

The Energy Venture Investment *Summit*



THURSDAY, FEBRUARY 17
2:45 PM (MT)

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GeoThermOPTIMAL

“Renewable Energy 24/7”

Dr. William W. Fleckenstein



1. People want renewable energy
2. People want energy 24/7 and **cheap**
3. Geothermal energy is virtually untapped
4. Geothermal energy needs to work

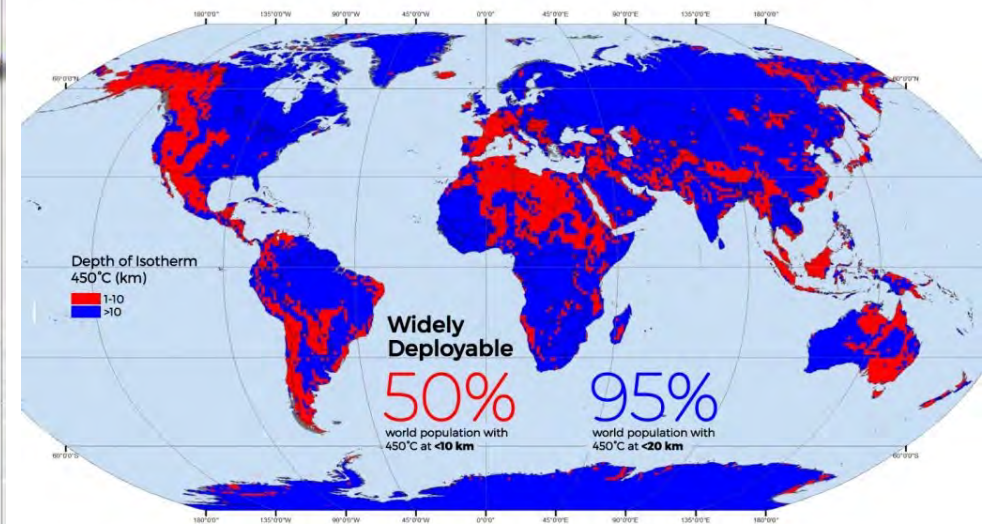
The Opportunity



- Hot rocks
abound in the
world.
- Natural
geothermal
reservoirs are
not common.
- EGS creates an
artificial
geothermal
reservoir.



