# NON- CONFIDENTIAL FINAL REPORT

# FINAL OUTCOMES REPORT (NON-CONFIDENTIAL)

## 1.0 PROJECT INFORMATION

| | |
|---|---|
| **1. ERA PROJECT ID #** | E0163373 |
| **2. CALL / ROUND** | Partnership Intake Program |
| **3. PROJECT TITLE** | Heartland Waste to Energy Project |
| **4. COMPANY NAME** | Varme Energy |
| **5. PROJECT TYPE** (R&D, Development, Demonstration, Implementation) | FEED Study, Pre-FID Deliverables |
| **6. LOCATION** (primary location the project took place by address, land description, or GPS coordinates) | 1501-10117 Jasper Ave NW, Edmonton, Alberta T5J 1W8 |
| **7. PROJECT START DATE** | January 15, 2024 |
| **8. PROJECT COMPLETION DATE** | April 30, 2025 |
| **9. TECHNOLOGY READINESS LEVEL (TRL) AT PROJECT INITIATION** | TRL 8 |
| **10. TRL AT PROJECT COMPLETION** | TRL 9 |
| **11. JOBS CREATED** | 8 direct jobs created, 50 indirect jobs created |
| **12. GHG EMISSIONS REDUCED** (Project-level: annual, cumulatively by 2030 and by 2050) | N/A |
| **13. TOTAL ERA FUNDING** | $2,803,563 |
| **14. TOTAL PROJECT VALUE** | $6,104,582.50 |

| | |
|---|---|
| **15. ERA PROJECT ADVISOR** | Rob Baker |
| **16. SUBMISSION DATE** | May 15, 2025 |
| **17. KEY PROJECT CONTACT NAME AND EMAIL** | Rory Wheat – rory@varme.ca |
| **18. QUOTE** (why was ERA a pivotal funder for this project? How did ERA funding help advance on the TRL scale? Etc.) | ERA funding was critical for Varme to advance the FEED study and other Pre-FID deliverables to bring the Heartland WTE Project closer to a Final Investment Decision. The funded project delivered a engineering details and a Class III cost estimate that are now being used to advance commercial and financial work streams. |
| **19. NOTABLE COMMUNICATIONS** | Carbon Capture Conference 2024 – Varme, ERA & EPA announced awarded funds. |
| **20. IMAGE** (please insert or link a photo capturing the technology for ERA publications) | |

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## 5.0 EXECUTIVE SUMMARY

Varme Energy Inc was incorporated 3 years ago as the first greenfield waste to energy with carbon capture project developers and owners in the North American marketplace.

This project is in support of the first of a kind Canadian greenfield waste-to-energy ("WtE") facility with integrated carbon capture. The project is being developed by Varme Energy ("Varme") with financial support from Canada Growth Fund ("CGF") and Emissions Reduction Alberta. This facility will take municipal solid waste (MSW) currently being driven and tipped in a landfill that's a 180 km round trip outside Edmonton. The Heartland Waste to Energy Project will instead divert 205 000 tonnes per annum of MSW into a new state- of- the -art WtE with carbon capture facility located on Gibson Energy's heavy industrial zoned land in Strathcona County. This project is a BECCS based pathway that will also stack methane avoidance carbon credits through Alberta's TIER compliance market.

Overall project design and implementation is lead by Varme COO Wayne Carey, Chair of the project engineering committee who has overseen the FEED study completed by WorleyCord and Babcock and Wilcox. Project carbon advisors BMO's capital markets team lead credit development activities including measurement and verification processes with Alberta's TIER system or alternative registries.

## 6.0 PROJECT DESCRIPTION

### 6.1 INTRODUCTION

This ERA funded activity was focused on the completion of the FEED study to deliver a class 3 cost estimate for Varme's waste to energy with carbon capture project. Additionally, the activity included certain scopes of work intended to move the project towards a final investment decision (FID) such as;

1) Planning, designing, and executing the outside battery limit (OSBL) interconnections including
    a. Internet connection
    b. Startup fuel source and connection
    c. Water access, treatment, and disposal
2) Development of 3D model and flyover video
3) Full Monte-Carlo risk matrix development and exercise
4) Planning and execution of technology supplier agreement and EPC agreements

Not included in the funded activities are regulatory application submissions, business development, and project financing.

### 6.2 BACKGROUND OF THE PROJECT

Varme Energy ("Varme") is currently in the development phase of building a first of a kind industrial scale WtE Facility with Carbon Capture and Storage ("CCS") in Alberta ("the Project"). The facility will use Municipal Solid Waste ("MSW"), containing both organic and non-biogenic waste, to generate low carbon intensity electricity for export to Alberta's grid. Diverting waste from municipal landfills avoids methane emissions that would have been emitted in the absence of the Project activity. The associated carbon dioxide (CO2) emissions from the Project will be permanently sequestered underground, creating a waste management and energy production solution that will significantly contribute to Alberta accomplishing its stated goal of achieving net zero by 2050.

Varme's objective is to demonstrate the capacity of this technology to provide a marketable solution that reduces greenhouse gas (GHG) emissions when compared with conventional landfill disposal. Emissions reductions are a result of decreasing landfill waste and associated methane emissions; converting waste to energy, thereby

displacing more carbon-intense forms of energy in the electrical grid; and capturing and storing carbon dioxide. The project will result in benefits to Alberta's economy by attracting clean technology investment, adding to the capacity of, diversifying, and lowering the C02 intensity of Alberta's electrical grid, adding to the local metals recycling market, enhancing Alberta's participation in the carbon credit market, creating jobs, attracting highly skilled professionals, and avoiding landfill expansion thereby freeing up land for higher value development.

Varme's business plan includes the build out of a portfolio of these facilities and become a sustainable waste management solution for other regions of the province. The company has been doing pre-feasibility work for multiple additional projects across Alberta including the Fort MacMurray region, Southern Alberta, Central Alberta and Calgary. Varme has received funding support from Emissions Reduction Alberta to progress the front-end engineering and design (FEED) study and other pre-final investment decision (FID) deliverables.

## 6.3 PROJECT OBJECTIVES

The objective of the Funded Activity is to demonstrate the capacity of this technology to provide a marketable landfill diversion solution that reduces GH) emissions when compared with conventional landfill disposal while generating clean energy. Emissions reductions result from a 50% decrease in waste hauling, diverting landfill waste and associated methane emissions; converting the diverted waste to electrical energy, thereby displacing more carbon-intense forms of energy in the electrical grid; and capturing and storing carbon dioxide generated from electricity production.

Key Activity Objectives:

- Advancing the Front-End Engineering and Design study
- Deliver Class 3 cost estimate that will be converted to a fixed price for the execution of the project.
- Execution Schedule that meets the current commercial conditions for the Project
- Risk Register and Risk Mitigation exercise that can be utilized by the Partners to evaluate the project
- Generate FEED Engineering materials that support the Design Basis and Commercial structure. (Energy produced and CO2 captured)
- Submission of Regulatory Applications to provide certainty to the Partners for FID.
- OPEX Cost Estimate
- Cost reduction exercise to optimize facility design to reduce capex and opex
- EPC Contract and supply agreements with major vendors to provide cost certainty to the Partners for FID

## 6.4 PERFORMANCE/SUCCESS METRICS IDENTIFIED IN THE CONTRIBUTION AGREEMENT

**ERA Project Scope**

The milestone timelines shifted due to changes in schedule of the engineering work; however the overall FEED study schedule and other deliverables did not shift substantially.

The project added engineering scope focused on assessing the amine selection. The initial FEED study was based on an MEA amine solvent, results from the engineering work indicated an opportunity to decrease OPEX and CAPEX through a more detailed evaluation of more advanced amine solvents which is ongoing.

Varme hired a project manager to support the FEED study work and manage the interactions with Worley, B&W, and other consultants and sub-contractors. Varme also brought on a commercial and legal advisor to provide

guidance on the structuring of the EPCM and technology supply agreements which are critical to the company delivering on the project execution successfully.

**Varme Structure Change**

Company's corporate structure remained relatively similar, increased executive team capacity with the addition of our President and Chief Commercial Officer Andreas Karlsen from Norway on a 3 year working visa to progress the commercial and corporate structure of Varme and its projects.

**Project Structure Change**

The project site remains on Gibson Energy land within Strathcona County, all environmental and utilities permits and applications have been completed based on this site location. The Canada Growth Fund has a 40% equity interest in the project. Varme is running a formal equity raise process to fulfill the remaining equity position with an outside investor.

### 6.5 TECHNOLOGY RISKS

Varme identified early on in this project that the flue gas composition is a risk for the integrated operations of these two technologies. Characterization of the City of Edmonton's waste feedstock will be necessary on ongoing basis to inform the operations.

At the beginning of the project, there was significant risk that the flue gas would not meet the air emissions standards set by Alberta's Designated Industrial Zone and Alberta Energy Regulator. With the study complete, we have assessed B&W's flue gas technology package and are confident it will meet the regulatory requirements. Some risk still exists around the flue gas composition and its downstream impact on carbon capture operations – since the data being modelled is from historical facility data and waste characterization.

Changes to CSA or other technical standards may cause design changes due to not granting "grandfather status". For all types of equipment being purchased for Varme's project this has been considered to mitigate risk of meeting technical standards or being fit for purpose for our HMB and the site characteristics.

## 7.0 PROJECT WORK COMPLETED AND OUTCOMES

### 7.1 METHODOLOGY

This funded project was a Front-End Engineering and Design (FEED) study and other pre-FID deliverables. The work was managed completed by Varme's management team and the relevant contractors and vendors. The FEED work was built off of an existing Class cost estimate and conceptual design. It was developed thoroughly with the objective of providing a detailed project design and execution plan, identifying any risks, and developing a + or – 15% cost estimate.

### 7.2 TECHNOLOGY DEVELOPMENT

This project involved the integration of two existing technologies, rather than the development of new technology. Key objective that moved the technology integration forward and reduced technical risk was the selection of appropriate amine for the CCS process.

Commissioning activities for the facility will be built out by Varme and the selected operator over the next 24 months.

### 7.3 PROJECT ACHIEVEMENTS, RESULTS, AND ANALYSIS

The project delivered a class 3 cost estimate and 3D model as well as the procurement packages that will be sent to vendors for final material pricing. These documents will be presented to the project's Steering Committee for FID decision.

Overall project outcomes:

- Class 3 cost Estimate and 3D Model
- Procurement packages, records of the final cost and model review and the final cost estimate.
- Completion and review of Monte Carlo Risk Matrix
- Execution plan for OSBL interconnections (Internet, startup fuel, electricity connection)
- All major regulatory applications submitted or approved

## 8.0 LESSONS LEARNED

### 8.1 CHALLENGES

Varme found it challenging to coordinate with the multiple interfaces between our design engineers, technology suppliers, and commercial stakeholders. This resulted in some lost time near the beginning of the project as these parties all learned how to work collaboratively together with Varme.

Near the beginning of the study, Varme struggled to coordinate the City of Edmonton's waste characteristic results with B&W's flue gas composition analysis from previous projects. We learned that there are multiple approaches to calculating this flue gas composition based on waste feedstock characteristics which caused challenges initially. We had to ensure all project proponents were using the appropriate methodology for calculating this.

Through the waste characterization process, Varme learned that the calorific value of the City's waste was lower than it had previously expected and modelled. This led to the upsizing of the facility by 25% from 150,000 to 205,000 tonnes annually as a base case.

Initially, the overall parasitic load for the carbon capture process was significantly under-estimated which resulted in a decrease in net exportable power – a minor commercial impact to the project.

### 8.2 PRACTICAL LEARNINGS

Varme engaged an external CCS engineering firm to validate process design and amine selection impacts for capturing CO2 from the waste to energy process. The facility boiler and CCS plant technology quality assurance and validation was completed along with a separate amine selection study to inform the CCS plant design.

Varme worked closely with SME's and the Government of Albert to prepare and submit an EPEA permit that includes unique consideration for flue gas testing methodology that can now be replicated across future WTE + CCS projects.

### 8.3 ORGANIZATIONAL LEARNINGS

A comprehensive Monte Carlo risk register simulation was completed to establish objective contingency, and escalation amounts for the project with an integrated team from Varme, B&W, and Worley

A major lesson for Varme was that more effort was needed in the Class 5 cost estimate that formed the basis of the FEED study. Future projects will undergo a more structured, gated process to advance from feasibility to Class 5 into FEED and class 3. This would have prepared the organization for the significant capex increase from Class 5 to Class 3.

### 8.4 HIGHLIGHTS

Some of the key highlights discovered through the project were;

- Understanding the impact of a lower calorific waste value and higher parasitic consumption of the CCS operations that ultimately drove the decision to increase the size of the facility by 25%.
- Informing the CCS amine selection process to meet the flue gas specification while optimizing for capex and opex.
- Informed Varme that the facility will actually generate water from its waste feedstock and will not require third-party water supplier for its process water needs. This led to the design for on-site water treatment and a disposal well.

