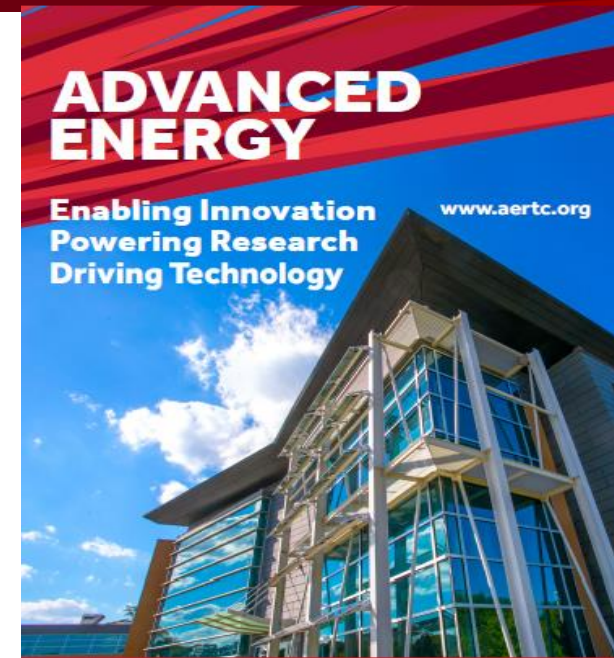


NARUC
National Association of Regulatory
Utility Commissioners

Advanced Energy Research & Technology Center

Stony Brook University 2/12/19

Robert B. Catell
Chairman




ADVANCED ENERGY™
Research and Technology Center
AT STONY BROOK UNIVERSITY



Research • Resources • Outreach • Commercialization



Mission

True partnership of academic institutions, research institutions, energy providers and industrial corporations. Innovative energy research, education and technology deployment with a focus on efficiency, conservation, renewable energy and nanotechnology applications for new and novel sources of energy.

Overview

- Located at R&D Park, Stony Brook University
- Energy-focused research facility
 - Research labs
 - Shared user-facilities
 - Business incubator labs
- Business assistance & technology support programs
- Industry & research collaboration
- Research partnerships
 - Brookhaven National Laboratory
- Bi-annual Advanced Energy Conference

Quick Facts

- Ribbon cutting - 2011
- Attracted \$140M+ in funding
- \$50M LEED platinum facility
- Supports 137 on-going energy projects
- Supports 10 research & training centers
- NYS SmartGrid Consortium - founder
- DOE Energy Frontiers Research Center
 - Center for Mesoscale Transport Properties
- DOE/NYSERDA
 - National Offshore Wind R&D Consortium
 - \$40M (DOE/NYSERDA)

Centers/Programs – On Site

- Advanced Energy Training Institute
- Center for Clean Water Technology
- Center for Integrated Electric Energy Systems
- Center for Mesoscale Transport Properties
- Clean Energy Business Incubator Program
- Institute of Gas Innovation and Technology
- National Offshore Wind Research and Development Consortium
- New York Energy Policy Institute
- NYS SmartGrid Consortium
- Thermomechanical & Imaging Nanoscale Characterization

Key Research Areas

- Advanced Combustion & Engines
- Bioenergy & Biofuels
- Battery & Storage Research
- Clean Transportation
- Energy Modeling/Simulation
- Energy Focused Nanocatalysts
- Energy Generators/Convertors
- Energy Harvesting
- Energy Impacts on Environment
- Energy Education and Outreach
- Grid Cybersecurity
- Grid Management
- Hydrogen Fuel Generation
- Low Carbon Energy
- Microgrids
- Offshore Wind Energy
- Photovoltaics & Fuel Cells
- Renewable Energy
- Smart Grid
- Smart Power Management
- System Resiliency



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- Smart Grid
- Smart Power Management
- System Resiliency

Institute of Gas Innovation and Technology



Institute of
Gas Innovation
and Technology

AT STONY BROOK UNIVERSITY

Mission:

Use Academic-Industry platform to accelerate advanced *natural gas* technology deployment and infrastructure upgrade to benefit community residents and businesses. This is accomplished through innovative energy research, analysis, education. The focus is on environmental performance and renewable energy technologies.

Founding Members



nationalgrid

Strategic Partners



I-GIT Projects

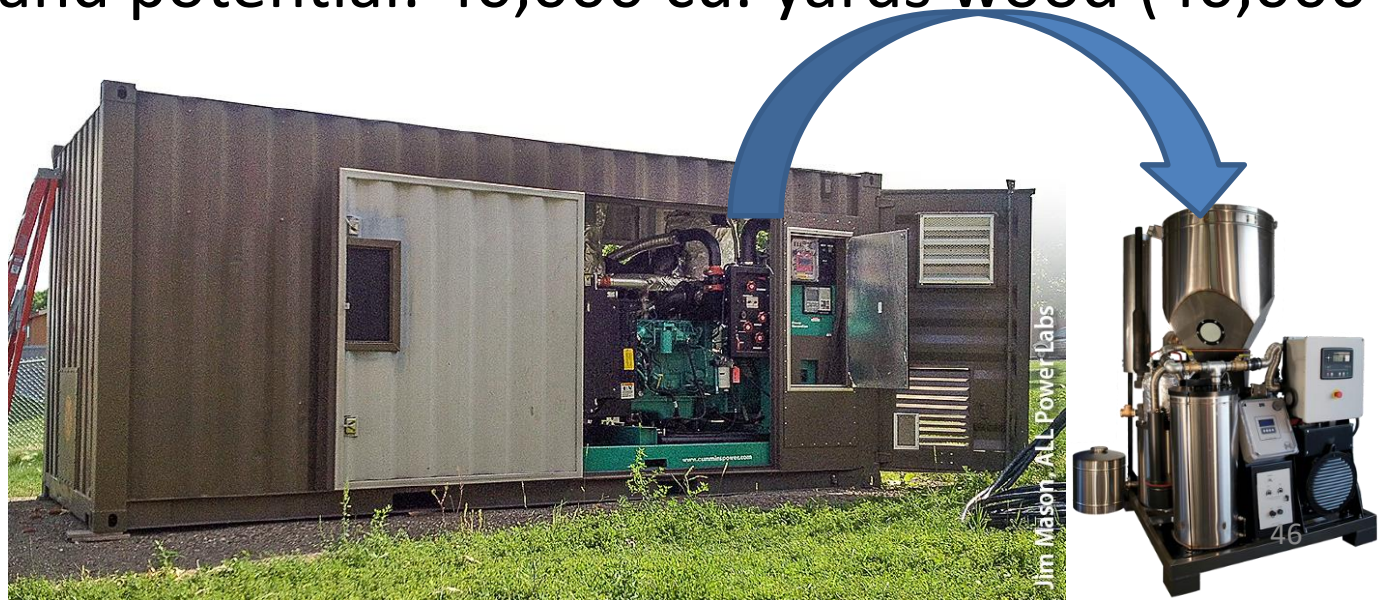
- Pillar #1
 - Gas and Power
- Pillar #2
 - Renewable Gas
- Pillar #3
 - STEM Workforce Training
- Pillar #4
 - International Consortium

I-GIT: Pillar #1

Low Carbon Technology

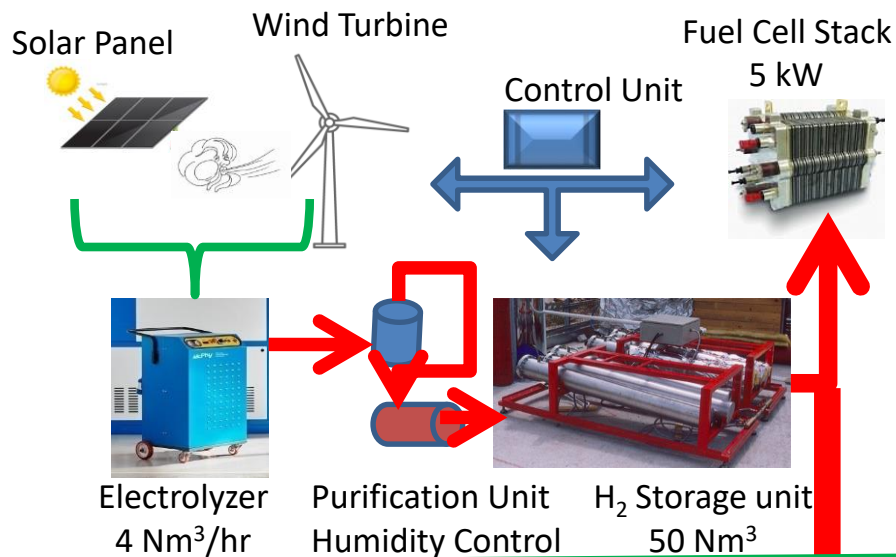
- Demo Project #1: Off-Grid Power
 - 30kW power pallet (APL PP30)
 - Can be flatbed truck mounted
 - Long Island potential: 40,000 cu. yards wood (40,000 MW)

Wood Waste-Gas-Power



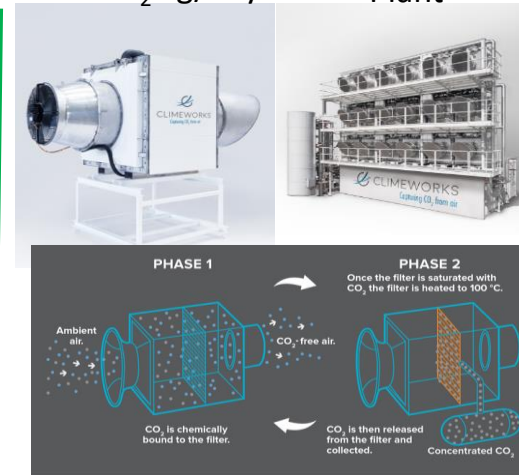
I-GIT: Pillar #1

Power-to-Gas Demo Project



Single collector
135 CO₂ kg/day

CO₂ Capture
Plant



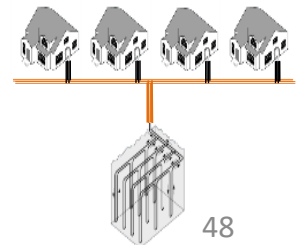
Key characteristics of the final HELMETH CO₂-methanation module:

- Multistep module with product water condensation
- Operating gas pressure: 10 - 30 bar
- Boiling water cooling: up to 300 °C (~ 87 bar)
- SNG output: 12 - 60+* kW_{HHV,CH₄} (1.08 - 5.42 m³/h CH₄, NTP)
- Modulation: 20 - 100+ %
- Final SNG-composition
CH₄: > 97 vol.-%
H₂: < 2 vol.-%

I-GIT: Pillar #2

Gas Gap Analysis Advancing Gas REV

- I-GIT is conducting Reforming the Energy Vision (REV) Project Reviews
 - Smart Homes in Floor Zones
 - Gas Demand Response (large gas equipment)
 - Infrastructure Efficiency and Smart Growth
 - Electric Support (MicroCHP)
 - Japan and US small cogeneration <5 kW available when needed
 - Geothermal Heating and Cooling with Solar Hot Water
 - Low energy cost compared to petroleum where gas not available
- In Progress
 - NYS REV analysis report
 - NYS RNG Assessment report



I-GIT: Pillar #3

Workforce Development



Stephanie Taboada
Ph.D. candidate



Jake Lindberg
Ph.D. candidate

**STEM
Women in Science & Engineering
(WISE)**



Lyufei Chen
Ph.D. candidate



Emily Costa
Undergraduate
PSEG Intern

I-GIT: Pillar #4

International Consortium

- European Marine Energy Center, Scotland
 - MOU signed 10/2018
- Three other international entities are under discussion

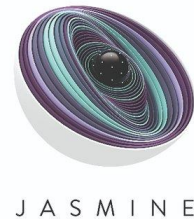


Energy Incubation Ecosystem

- 19 companies (as of 2/1/19)
- AERTC Incubator
 - 6 companies
 - Physical space
- Clean Energy Business Incubation Program
 - 16 companies (3 located in AERTC)
 - Virtual incubation program
- Offerings
 - Business development/strategic planning
 - Investor pitch review/access to investors
 - Manufacturing/engineering expertise
 - Seminars and workshops
 - Faculty and student talent
 - Specialized research facilities on campus
 - Dedicated company space available

AERTC Incubator Companies

- Brookhaven Technology Group
 - Particle accelerator/ion sources
- Energystics
 - Vibrational Energy
- ChemCubed
 - Additive manufacturing/3D printing
- Jasmine
 - Energy Management Systems
- ThermoLift
 - Natural Gas Heat Pump
- Unique Technical Services
 - Electric vehicles



CEBIP Incubator Companies

- Allied Microbiota
 - Soil Remediation
- Bonded Energy
 - Building IoT
- Edgewise Energy
 - Distributed Energy
- Energystics
 - Vibrational Energy
- EnviroPower
 - Micro-CHP
- Green Framework
 - Maritime Energy
- modelizeIT
 - Datacenter Efficiency
- NeuralNet
 - Utility Sensors/IoT
- NextSwitch/BTG
 - Particle accelerator/ion sources
- Re-Nuble
 - Food waste to fertilizer
- RoadPower
 - Energy Harvesting
- SPIRA
 - HVAC Sensors
- StorEn
 - Flow Batteries
- Sulcrete
 - Sulfur Concrete
- ThermoLift
 - Natural Gas Heat Pump
- Unique Electric Systems
 - Electric Vehicles



Clean Energy Business
Incubator Program

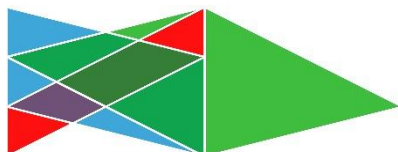
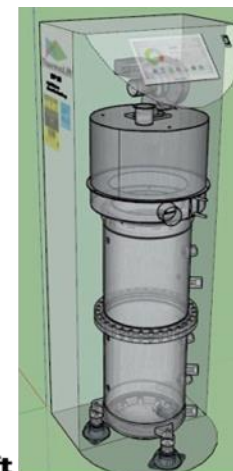
AT STONY BROOK UNIVERSITY



ThermoLift

Clean Energy Game Changer

- Up to **50% Reduction** in Energy Use
- **40% Solar** Powered (up to 100%)
- **One Appliance** – Heating, Refrigeration, Cooling / Air Conditioning and Hot Water
- **Cold Climate Monovalent Heating** (no additional heat source needed even below 0 degrees F)
- **Cooling with Natural Gas**
- **Clean** – No Toxic Emissions or Materials (i.e. better than EU and California indoor air quality regulations and standards)
- **No Refrigerants** – No Toxic Leakages, Lower Operating Cost



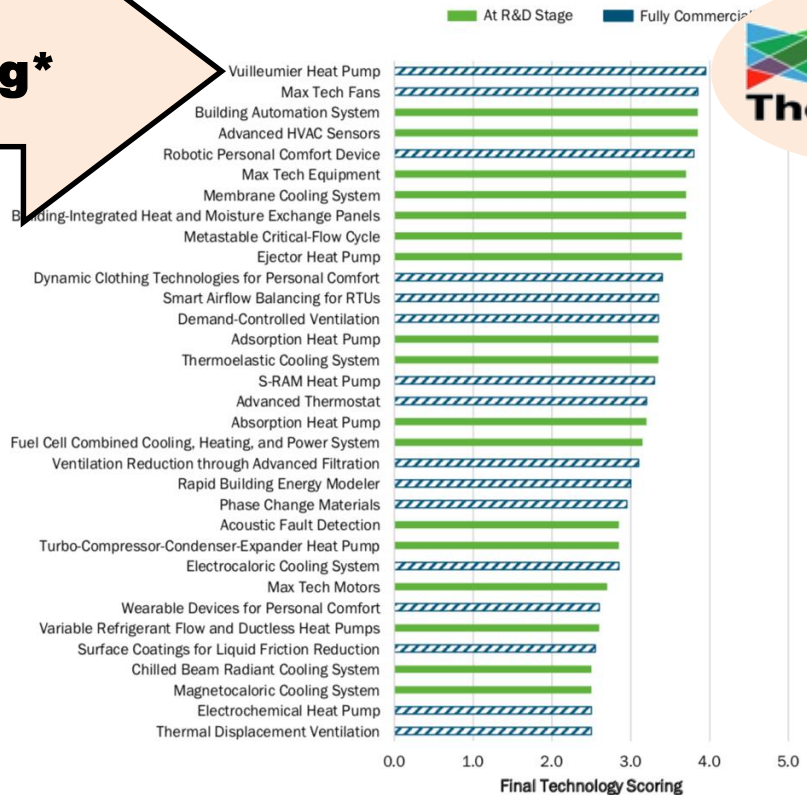
ThermoLift

ThermoLift

DOE Highest Ranked Potential

ThermoLift Highest Ranking*

ENERGY SAVINGS POTENTIAL AND RD&D OPPORTUNITIES FOR COMMERCIAL BUILDING HVAC SYSTEMS



Energy Savings Potential and
RD&D Opportunities for
Commercial Building HVAC
Systems

December 2017

Selection based on review of 300 technologies

** ThermoLift and Paul Schwartz cited specifically
by name elsewhere in the report.*

Figure 9: Final ranking of high priority technology options

Thank You!!

Have a Great Day!!

Robert B. Catell

Chairman

robert.catell@stonybrook.edu



www.aertc.org



@AERTC_SBU

Committee on Gas

February 12, 2019



Emerging Natural Gas Technologies: Safe, Reliable, Efficient and Environmentally Responsible

February 13, 2019
Kristine Wiley

75-year History of Turning Raw Technology into Practical Energy Solutions

FOR A BETTER ECONOMY AND A BETTER ENVIRONMENT

SUPPLY

CONVERSION

DELIVERY

UTILIZATION



RESEARCH &
DEVELOPMENT



PROGRAM
MANAGEMENT



TECHNICAL/
ANALYTICAL



CONSULTING



TRAINING



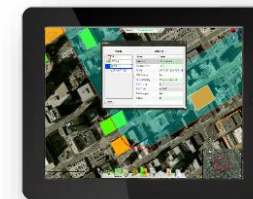
COMMERCIALIZATION



World-class piloting
facilities headquartered
in Chicago area

Pipeline Infrastructure Advancements

- Addressing challenges in energy distribution, system integrity, asset lifecycle tracking, cyber security, and environmental footprint
 - Rehabilitating/enhancing existing infrastructure
 - New pipe materials and installation methods
 - Intelligent infrastructure, advanced sensors, smart meters and devices
 - Minimization of methane releases
 - Accommodation of renewable natural gas supplies






























Operations Technology Development

OTD

Operations
Technology
Development

Identify, select, fund, and oversee research projects resulting in innovative solutions and the improved safety, reliability, and operational efficiency of natural gas systems

 PSNC ENERGY® A SCANA COMPANY	 Southern California Gas Company A Sempra Energy utility	 Pacific Gas and Electric Company	 ATMOS energy	 SOUTHWEST GAS
 Ameren FOCUSED ENERGY. For life.	 conEdison	 CenterPoint Energy	 Entergy	 PEOPLES GAS® NATURAL GAS DELIVERY
 INTERMOUNTAIN GAS COMPANY A Subsidiary of BNV Americas Group, Inc.	 NYSEG RG&E	 National Fuel	 AVISTA	 NiSource
 NW Natural® We grew up here.	 APGA Research Foundation	 Oklahoma Natural Gas. A Division of ONE Gas	 ENBRIDGE	 Washington Gas A WGL Company
 Dominion Energy	 Nicor Gas	 TECO PEOPLES GAS	 DUKE ENERGY	 spire
 nationalgrid	 Liberty Utilities			

Emerging Technologies

Reduce Risk, Increase Safety, Manage Costs

OPW Breakaway Fitting

Reduce the risk of incident when meter set assemblies and other aboveground pipe are impacted by vehicles, snow, and ice.



3M Locatable Plastic Pipe

Passive tags installed by the PE pipe manufacturer. Replace tracer wire, no continuity required.



ORFEUS HDD Obstacle Avoidance

Ground-penetrating radar based system for horizontal drilling obstacle avoidance. Addressing steps to bring to the U.S. market.



Excavation Encroachment Notification

Reduce risk of third-party damage from excavation and ag equipment. GIS-based real-time tracking. Currently rolling out 150 unit demo with PG&E and others.



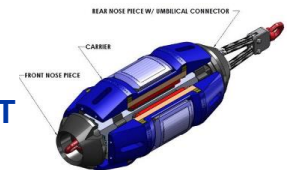
Lorax Integrated Intelligent Safety System (IISS)

Mitigate risk of gas leaks and third-party damage on commercial, multi-family, and small industrial service lines.




Quest Integrated Small Diameter EMAT

Address need for inspection tool for smaller diameter (e.g., 8") pipe. Tool, electronics, software integration completed. Ready for field test during 2018.




Focus Area: Methane Detection and Remote Sensing


Flexibility to Deploy Multiple Technology Solutions



Technology
y
Sensor Type
Detection



Platform
Hand-held
Vehicle
UAVs
Drones



Asset
Pipelines
M&R Stations
Compressor
Stations



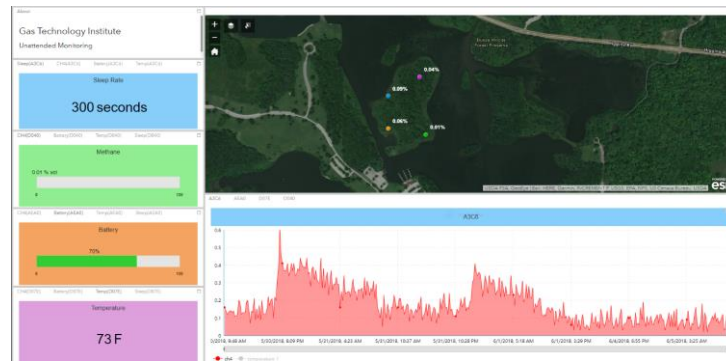
Use Case
Leak survey
Leak
Investigation
Stationary



Remote Methane Monitoring Tools

Providing Situational Awareness

- GTI has developed a network of wireless remote sensors to allow operators to assess and monitor leaks while limiting exposure to hazardous environments.
- User display is accessed via webpage eliminating need to develop separate apps for different mobile devices
- Field prototypes have been developed in 2 form factors and the technologies have been licensed and are being commercialized



Enhancing Safety Through Adoption of Residential Methane Detectors



- > RMDs are commercially available however there is low customer adoption
- > Extensive laboratory testing of commercially available RMDs has been completed
- > National pilot study has been executed to collect performance data in various residential settings

An opportunity to augment existing safety programs and add another layer of protection for the detection of leaks

Improve Accuracy and Reliability

- > Work collaboratively with manufacturers to ensure commercial products deliver safety enhancement expectations for the gas industry

Adoption of Codes and Standards

- > Modify existing UL 1484 standard with emphasis on lower detection limit
- > Seek parallel path of certification through International Code Council and NFPA

Enhanced Awareness and Education

- > Continue stakeholder education and outreach and develop formal advocacy plans
- > RMD Educational Awareness Study

Product Advancement

- > Determine optimal placement of detectors based on U.S. building construction practices and typical ventilation effects

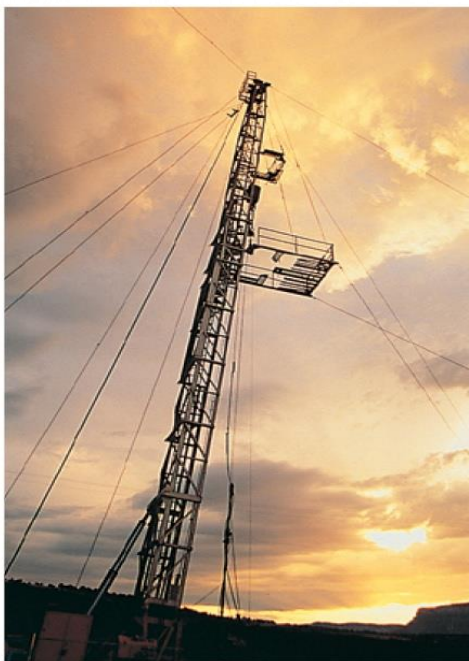
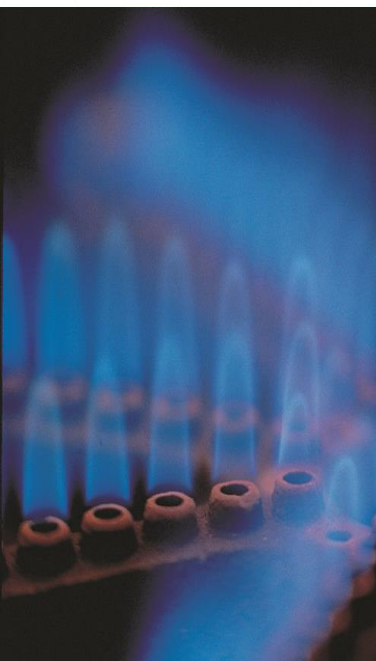
Methane Detection/Remote Sensing Technology Opportunities

- Real time monitoring, processing and display
- Multi-sensor platforms
- IoT integration into devices
- Networking and communication of sensors back to operators
- Data integration for risk/decision management
- Operational and deployment considerations



Turning Raw Technology into Practical Solutions

www.gti.energy |  [@gastechnology](https://twitter.com/gastechnology)



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AVISTA

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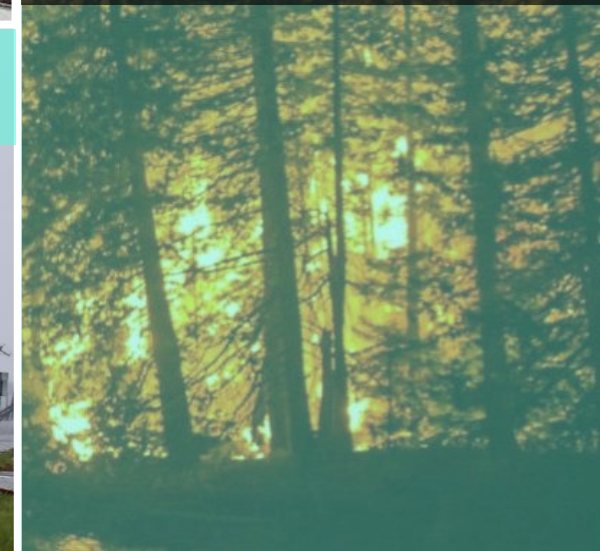
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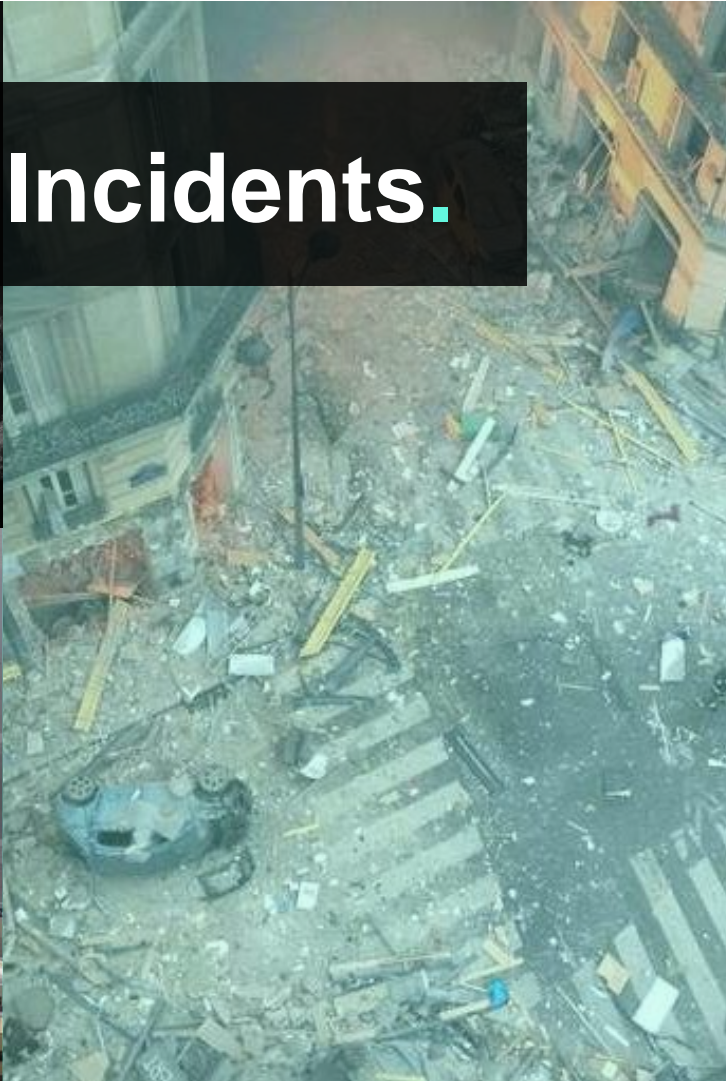
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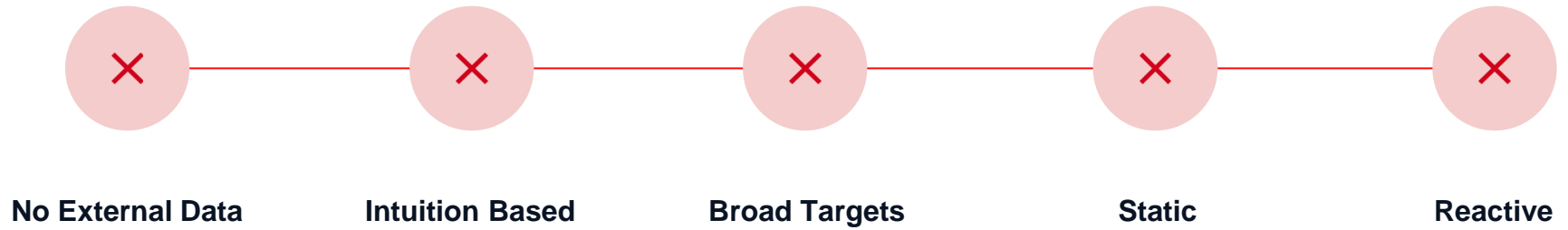


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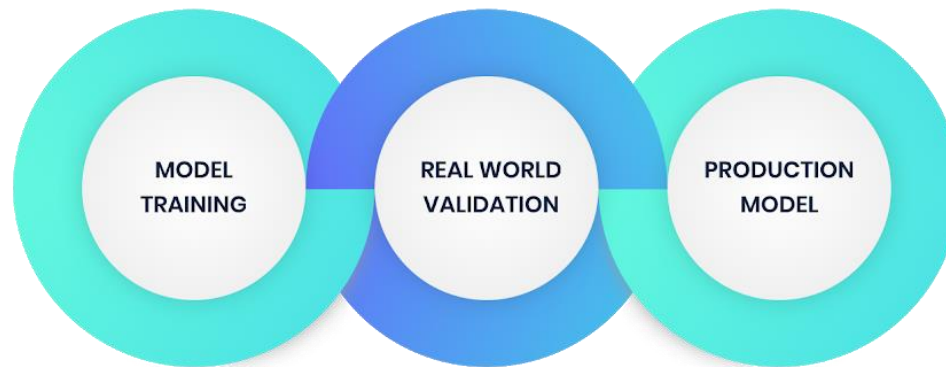


Permits



Building

Predictive Intelligence.

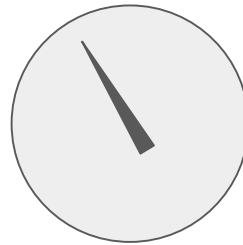


Decision Intelligence.



Interventions

6



Leaks Prevented

3.45





No External Data



Intuition Based



Broad Targets



Static



Reactive

AI helps utilities keep pace with change.



External Data



Empirical



Pinpointed



Dynamic



Proactive

Committee on Gas

February 12, 2019

“America First” LNG Export Policy

**Paul N. Cicio
President
Industrial Energy Consumers of America (IECA)**

Industrial Energy Consumers of America

- Exclusively represent manufacturing energy consumers.
- Member companies have over \$1.0 trillion in annual sales, 1.7 million employees.
- Chemicals, plastics, steel, iron ore, aluminum, paper, food processing, fertilizer, glass, industrial gases, building products, automotive, independent oil refining, and cement.

A Rational Public Policy is Needed that Protects the U.S. Consumer

- Not against LNG exports. Against excessive LNG exports.
- Prevent low U.S. natural gas prices from being connected to the high global LNG market price, like crude oil prices are today.
(\$3.00 MMBtu HH vs. \$12.00 MMBtu Asia)
- Limit LNG exports to volumes to levels that are in the public interest. (the public not negatively impacted)

Excessive LNG Exports Uniquely Increase Consumer Risks

- DOE export approvals are being made today for periods of 20-30 years.
- The global LNG market is not a 'free' market: LNG buyers are state-owned enterprises (SOEs) and foreign government utilities with automatic cost pass-through.
- All large LNG consuming countries have winter when we do.



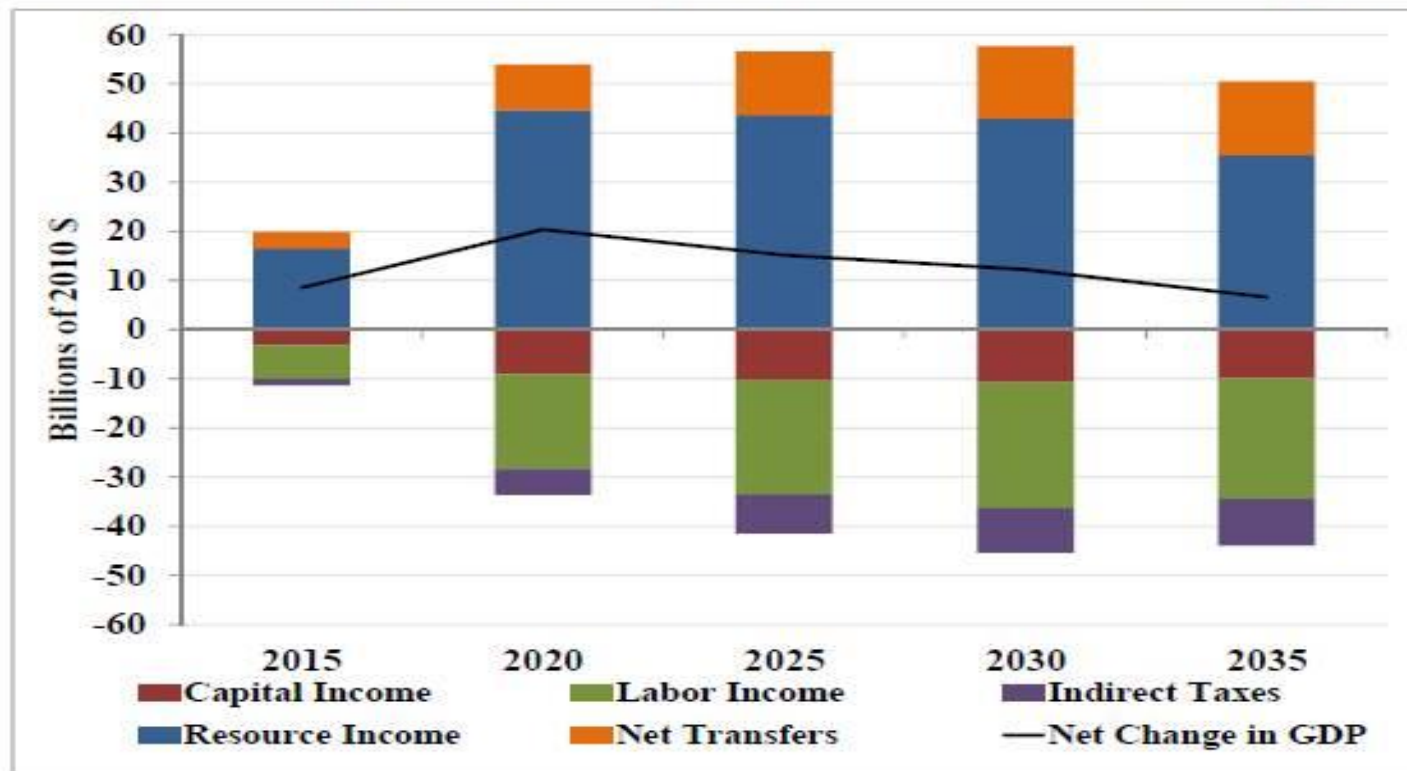
**The Natural Gas Act (NGA) requires
that exports of LNG to non-free
trade agreement (NFTA) countries
must not be inconsistent with the
public interest.**

'Public Interest' has Never Been Defined!

- The Natural Gas Act does not define it.
- A Government Accountability Office report concludes that DOE has not defined public interest.
- Supreme Court defined public interest. The NGA is “to protect consumers against exploitation at the hands of natural gas companies.” “...welfare of the consumer”.
- Instead, DOE LNG export studies focus on net economic benefit to justify approving larger export volumes.

LNG Exports Create Winners and Losers (Consumers)

Figure 3: Change in Income Components and Total GDP in USREF_SD_HR (Billions of 2010S)



Source: DOE report on "Macroeconomic Impacts of LNG Exports from the United States," page 8

DOE Approved LNG Export Volumes

Non-Free Trade Agreement (NFTA) Countries

- Volume approved: 21.4 Bcf/day, 30% of 2018 U.S. demand
- Volume pending approval: 27.3 Bcf/day, 37% of 2018 U.S. demand

Federal Register

December 28, 2018

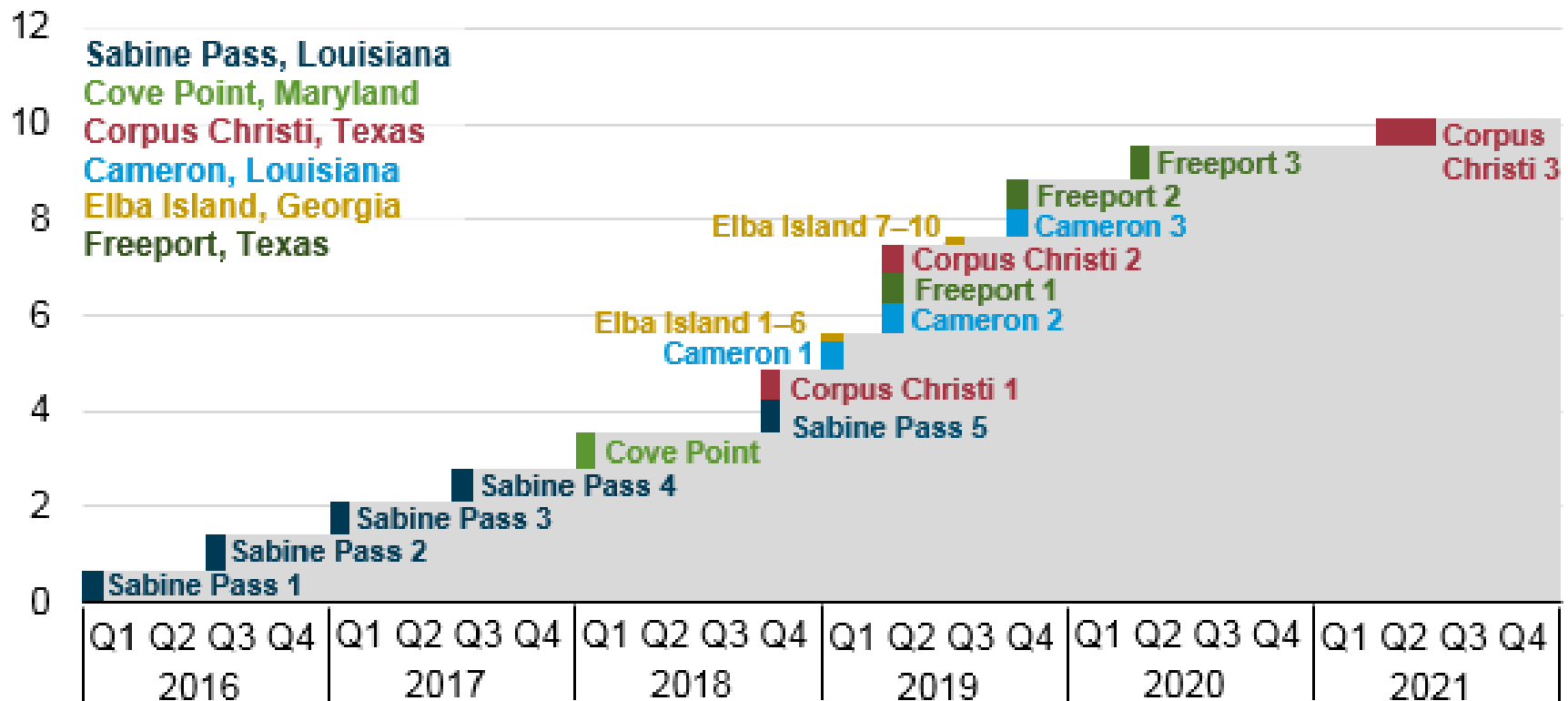
- DOE announced intention to approve export volumes to NAFTA countries up to 52.8 Bcf/d, or 71 percent of 2018 U.S. demand.
- DOE admits that the economic model used to justify this volume is ‘proprietary’. *Results cannot be reproduced or verified by independent third parties.*



LNG Export Volumes of this Magnitude Cannot Possibly be in the ‘Public Interest’

EIA: LNG Export Capacity to More than Double in 2019

U.S. liquefied natural gas export capacity, 2016–2021
billion cubic feet per day





IECA Report

Compares EIA AEO 2019 Cumulative Demand Vs. Natural Gas Resources

RESULT: By 2050, 61 Percent of all Known U.S. Natural Gas Resources Would be Consumed

- 2018- 2050 (32 years)
 - **Result:**
 - Cumulative consumption equal to 1,357 Tcf
 - EIA technically recoverable U.S. Resources in 2017: 2,215 Tcf
 - Page 2, EIA says, 'Estimates of TRR are highly uncertain,..''

EIA – Technically Recoverable U.S. Natural Gas Resources (w/o Alaska)

	Proved Reserves	Unproved Reserves	Total Technically Recoverable Resources
Lower 48 (Onshore)	855.6	4,557.3	5,412.9
Lower 48 (Offshore)	18.1	637.5	655.6
Total (Bcf/d)	873.7	5,194.8	6,068.5
Total (Tcf)	318.9	1,896.1	2,215.0

Source: Technically recoverable U.S. dry natural gas resources as of January 1, 2017
Energy Information Administration (EIA) <https://www.eia.gov/outlooks/aeo/assumptions/pdf/oilgas.pdf>

Australia – A Cautionary Tale

- A country rich in natural gas resources.
- Domestic consumers are paying the ‘Asian LNG net-back’ price.
- Australian Competition and Consumer Commission (federal agency) says net back prices have increased from 7.27 Gj in 2017 to 10.69 Gj YTD 2018, **a 47 percent increase**.
- Historically \$3 MMBtu, now \$8, \$9, \$10.

Will More LNG Export Terminals be Built? YES.

State Owned Enterprises (SOEs)

- Golden Pass: 2/5/19 Exxon and Qatar
- Saudi Arabia: WSJ 1/9/19 announced potential investment in four terminals in 2019.

Questions?

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