##### 2.1.0.104 System Modeling of the Waste to Energy Industry

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| --- | --- |
| **Project General Information** | |
| **Current Year CPS Agreement Number:** 29525 | **Prior Year CPS Agreement Number:** |
| **Work Category:** AOP Project (Direct-Funded Lab Project) | **FOA Number:** |
| **Mod:** 0 | **Planned Project End Date:** 9/30/2021 |

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| **Project Ownership and Performers** | |
| **EERE Project Lead Information** | **Lab Performer Information** |
| **Name:** Hoffman, Beau | **Name:** Inman, Danny |

**Project Summary**

Leveraging existing waste from landfills, confined animal feeding operations (CAFOs), and publicly owned treatment works (POTWs) to generate energy and produce chemicals could add revenue to existing waste disposal/treatment operations and contribute to high-level sustainability goals. Although these waste streams are readily available throughout the country, most of the current waste-to-energy projects only utilize biogas to produce electricity. Transitioning from the current status of disparate projects producing low-value energy to a cohesive industry optimized around producing fuels and chemicals from waste will require a systems approach to understand the impacts of external factors, internal feedbacks, and key levers and maximize the impact of the Department of Energy’s efforts.

**Project Objectives**

The objective of this project is to perform systems analyses to elucidate the impact of policy, R&D, and technoeconomics on the waste-to-energy system as a whole as well as at specific points in supply chain and for individual sectors (i.e., landfills, CAFOs, POTWs). This project will leverage existing DOE models (e.g., the Waste-to-Energy System Simulation (WESyS) model), along with current DOE technoeconomic data, resource assessment data, and stakeholder input to perform analyses that are directly tied into the DOE’s Bioenergy Technology Office goals. This project differs from the previously DOE-funded WESyS project in that it is primarily analysis-focused. The two-year WESyS project (2016 – 2017) was predominately focused on model development, calibration, validation, and data collection. This project will leverage these activities to produce simulation-based analyses.

**Modality Summary**

| **Modality #** | **TRL #** | **Modality(s)** | **Total FY 2020 Cost** | **Weight (%)** |
| --- | --- | --- | --- | --- |
| 5 |  | Strategic, Market and Techno-Economic Analysis | $306,000 | 100% |
| **Project Total** | | | **$306,000** | **100%** |

**Related Projects**

|  |  |  |  |
| --- | --- | --- | --- |
| 2.2.1.108 | Waste to Energy Feedstock Evaluation | Multi-performer Project | Anelia Milbrandt |

**Multi-Performer Projects**

*There are no Multi-Performer Projects on this project.*

**Milestones**

| **Milestone Name/Description** | **Criteria** | **End Date** | **Type** |
| --- | --- | --- | --- |
| Provide model documentation to relevant stakeholders as part of the formation of an external advisory board in Q2. Supporting documentation will be decided on in consultation with DOE and could include a draft methods section for a journal article or a one-page flier that highlights the methods, approach, and capabilities of WESyS. |  | 12/30/2019 | Quarterly Progress Measure (Regular) |
| Formation of an external advisory board (targeting up to 10 members) and initial model review webinar. We will contact interested stakeholders from industry, government, and academia to serve as an external advisory board for the WESyS project. This board will provide critical input on modeling approaches, scope, analysis questions, and results. We will use the documentation developed in Q1 to execute an initial model review webinar with the external advisory board by March 30, 2020. |  | 3/30/2020 | Quarterly Progress Measure (Regular) |
| Summarizing input received from the first review with the external advisory board, including input on the approach, scope, results, and outcomes. We will also outline next steps identified during the model review. |  | 6/30/2020 | Annual Milestone (Regular) |
| Synthesis of the insights gained through sensitivity and scenario analyses performed in FY19. This systhesis will be the basis of a manuscript suitable for submission to a relevant refereed journal. This synthesis will be in the context of providing DOE and the community at large with actionable information. We will provide BETO with a draft manuscript by the end of the quarter. Submission to a suitable journal will be at a later date, likely within the 2020 calendar year. Whether to proceed and the exact date of submission is dependent on NREL and DOE reviews. |  | 9/30/2020 | Quarterly Progress Measure (Regular) |

**Go/No-Go Decisions**

| **Name** | **Description** | **Criteria** | **Date** |
| --- | --- | --- | --- |
| Critical model review | Are the analyses and model relevant for BETO and the stakeholder community at large? This decision will be based on the review of our model documentation by BETO. | 1) Meets BETO/stakeholder needs; proceed.  2) There are model and data deficiencies; update the model and/or data deficiencies.  3) The model and analysis fail to meet BETO/stakeholder needs; terminate project. | 06/30/2020 |

