



Energy & Environmental Research Center (EERC)

iPIPE 2.0

Intelligent Pipeline Integrity Program

North Dakota Oil & Gas Research Program

Bismarck, North Dakota

February 23, 2022

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EERC Assistant Director for Energy, Oil and Gas

iPIPE 2.0 implementation focus and continued exploration



“These projects are coming here because we embrace innovation.”

Governor Burgum, State of the State Address, February 16, 2022



IPIPE FINANCIALS



	iPIPE 1.0 (2018–2022)	
	<u>NDIC Share</u>	<u>Commercial Share</u>
Funding	\$2,600,000	\$2,577,000
Expended	\$2,186,998	\$2,363,904
Member Cost Share		\$640,956
Vendor Cost Share		\$3,546,581
Total (12/31)	\$2,186,998	\$6,551,441

3:1 match

Request	iPIPE 2.0 (2022–2023)	
	NDIC Share	Commercial Share
Funding	\$400,000	\$1,450,000
Future Cost Share		TBD

3.6:1 match

iPIPE 1.0 - \$626,098 outstanding funds

OSK Subcontract: \$552,817

TOKU Final Payment: \$65,400

Other costs: \$7,881

RECOGNITION

- Media attention
 - 100+ mentions of iPIPE in the media
 - Feature article in *Pipeline & Gas Journal*
 - Feature article in SPE's *Journal of Oil & Gas Facilities*
 - Feature article in *Pipeline Technology Journal*
 - Six-episode series focused on iPIPE on "The Pipeliners Podcast"
- Awards
 - API Industry Innovation Award (Nov 2018)
 - IOGCC Chairman's Stewardship Award (Aug 2019)



MEMBER RECOGNITION



iPIPE MEMBERSHIP

Energy Transfer is involved in a number of organizations that are focused around the constant improvement of pipeline safety and operations. The intelligent Pipeline Integrity Program (iPIPE) is an industry-led consortium whose focus is to contribute to the advancement of near-commercial, emerging technologies to prevent and detect gathering pipeline leaks.

→ VISIT WEBSITE



Accelerating the flow of innovation down the iPIPE

In 2019, Enbridge joined the intelligent Pipeline Integrity Program (iPIPE), an association of companies in the upstream and midstream pipeline industry. The association works with entrepreneurs in the pipeline integrity space, driving innovation and accelerating the development of leak detection and prevention technologies.

Learn more

GROWTH



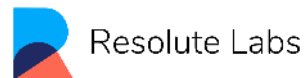
TECHNOLOGY SCOUTING

110+ VETTED

Table 1. Technology Screening and Selection

Date:	May 2018 First Round	Oct 2018 Second Round	Oct 2019 Third Round	Oct 2020 Fourth Round	Total
Invited:	7	21	62	58	120+
Proposals:	7	10	14	24	55
Presented:	7	9	8	10	34
Selected:	2	4*	2	2	10

* Two selections were unable to agree upon terms, so contracting did not occur.



Critical Challenges. Practical Solutions.

DIRECT-C

Sensing of Hydrocarbons and Produced Water



Application

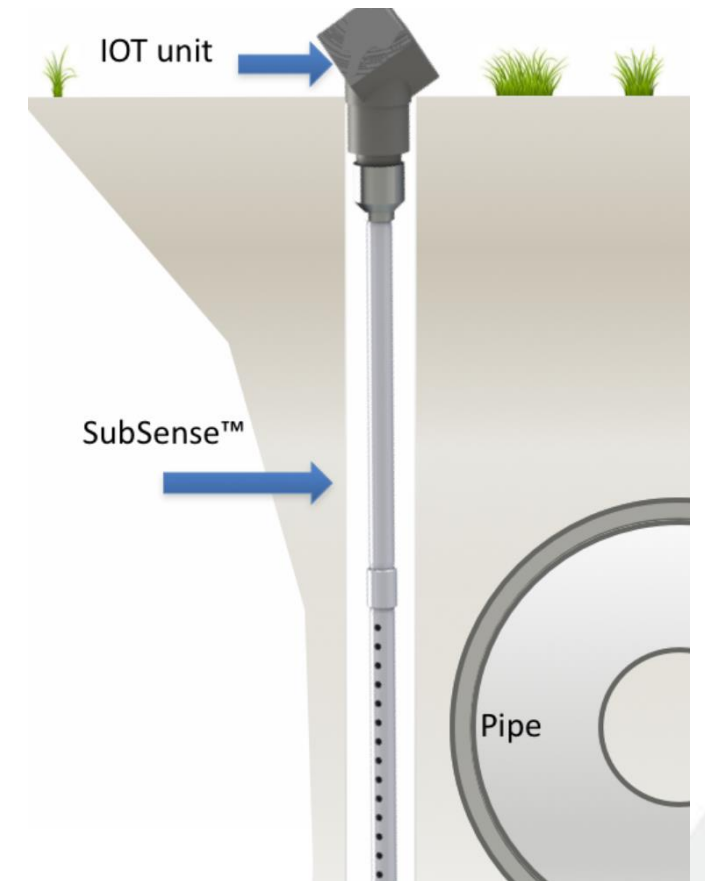
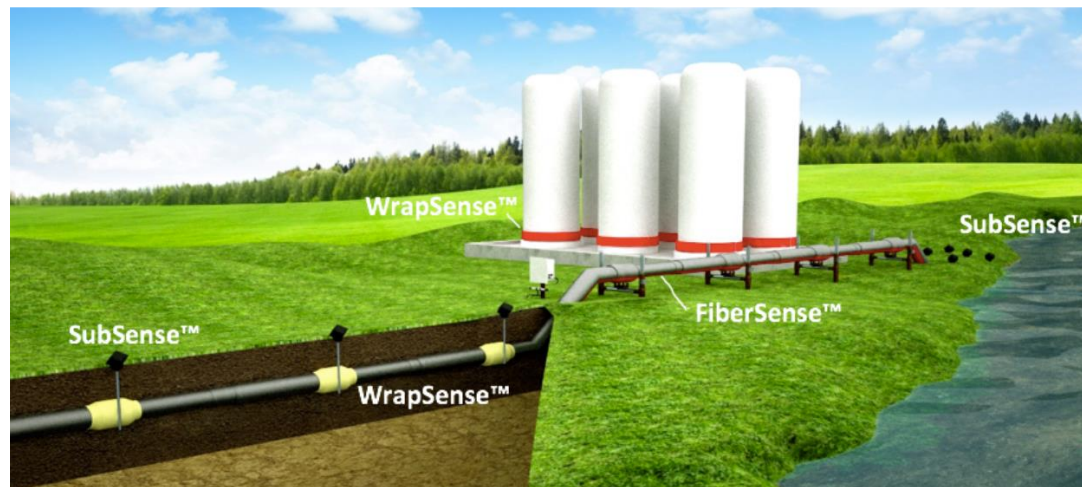
- Useful in focused areas.
- Attached on or near pipe and equipment.

Development

- Pushed technology beyond HC application exploring PW.
- Enhanced installation methods, product hardware, alarm algorithms, and remote communications.

Success

- In use in North Dakota.
- Achieved growth in eight states, Canada, and Europe.



Critical Challenges. Practical Solutions.

INGU SOLUTIONS

iPIPE

Application

- Advanced in-line inspection.
- Advanced technology for gathering lines that are otherwise difficult to inspect.

Development

- Demonstrated Pipers capability in operational pipelines.
- Developed launch and receive methods.
- Validated repeatability between free-floating and cleaning pig deployments.

Success

- INGU has operated in North Dakota and inspected over 300 pipelines for over 100 customers in 15 countries building a network of nine agents.



SATELYTICS

Application

- Leak detection from space.
- Advanced processing and algorithms of satellite data to provide actionable alerts.

Development

“We often state that iPIPE was beneficial in providing copious amounts of data to train our algorithms. With 3 years of weekly monitoring, our algorithms were provided with an extensive training opportunity.”

Success

- Deployed commercially in North Dakota on the Pelican Pipeline system.
- Projects with BP: leak detection, chemical and carbon accounting.
- Duke Energy (methane), Central Hudson Gas & Electric, Washington Gas, Southern Company, ADNOC, SoCalGas, ItalGas, Oxy, Dominion Energy.

iPIPE



Critical Challenges. Practical Solutions.

PIPELINE RISK



Application

- Advanced risk identification.
- Leverage machine learning (ML) processes and technology to support pipeline and facility risk mitigation.

Development

- Explored application with customer and regional data.

Success

- Application identifies higher-risk areas of pipeline segments and ranks risk.



