Repurposing Abandoned Gas Wells in West PA for Geothermal Energy

Presented to Citizens Advisory Council (CAC)

By RIZZO International

April 14, 2026

RIZZO INTERNATIONAL

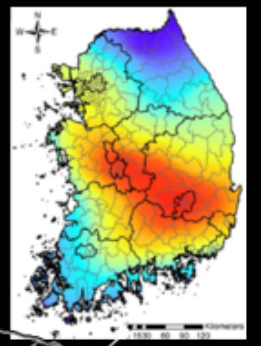
About RIZZO International

- ✓ Founded in 1985 and headquartered in Pittsburgh, PA
- ✓ Family-owned
- ✓ About 100 civil engineers and earth scientists
- ✓ 40 years of experience in geophysical investigations and engineering for energy projects

GLOBAL IMPACT

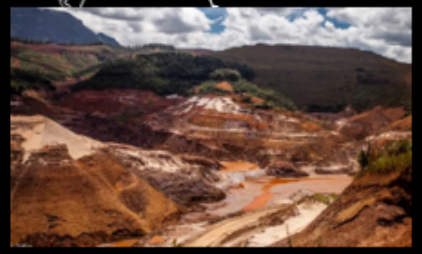
The Chalk River Laboratory site will be home to a variety of new advanced nuclear facilities and micro nuclear reactors. RIZZO is performing site response analysis and soil structure interaction work.

The Krsko nuclear plant provides more than one quarter of Slovenia's electrical power along with roughly a fifth of Croatia's. RIZZO is performing seismic hazard evaluation work and seismic evaluation work of equipment, thus contributing to the safety and resiliency of the plant.



South Korea has the largest number of nuclear plants per square mile in the world. The state-owned utility hired RIZZO to perform a seismic hazard revision of the peninsula, with focus on its two oldest nuclear plants – Wolsong and Kori nuclear plants.

The first Small Modular Reactor in the United States is planned to be built in Idaho. RIZZO is leading the site characterization work for geological, water and meteorological conditions at the site.



The Brumadinho dam disaster occurred on 25 January 2019 when a tailings dam at the Córrego do Feijão iron ore mine suffered a catastrophic failure. RIZZO served as independent consultant in the evaluation and remediation of the tailings dam.

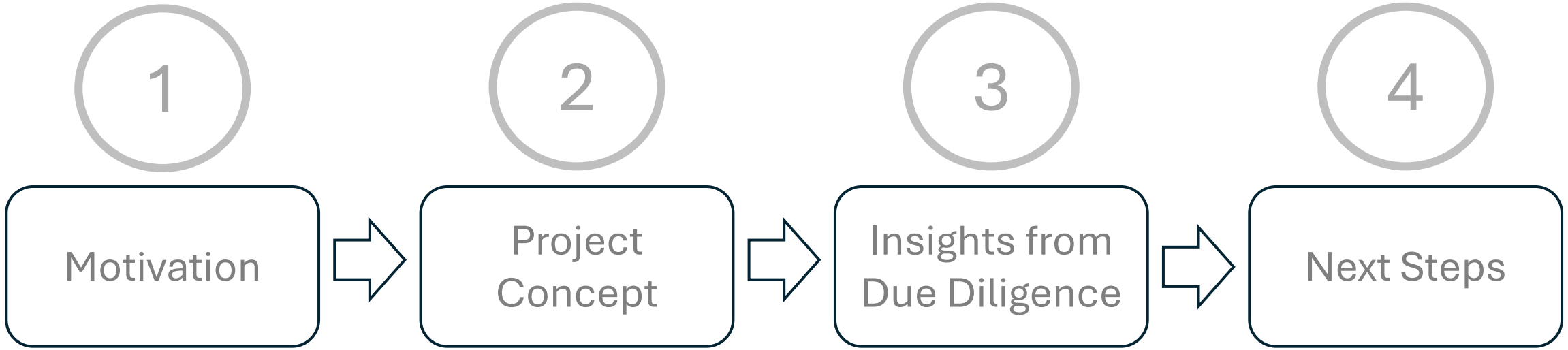
The Genkai nuclear plant was the first plant in Japan for planned startup after the Fukushima Daiishi tsunami. RIZZO performed the tornado hazard site evaluation that contributed to the plant's successful startup.

OBJECTIVES of this presentation

1. To introduce a project concept focused on repurposing abandoned gas wells for geothermal production in Western PA.

2. To seek partnerships interested in moving this project concept forward.

STRUCTURE of this presentation



Our **MOTIVATION**

Motivation

FAMILIES across Pennsylvania are being impacted by the rise in energy cost!

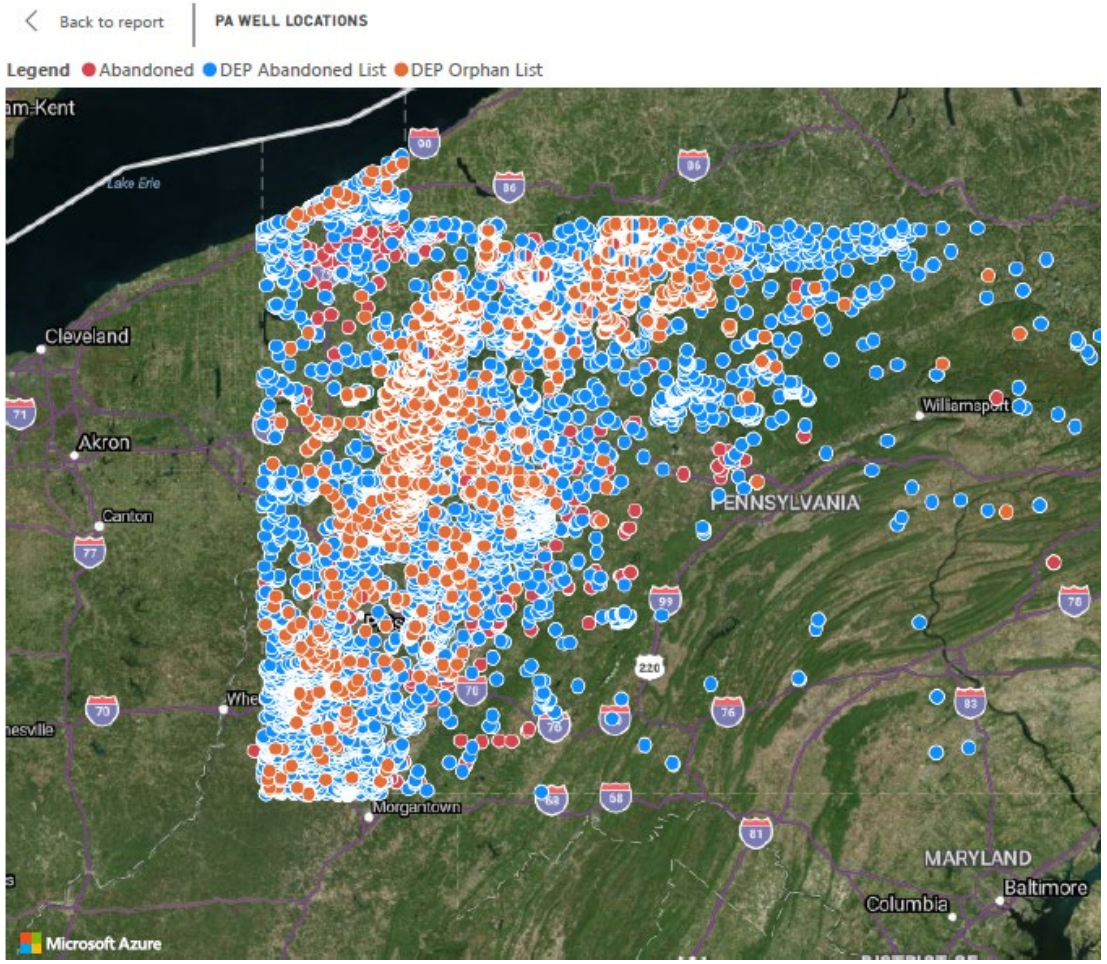
There are fundamental drivers for this cost increase:

- Rising demand from data centers, electrification, and industrial growth is further driving price escalation
- Grid capacity constraints and long interconnection queues are delaying new supply and reinforcing upward price pressure
- Aging energy infrastructure increases the risk of outages and costly system upgrades

Ohiopyle state park, PA

Motivation

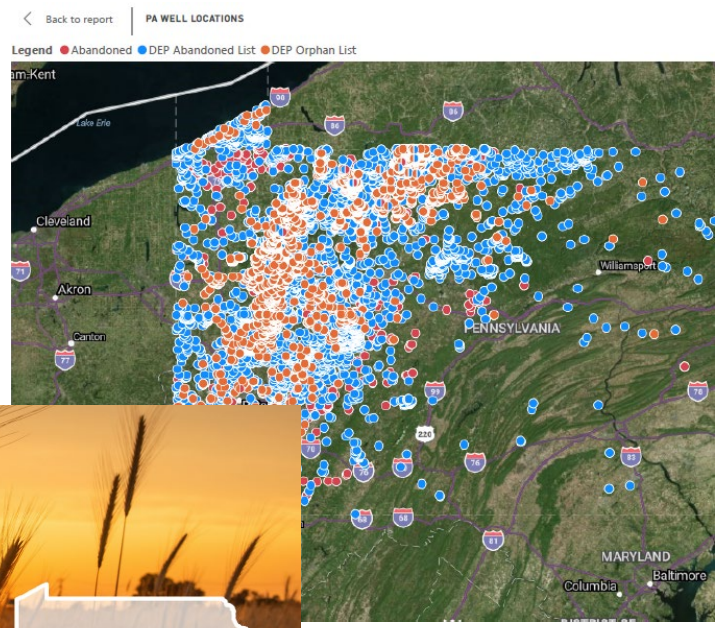
- Repurposing abandoned gas wells for geothermal energy provides a local, affordable and stable cost, and dispatchable energy source.
- Currently, there are more than 190,000 documented wells in Pennsylvania
  - +17,000 abandoned
  - +6,000 orphaned
- Moderate geothermal gradient of 104° - 194°F (40° - 90°C)
- There are heating networks and industrial users in proximity to wells
- The largest Capital Expense (CAPEX) and early project development risk for a geothermal projects: **drilling and site viability.**
- Hence our interest to tap into existing wells for geothermal development.

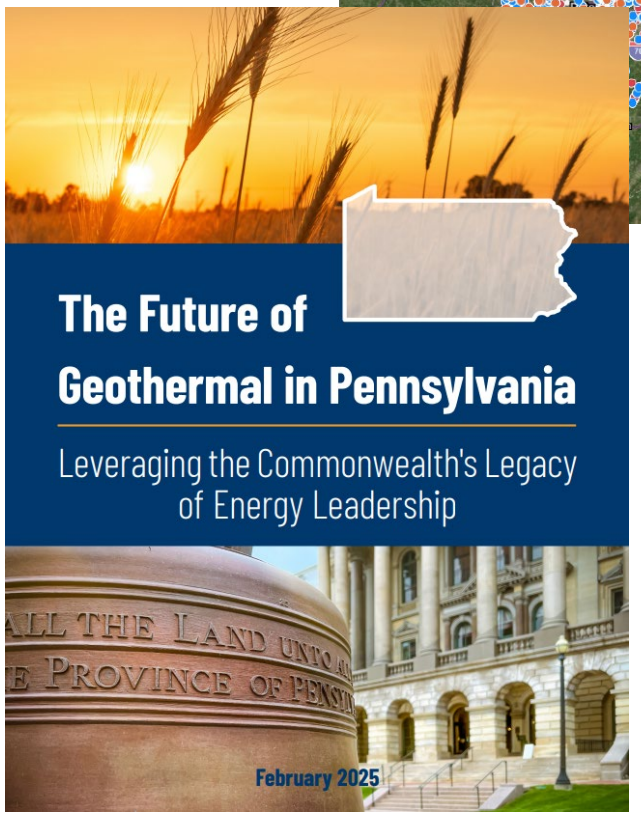


Motivation

The potential:

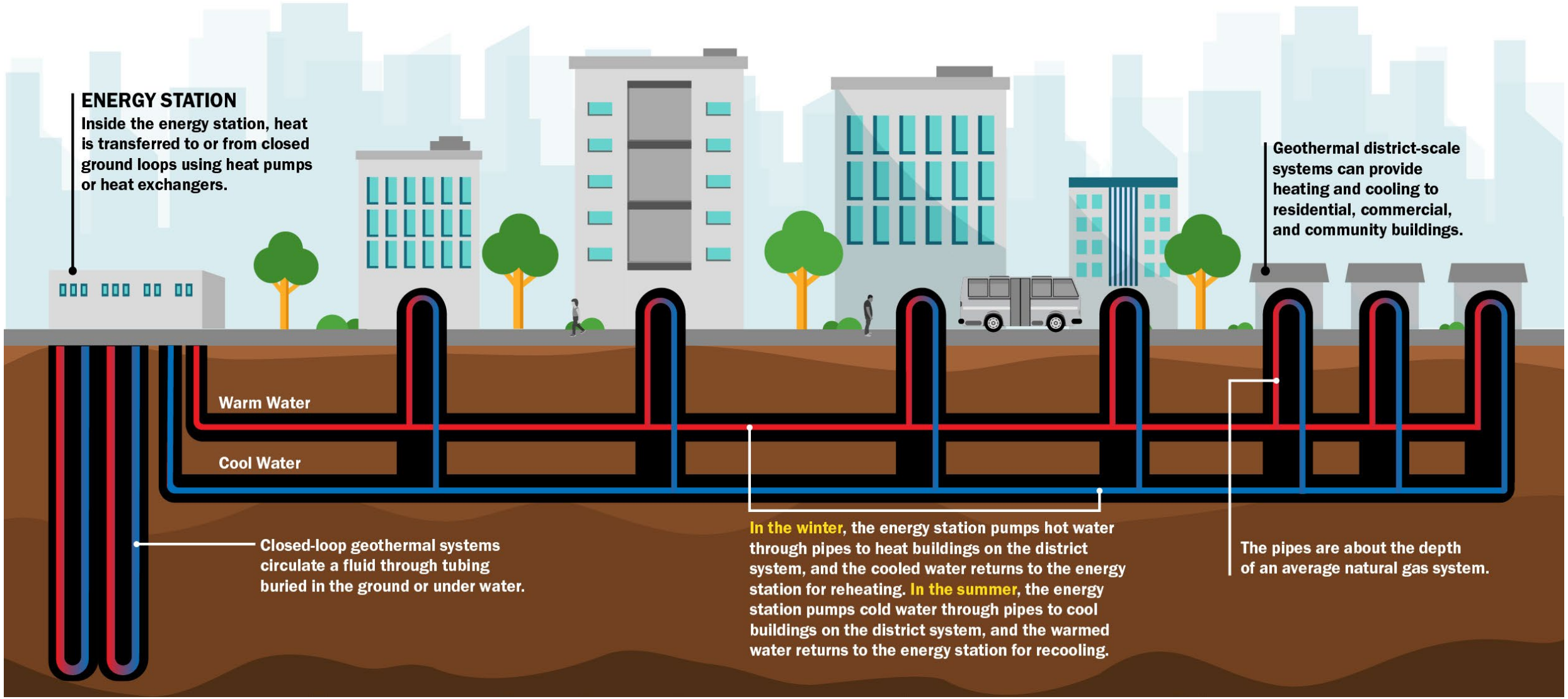
- Reduce **groundwater and methane risks** by upgrading integrity and sealing pathways of the existing wells,
- **Lower energy costs** by avoiding new drilling and delivering local, steady thermal energy,
- A **“win-win” situation** for West PA: cleanup + jobs + more affordable energy.





