

## Westgen Technologies: Unlocking EPOD Economic Zero Bleed Pneumatic Instrument Air Retrofit Solution

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- Name of ERA Project Advisor: Aaron Baugh
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### **Project Description:**

Convrg Innovations (formerly Westgen Technologies) embarked on a groundbreaking project aimed at revolutionizing emissions reduction in the oil and gas industry. Focused on the development and deployment of EPOD technologies, the project achieved remarkable milestones, contributing to environmental, economic, and social dimensions.

### **Environmental Impact and GHG Emissions Reduction:**

The project achieved a significant reduction of 9,027 tCO<sub>2</sub>e from the 12 deployed units, marking a noteworthy contribution to Alberta's emissions reduction targets. Looking ahead, the forecast indicates a substantial increase in emissions reduction by 2032. The project's commitment to continuous innovation and sustainable practices positions Convrg Innovations as a key player in achieving long-term environmental objectives.

While the immediate impact is evident, the broader influence extends to the projected reduction figures, aligning with the province's ambitious emission reduction goals. Convrg's dedication to advancing emission reduction technologies reflects a commitment to environmental stewardship and a sustainable future for the energy sector.

This reduction, coupled with the anticipated future impact, reinforces Convrg Innovations' role in spearheading environmentally conscious solutions within the oil and gas industry. The project not only meets current environmental targets but also actively contributes to shaping a greener and more sustainable energy landscape for years to come.



**Economic and Social Contributions:**

Convrq will continue to focus on emissions reduction technologies, employing locally in Alberta. The local ripple effect, generated by field technicians operating in remote areas, enhances both economic and social aspects in local communities.

**Conclusion:**

Convrq Innovations' project represents a convergence of technological innovation, environmental responsibility, and economic prosperity. From the initial design of EPOD and EPOD Mini to the current advancements, the project serves as a model for responsible and impactful innovation in the oil and gas industry. Convrq's commitment to continuous improvement, environmental stewardship, and societal well-being solidifies its position as a transformative force in the energy sector.



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## Executive Summary

The primary goal of this project was to establish a validated track record for the EPOD power generation technology, aimed at accelerating industry adoption. While Westgen initially focused on the new well market, the retrofitting of legacy wellsites in Alberta emerged as a significant opportunity. Westgen recognizes the need for a fit-for-purpose instrument air solution utilizing the EPOD technology platform to unlock this potential. The second objective involved the development of EPOD-Mini. The third objective aimed to derisk the economic model for instrument air retrofits of gas pneumatics, facilitating widespread adoption through carbon credit financing.

Following a change request, the project milestones were streamlined from seven to four, and the total number of EPODs was adjusted to 12 down from 20 due to faster-than-expected adoption. Funding reallocation occurred from deployment scope to research and development initiatives, focusing on achieving project cost reduction goals and addressing power quality issues.

While the initial plan targeted the deployment of 20 units with an estimated GHG emissions reduction of 546,000 tCO<sub>2</sub>e over a 25-year lifespan, the actual emissions reduction during this project phase was 9,027 tCO<sub>2</sub>e. It is crucial to note that this number is based on a one-year timeframe and only 12 units, as opposed to the anticipated 20 EPODs and EPOD minis.

Looking ahead, the market rollout of EPOD and EPOD-Mini to achieve 50% market penetration in the target Alberta market by 2030 could result in an 83,000,000 tCO<sub>2</sub>e emissions reduction by 2050. Furthermore, this project is expected to generate employment opportunities, with dozens of Albertans employed within the next two years. Subsequent commercialization efforts are projected to employ hundreds by 2024 and beyond.

## Project Description

### Introduction

The urgent global concern of methane venting from pneumatic devices within the oil and gas industry, contributing to an alarming 532.5 million tonnes of CO<sub>2</sub>e annually, prompted the establishment of Westgen Technologies. This environmental challenge not only demanded resolution but also revealed an unmet market need. As a response, Westgen embarked on a mission to pioneer innovative solutions that not only rectify environmental issues but also address the prevailing gaps in the industry.