TOKU

Application

- Leak detection.
- Advanced pressure sensing applying ML.
- Ability to detect anywhere along a pipeline system.

Development

- Distinguish between operational signals such as pump-off versus leaks in gathering lines.
- Completed tests and advanced ML algorithms.
- Development of Illumass (customer monitoring package).

Success

- ML can distinguish similar signatures, operational vs. leaks.
- Can detect leaks in the presence of changes occurring simultaneously.
- Sensors presently in use in North Dakota.



iPIPE



door

ORBITAL SIDEKICK



Application

- Leak detection from space.

Development

- Advance the resolution, accuracy, and frequency of hyperspectral satellite data.
- Compare to manned overflights.

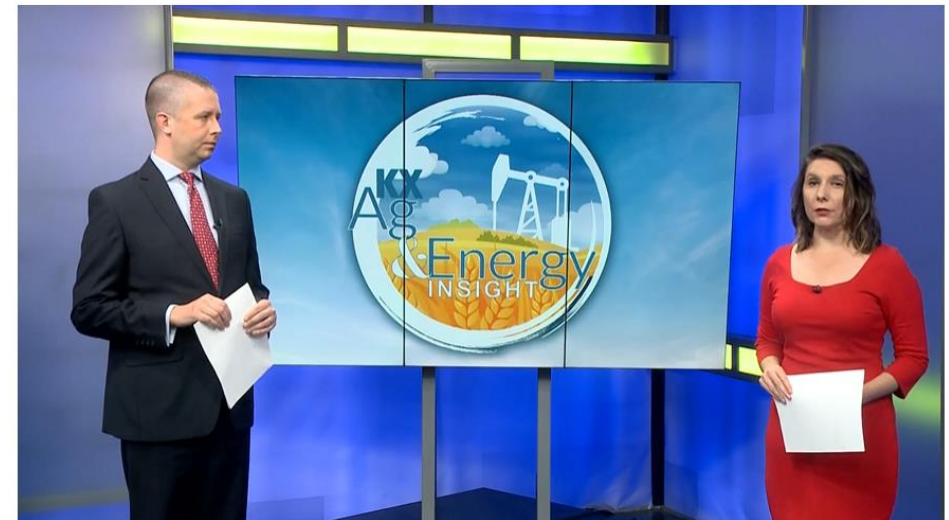
Success

- Achieved launch and learnings from Aurora mission.
- Focus ahead on next mission.

STATE NEWS

North Dakota's iPIPE goes to space!

The satellite will detect & prevent pipeline leaks from space.



MOMENTUM



- Growing membership and enthusiastic membership.
- Flood of emerging technologies wanting to compete in selection process in 2022.
- Implementation of technologies explored.
- Venture capital firms helping to fund start-ups that iPIPE selected.
- Looking for technologies that fill gaps.
- Evolving space race.
- Working toward greater collaboration.

✓ SUCCESS FOR NORTH DAKOTA

✓ DEMONSTRATION OF NORTH DAKOTA LEADERSHIP

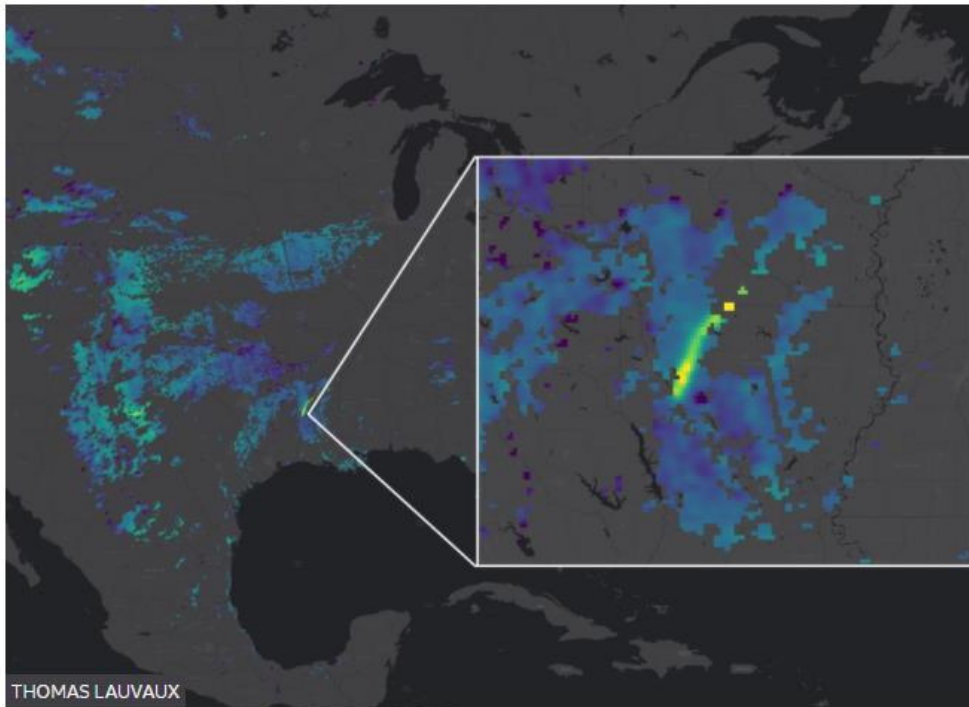
iPIPE 2.0 is working ahead of our competition