## 9.0 GHG BENEFITS

Our funded activity does not result in direct GHG emission reductions, however the HMB and facility design will contribute data for the quantification of its overall emissions profile and reductions.

### 9.1 PROJECT BASELINE EMISSIONS

**Table 2. Example baseline emissions case**

| SOURCE | Annual Emissions | Absolute Emissions |
|---|---|---|
| Organic Waste Transport | 651 | 16,936 |
| Landfill decomposition | 6,300 | 1,801,806 |
| Fuel extraction and processing | 7,750 | 36,881 |
| Grid Electricity Generation | 6,451 | 167, 723 |
| TOTAL | 77,821 | 2,023,345 |

The baseline is calculated assuming status-quo landfilling of the 205,000 tonnes of municipal solid waste per year and the resulting methane emissions.

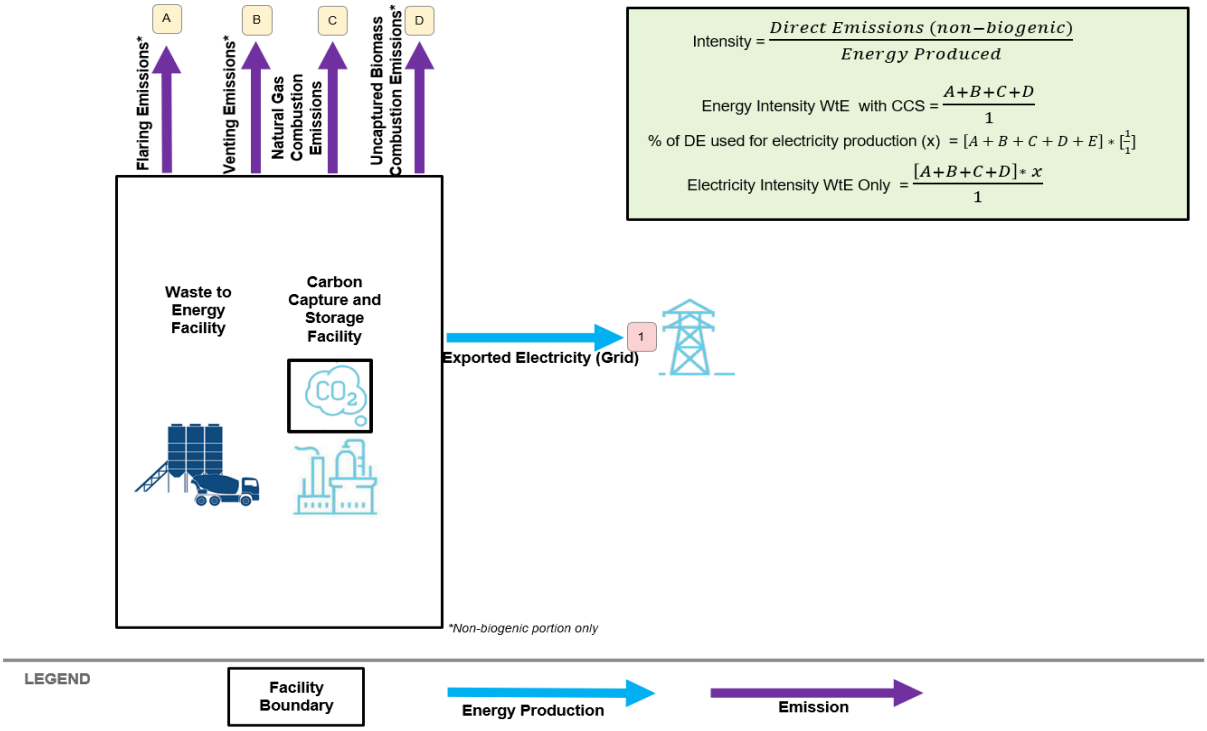
### 9.2 PROJECT EMISSIONS

**Table 3. Calculated emissions intensity of Varme's project (pre & post CCS calculation, inclusive of biogenic CO2 fraction)**

| Calculation - Electricity Emissions Intensity | | | | |
|---|---|---|---|---|
| Intensity | Value | Units | Calculation | Comments |

| | | | | | |
|---|---|---|---|---|---|
| Calculations | Non-Biogenic Direct Emissions (WtE + CCS) | 4,969 | tCO2e | Non-Biogenic Carbon Flared by WtE + Non-Biogenic Carbon Vented by WtE + Non-Biogenic Carbon Not Captured by CCS + Total WtE Natural Gas Fuel Consumption Emissions (CO2e) | Non-biogenic portion only |
| | Non-Biogenic Direct Emissions (WtE) | 75,681 | tCO2e | Non-Biogenic Carbon Produced by WtE + Total WtE Natural Gas Fuel Consumption Emissions (CO2e) | Non-biogenic portion only |
| | Energy Production (WtE + CCS) | 56,400 | MWh | Energy Production Net CCS Electricity Load | |
| | Energy Production (WtE) | 195,200 | MWh | CCS Heat Load (MWh) + Energy Production Net CCS Electricity Load + CCS Electricity Load | |
| | WtE % Electricity Production | 62% | % | (Energy Production Net CCS Electricity Load + CCS Electricity Load) / Energy Production (WtE) | |
| | WtE % Heat Production | 38% | % | CCS Heat Load (MWh) / Energy Production (WtE) | |
| | WtE + CCS % Electricity Production | 100% | % | Energy Production (WtE + CCS) / Energy Production (WtE + CCS) | |
| WtE with CCS | Energy Carbon Intensity WtE and CCS | 0.088 | tCO2e/MWh | Non-Biogenic Direct Emissions (WtE + CCS) / Energy Production (WtE + CCS) | |
| | Electricity Carbon Intensity WtE and CCS | 0.088 | tCO2e/MWh | Direct Emissions (WtE + CCS) * WtE % Electricity Production / (Energy Production Net CCS Electricity Load) | |
| WtE Only | Energy Carbon Intensity WtE Only | 0.388 | tCO2e/MWh | Non-Biogenic Direct Emissions (WtE) / Energy Production (WtE) | |
| | Electricity Carbon Intensity WtE Only | 0.388 | tCO2e/MWh | Direct Emissions (WtE) * WtE % Electricity Production / (Energy Production Net CCS Electricity Load + CCS Electricity Load) | |
| | Heat Carbon Intensity WtE Only | 0.108 | tCO2e/GJ | Direct Emissions (WtE) * WtE % Heat Production / CCS Heat Load (GJ) | |

**Figure 1. Emissions intensity calculation of WTE with CCS (provided by BMO)**




## 9.3 EMISSIONS REDUCTION IMPACT

This FEED study was not designed to provide the emissions reduction calculations; however, it will inform these calculations. These calculations are being done separately by the development team and its consultants. Additional calculations can be provided if the ERA team would like.

Baseline Emissions Sources

- Landfill waste degradation (methane generation and release)
- Waste collection and transport
- Grid sourced electricity

Varme's project will ultimately reduce GHG emissions by addressing baseline emissions through several pathways.

- Reduce the waste hauling distance and associated hauling emissions. This analysis is based on the difference in hauling distance between the City of Edmonton and the Ryley Landfill (180km) vs. the project site (90km). The market analysis assumes this distance change (i.e., 90km) for each of the four additional facilities.
- Avoided methane emissions from landfill decomposition by diverting waste for energy generation
- Generate decarbonized power, thereby reducing the need for power from natural gas power plants or other fossil fuel sources

# 10.0 ENVIRONMENTAL, ECONOMIC, AND SOCIAL IMPACTS

## 10.1 OTHER ENVIRONMENTAL IMPACTS

Unlike conventional WTE systems, which primarily focus on landfill diversion and energy recovery, Varme's facility represents a novel convergence of multiple advanced technologies to maximize environmental and economic benefits.

This project is designed to simultaneously:

1) Avoid methane emissions by diverting municipal solid waste from landfills.

2) Generate clean, baseload energy to supply local grids, displacing fossil fuel-based generation.

3) Capture and permanently store carbon emissions from the combustion process

4) Upcycle process byproducts into valuable materials, such as construction aggregates or recycled waste streams, further reducing waste and enhancing circular economy principles.

5) Eliminating the potential for accumulation of leachates and microplastics in local ecosystems and watersheds

## 10.2 PROJECTED ECONOMIC IMPACT

**Socio-Economic Impacts:**

The project represents a ~$700+ million investment into Alberta's economy and infrastructure.