### Background

In 2018, Westgen's journey began with a discerning analysis of the oil and gas landscape, unveiling a critical power generation gap in the endeavor to eliminate pneumatic methane emissions at remote wellsites. The historical backdrop narrates the evolution of this pioneering project, from its conceptualization to the meticulous formation of a dedicated team and partnerships crucial for its success. Among the milestones, the first EPOD prototype emerged in May 2019, underwent rigorous testing, and secured a field trial, marking a



significant turning point in Westgen's commitment to environmental sustainability and technological innovation.

### Solution

At the heart of Westgen's response to the power generation challenge lies the EPOD, a revolutionary 6-, 20-, or 35-kW remote power generation solution. This ingenious technology not only addresses the immediate need to eliminate methane venting but also tackles the intricate issue of powering an instrument air compressor in remote wellsites. Unlike conventional technologies with limitations, the EPOD leverages a low-cost, mass-market industrial reciprocating internal combustion engine, previously deemed unsuitable for remote applications. Key design elements, including advanced engine control logic, a novel electrical design with battery backup, an extended maintenance interval lube oil system, gas and solar hybrid power, and meticulous fuel gas filtration, collectively empower the EPOD to deliver a reliable, cost-effective solution.

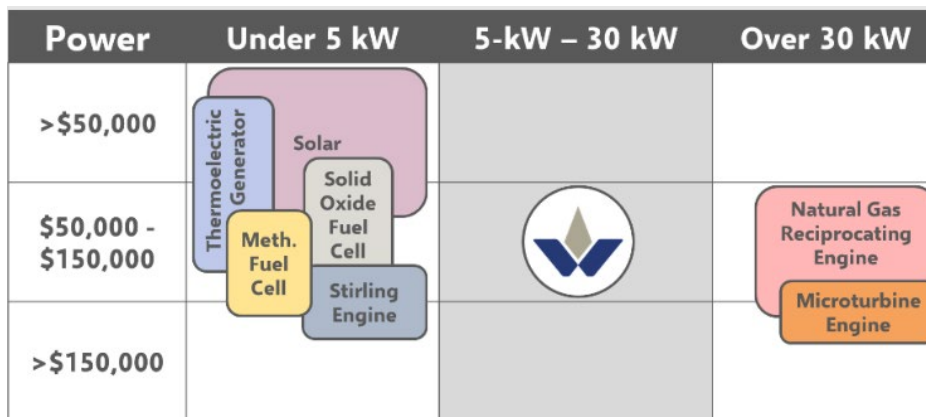


Figure 1: Power Generation Gap



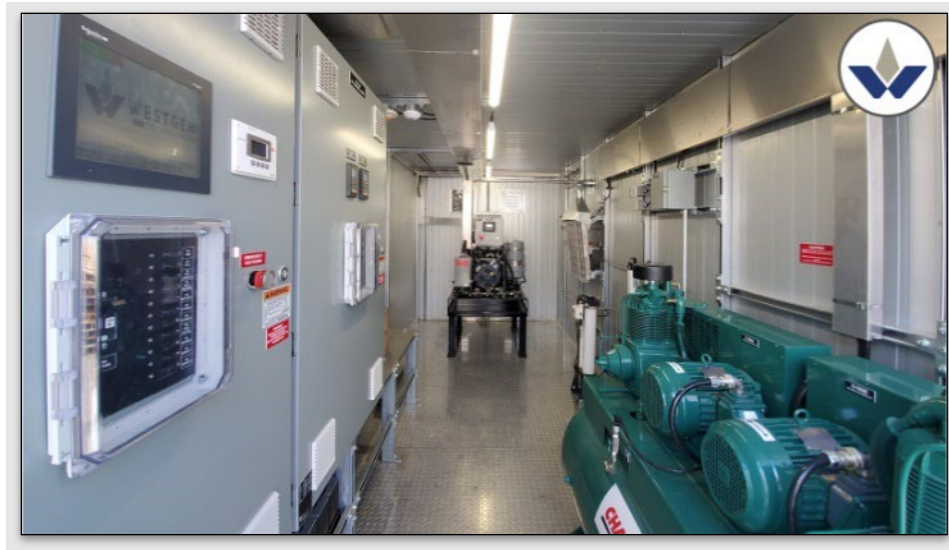


Figure 2: Inside of an EPOD

Since the creation of the first EPOD prototype in May 2019, Westgen has achieved remarkable commercial success. This transformative technology not only meets the environmental imperative but positions Convrq Innovations at the forefront of emissions reduction and sustainable energy solutions.

