ThermoPhotoVoltaics - TPV at JX Crystals Inc

Dr. Lewis Fraas

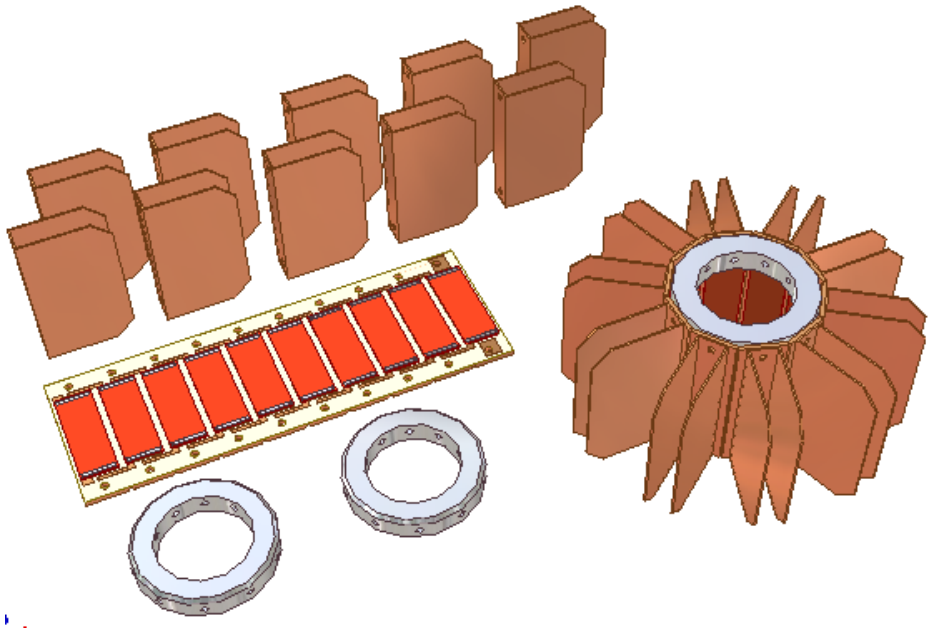
October 2011

CRYSTALS
Intelligent Alternative Energy

Primary Achievements

- IR sensitive III-V cells
- Pilot production of GaSb IR cells
- Spectral Control
- Midnight Sun™ TPV Stove