This project will implement one of the first incineration-based WtE plants with integrated carbon capture and storage. This facility will require advances in engineering design and construction. Moreover, given the novelty of this technology, it is not considered by current regulations, policies, and protocols. Therefore, Varme will be determining how to ensure this technology is accepted on the regulatory, permitting, and carbon credit protocol fronts that will move the industry forward.

One of the major indirect benefits of landfill diversion is the conservation and value retention of our land for ecological recovery, agriculture, or commercial/residential development. Utilizing land for landfilling is the lowest GDP and highest liability creation activity that we can subject it to. Without a sustainable waste to energy option available in the market, our waste diversion market is unable to fully divert municipal solid waste from needing landfills.

**Job Creation:**

**The Funded Project:**

This FEED study directly fully or partially funded the employment of 8 development positions within Varme that led and supported the different FEED study related work streams. Indirectly, an estimated 50 sub-contractors, consultants and engineers working on multiple aspects of the FEED study and other deliverables.

**The Facility:**

Once into construction, the Waste to energy with carbon capture facility will generate up to 300 engineering and construction jobs and once commissioned, create 30 full time jobs for operations and maintenance of the facility.

In addition to this, Varme's project will contribute significantly to the labor economy through;

- Attracting talented, highly skilled professionals to Alberta to work with sustainable assets
- Providing capacity- and skill-building opportunities for young professionals in the province
- Providing opportunities for women and gender-diverse individuals who want careers in the skilled trades, trucking, and related fields by becoming an Employer of Choice with Women Building Futures

### 10.3 RESULTED INNOVATION CAPACITY

Throughout this project, Worley has been able to gain its first ever access on designing and integrating a waste to energy facility with post-combustion carbon capture. This will generate value to the wider innovation economy in Alberta as they go on to leverage this learning with other projects.

B&W has developed multiple white papers tied to this project and the novel integration of waste feedstocks producing unique flue gas for a carbon capture system to operate with. These white papers are listed below under Scientific Achievements.

Varme has developed good relationships with several post-secondary institutions. In 2023, Varme sponsored two students from NAIT to complete a Capstone project with Varme's business. Varme has received letters of support from both University of Alberta and University of Calgary.

### 10.4 SOCIAL IMPACT AND EDI OUTCOMES

**Women Building Futures:**

Varme will provide opportunities for women and gender-diverse individuals who want careers in the skilled trades, trucking, and related fields by becoming an Employer of Choice with *Women Building Futures*

**Local Landowner Engagement:**

Hired local community engagement experts to support landowner and regional stakeholder engagement process

Oct 9, 2024: Participated in a public community town hall to share project status

Mar 2025: Completed Environmental Protection and Enhancement Act (EPEA) public program with no formal Statements of Concern (SOC) registered by the community during the formal intake

**Indigenous Engagement**:

Active dialogue with Alberta Indigenous Opportunities Corporation (AIOC) exploring post-FID investment opportunities for multiple Nation's into Varme's project portfolio

Plan in place for 5% minimum project scope with Indigenous services and suppliers

## 11.0 SCIENTIFIC ACHIEVEMENTS

Below is a list of white papers that were published or used by Babcock and Wilcox during this project. Note, all of these are available publicly but can be made available on request.

BR1279 Furnace Wall Corrosion in Refuse Fired Boilers

BR1280 Considerations for the Design of Refuse-Fired WaterWall Incinerators

BR1292 Continuously Monitoring Furnace Temperatures in Refuse Fired Boilers

BR1290 Operating Experience is Reflected in Nashville's New Refuse Boiler

BR1289 Considerations in the Design of High Temperature and Pressure Refuse Fired Boilers

BR1344 Design and Operating Experience with High Temperature and High Pressure Refuse Fired Boilers

BR1366 Resource Recovery in Palm Beach

BR1378 Waste Fuels: Their Preparation, Handling and Firing.