### Project Objectives

1. Derisk the EPOD power generation technology.
2. Develop EPOD Mini with a target of 50% of the cost of EPOD.
3. Derisk the economic case for instrument air retrofits of gas pneumatics to enable widespread adoption on the basis of carbon credit financing.

### Discussion on Changes

In pursuit of maximum efficiency, recognizing that internal cash flow challenges were no longer a constraint, Westgen proposed a strategic shift in November 2022 to:

1. Consolidate milestones 4, 5, 6, and 7 into milestone 4.
2. Extend the timeline of milestone 4 to September 30th, 2023.
3. Reduce the deployment scope of milestone 4-7 from 12 deployments to 4 units deployed to 3 unique locations.
4. Reallocate funding from deployment scope change to R&D initiatives to achieve project cost reduction goals and resolve outstanding power quality issues.



This change request was approved and milestone 4 was conducted accordingly.

#### Other Changes:

- Change in company name.
  - Westgen technologies is now Convrq Innovations
    - Reasoning: Westgen Technologies was founded in 2019 with a focus on power generation in Western Canada. Since this time the purpose and vision for our company has evolved and we are now an emissions reduction solution company serving customers across North America. We identified an opportunity to build a brand more focused around supporting the oil and gas industry to decarbonize. This brand will serve as a platform to continue selling our existing solutions as well as bring new solutions to market over time. This will support the continued path of accelerated revenue growth that has been demonstrated over the past 5 years.

#### Technology Risks

Initially, risks included challenges associated with remote power generation. The commercial demonstration of EPOD addressed uncertainties, successfully creating, derisking, and deploying the technology. New risks identified during the project included higher costs, regulatory uncertainty, and power quality issues, all mitigated during milestone 4.

## Project Work Scope

### Experimental Procedures/Methodology

The methodology was broken down into four milestones (after the change request). The goals and methodology are listed below for each milestone.

#### **Milestone 1: *Wellsite Quantification and Selection for Demonstration***

- Desktop study and stratum development.
- Field baseline wellsite study.
- Select wellsites for EPOD deployments.
- Prepare report on findings.

#### **Milestone 2: *Deployments 1-4 & EPOD-Mini Prototype Design***

- Field baseline wellsite study.
- Update EPOD design.
- Order, fabricate, and assemble EPOD units 1-4.
- Deploy EPOD to Wellsites & Train Operators.
- Initial develop of pre-commercial EPOD Mini Design.



### **Milestone 3: Deployments 5-8, Operate, Design Improvements**

- Order, Fabricate, and Assemble EPOD/EPOD-Mini Units.
- Deploy EPOD/EPOD Mini to Wellsites and Train Operators.

### **Milestone 4: Deployments 9-12, Operate, Design Improvements & Final Design, Develop Commercialization Plan and Share Learning (formerly MS4-7)**

- Order, Fabricate, and Assemble EPOD/EPOD Mini Units.
- Deploy EPOD/EPOD-Mini to Wellsites & Train Operators.
- Perform Extended Operation.
- Collect Data via Remote Monitoring and Operator Input.
- Develop and Validate Carbon Credits.
- Review Data and Take Lessons Learned.
- Development of Commercial EPOD Mini.
- Value Engineering and foundational power quality improvement.
- Compile Data and Develop Report for Industry.
- Develop commercialization plan.

### **Technology Development**

The evolution from conceptualization to commercial availability marks a significant milestone for the EPOD and EPOD Mini. These technologies stand as a testament to Westgen's commitment to advancing sustainable power generation in the oil and gas industry. The intricacies of each installation, intricately documented in milestones 2-4, provide a comprehensive overview of the development journey.

### **Commercial Availability and Sales:**

Since development of the EPOD Mini, widespread adoption has been achieved across North America. Over 550 units have been deployed of which over half are a version of the Mini. While the full 50% price reduction was not able to be achieved, average price reductions have been close to 30%.