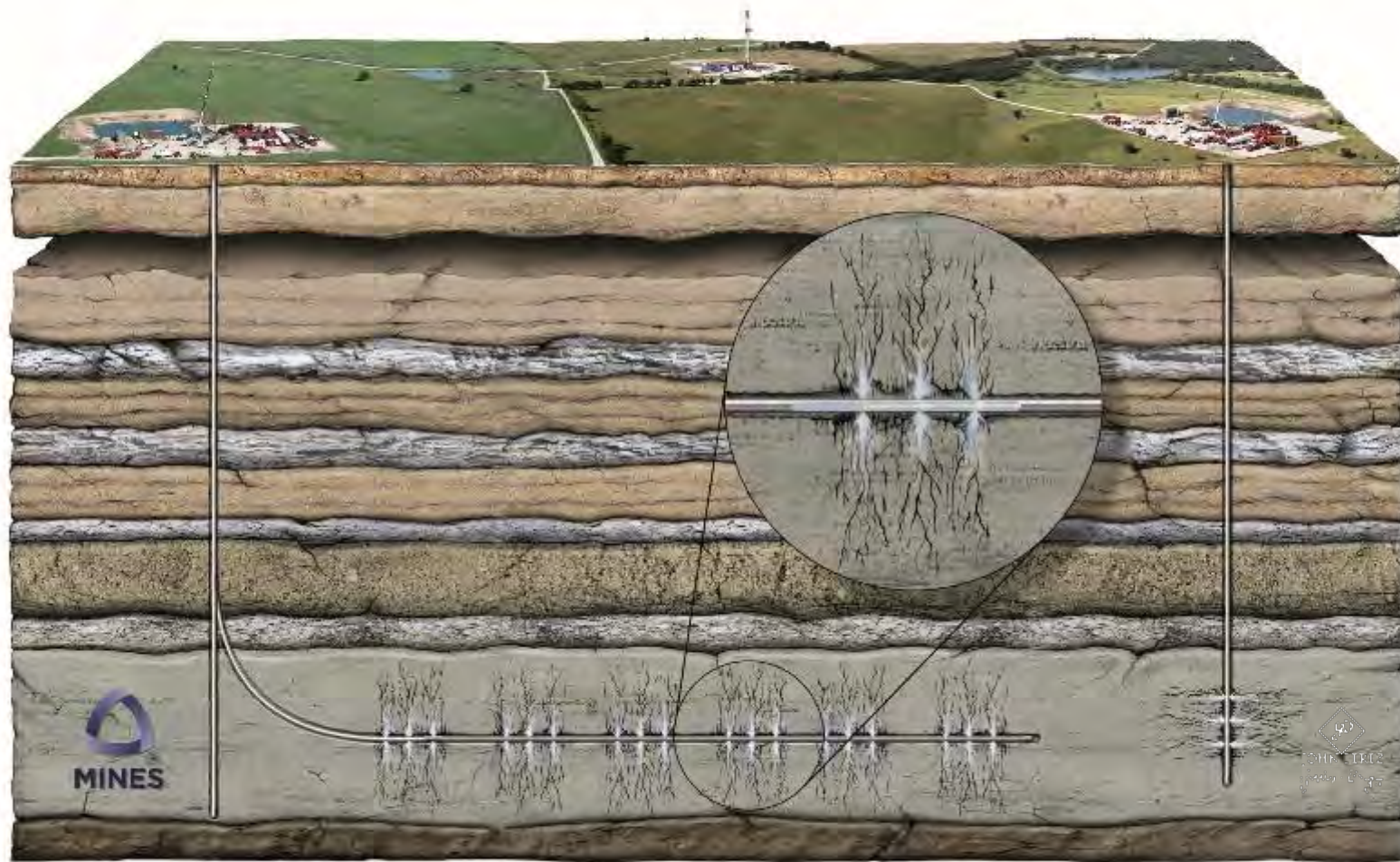
SuperHot Rock Geothermal: A Solution for Powering the Global Population