Green | Energy & Science

Louisiana Investigates Massive Methane Cloud Seen From Space

February 14, 2022, 2:47 PM CST

The plume was the most severe concentration of the powerful greenhouse gas spotted by the Sentinel-5P satellite in the U.S. since October.



A Constellation of Satellites Hunting Methane Leaks Is Launching Soon

Stephen Rassenfoss, *JPT* Emerging Technology Senior Editor

March 9, 2021 |

COLLABORATION

New Federal Regulations Add More Than 400,000 Miles of “Gas Gathering” Pipelines Under Federal Oversight

Monday, November 15, 2021

unregulated gas gathering pipelines. The final rule will—also for the first time—require pipeline operators to report safety information for all gas gathering lines, representing more than 425,000 additional miles covered by Federal reporting requirements.

Estimated effective date May 15, 2022

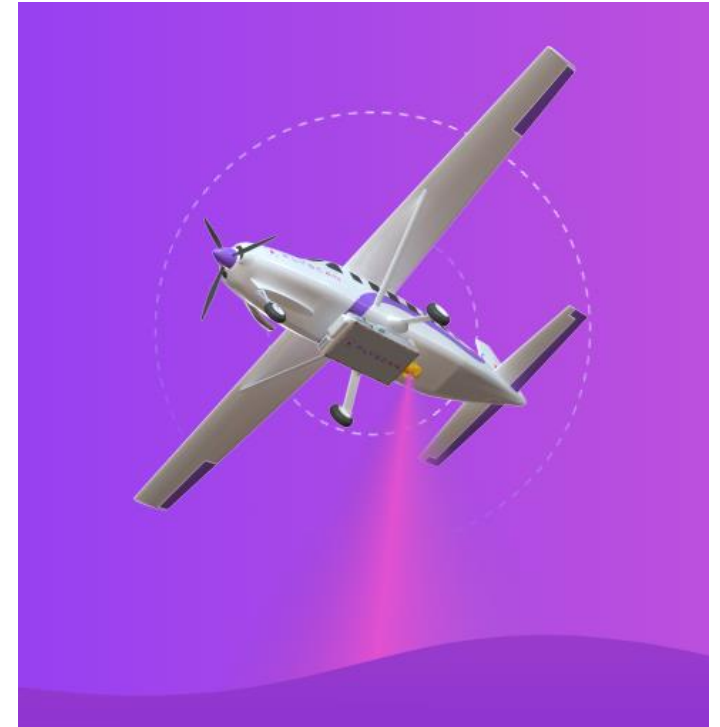


Image courtesy of Flyscan

iPIPE 2.0 – Can we fly once and collect better data with technology?

EXPECTED RESULTS (2022–2023)



- Technology selection event
 - Complete at least two new projects
 - Grow industry membership
 - Annual member forum
 - Continued monthly membership meetings
 - Advance technology to commercial application and demonstrate commercial deployment
- Advance
 - In-line detection
 - Sensors
 - Satellite
 - Aerial
 - Drone

iPIPE 2.0 – the best is yet to come.





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A wide-angle photograph of a university campus at sunset. The sun is low on the horizon, casting a warm glow over the scene. In the foreground, there are large trees with some yellowing leaves. In the background, there are several large, multi-story brick buildings, likely university halls or administrative buildings. A parking lot with several cars is visible in the middle ground. The sky is a mix of orange, yellow, and blue.

THANK YOU

Critical Challenges. Practical Solutions.