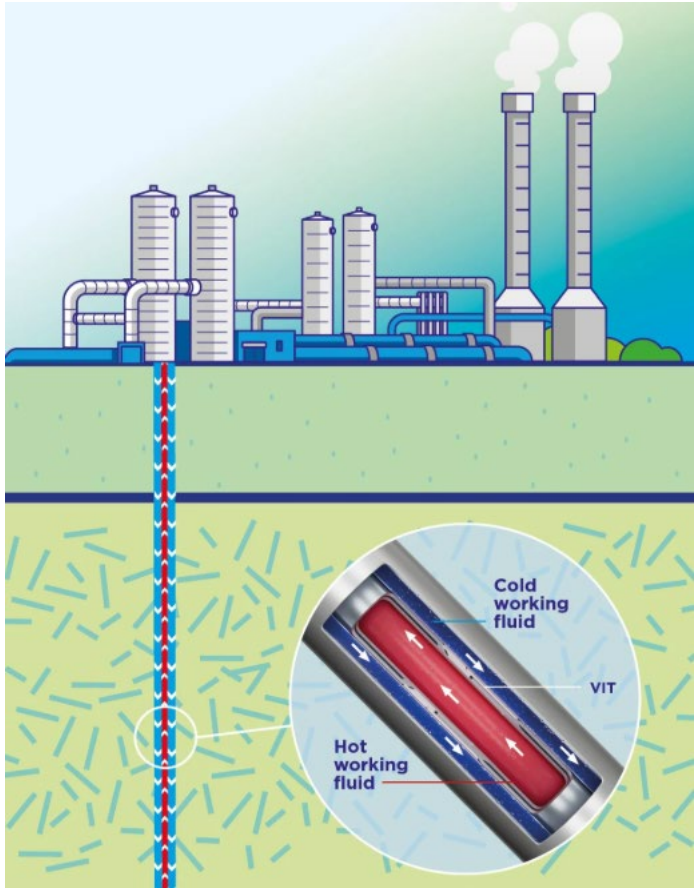
Project **CONCEPT**

Proposed Development Concept



Technologies identified

- **Vallourec – Thermocase VIT**
  - This company manufactures vaccum insulated tubing (VIT) for closed-loop geothermal systems to optimize underground heat extraction by minimizing thermal losses compared to standard tubing.
  - This system significantly reduces heat loss between inner and outer tubes, thereby allowing hot and cold fluids to coexist in proximity. This improves heat extraction efficiency in closed-loop geothermal wells.
  - This technology supports a range of use cases including converting non-productive oil and gas wells into closed-loop geothermal systems.



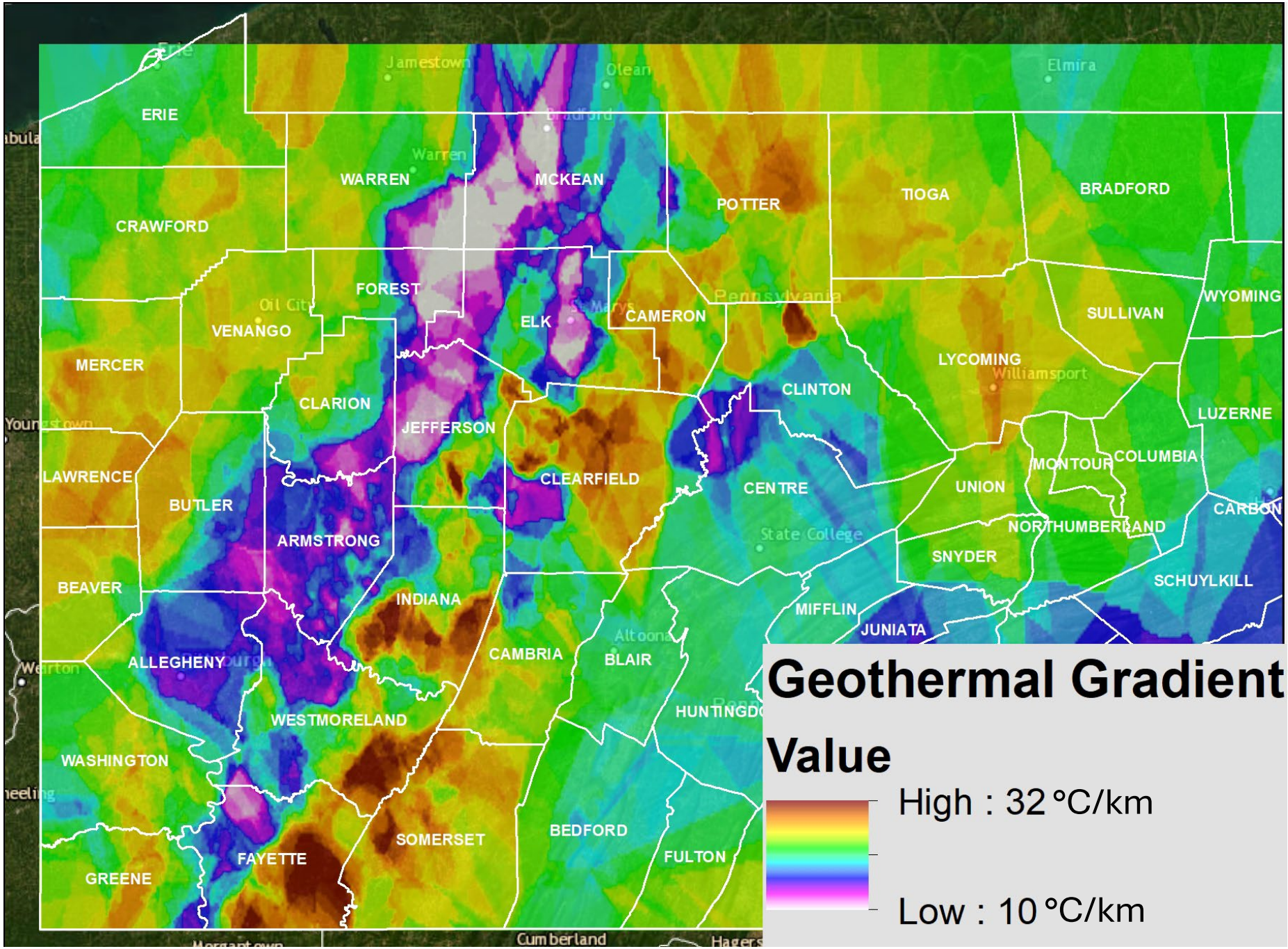
Source: Vallourec

- We are seeing that the main risk for development of this project is on the viability of the site, not the technology.

- Existing wells have mostly addressed this site risk. Hence our interest to move forward to conceptualize and help develop a project.

- RIZZO aims to leverage our energy and geosciences expertise to develop a pilot project in West PA, eyeing scalability for broader regional impact.