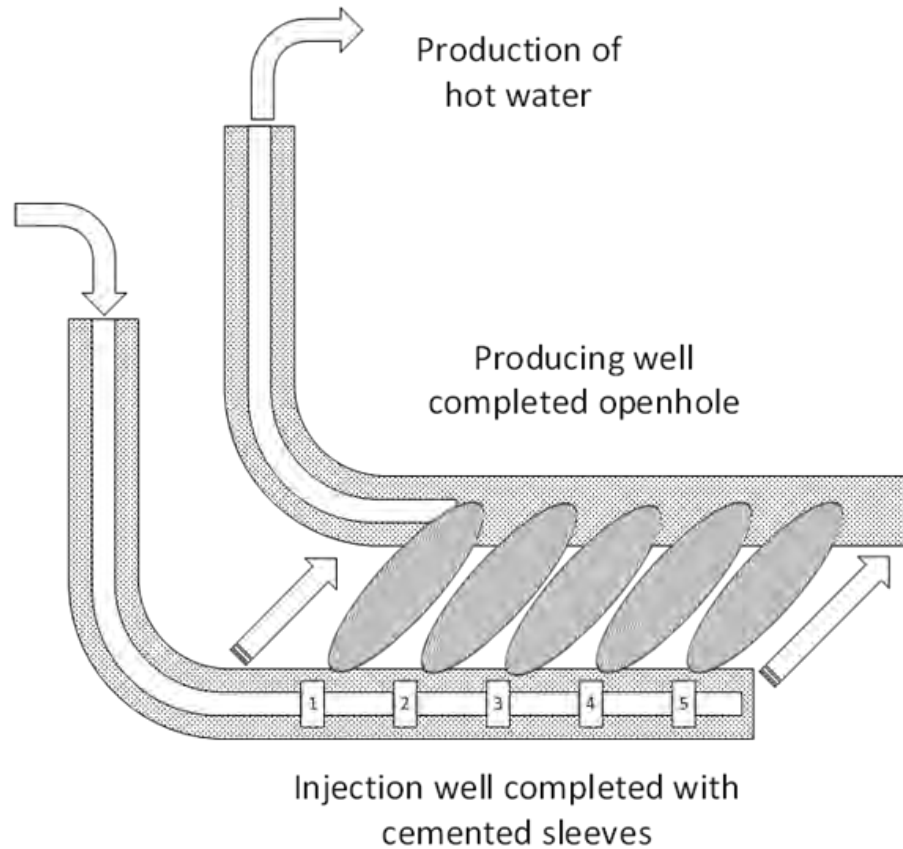




1. Take what worked in the Shale Revolution
2. Make it work for Enhanced Geothermal Systems (EGS)
3. \$5 million performance-based DOE Utah-FORGE research contract award,
- fully funding development work.

The Starting Point





1. Cemented frac sleeves
2. Creation of EGS heat exchanger
3. Control of EGS heat exchanger

Why GeoThermOPTIMAL?



- **Innovation 1:** Development of multi-stage fracturing technology with cemented frac-sleeves for EGS environments.
- **Innovation 2:** Cemented frac-sleeves also function with tractor control system, to detect and remediate injection short circuiting.

Impact: Economic technology for effective EGS systems.