**Risks**

| **Name** | **Status** | **Target Completion Date** | **Severity** | **Response** | **Description** |
| --- | --- | --- | --- | --- | --- |
| Budget uncertainty |  | 9/30/2020 | High |  | PI will frequently communicate with BETO technical monitors and financial analysts to anticipate potential budget changes. PI will use active financial management to keep the project nimble in the face of unforeseen budget uncertainties. |
| Shifting requirements |  | 9/30/2020 | Low |  | Inclusion of plans for specific analysis topics in AOP, with precise analysis topics determined later in consultation with BETO in order to be responsive to emerging issues. |

**Tasks**

| **Name** | **Description** | **Funding** |
| --- | --- | --- |
| WTE systems analysis, including manuscript preparation | Much of the effort in FY20 will be focused on developing a manuscript that collates the insights gained through sensitivity and scenario analyses performed in FY19. The focus of the article will be decided on in consultation with DOE. One example would be to describe how learning parameters impact investment in low-TRL WTE technologies such as hydrothermal liquefaction (HTL). This task will support the preparation of the manuscript delivered in Q4 of FY20 and the execution of additional analyses, as needed, to support its development. | $130,000 |
| Model review with external advisory board | This task includes forming an external advisory board, executing an initial model review webinar, and developing a memo to summarize the input received from the webinar. | $66,000 |
| Model documentation | This task will entail producing a model overview presentation and supporting documentation, including information on data sources, core equations and their explanation, policy implementation, figures presenting key model concepts including influence diagrams, logic, and data relationships. This documentation will be used to support the development of the external advisory board and may be modified as supplementary information for the manuscript. | $75,000 |
| Model maintenance and improvement | Initial implementation of model improvements based on the board’s feedback (in order to be responsive to the external advisory board and to perform initial analyses). | $35,000 |

**Subcontractors**

| **Name** | **Sub ID** | **Responsibility** | **Planned Cost ($)** | **Type** | **Start Date** |
| --- | --- | --- | --- | --- | --- |
| Lexidyne, LLC | LEU-6-62525-01 | Primary Performer of critical modeling base code development and systems thinking consulting | $54,000 | For-Profit Organization | 10/1/2018 |

**Travel**

| **Month-FY** | **Destination** | **Purpose** | **Estimated Cost** | **Travel Type** |
| --- | --- | --- | --- | --- |
| October | WEF-TEC | To attend and present at an industry-relevant conference. | $4,000 | Domestic |

**Project Financial Details**

| **Funding Type** | **FY 2019 Cost** | **Total FY 2020 Budget Authority (Planned)** | **Total FY 2020 Funding Level (Planned)** | **FY 2020 Cost (Planned)** | **FY 2021 Beginning Uncosted (Estimated)** | **% Uncosted (Estimated)** | **FY 2021 Funding Level (Planned)** | **FY 2022 Funding Level (Planned)** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **BM0101010** | **$306,000** | **$300,000** | **$348,000** | **$306,000** | **$46,000** | 15 | **$300,000** | **$300,000** |
| Cap Equip | $0 | $0 | $0 | $0 | $0 | 0 % | $0 | $0 |
| Operating | **$306,000** | **$300,000** | **$348,000** | **$306,000** | **$46,000** | 15 | **$300,000** | **$300,000** |
| **Total** | **$306,000** | **$300,000** | **$348,000** | **$306,000** | **$46,000** | 15 | **$300,000** | **$300,000** |

**Project Cost Plan**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Funding Type** | **OCT** | **NOV** | **DEC** | **JAN** | **FEB** | **MAR** | **APR** |
| **BM0101010** | **$13,000** | **$23,000** | **$21,000** | **$25,000** | **$23,000** | **$23,000** | **$27,000** |
| Cap Equip | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| Operating | $13,000 | $23,000 | $21,000 | $25,000 | $23,000 | $23,000 | $27,000 |
| **Total** | **$13,000** | **$23,000** | **$21,000** | **$25,000** | **$23,000** | **$23,000** | **$27,000** |
| **Funding Type** | **MAY** | **JUN** | **JUL** | **AUG** | **SEP** | **Total** | **FY 2020 Beginning Uncosted (Estimated)** |
| **BM0101010** | **$31,000** | **$30,000** | **$29,000** | **$30,000** | **$25,000** | **$300,000** | **$48,000** |
| Cap Equip | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| Operating | $31,000 | $30,000 | $29,000 | $30,000 | $25,000 | $300,000 | $48,000 |
| **Total** | **$31,000** | **$30,000** | **$29,000** | **$30,000** | **$31,000** | **$36,000** | **$48,000** |

**Project Cost Breakdown**

| **Category** | **Total FY 2019 Funding Level** |
| --- | --- |
| In-House Labor | $248,000 |
| Subcontracts | $54,000 |
| Travel | $4,000 |
| Capital Equipment | $0 |
| Supplies | $0 |
| Other | $0 |
| **Total** | **$306,000** |