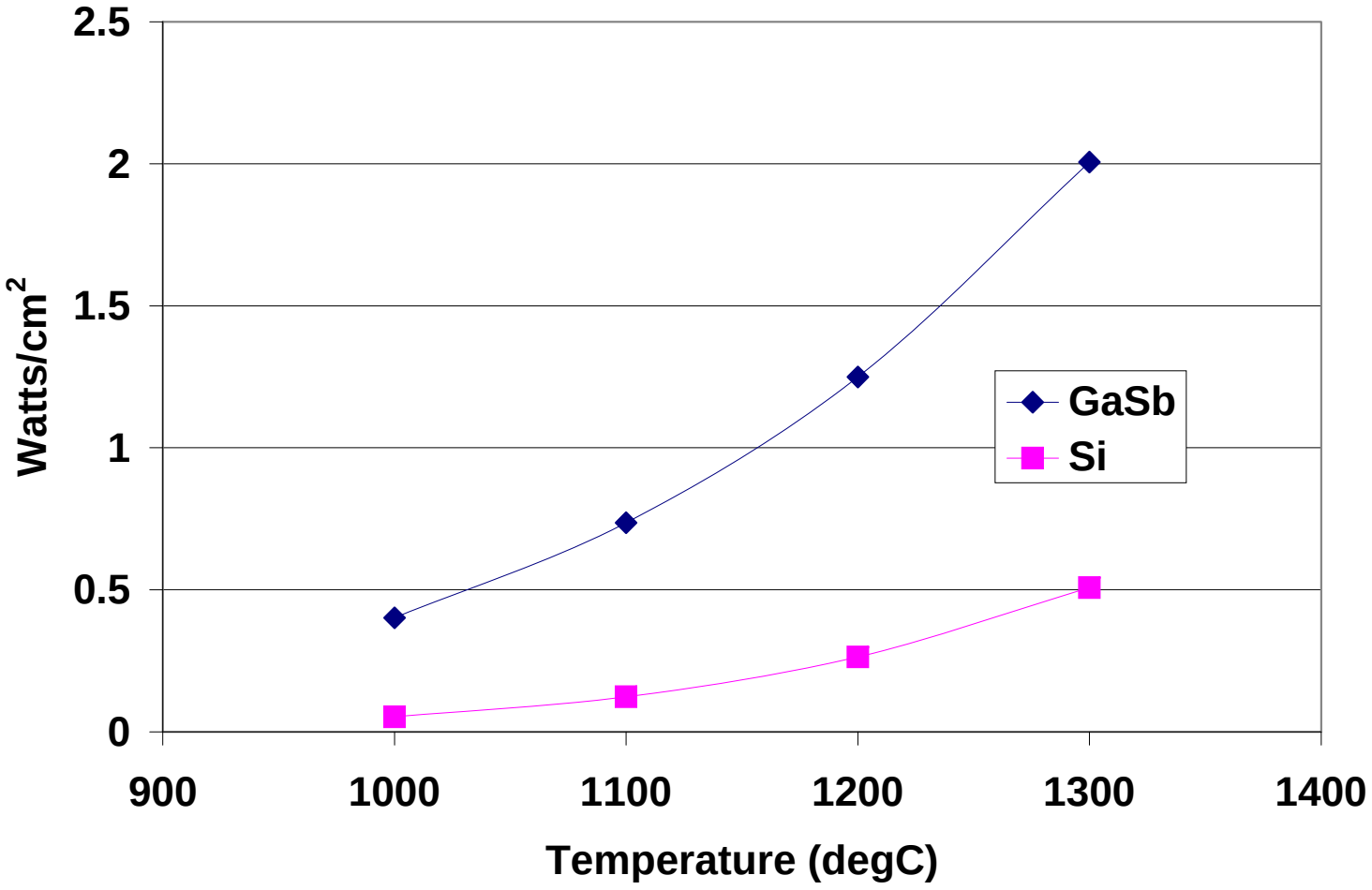
JX Crystals TPV Demonstrator

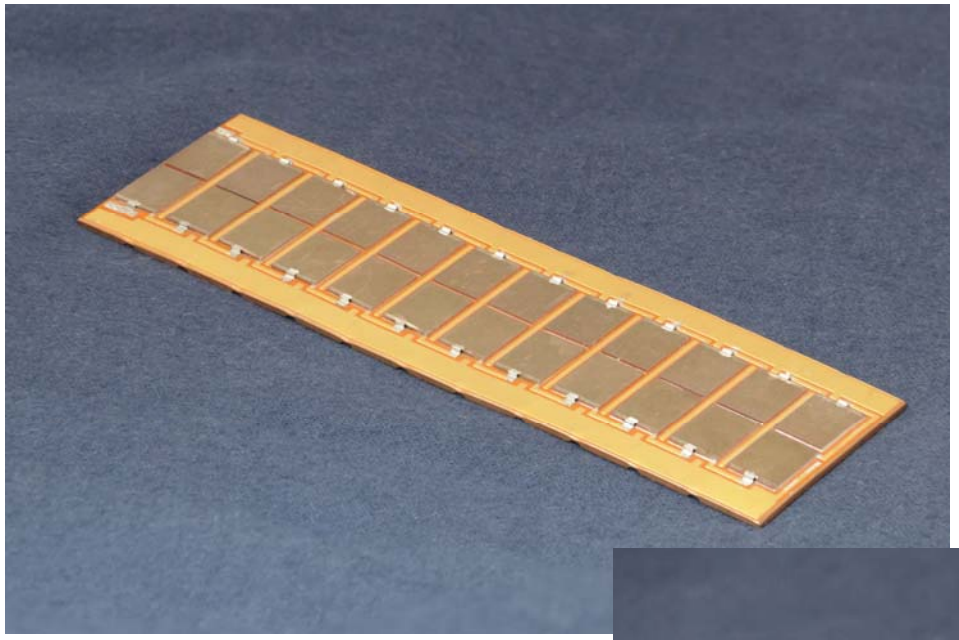


TPV Circuit rolls up into cylinder with fins added for cooling

Oil Lamp with TPV cylinder operates radio