Market Size

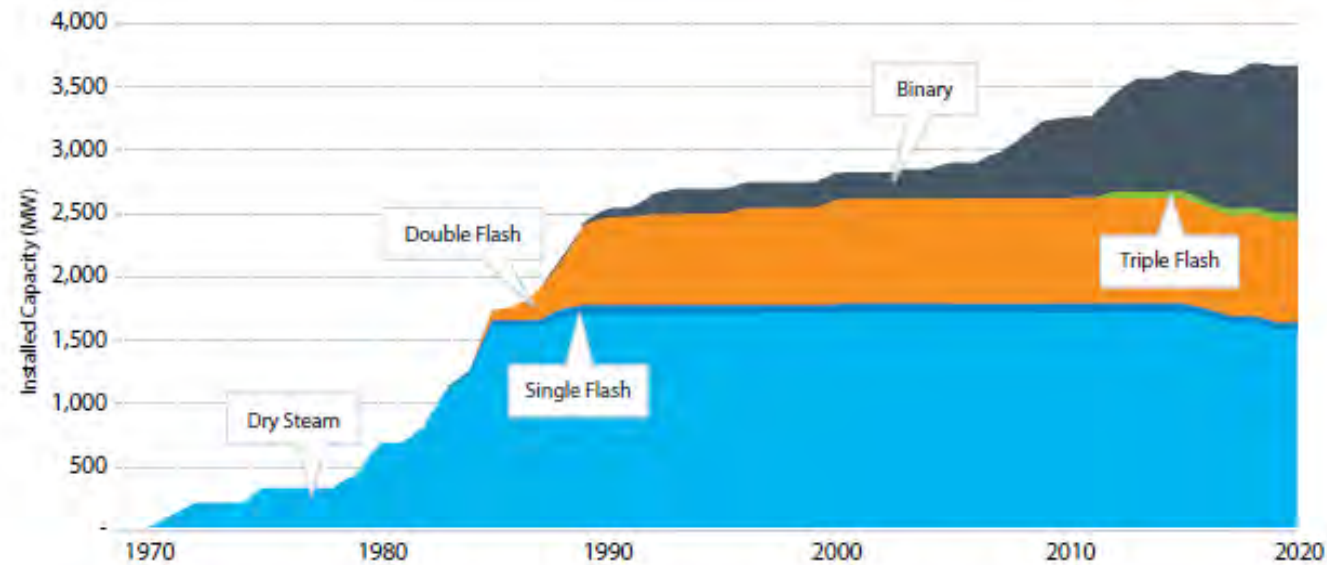
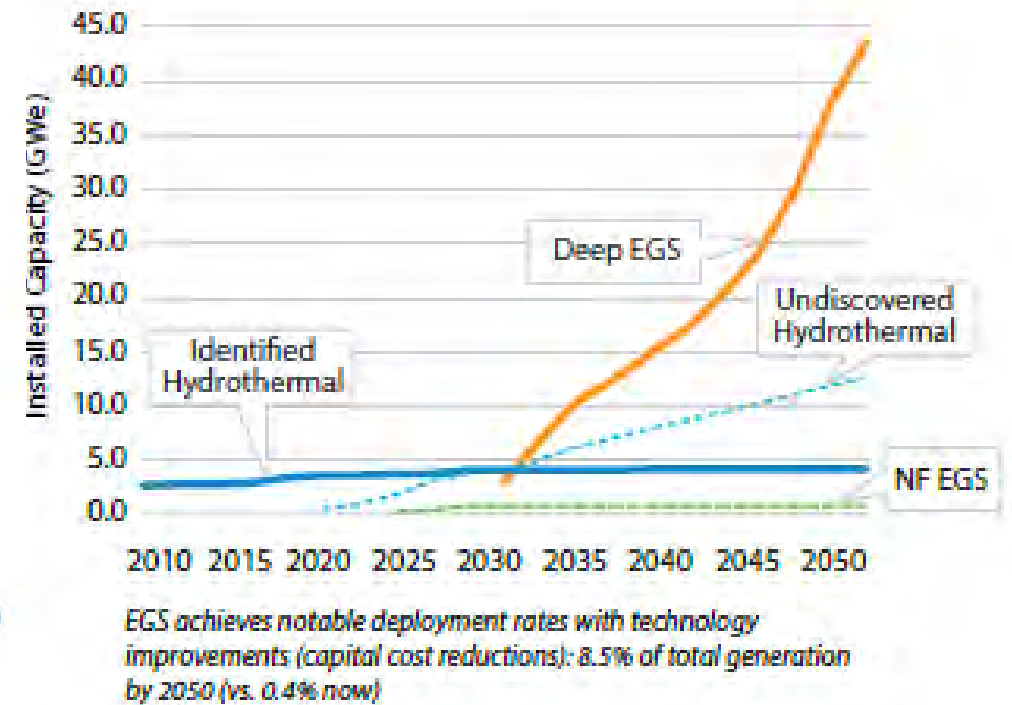


Figure 3. U.S. geothermal capacity by plant technology



Market Size

1. 31 states mandatory RPS requirements
2. 28 states mandate renewable power
3. Market growing

