ALBERTA INNOVATES

CLIMATE CHANGE INNOVATION AND TECHNOLOGY FRAMEWORK

Awardee Summary

CCITF PROGRAM	Clean Technology Development
PROJECT TITLE	An AI-Enabled Non-Intrusive Approach for Optimal Planning and Operation of Sustainable Greenhouses
SECTOR	Low Carbon Electricity, Green Buildings
ORGANIZATION	University of Alberta
PROJECT LEAD	Hao Liang
AI PROJECT ADVISOR	Mehr Nikoo
GRANT AMOUNT	$90,000
START DATE	TBD
END DATE	TBD

PROJECT OBJECTIVE: Development of an artificial intelligence enabled non-intrusive approach for sustainable greenhouse operation.

PROJECT PROFILE: Greenhouses require significant energy resources, and in Canada, total demand is estimated at 8,101,688,133 kWh which translates to $288,250,000 in annual electricity, heating and transportation fuel costs. The severity of energy costs on the viability of greenhouse operations is primarily based on regional conditions and crop selection. But these variable costs represent one of the largest forces acting against domestic competitiveness and profitability. To execute Alberta's Climate Leadership Plan, we must address sector goals in GHG reduction and simultaneously reverse a negative trend in operating margins through unprecedented energy resource intelligence, and effective tools for optimal greenhouse planning and operations in the era of de-carbonization and sustainability.

Greenhouse Growers in Canada have identified the greatest threats to their operations and industry in the short and medium terms to be energy market exposure and market prices for their products. In Alberta, 42% agree with this assessment, with 21% concerned about the future of energy. It is obvious that reductions in energy consumption and increases in efficiency are paramount to the profitability and sustainability of the horticulture industry. Yet, energy efficiency is conventionally capital intensive and generally not practical for a large amount of growers. Less obvious and perhaps more critical is the realization that new business models, revenue streams and optimal business practices will be a necessary aspect of asset planning and operation.

To ultimately address the complex nature of optimal planning and operation in the context of a highly regulated sustainable greenhouse environment, we must develop a non-intrusive artificial intelligence (AI)

enabled approach, which can significantly increase our capability to resolve massive optimization problems in real-time.

Once the AI is enabled, our capacity to predict the future, optimize and asset plan for a sustainable greenhouse operation minimizes the need for additional ICT infrastructure and ultimately makes the energy intelligence universal. The proposed AI-enabled non-intrusive approach will be integrated with the industrial partner, Pomphrey Industries Corporation's DRAX platform and piloted at an existing 65,000 sq. ft. greenhouse facility located in Alberta. Useful production resources as a result of the pilot case study will be made available to industry to facilitate the transition to a cleaner, more profitable framework.

GHG EMISSION REDUCTION SUMMARY: