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.
THE ENVIRONMENT

BE PROACTIVE, NOT REACTIVE.

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

BE PROACTIVE, NOT REACTIVE.

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.

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Our IoT Product finds critical variables to pipeline health.

WIRELESS

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

IQrotech
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.

ARTIFICIAL INTELLIGENCE
Neural networks analyze the data to see what humans can’t.

IQro tech
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

When an immediate threat is detected, Email and Text alerts are sent to.
BE PROACTIVE, NOT REACTIVE.

THE ARTIFICIAL INTELLIGENCE

be predicted Days, Months, even
OUR TECH CAN PREDICT LEAKS WITH A PROJECTED 96% ACCURACY
THE USER INTERFACE

BE PROACTIVE, NOT REACTIVE.
Partnered with over 32,000 miles already!

1% of miles in America
THE EXECUTIVE TEAM

BE PROACTIVE, NOT REACTIVE.

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

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!
BE PROACTIVE, NOT REACTIVE.

THE BOARD OF ADVISORS

Brigham McCown
Industry Advisor
Former Acting Administrator

Rich Eggers
Strategy Advisor
Former Director of Global Strategy

Don Bortniak
Technology Advisor
Former Director of HRIT

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

- Raised over $4,000,000 in Venture Capital
- **Ocean Accelerator** Class IV
- Presented at **TEDxPSU**
- “**Most Innovative Company** in the world” - Collision
- “**Most Promising Oil & Gas Technology Solution Provider 2018**” - CIO Review
- “Among the **Top 20 Clean Energy Companies** World Wide” - Cornell University and NYSERDA
- “**Best Pipeline Leak Detection Technology Provider in the USA**” - Global Energy Awards
Committee on Gas

February 12, 2019
urb}int

Plan for what's next.
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.  Ameren  evergy

national grid  Alliant Energy  MGE  Madison Gas and Electric  Southern Company

OG&E  ptt Group  TEPCO  AVISTA

urbjnt
Our world is changing.
The only way utilities can keep up is with technology.
New era of weather.

HEAVY DOWNPOURS

ACRES BURNED BY WILDFIRES

HURRICANE WIND SPEED

25 Knots by 2090

HEAVY DOWNPOURS

30% since 1980

2X since 1989
Urbanization.

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

Increase since 1950

4-6%
Annual growth rate

CONSTRUCTION ACTIVITY
Aging Infrastructure.

$177B
Investment gap 2016 - 2025

$270B
Replacement cost for gas pipes.
Nearly half of the utility workforce will be nearing retirement age.
High-risk Incidents.
Traditional Process.

- No External Data
- Intuition Based
- Broad Targets
- Static
- Reactive
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
AI helps utilities keep pace with change.

- External Data
- Empirical
- Pinpointed
- Dynamic
- Proactive
Committee on Gas
Advanced Energy Research & Technology Center

Stony Brook University
2/12/19

Robert B. Catell
Chairman

www.aertc.org
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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- Photovoltaics & Fuel Cells
- Renewable Energy
- Smart Grid
- Smart Power Management
- System Resiliency
Institute of Gas Innovation and Technology

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

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

Key characteristics of the final HELMETH CO\textsubscript{2}-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\textsubscript{HHV,CH\textsubscript{4}} (1.08 - 5.42 m\textsuperscript{3}/h CH\textsubscript{4}, NTP)
  • Modulation: 20 - 100+ %
• Final SNG-composition
  • CH\textsubscript{4}: > 97 vol.-%
  • H\textsubscript{2}: < 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
- Sulfcrete
  - Sulfur Concrete
- ThermoLift
  - Natural Gas Heat Pump
- Unique Electric Systems
  - Electric Vehicles
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

DOE Highest Ranked Potential

Selection based on review of 300 technologies

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

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

Identify, select, fund, and oversee research projects resulting in innovative solutions and the improved safety, reliability, and operational efficiency of natural gas systems.
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. Replaces 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 due to 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 Development
Technology Evaluation
Modeling
Methodologies
Measurement Studies

Technology
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

<table>
<thead>
<tr>
<th>Improve Accuracy and Reliability</th>
<th>Adoption of Codes and Standards</th>
<th>Enhanced Awareness and Education</th>
<th>Product Advancement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work collaboratively with manufacturers to ensure commercial products deliver safety enhancement expectations for the gas industry</td>
<td>Modify existing UL 1484 standard with emphasis on lower detection limit</td>
<td>Continue stakeholder education and outreach and develop formal advocacy plans</td>
<td>Determine optimal placement of detectors based on U.S. building construction practices and typical ventilation effects</td>
</tr>
<tr>
<td>Extensive laboratory testing of commercially available RMDs has been completed</td>
<td>Seek parallel path of certification through International Code Council and NFPA</td>
<td>RMD Educational Awareness Study</td>
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<td>National pilot study has been executed to collect performance data in various residential settings</td>
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</table>
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
Committee on Gas
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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.
Energy Impact Partners.

The world's leading coalition of utilities investing a new energy future.
Our world is changing.
The only way utilities can keep up is with technology.
New era of weather.

HEAVY DOWNPOURS

HURRICANE WIND SPEED

ACRES BURNED BY WILDFIRES

25 Knots
by 2090

30%
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U.S. POPULATION LIVING IN URBAN AREAS - 82%

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Increase since 1950

4-6%
Annual growth rate

CONSTRUCTION ACTIVITY
Aging Infrastructure.

GAS INFRASTRUCTURE

$177B

Investment gap
2016 - 2025

$270B

Replacement cost for
gas pipes.
Changing world. Nearly half of the utility workforce will be nearing retirement age.
High-risk Incidents.
Traditional Process.

- No External Data
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Predictive Intelligence.
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Interventions: 6

Leaks Prevented: 3.45
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 2010$)

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
DOE announced intention to approve export volumes to NFTA 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
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)

<table>
<thead>
<tr>
<th></th>
<th>Proved Reserves</th>
<th>Unproved Reserves</th>
<th>Total Technically Recoverable Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lower 48 (Onshore)</strong></td>
<td>855.6</td>
<td>4,557.3</td>
<td>5,412.9</td>
</tr>
<tr>
<td><strong>Lower 48 (Offshore)</strong></td>
<td>18.1</td>
<td>637.5</td>
<td>655.6</td>
</tr>
<tr>
<td><strong>Total (Bcf/d)</strong></td>
<td>873.7</td>
<td>5,194.8</td>
<td>6,068.5</td>
</tr>
<tr>
<td><strong>Total (Tcf)</strong></td>
<td>318.9</td>
<td>1,896.1</td>
<td>2,215.0</td>
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</table>

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](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
Questions?

Industrial Energy Consumers of America

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