

ALBERTA INNOVATES CLEAN ENERGY

ADVANCED HYDROCARBON
METHANE EMISSION REDUCTION

FUNDING DETAILS

Spherical Rotors Inc. Expander for Zero Emissions Remote Power Generation

Unlike hydroelectric dams, natural gas sites generally don't convert any pressure loss to electricity. Spherical Rotors is developing patented expander technology expected to be advanced enough to function as the world's first power-generating gas control valve to accommodate widely varying natural gas site conditions for zero-emissions operation electricity production.

Compressor mode will boost atmospheric pressure air to varying pressures while experimenting with internal adjustment features at varying operational speeds. Expansion mode will generate power at pressures found across the natural gas pipeline system. These tests, combined with control valve classification testing, assess assumptions regarding the strong value proposition expected.

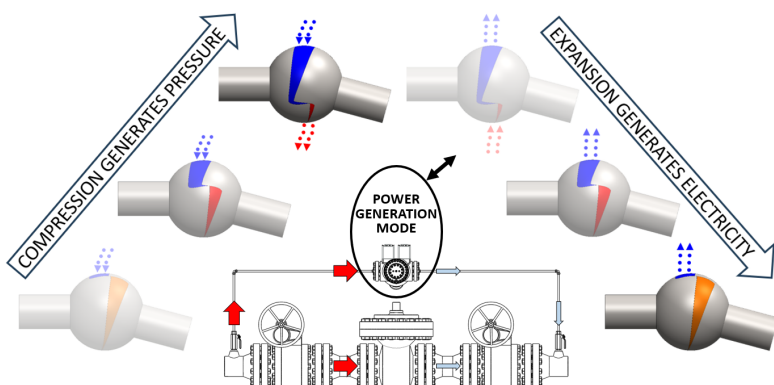


Image: Conceptual Rendering of Spherical Rotors' Reversibly Operated Technology



RECIPIENT:
Spherical Rotors



PARTNERS:
ATCO Gas, Apex
Utilities, Birchcliff
Energy, ARC Resources
(via NGIF Accelerator)



TOTAL BUDGET:
\$605,000



AI FUNDING:
\$248,000



PROJECT DATES:
AUG 2024 –
SEP 2025



PROJECT TRL:
Start: 3
End: 4

APPLICATION

Electricity at off-grid natural gas sites enables a competitive advantage by remotely monitoring assets, but electrical grid tie-ins are generally uneconomical. Electrically operated valves meet emissions reduction goals and comply with new regulatory requirements which prohibit venting natural gas to operate valves. However, a gas site requiring 500W typically doesn't have enough economic capacity or space to accommodate intermittent solar photovoltaic panels with battery backup. To address this challenge, an operator could utilize an expander.

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PROJECT GOALS

Key assumptions will be tested early at progressive stages:

Engineering/Theoretical: Resolve any challenges before prototyping and file additional patent material to capture improvements. Confirm emissions reduction calculations.

Assembly/Fit Testing Prototyping: Assess achievable and required positional accuracy and tolerances of novel spherical rotor components using fit-for-purpose assembly jig.

Compression Tests: Compress atmospheric pressure air to assess performance, including sealing, quickly making any required updates.

Expansion Tests: Confirm power generation capabilities align with customer expectations by mimicking a wide range of pressures found at natural gas sites. Measured results are used to project natural gas performance.

Control Valve Classification: Assess viability of internally sealing flow to not require any supporting equipment in commercial applications.

BENEFITS TO ALBERTA

Expanders eliminate the otherwise high cost of thermo-electric-generators (TEGs) burning gas for site power. Current screw and scroll expanders can't handle high enough pressures. Known experimental expanders require expensive system compromises or modifications, including accommodating pressure fluctuations with control valve(s). Spherical Rotors' rotary expander is uniquely expected to independently handle these pressure fluctuations. The novel geometry enables a high-pressure rating and the near-zero clearance volume is like scroll equipment combined with extending screw equipment adaptability to theoretically even enable high efficiency at high pressure ratios. For example, waste-heat-to-power and heat pump applications may now optimally use seasonally varying and lower ambient temperatures. Long-term goals to manufacture and implement zero-emissions operation expanders, compressors, pumps and control valves foster sustainable and diversified local economic prosperity.



2 Patents



2 Project Jobs



75-125 Future Jobs



2-4 Mt/yr Future
GHGs Reduced

CURRENT STATUS

MAY 2025

- Resolving challenges, including rotor manufacturability, led to significant improvements bolstering Spherical Rotors' know-how, trade secrets and patent portfolio
- Accurately and cost effectively constructed novel spherical rotors with a new process
- Successfully completed Assembly/Fit Testing Prototyping to assess achievable and required positional accuracy of the novel spherical rotors