Preliminary Results from **DUE DILIGENCE**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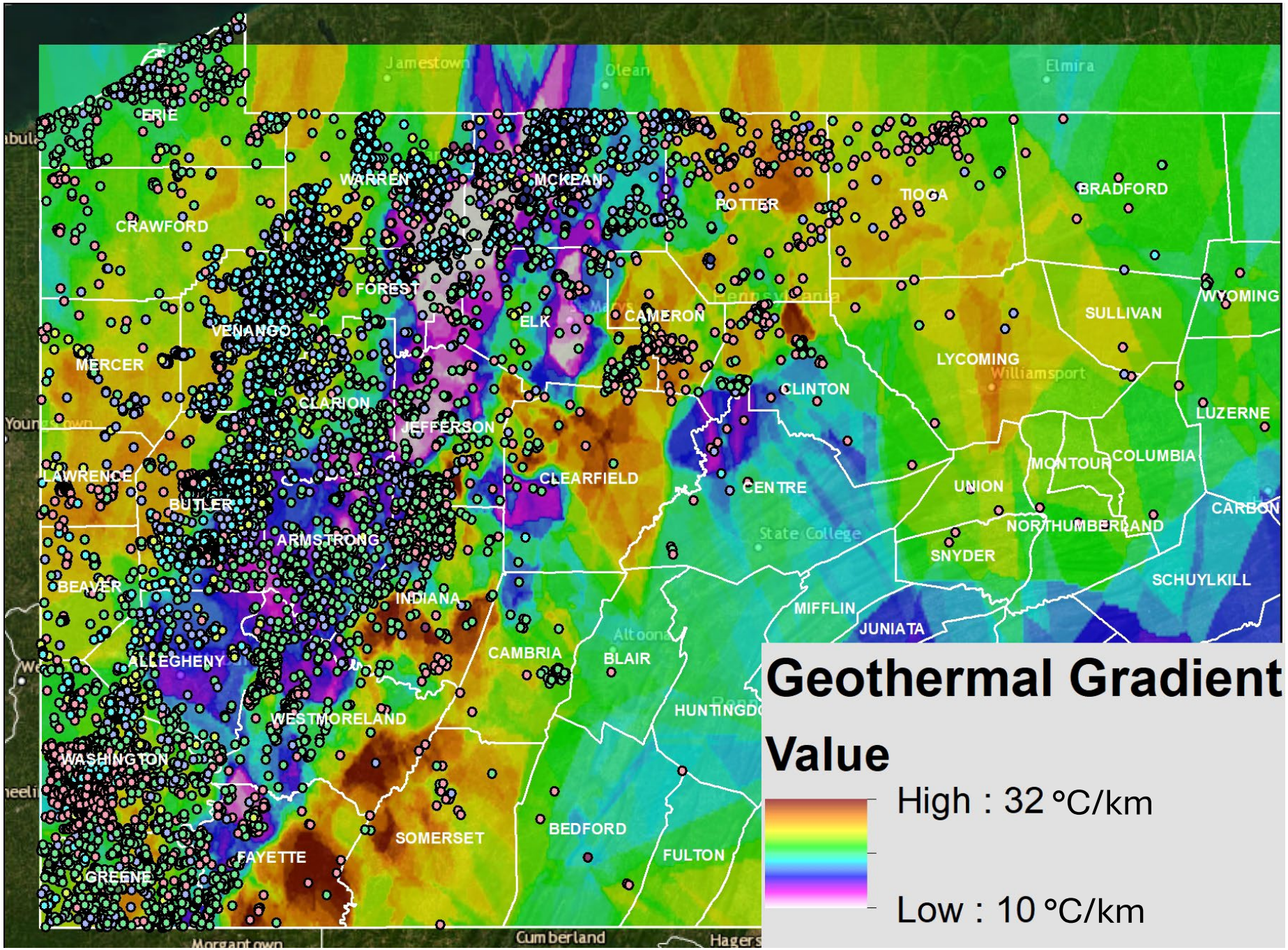
GREENE
Geothermal Gradient
Value
High : 32 °C/km
Low : 10 °C/km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Cumberland
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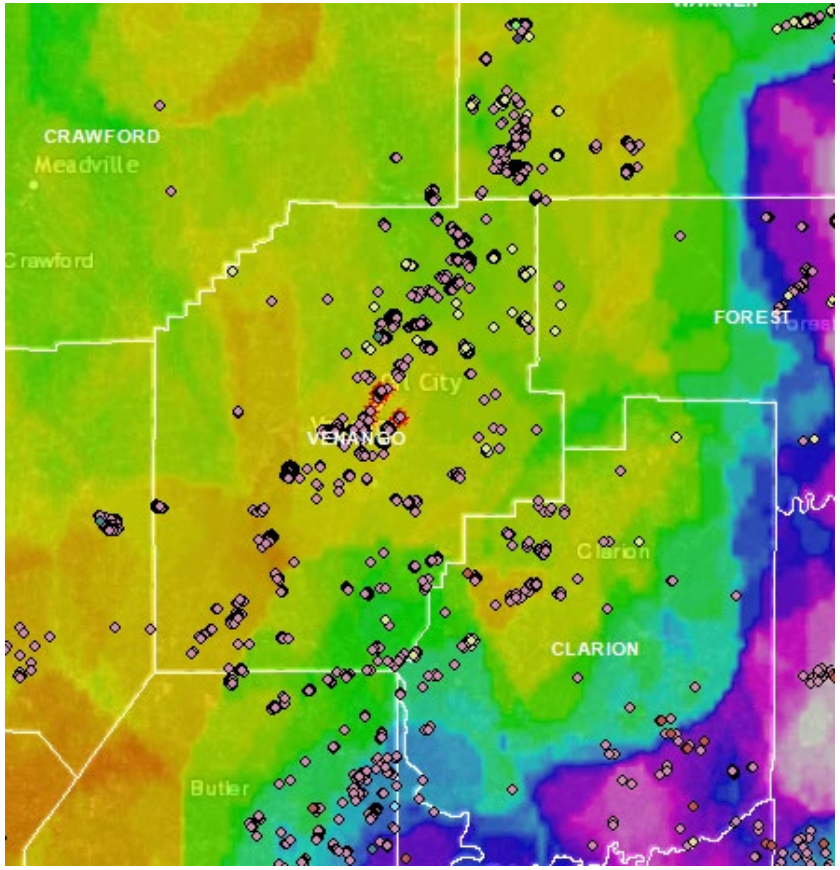
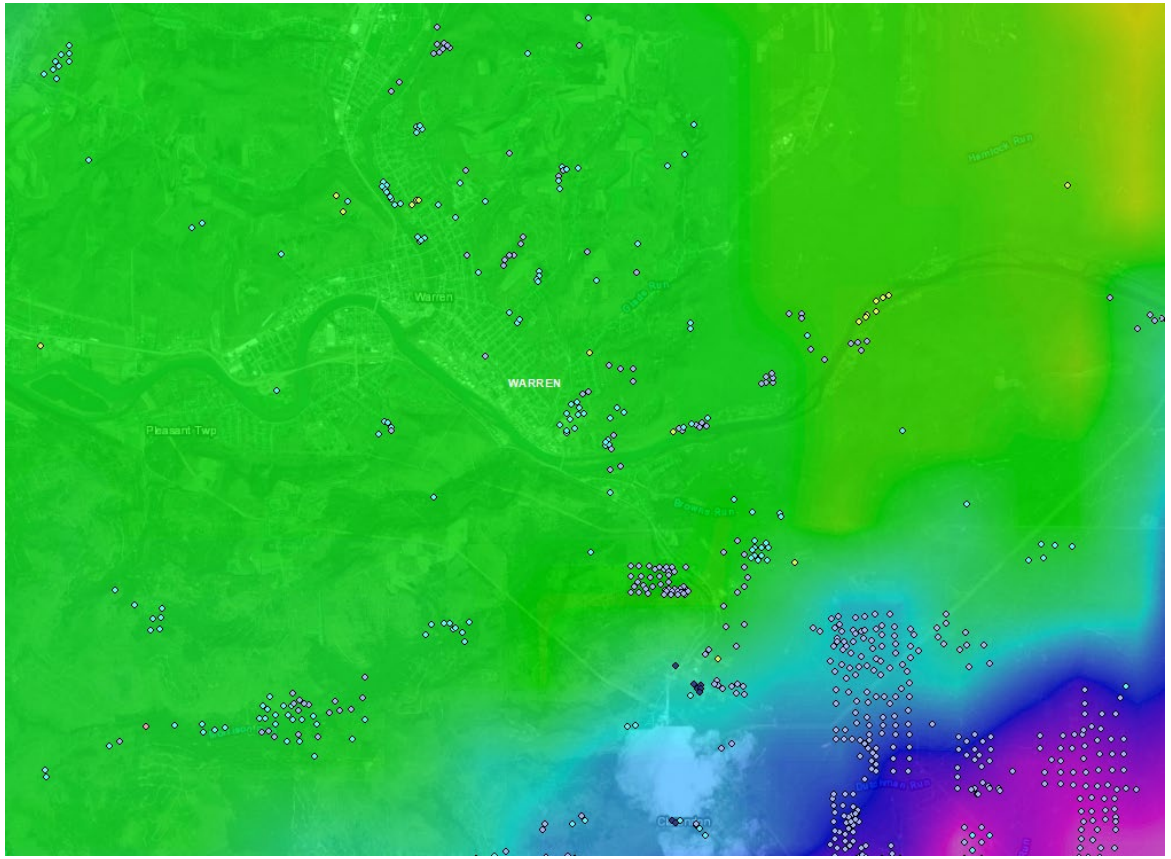
Oil City (Option 1)

