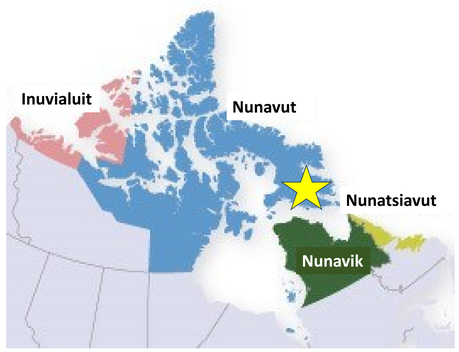
Canada – Inuit Nunangat – United Kingdom Arctic Research Programme 2021-2025

Advanced Solar Integration
A Component of the REMIROCaN Project



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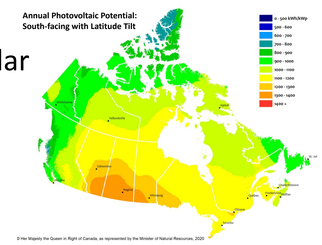
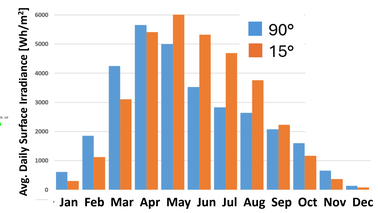
In collaboration with Nunavut Nukkiksautiit Corporation (NNC), a subsidiary of Qikiqtaaluk Corporation.
This work has been approved by the Nunavut Research Institute.

BUILDING INTEGRATED SOLAR

Low-Arctic Solar Potential

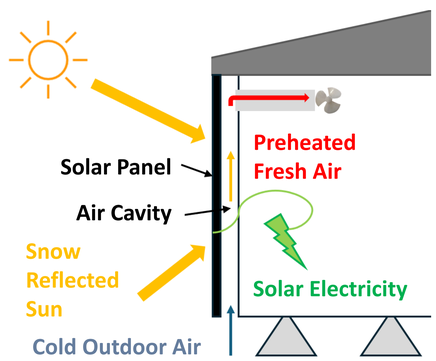
- Eastern and low-Arctic have good solar potential
- Higher PV efficiency in cold temperatures
- Several months of snow reflection
- Reduced diesel usage
- Building integration reduces land usage

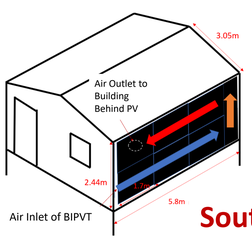




Building Integrated Photovoltaics/Thermal Collectors

- **Solar Electricity Generation**
- **Replaces cladding** serving as **rain** and **UV** barriers
- Improved **architectural integration**
- **Heat Recovery** for preheating **fresh air** or **heat pump**
- **Improves** Solar panel efficiency

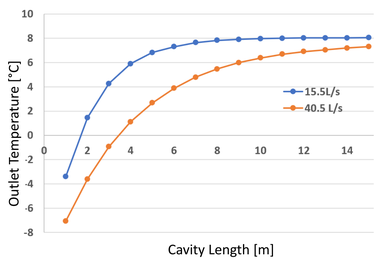




Iqaluit Demonstration House

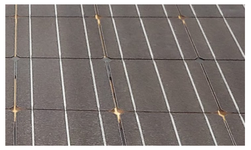
- **6-300Wp Semi-transparent PV**
- **1.8 kWp** Array
- **~3.4 MWh/year** electricity generation
- **Longer** air flow path = **higher** outlet air **temp**
- **10m instead** of **2.4m**

Mathematical Modeling using **Iqaluit Weather**



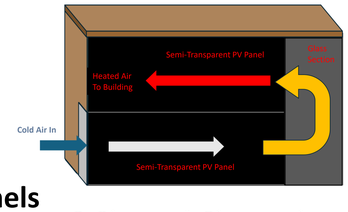
South façade area maximized with solar system

PROTOTYPE DESIGN



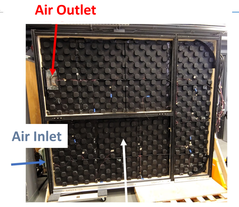
Semi-Transparent PV Panels and Clear Glass Section

- Space between solar cells uses **clear glass**
- **Increased sun penetration** to air cavity



C-Shaped Channel

- **Increased air flow path**

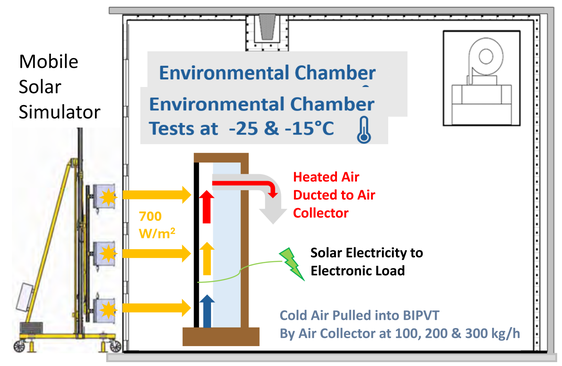


Back Cavity Surface

- **Rough** surface for **increased** turbulence and **heat** transfer
- Painted flat black for increase irradiance absorptance

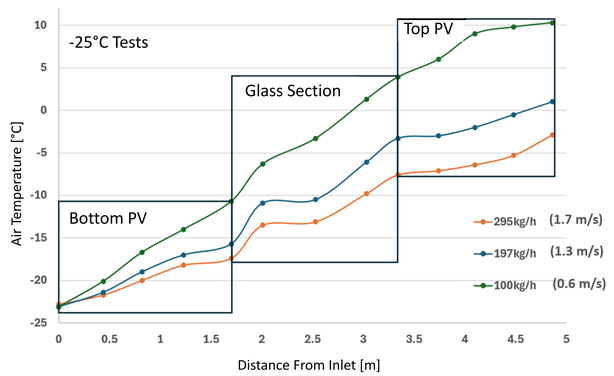
Solar Simulator Environment Chamber Solar Wall Testing

- **Prototype tested** with a simulated **Iqaluit Cold Sunny Winter Day**



Experimental Performance Testing Results

- **Temperature Increases through BIPVT: 20-33°C**
- **Thermal Efficiency: 37-53%**
- **Next phase of research will consider prefabricated cabins with modular BIPV/T systems**



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