Reliability issues were faced with the EPOD Mini during initial deployment. Managing airflow and HVAC through the unit proved to be a substantial challenge in very cold (lower than -30C) temperatures. Changes were made to the HVAC design to change air flow inside the unit and correct this. Additionally, challenges were discovered in the batteries used, several versions tested substantially deviated from manufacturer performance specifications. It took over a year and over 7 battery manufacturers to find a version that had sufficient performance.

Market adoption has not been as swift as anticipated in the move to zero emissions wellpads. A challenge that was encountered with unexpected results was the staged regulations to go first to low bleed then zero bleed. This has created a situation with marginal venting changes to go from low to zero bleed and minimal economics



incentive beyond regulations. In situations where facilities were going from high bleed to zero bleed, positive economics were realized in the deployments using carbon credits.

Additionally, as wellpad design has progressed in Canada and efforts to reduce environmental impact have come into play, producers are placing more pads and more technology on a single site. This has pushed power demand higher, pushing most new builds into larger units. We have not yet seen this change in the United States, but expect similar results from them in the future.

Ultimately an even smaller version of the EPOD will be required to address the legacy sites that have moved to low bleed first, and to address venting from very small (1-2) well legacy sites, however several hundred units have been deployed on the design developed from the grant, resulting in substantial emissions reduction.

### **Installation Insights:**

Within the framework of the project, 12 installations were undertaken, each offering unique insights and lessons. Detailed documentation in milestones 2-4 provides a nuanced understanding of the challenges encountered and the corresponding learning experiences. These installations not only contributed to the overall project achievements but also facilitated continuous improvement and refinement of the EPOD and EPOD Mini technologies.

### **Overall Project Achievements**

The deployment of these EPODs provided a tremendous learning experience both from a design improvement perspective and from a unit sizing and client installation perspective. Addressing the latter first, we learned quickly that expected design conditions and air demand often varied greatly from actuals. Several of the first units were wound up being undersized for demand and we developed a whole new sizing process, moving sizing in house and not accepting client design rates.

Several lessons were learned that carried across both the traditional EPOD and our EPOD Mini. These design improvements include more effective and efficient ways of managing HVAC and the ability to utilize waste heat from components in the unit, a more reliable and longer lasting battery system and substantial changes to our supply chain to increase the quality and reliability of components in the field. This was particularly impactful during the supply chain challenges following Covid-19.

While the targeted cost reductions were not fully realized, substantial cost reductions over the larger design were achieved (in excess of 30%) and we were able to show that with the carbon market in Alberta, positive economics could be achieved on many instrument air conversions.



## Results of Experiments and Analysis of Results

The outcomes related to methane emission reduction will be explored in detail in the following Emissions Reduction Impact section. The deployment and ongoing operations of the EPODs have proven to be successful. Notably, the cost of the EPOD Mini exceeded initial projections, a result of strategic design choices to meet market demands and unforeseen challenges within the supply chain, including inflation.

Despite these challenges, testing of EPOD-Mini pricing in both Canadian and US markets revealed it to be a highly competitive option for retrofitting existing gas-emitting pneumatic devices. In the context of milestone 4, it's essential to acknowledge an increase in material costs attributed to larger seacans, additional solar panels, and a more robust panel design. Some of this cost escalation can be attributed to inflation experienced over the past year.

## Commercialization

Significant strides have been made in the commercialization of EPOD and EPOD Mini technologies. The Technology Readiness Level (TRL) of the EPOD and EPOD Mini have reached a 9, showcasing its advanced stage of development and readiness for widespread implementation.

### Technology Advancement

Throughout the project duration, notable technological advancements have been achieved. These include strategic design modifications to enhance market alignment, rigorous testing of EPOD-Mini pricing to ensure competitiveness, and the successful deployment of 12 units, each contributing valuable insights for continuous improvement.