- Well cluster 1 mi to North
- DEP OFC O&G Mgmt. owns wells
- well type – oil (abandoned), undetermined (orphan)
- Geothermal gradient approx. 25 – 29 °C/km



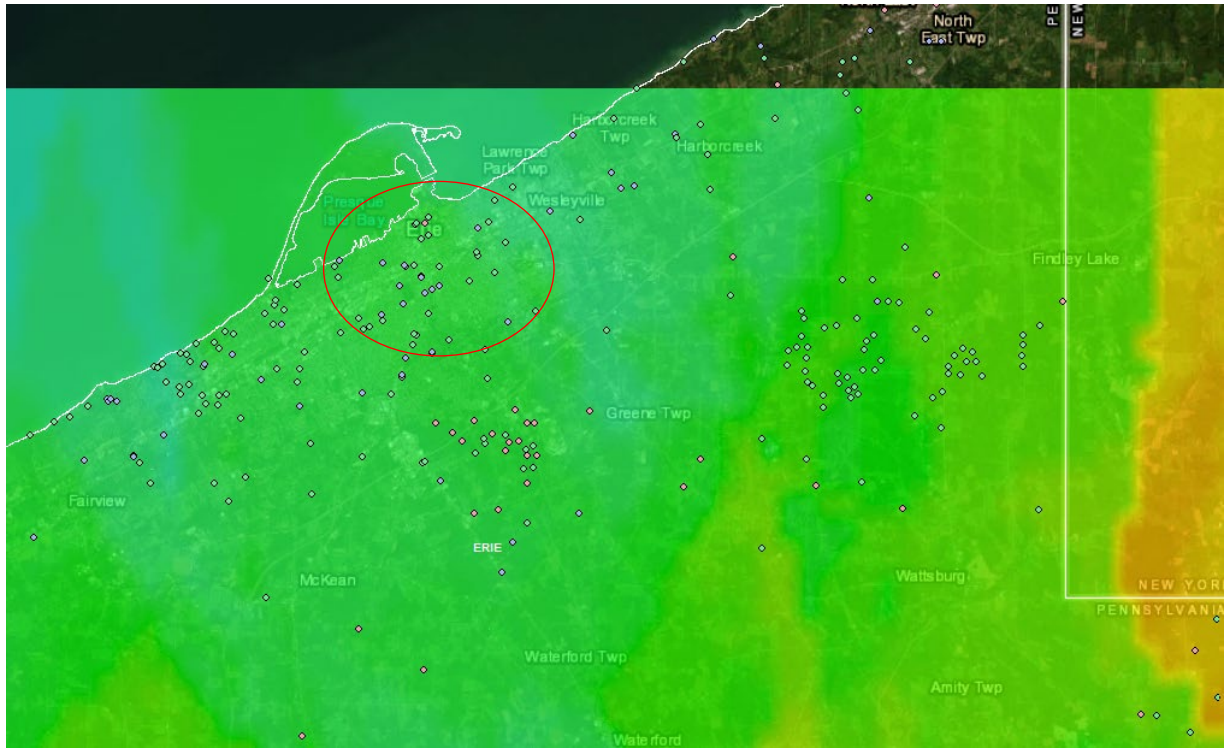
Warren (Option 2)

- Several well clusters
- DEP OFC O&G Mgmt. owns several of the clusters
- well type – oil or undetermined.
- Geothermal gradient approx. 21 – 23 °C/km



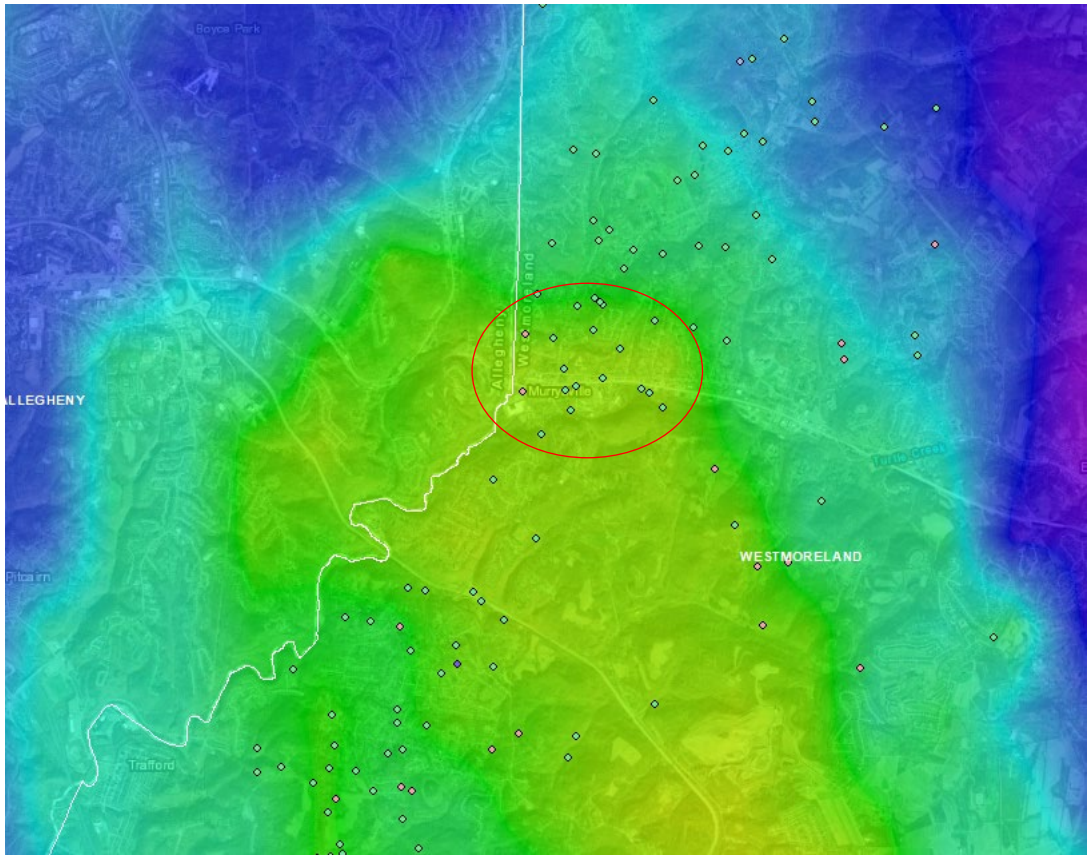
Erie (Option 3)

- Several well clusters
- DEP O&G Mgmt. owns circled clusters
- well type – gas or undetermined.
- Geothermal gradient approx. 21 – 25 °C/km