Table 9. RPS Details by State

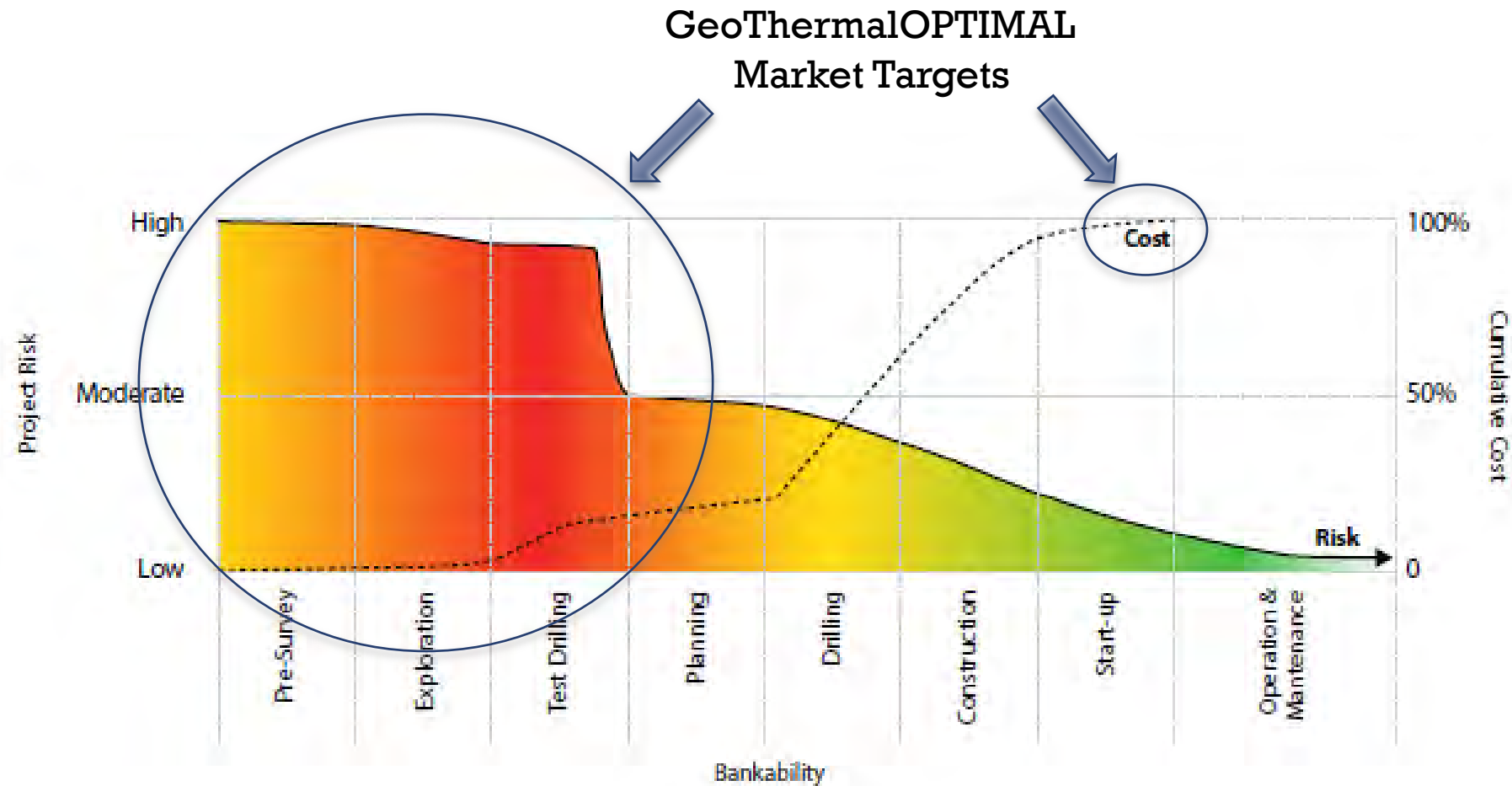
Data from individual state codes

State	Target	Target Year	Mandatory	Power	Thermal Equivalent
Arizona	15%	2025	Yes	Yes	Y
California	60%	2030	Yes	Yes	
Colorado	30%	2020	Yes	Yes	
Connecticut	44%	2030	Yes	Yes	
Delaware	25%	2026	Yes	Yes	
Hawaii	100%	2045	Yes	Yes	
Illinois	25%	2026	Yes	No	
Indiana	10%	2025	No	Yes	Y
Iowa	105 MW		Yes	No	
Maine	100%	2050	Yes	Yes	
Maryland	50%	2030	Yes	Yes	Y
Massachusetts	35%	2030	Yes	Yes	Y
Michigan	35%	2025	Yes	Yes	
Minnesota	27%	2025	Yes	No	
Missouri	15%	2021	Yes	No	
Montana	15%	2015	Yes	Yes	
Nevada	100%	2050	Yes	Yes	Heat pumps
New Hampshire	25%	2025	Yes	No	Heat pumps
New Jersey	50%	2030	Yes	Yes	
New Mexico	100%	2045	Yes	Yes	
New York	70%	2030	Yes	No	
North Carolina	12.5%	2021	Yes	Yes	Y
Ohio	8.5%	2026	Yes	Yes	
Oregon	50%	2040	Yes	Yes	N
Pennsylvania	18%	2021	Yes	Yes	Case by case
Rhode Island	38.5%	2035	Yes	Yes	
South Carolina	2%	2021	No	Yes	
Texas	10 GW	2025	Yes	Yes	Heat pumps
Vermont	75%	2032	Yes	Yes	
Virginia	100%	2045	Yes	Yes	Y
Washington	100%	2045	Yes	Yes	
Wisconsin	10%	2015	Yes	Yes	
D.C.	100%	2032	Yes	Yes	N
Utah	20%	2025	No	Yes	Y
Totals:			31	28	7