### Performance/Success Metrics Update:

On average, both our traditional EPOD and the EPOD Mini now have operational uptime that exceeds the targeted 99%. Challenges were encountered with the mini's in the first year and these challenges have now been addressed (see earlier discussions). The cost for both EPOD and EPOD Mini have surpassed initial projections due to design choices, supply chain challenges, and inflation. Despite these challenges, the EPOD Mini has been an economic choice and sits in the lower half of pricing compared to competition while maintaining reliability and functionality.

## Lessons Learned

### Challenges and Obstacles:

1. Higher Costs Than Expected:
  - a. Inflationary pressures and supply chain constraints contributed to costs exceeding initial projections. Adapting to fluctuating market conditions and implementing strategies to manage these challenges were crucial for project resilience.
2. Staff Continuity:



- a. The departure of key personnel, posed challenges in project continuity. Navigating these changes required strategic adjustments to ensure a seamless transition and ongoing project success.

**Important Lessons Learned:**

The project's journey has been a rich source of insights, yielding valuable lessons in various domains.

- Business Dynamics:
  - Adapting to dynamic market conditions, including inflation and supply chain challenges, necessitated agile business strategies. This experience underscored the importance of building resilience into the project framework.
- Staff Management:
  - The departure of key team members highlighted the significance of effective knowledge transfer and succession planning. Ensuring continuity amid personnel changes emerged as a critical aspect for project stability.
- Regulatory Considerations:
  - Ongoing engagement with regulatory frameworks is crucial. Lessons from the project reaffirmed the need for proactive adaptation to evolving policies and regulations impacting the energy sector.

These lessons form the foundation for ongoing development, commercialization, and future endeavors, contributing to a more robust and informed approach in addressing challenges and embracing opportunities.

## Environmental Benefits

### Emissions Reduction Impact

A third-party environmental benefits report was conducted for all units in the project. It was found that a total of 9,027 tCO<sub>2</sub>e was abated through these 12 units.

It is forecasted that the EPOD product line will lead to emissions reductions of 13,672 (ktonnes CO<sub>2</sub>e) by 2032 in Alberta and British Columbia alone.

	Greenhouse Gas Emissions	
	CO <sub>2</sub> e	Tonnes
Baseline Emissions		9,726
Project Emissions		699
<b>Net Emission (Absolute Emissions) Reductions</b>		<b>9,027</b>



Figure 3: GHG Emission Reductions During Project

**Canadian Roll-Out GHG Results**

Market Rollout in Canada (AB+BC)		
Year	Cumulative Applications	Total GHG Reductions CO2e (ktonnes)
2023	256	145
2024	580	330
2025	1,215	690
2026	1,697	964
2027	2,180	1,239
2028	2,662	1,513
2029	3,145	1,787
2030	3,627	2,061
2031	4,109	2,335
2032	4,592	2,609
<b>Total</b>	<b>24,063</b>	<b>13,672</b>

Figure 4: Market Rollout and GHG Emission Reduction Forecast

## Economic and Social Impacts

### Projected Economic Impacts in Alberta:

Convrg (formerly Westgen), continues to focus on growth and development in the emissions reduction space. With locations in Calgary, Balzac, Grande Prairie and Texas as well as third party distributors across Appalachia, the Colorado and Bakken basins, Convrg continues to channel revenue back to Alberta. Convrg continues to source a significant portion of their supply chain locally, including the key components to the design (the generators, compressors and batteries).

The deployment of more EPODs generates a ripple effect of local social benefits. As field technicians operate in remote areas of Alberta, their presence stimulates local economies. Increased spending on accommodations, supplies, and services at local establishments contributes to economic growth in these communities.

Beyond direct employment and local economic stimulation, the project's economic impacts extend to improving the Canadian oil and gas industry's ability to eliminate methane emissions. This not only enhances environmental performance but also makes the industry more attractive to capital investment, fostering economic growth at a broader scale.



### **Increased Innovation Capacity:**

The project has played a pivotal role in enhancing innovation capacity within the province. Training of highly-skilled personnel and forging partnerships with start-up companies has fostered a dynamic ecosystem of knowledge development. This has positioned Alberta as a hub for innovation in emissions reduction technologies, contributing to the province's reputation as a leader in sustainable energy solutions.