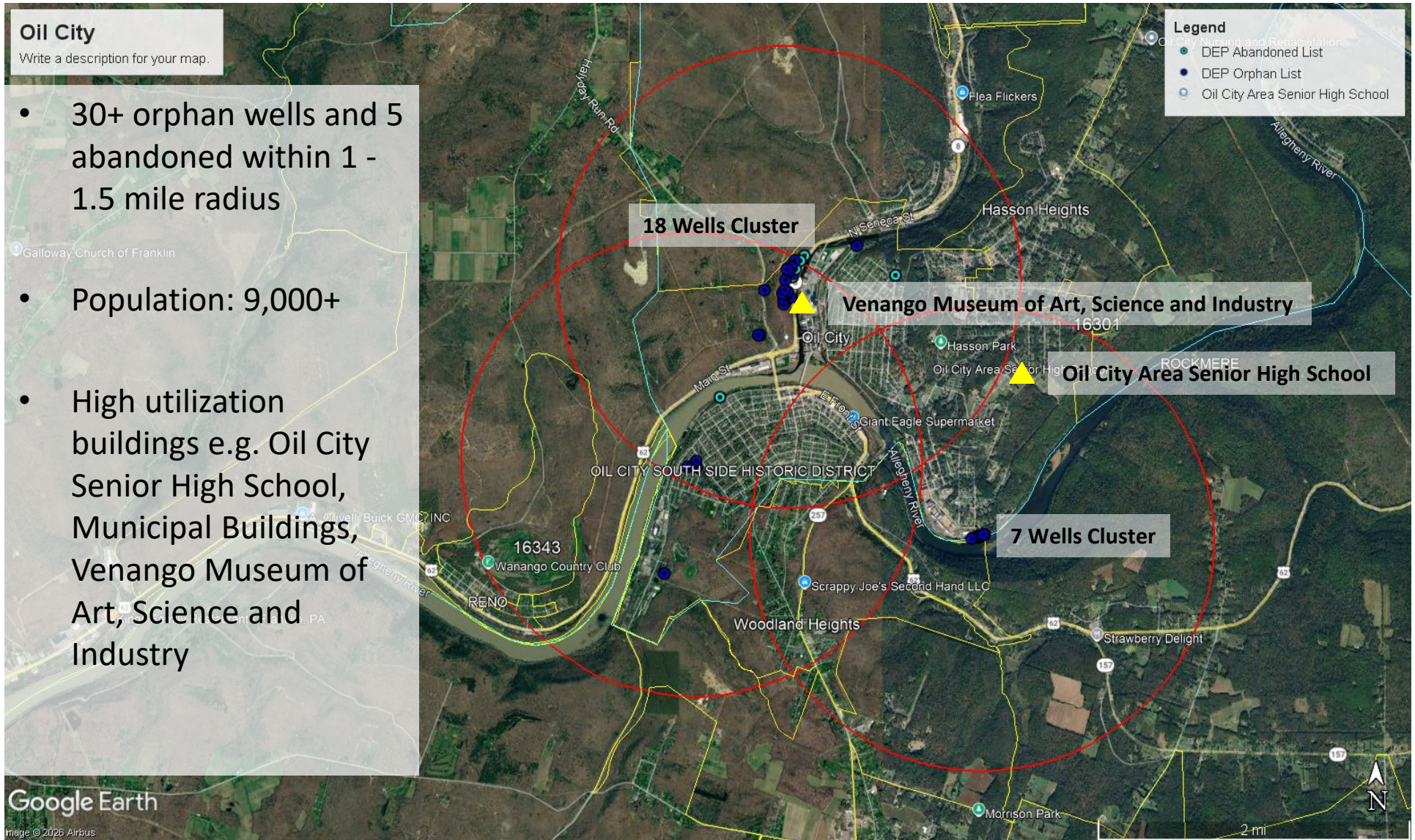


Murrysville (Option 4)

- 12-20 wells in 1.5 mi radius
- Mainly unknown operators and DEP OFC O&G Mgmt.
- well type – gas or dry hole (abandoned), undetermined (orphan)
- Geothermal gradient approx. 21 – 27 °C/km



Oil City, Venango County

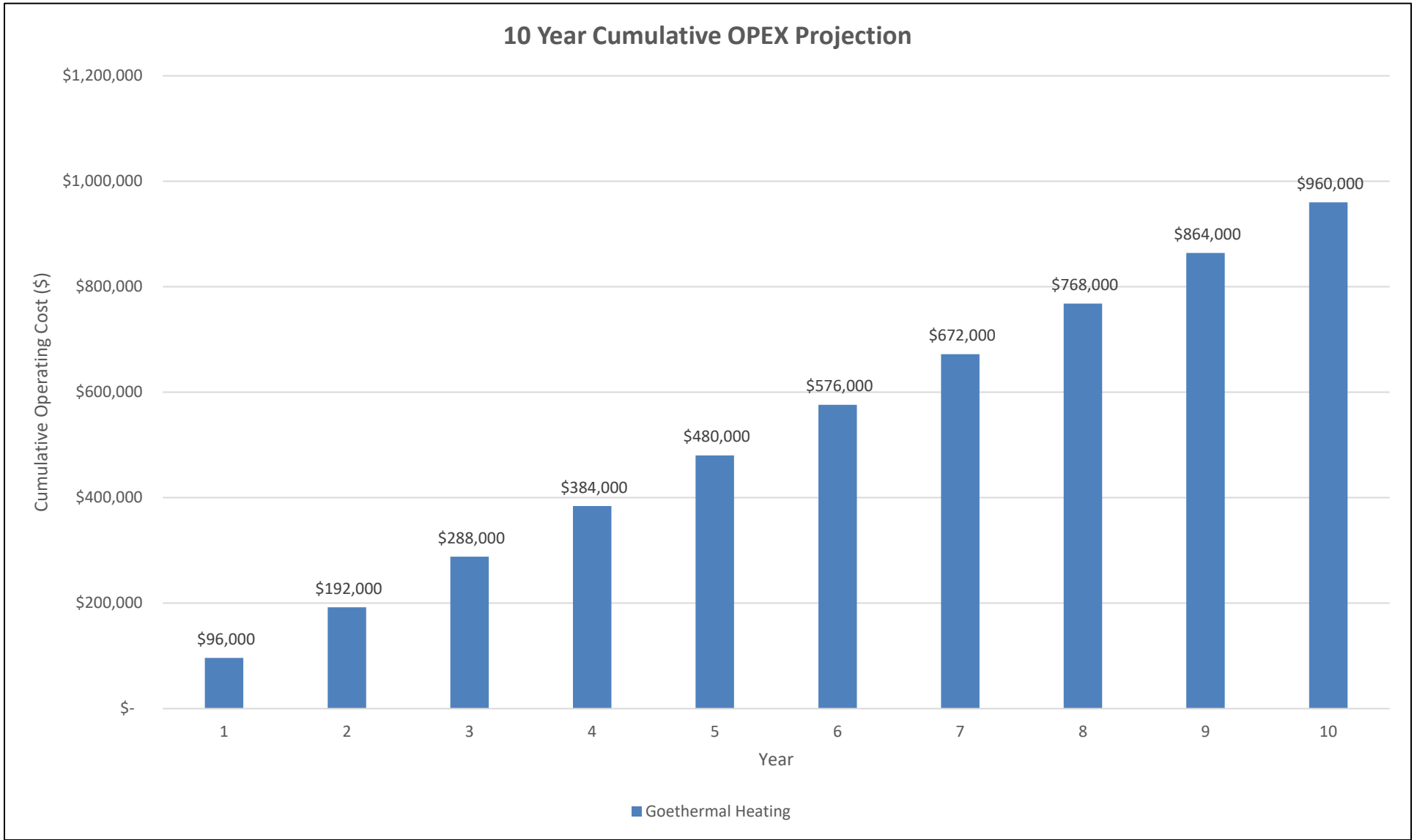


- 30+ orphan wells and 5 abandoned within 1 - 1.5 mile radius
- Population: 9,000+
- High utilization buildings e.g. Oil City Senior High School, Municipal Buildings, Venango Museum of Art, Science and Industry

Due Diligence (OPEX)

COST CATEGORY	GEOTHERMAL HEATING	
Fuel / Electricity	$	45,000.00
Maintenance / Tune-ups	$	20,000.00
Monitoring & SCADA	$	7,000.00
Field Equipment Up-keep	$	12,000.00
Insurance & compliance	$	12,000.00
TOTAL Annual OPEX	**$**	**96,000.00**

Due Diligence (OPEX)



Due Diligence (CAPEX)

COMPONENT	$/kW$_t$	3 MWt without Drilling	3 MWt with Drilling	Notes
Surface[1]	500 – 800	$1.5M	$2.4M	Heat exchangers, pumps, controls, water tanks etc.
Subsurface[1]	700 – 1,200	$2.1M	$3.6M	Well re-entry, drilling, cleaning, integrity checks, tie-ins
District Pipe Loop	800 – 1,000	$2.4M	$3.0M	Trunk piping, valves, metering, vaults, insulation.
Engineering and Installation	400 – 700	$1.2M	$2.1M	Desktop studies and data analysis
Investigation and Testing	10 – 15% TOTAL	$0.7M	$1.7M	Well logging, flow tests, tracer tests, geotech, environmental, permitting.
	TOTAL	**$7.9M**	**$12.8M**	

Note:

[1]Cost based on cluster of 4 wells.

CAPEX for 3MWt heating system.