2021 U.S. Geothermal Power Production and District Heating Market Report



Market Target

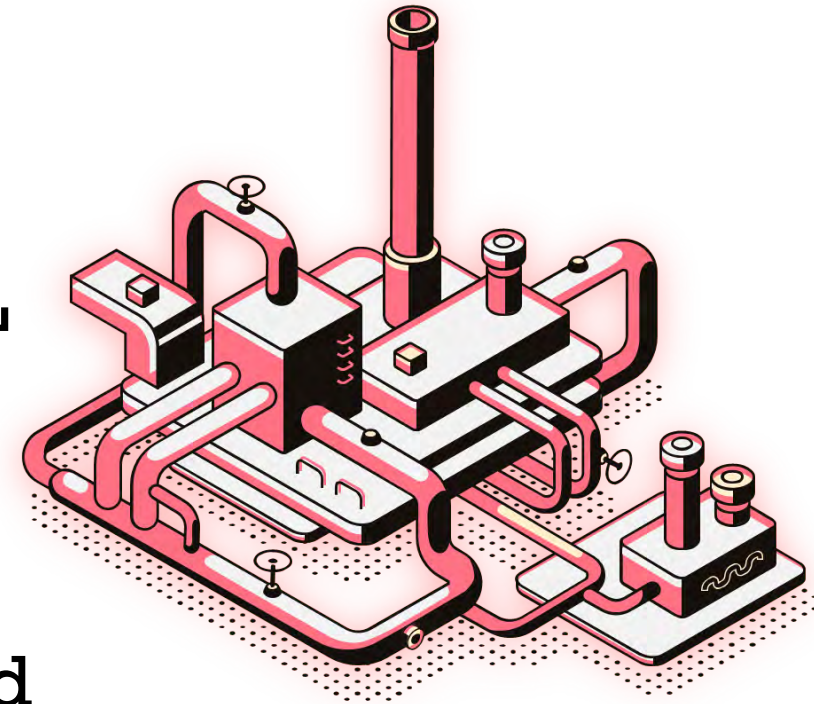


2021 U.S. Geothermal Power Production and District Heating Market Report

Business Model



1. Complete development and demonstration of GeoThermOPTIMAL tools for EGS at FORGE site in Utah
2. Demonstration of the GeoThermOPTIMAL EGS system
3. Develop companion EGS technologies.
4. Scale up to provide EGS for RPS mandated and economically driven power systems



The Team



Dr. Will Fleckenstein leads a CSM team (Dr. Hossein Kazemi, Dr. Jennifer Miskimins, Dr. Alfred Eustes) responsible for the execution and risk management for the project with many years of research, engineering and operations experience.



Tom Hill leads Tejas RE, responsible for the development and delivery of the sliding sleeve. Tejas RE has expertise in project management, engineering and delivering high pressure, high temperature technologies, including sleeve design and manufacturing.



George King leads KSWC Engineering and Machining, responsible for the development and delivery of the tractor. KSWC has precision machining and engineering capabilities to serve the prototyping and/or production needs of this project.

Contact Information



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