### **Equity, Diversity, and Inclusion:**

Convrg's (formerly Westgen) commitment to Equity, Diversity, and Inclusion (EDI) deeply influenced this project as well as all new hires. Our recruitment process prioritizes diversity and inclusivity, aligning with our DEI policy's core principles. We strive to create a workplace where everyone feels valued, fostering a culture of equity and inclusion. Our project promotes equitable career opportunities, measured by performance goals that reflect our commitment to advancement for all. Employee engagement through surveys and focus groups will provide insights to eliminate potential barriers to diversity and inclusion. In selecting partners, we prioritize those who share our values of diversity and inclusion. Transparent accommodation efforts underscore our dedication to meeting employees' needs. Convrg's DEI policy is the foundation of a project that embraces differences, fosters inclusion, and ensures equitable opportunities for all.

## **Overall Conclusions**

The culmination of this project marks a transformative journey in the pursuit of sustainable energy solutions within the oil and gas industry. From the inception of the EPOD to the current advancements with the EPOD mini and newer products, the project has not only met but exceeded expectations, contributing significantly to environmental, economic, and social dimensions.

### **Environmental Impact:**

The deployment of EPOD technologies has ushered in a new era in emissions reduction. While immediate environmental benefits have been realized, ongoing research signals a commitment to further enhance the eco-friendliness of these innovations. The anticipated reduction in carbon footprint, extended product lifespan, and responsible recycling initiatives underscore Convrg's dedication to minimizing environmental impact.

### **Economic and Social Contributions:**

Convrg's has deployed more than 550 units across North America and continues to focus on development of new emissions reduction technologies. Job creation spans innovation, operations, and production roles, fostering economic resilience within the province. The local ripple effect, stimulated by field technicians operating in remote areas, not only supports economic growth but also enhances the social fabric of communities.

### **Conclusion non GHG Emissions Reduction:**

While immediate GHG emissions reduction figures are detailed in the respective sections, the overarching impact is substantial. Convrg's commitment to reducing methane emissions, coupled with the successful deployment of EPOD technologies, has resulted in a significant positive contribution to Alberta's emissions



reduction targets. The 9,027 tCO<sub>2</sub>e reduction from the 12 units in the project is a noteworthy achievement, laying the groundwork for broader environmental benefits in the future.

In conclusion, the Convrg Innovations project stands as a testament to the intersection of technological innovation, environmental responsibility, and economic prosperity. The journey from initial design to the current advancements not only underscores the success of the project but also paves the way for a sustainable and resilient future in the energy sector. Convrg's commitment to continuous improvement, environmental stewardship, and societal well-being positions the project as a model for responsible and impactful innovation in the oil and gas industry.

## Communications Plan

### Knowledge-Sharing and Communication Activities:

Throughout the project, Convrg Innovations undertook a comprehensive communication strategy to share key knowledge and project developments. Various communication channels were utilized to disseminate information about the EPOD and EPOD Mini, as well as project findings.

### Highlights of Knowledge-Sharing Activities:

#### 1. Methane Leadership Conference (October 2022):

- a. An executive from Convrg presented detailed insights into the EPOD during the Methane Leadership Conference. The presentation included the results of a case study, providing a platform for industry leaders to understand the technology's impact.

#### 2. Canada Emissions Reduction Innovation Network (CRIN) Showdown:

- a. Westgen actively participated in CRIN's Electrical Generation Technology showdown, achieving the highest level of electrical efficiency among all systems examined. This accomplishment showcased the project's advancements in emissions reduction technology on a broader industry platform.

### Communication Tools and Future Plans:

Convrg employed a diverse set of communication tools during the project, including case studies, white papers, and presentations at industry events. The company also utilized its blog to announce the release of the EPOD Mini and retrofit opportunities to the market.

### Future Communication Strategies:

In the future, Convrg plans to continue using a multi-faceted approach to communication. This includes leveraging blogs, whitepapers, case studies, and industry event presentations. These channels will be instrumental in disseminating information about upcoming projects, new product releases, and updates to



existing products. Convrq is committed to maintaining transparent and informative communication with its stakeholders, industry peers, and the public to foster awareness and understanding of its innovative solutions.

## Literature Reviewed

N/A