Cost estimates for district heating of 1-high school and 200-homes

Due Diligence (LCOH)

Geothermal

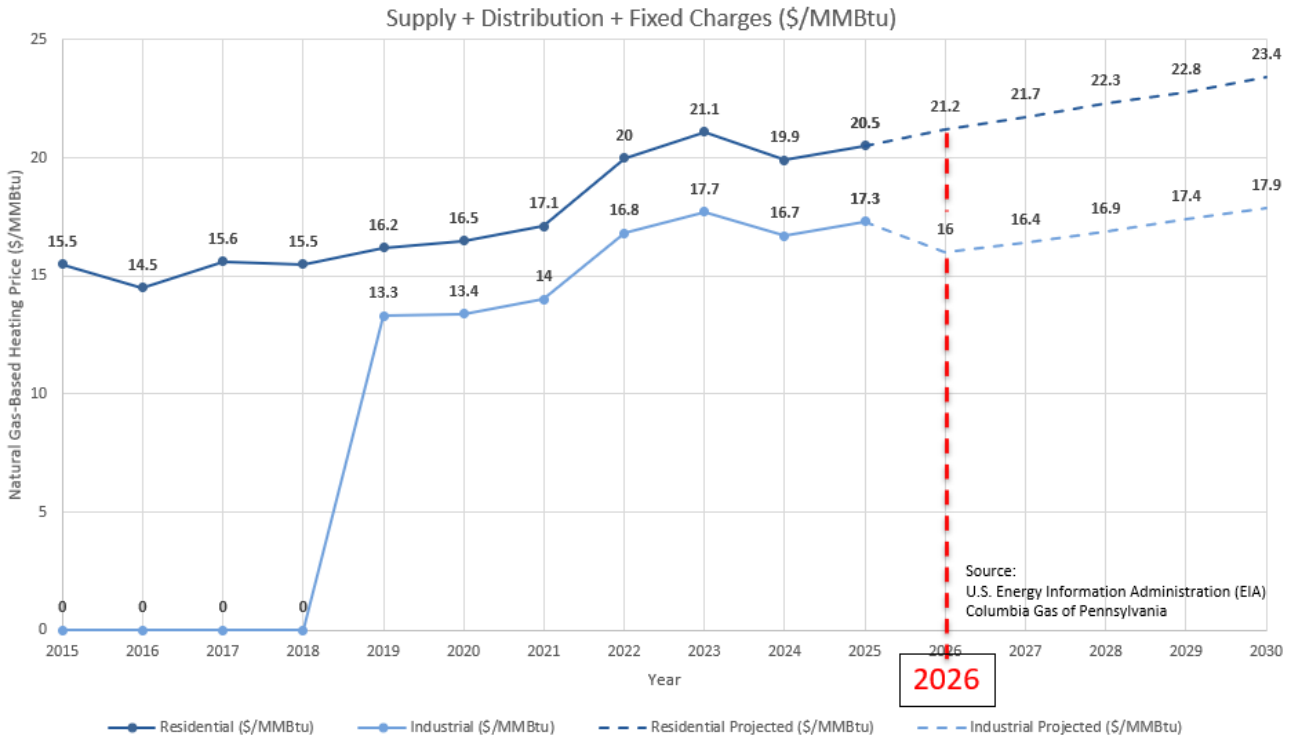
SCENARIO	LCOH ($/MMBtu)
Without Drilling CAPEX ($7.9M)	**18.66**
With Drilling CAPEX ($12.8M)	**28.59**

Note:

Geothermal System lifetime of 30 years.

Natural Gas

End User Gas-Based Heating Costs in Pennsylvania



Regulatory Framework: Leveraging Existing Framework

- ✓ Currently, there is no regulatory framework in PA for geothermal projects nor for repurposing abandoned gas wells.
- ✓ However, there are existing regulations/programs that could be leveraged to cover the core **CATEGORIES** of a geothermal project.

Category	Regulation / Program	Regulatory Body	What It Covers Today	Relevance to Geothermal Repurposing
Oil & Gas – Statutory	Pennsylvania Oil and Gas Act (Act 13)	Pennsylvania Department of Environmental Protection	Well ownership, permitting, transfers, plugging, liability	Can be adapted to allow well conversion instead of plugging, including ownership transfer to geothermal operators
Oil & Gas – Technical Standards	25 Pa. Code Chapter 78 / 78a	Pennsylvania Department of Environmental Protection	Well construction, casing, cementing, mechanical integrity	Directly applicable to ensuring structural integrity of geothermal wells
Abandoned & Orphan Wells Program	PA DEP Orphan Well Program	Pennsylvania Department of Environmental Protection	Identification, tracking, and remediation of abandoned wells	Provides inventory and screening basis for candidate geothermal wells
Underground Injection Control (UIC)	EPA/PA UIC Program	Pennsylvania Department of Environmental Protection (partial delegation)	Regulation of subsurface fluid injection	Can regulate geothermal fluid circulation and reinjection systems
Water Withdrawal Regulation	Basin Commission Permits	Susquehanna River Basin Commission / Delaware River Basin Commission	Surface and groundwater withdrawals	Applicable where makeup water or supplemental supply is needed
Environmental Protection – Construction	Chapter 102 (Erosion & Sediment Control)	Pennsylvania Department of Environmental Protection	Earth disturbance, stormwater management	Covers site preparation, trenching, and piping installation
Waterways & Wetlands	Chapter 105 (Water Obstruction & Encroachment)	Pennsylvania Department of Environmental Protection	Impacts to streams, wetlands, crossings	Applies to district heating piping and infrastructure crossings
Air Quality (Minor Source)	PA Air Quality Regulations	Pennsylvania Department of Environmental Protection	Emissions permitting	Limited but relevant for auxiliary equipment (e.g., pumps, backup systems)
Land Reuse / Brownfields	Pennsylvania Act 2 Land Recycling Program	Pennsylvania Department of Environmental Protection	Cleanup standards, liability protection for contaminated sites	Enables safe reuse of legacy well sites with reduced liability risk

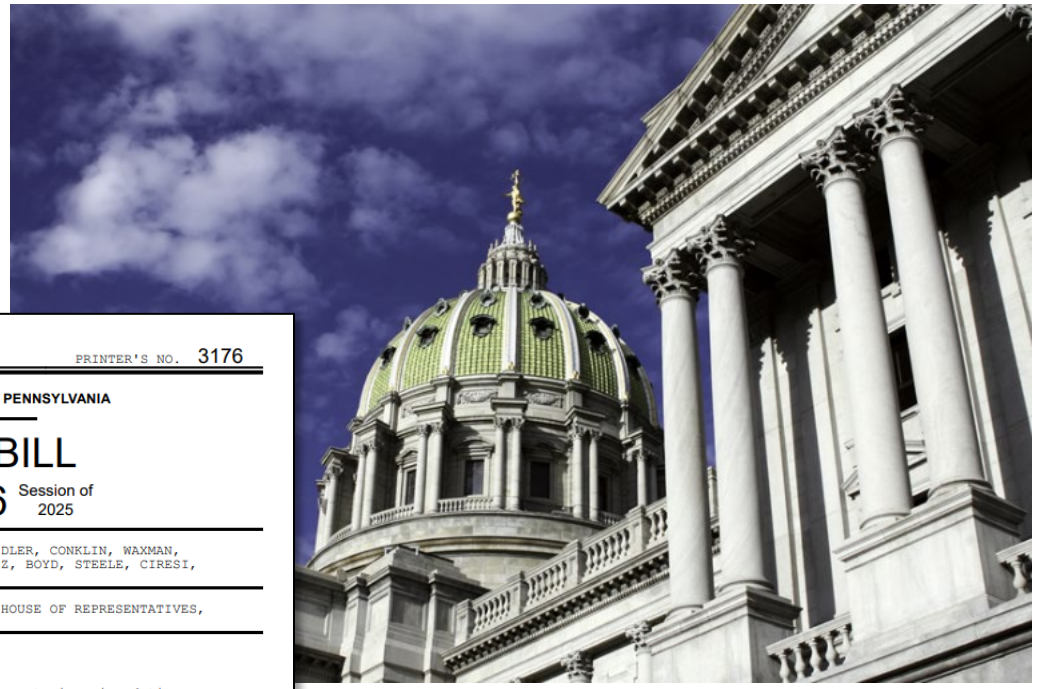
Regulatory Framework: Gaps and Recommended Actions

