

# NYSP2I Conducts Performance Evaluation of Tyll Gen III-M Solar Photovoltaic Thermal (PVT) Panels



## Tyll Solar, LLC

Tyll Solar, LLC. (Tyll) is a solar energy research and development company located in Rochester, NY and a member of Venture Creations Incubator Program (VCI) supported by New York State Energy Research and Development Authority (NYSERDA). Tyll developed and produced an integrated photovoltaic thermal (PVT) solar panel intended to generate electrical energy greater than traditional photovoltaic (PV) panels while also providing heat. This is done by cooling the solar cells in the panels with liquid coolant flowing through a manifold on the back of the panel. When the cells are cooled, they produce more electricity, while the heat gained by the coolant can be then be used as a thermal energy source.

## Challenge

Tyll claimed their Gen III-M solar PVT panel design would have a significant impact on the total energy production of the panels and result in greenhouse gas (GHG) savings as compared to industry standard PV panels. Tyll sought to quantify the potential electrical and thermal performance and GHG impact of their product as compared to industry standard PV panels.

## Solutions

Tyll requested the assistance of New York State Pollution Prevention Institute (NYSP2I) to test and analyze the comparative energy performance and use phase GHG impact of the Gen III-M PVT panels at Rochester Institute of Technology's (RIT) solar test bed. In support of this evaluation, Tyll provided Gen III-M PVT panels as well as industry standard PV panels for a side by side comparison at the RIT test site. NYSP2I installed Tyll's Gen III-M PVT panels and the baseline PV panels in two separate arrays, providing electrical and thermal energy instrumentation to capture the input and output parameters of each array. Environmental factors such as solar irradiance, ambient temperature, wind velocity, and electrical and thermal output were logged by a custom data acquisition system created by RIT.

## Challenge

- Tyll Solar requested NYSP2I to quantify the electrical and thermal performance of the Gen III-M solar PVT panel design and determine the potential use phase GHG impact vs. industry standard PV panels.

## Solution

- NYSP2I installed Tyll Gen III-M PVT panels and the industry standard PV panels in two arrays at RIT's solar test bed located at the Golisano Institute for Sustainability.
- NYSP2I performed comparative testing and analysis over a 6 week period in Autumn, calculating the electrical and thermal energies in addition to the potential GHG impacts.

## Results

- Tyll Gen III-M solar PVT panels demonstrated the potential to produce significantly more total energy and have increased potential GHG reductions vs. the industry baseline PV panels due to the combined production of electrical and thermal energy.

## Results

NYSP2I filtered the test data to account for measurement accuracy and environmental limitations, improving the robustness of the data set. The filtered data was analyzed for the electrical and thermal performance of Tyll's Gen III-M PVT panels as compared to the industry standard PV panels, as measured at the RIT test site. The results are as follows:

### Comparative Analysis:

- Tyll Gen III-M PVT panels, when normalized for manufacturer flash ratings, produced on average 4.3% more electricity than baseline PV panels.
- Tyll Gen III-M panels produced on average 553% more total energy than baseline PV panels relative to the combination of electrical and thermal energy.

### Thermal Performance:

- Tyll Gen III-M PVT panels were able to capture and transfer on average:
  - ▶ 509 W and 4.79 kWh of thermal energy per panel per day, the equivalent of 0.163 US Therms of natural gas per panel per day over a six-week test period in typical September/October weather in Rochester, NY.

### Greenhouse Gas Emissions Impact (GHG):

- Tyll Gen III-M PVT panels are estimated to provide a potential GHG emissions reduction of:
  - ▶ 0.864 kgs of CO<sub>2</sub>e per panel per day when considering both electrical and thermal energy outputs as compared to using the electrical grid and natural gas for the equivalent energy.
  - ▶ 0.765 kgs of CO<sub>2</sub>e per panel per day more than the baseline PV panels as tested.

- Tyll Gen III-M PVT panels produced on average 553% more total energy than baseline PV panels, and similar electrical conversion efficiency.
- Tyll Gen III-M PVT panels provided a potential GHG emissions reduction of 0.765 kgs of CO<sub>2</sub>e per panel per day greater than the industry baseline PV panels as tested.

## Testimonial

"We have found that working with NYSP2I at RIT has been expeditious, professional and reliable. 'Third-party testing' from NYSP2I will be a respected component in our war chest moving forward into the market. We applaud the entire team for their efforts in completing this vital phase of our business."

**Jay Fischer, Founder and Chairman**

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