BR1410 Application of Selective Catalytic Reduction for NOx Control with Waste Fired Boilers

BR1822 Increasing the Combustion Capacity and Performance of Existing Waste to Energy Plants

BR1935 World Class Technology for the Newest Waste to Energy Plant in North America – Palm Beach Renewable Energy Facility 2

**For carbon capture:**

BR1848 Clean Coal Technologies with Carbon Capture Systems for the Electric Power Industry Addressing Operational Flexibility and Costs

BR1854 B&W Demonstration Ready RSAT Technology for Post Combustion Carbon Capture

BR1869 Reducing Carbon Footprint by Deploying Advanced Steam Plants and Integrating Carbon Capture Technologies

BR1871 B&W's RSAT Process and Field Demonstration of OptiCap Solvent at US DOE's National Carbon Capture Center

BR1926 Design and Initial Operating Experience of a 150 MWe Utility Boiler Upgrade to Optimize Carbon Capture and Storage

## 12.0 POST-PROJECT STEPS

### 12.1 NEXT STEPS AND FOLLOW-UP PROJECTS

Varme's immediate next step for the project will entail kicking off a more detailed engineering study to progress detailed design and find capital reduction opportunities. We will also develop a construction execution plan, complete RFQs for major equipment items, issue purchase orders, and progress the engineering, construction and management contracts with chosen vendors and contractors.

### 12.2 PARTNERSHIPS (REMOVED)

## 13.0 OVERALL CONCLUSIONS

The class 3 cost estimate is sufficient for Varme to move forward with an equity finance process. However, there remains significant uncertainty around certain scopes of the facility design, indicating a need for continued engineering work that will improve the cost estimate and can be focused on cost-reduction opportunities.

Varme is compiling a scope of work that will sufficiently move the needle on facility design and cost reductions and will be seeking additional capital to continue this work.

## 14.0 COMMERCIALIZATION AND TECHNOLOGY TRANSFER PLAN

### 14.1 PROJECT COMMERCIALIZATION ADVANCEMENTS

No commercialization metrics were specified in the CA. Varme's Knowledge Transfer Plan contains details for business model and commercialization pathway.

#### 14.1.1 PROJECT TECHNOLOGY ADVANCEMENTS

This FEED study has provided extensive insight into the design and operability of a waste to energy with carbon capture plant. It's provided knowledge sharing opportunities for Varme, Worley, B&W, City of Edmonton, and other commercial partners to better understand the impacts of waste characteristics on flue gas and CCS amine reactions.

The study has generated a capital estimate and significantly de-risked the construction of the project, which will create investment certainty for the equity partners.

#### 14.1.2 PROJECT TRL ADVANCEMENTS

The project's TRL has gone from an 8 to 9 throughout this project.

### 14.2 TECHNOLOGY PROVISION AND THIRD-PARTY VENDORS

**Babcock & Wilcox (B&W)**

### 14.3 COMPETITIVE SCAN

The waste-to-energy sector depends on waste feedstocks and primarily competes with landfills for market share. Varme's solution provides a superior economic and environmental alternative to landfilling and other landfill diversion methods. Unlike composting and anaerobic digestion, which can only process organic waste, Varme's technology can handle both organic and inorganic waste, allowing for the diversion of a greater share of municipal solid waste. Compared to pyrolysis and other emerging waste-to-energy technologies, incineration is a more proven, lower-risk solution that is already commercially viable for processing mixed waste streams.

Furthermore, Varme's WtE approach is more economically sustainable than landfilling. Traditional landfills generate long-term liabilities, including methane emissions, leachate management costs, and eventual site remediation expenses. In contrast, Varme's facility transforms waste into a revenue-generating asset through energy production, carbon credit generation, and the sale of byproducts. The integration of carbon capture and storage further enhances the economic value of the project by providing an avenue for monetizing emissions reductions, attracting jurisdictions and corporations seeking innovative ways to meet sustainability targets.

As the first private greenfield installation of this kind, Varme will establish a competitive advantage by proving the feasibility and benefits of this approach. The ability to finance, build, and operate such a complex facility will position Varme as a leader in the Canadian waste-to-energy sector, paving the way for future projects and expansion.

### 14.4 MARKET AND END-USERS

**Alberta Focus:**

Alberta provides a distinct competitive advantage forWtE with carbon capture due to its leadership in carbon capture, utilization, and storage (CCUS). The province has invested billions into CCUS projects, leading to robust regulatory frameworks, extensive knowledge sharing, and well-established infrastructure. As an early pioneer, Alberta was the first to inject solvents for enhanced oil recovery (EOR) in the 1950s and later developed subsurface $CO_2$ disposal methods for natural gas processing. In 2010, it introduced Canada's first comprehensive carbon sequestration legislation, reinforcing its commitment to emissions reduction. With approximately 78 billion metric tons of proven geological storage capacity, Alberta offers a highly viable and de-risked environment for large-scale $CO_2$ sequestration. The province's rigorous regulations ensure stability and predictability for CCUS projects, making it an ideal market for integrating WtE with carbon capture. Given that WtE facilities both reduce landfill methane emissions and generate $CO_2$, Alberta's existing CCUS infrastructure and favorable policies position it as the optimal location for Varme Energy to deploy its innovative waste-to-energy with carbon capture solution.

**Canada Expansion Opportunities:**

Beyond Alberta, certain jurisdictions within Canada are beginning to advance knowledge around carbon sequestration opportunities within different geologies. Provinces are also beginning to develop regulatory and policy frameworks to support their own respective CCS industries. As these pieces progress, Varme is establishing relationships with municipalities that are looking for sustainable waste diversion solutions and are determining project feasibility for its growing portfolio.

### 14.5 MARKETING

Varme is very active on LinkedIn and runs a company newsletter for major company and project updates and general marketing.

Varme participates in several public presentations, conferences and news interviews each year to market and promote the waste to energy industry.

### 14.6 DISTRIBUTION

The communication pathway that Varme has established will be replicable and copied across the portfolio of early stage projects Varme is looking at developing. Engagement with municipalities and waste companies is the key focus for distributing the technology solution to other Cities and regions.

### 14.7 TECHNOLOGY PROTECTION

IP is not a concern for Varme as we will be entering into contracts directly with the owners of IP associated with operations of the facility (notably, B&W). The contracts contain, or will contain, standard commercial terms including a representation and warranty from the counterparty that they have all IP rights necessary to grant any rights or licenses to the Applicant to use the IP. Varme is working with external counsel to ensure that the contracts provide necessary rights and protections in respect of intellectual property matters.

Any new intellectual property being generated will come from the integration of the waste to energy and carbon capture technologies in the overall process.

Varme is setting up this project as a special purpose vehicle (SPV) and the intention is for this entity to own or share any IP resulting from the integration of component technologies. Varme's full IP strategy is still under development.

### 14.8 COST OF COMMERCIALIZATION

The full budget for the now completed FEED study, SG&A and other pre-FID deliverables comes to $7.3 million.

The transfer plan outlines the commercialization pathway that Varme has developed to take the learning from this funded project and leverage it into a full- scale deployment of the solution and a replication of this across jurisdictions.

### 14.9 SHORT-TERM ACTIONS

Varme is progressing the final commercial agreements including the power purchase agreement (PPA) and Carbon Dioxide Removal (CDR) offtake/purchase that are required to secure an equity partner to co-finance the project. These steps are critical to advance the project from shovel ready into the construction phase.

### 14.10 LONG-TERM COMMERCIALIZATION

Varme continues to advocate for strong provincial landfill diversion policies that will influence how municipalities are incentivised to deal with their municipal solid waste, and positioning waste to energy with carbon capture as a complete solution.

Varme is in discussions with potential equity investors that are keen to advance a portfolio of projects under similar commercial structures. There is also significant efforts being made with other municipalities to explore novel or unique commercial structures that will enhance the business case for this technology solution.

## 15.0 COMMUNICATIONS PLAN

### 15.1 KNOWLEDGE SHARING DURING PROJECT

As part of the regulatory process to secure it's Environmental Protection and Enhancement Act Permit and it's Rule 007 Alberta Utilities Commission Permit, Varme was required to share some of the learning from this project publicly and selectively with landowners and nearby industry proponents. The ERA funded project supported our ability to do this in a timely manner to maintain the project's schedule.

Varme has spoken at public events and referenced ongoing work being completed as part of this funded project. These include;

Town of Devon's *Walk the Talk Presentation* (April 2025)

Canadian Hydrogen Convention – Edmonton Unlimited Clean Tech Pitch (April 2025)

### 15.2 KNOWLEDGE SHARING POST PROJECT

Varme publishes a newsletter every 1-2 months which will share the completion of this FEED study and other pre-FID deliverable announcements – with appropriate recognition to ERA's funding support.

Varme will be speaking at several major industry events over the next 12 months including but not limited to;

- Inventures 2025 (Calgary)
- Global Energy Show 2025 (Calgary)
- Carbon Capture Canada 2025 (Edmonton)
- Carbon Capture Canada (Edmonton)

## 16.0 LITERATURE REVIEWED.

N/A

**Definitions**

B&W – Babcock and Wilcox (Company)
CDR – Carbon Dioxide Removal
FID – Final Investment Decision
MSW – Municipal Solid Waste
RFQ – Request for Quote