- ✓ Although there are gaps to be addressed in the regulatory space, there are also clear actions to solve/address such gaps:

Gap	Current Limitation	Impact on Projects	Recommended State Action
No Well Conversion Pathway	Existing laws (e.g., Pennsylvania Oil and Gas Act (Act 13)) only recognize active use or plugging	Prevents legal transition of wells from oil & gas to geothermal use	Create a "Well Conversion Permit" allowing reclassification of wells for geothermal applications
Unclear Ownership & Liability	Many abandoned wells lack clear ownership; liability remains uncertain	Discourages private investment due to long-term risk exposure	Establish liability transfer mechanisms and state-backed certification of "conversion-ready" wells
No Geothermal-Specific Standards	Current standards (Chapter 78/78a) focus on extraction, not thermal use	Lack of technical clarity for design, operation, and monitoring	Develop geothermal-specific design and operational standards (thermal performance, monitoring, sustainability)
UIC / Fluid Circulation Ambiguity	Injection regulations designed for waste disposal or oil & gas operations	Over-regulation or uncertainty for benign geothermal fluids	Create a streamlined geothermal UIC subclass for closed-loop and low-risk systems
No District Heating Framework	No regulatory classification for geothermal district energy systems	Barriers to permitting, financing, and right-of-way development	Define district geothermal systems as regulated energy/thermal utilities with clear permitting pathways
Lack of Incentives for Reuse	Current funding prioritizes well plugging over reuse	Missed opportunity to convert liabilities into energy assets	Introduce financial incentives (tax credits, grants, pilot programs) for geothermal repurposing
Fragmented Regulatory Authority	Multiple agencies (e.g., Pennsylvania Department of Environmental Protection, basin commissions, local entities) operate independently	Increases permitting time, cost, and complexity	Establish a "one-stop geothermal permitting office" to streamline approvals

Regulatory Framework: House Bill No 2076

- ✓ Time has found us! Hearings are ongoing for establishing a regulatory framework for geothermal energy projects.



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THE GENERAL ASSEMBLY OF PENNSYLVANIA

HOUSE BILL

No. 2076 Session of 2025

INTRODUCED BY VENKAT, C. WILLIAMS, FIEDLER, CONKLIN, WAXMAN, MERSKI, HILL-EVANS, FRANKEL, SANCHEZ, BOYD, STEELE, CIRESI, GREEN AND WEBSTER, DECEMBER 1, 2025

AS REPORTED FROM COMMITTEE ON ENERGY, HOUSE OF REPRESENTATIVES, AS AMENDED, APRIL 13, 2026

AN ACT

Providing for geothermal energy development; imposing duties on the Department of Environmental Protection; promulgating regulations; establishing the Geothermal Energy Development Fund; and imposing penalties.

TABLE OF CONTENTS

NEXT Steps

Concluding Remarks and Next Steps

RIZZO is interested in further developing a pilot project in Oil City Township, Venango County.

Findings from our Due Diligence:

- Our due diligence shows that Oil City possesses the prime elements for a **viable geothermal project**: adequate thermal gradient for heating, existing wells near customers
- Further, our due diligence show that, when including capital cost savings from drilling because of existing wells, and reflecting the available geothermal gradient from Oil City wells, the **LCOH estimates** are competitive relative to gas-based heating.
- We have identified gaps in the **regulatory framework** for geothermal projects in PA and we can collaborate with state policy makers to accelerate the effort of regulations

Next:

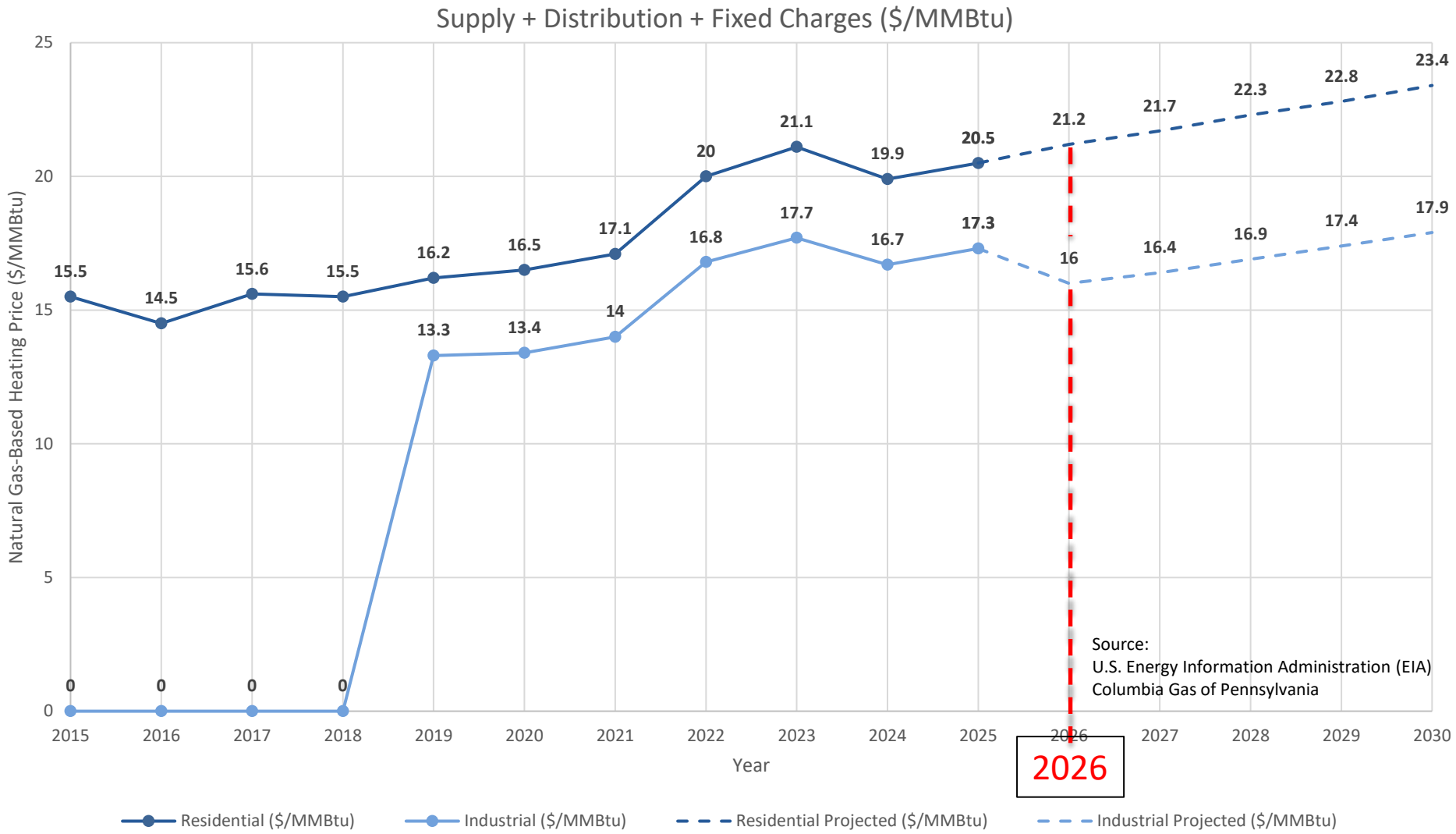
- Present this project concept to community leaders and policy makers from Oil City – gain political support
- Secure grant funding to complete concept engineering and site thermal studies
  - Orphan Well Plugging Grant Program provides $70,000/well plugging. We propose using this grant funding for 7 wells in Oil City to finish concept study and secure financing (7 wells x $70,000 = $490,000) – this funding will cover concept engineering and additional field work needed to secure financing.

Thank you for your time

RIZZO INTERNATIONAL

Additional Slides

End User Gas-Based Heating Costs in Pennsylvania



GDH System in Northeast US

West Virginia University
(Morgantown, WV)

LCOH:
$17.5/MMBtu (30 yr)
Nat. Gas ~$16/MMBtu

Swarthmore College
(Swarthmore, PA)

LCOH:
Geothermal - $11.7/MMBtu (50 yr)
Nat. Gas - $21.2/MMBtu