New GaSb IR Cell Developed by JX Crystals Enabling for Low Cost High Power TPV

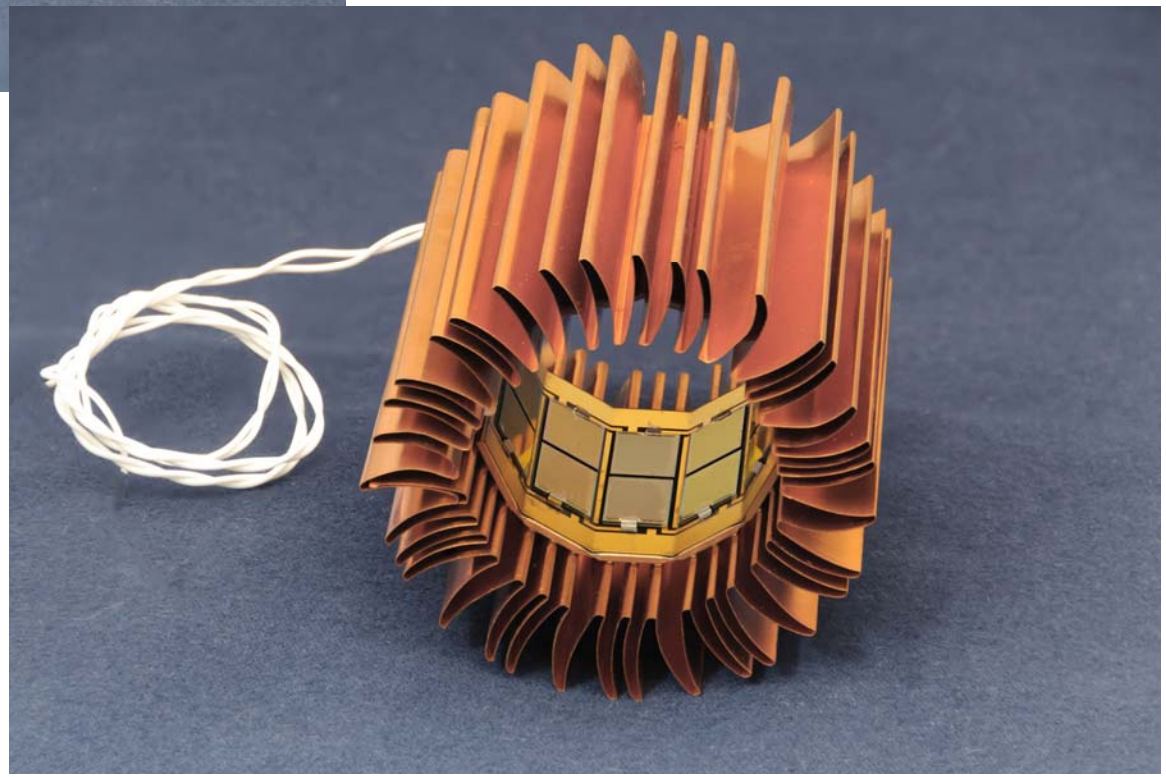




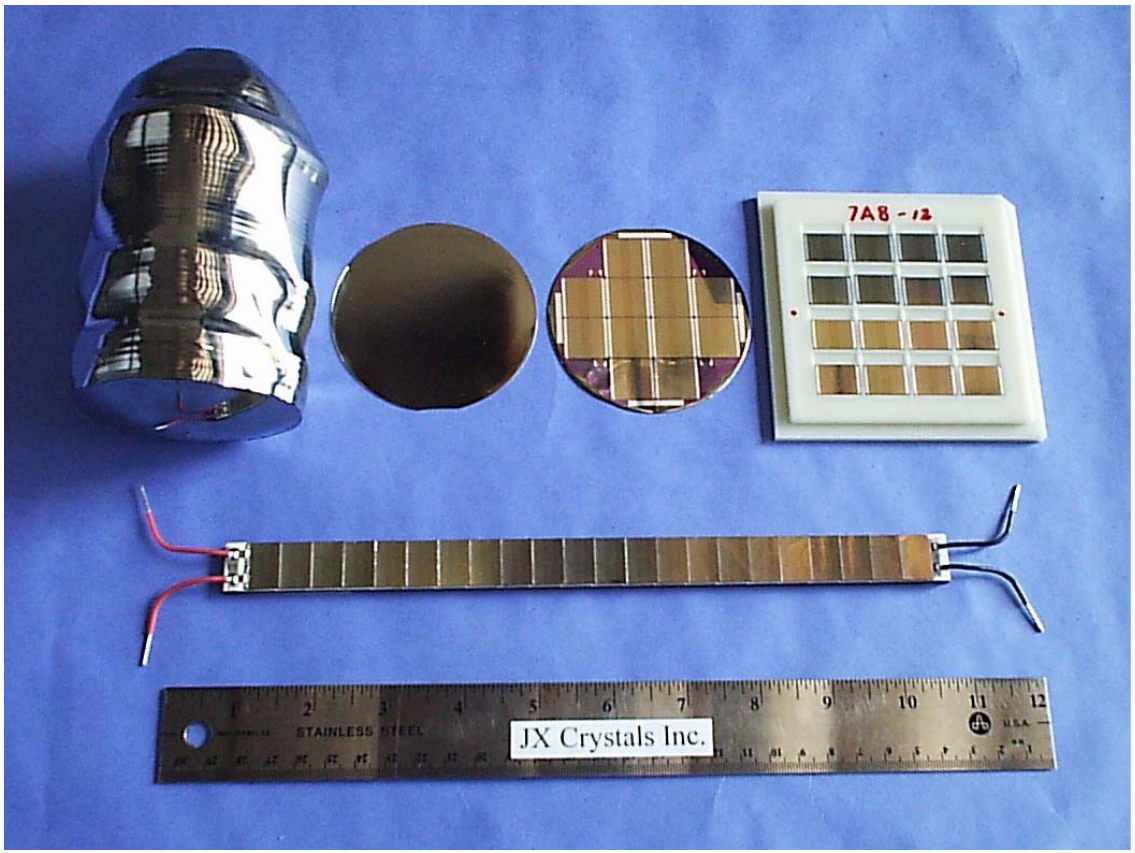
20 W
GaSb TPV Circuit
& Cylinder

Cells and Circuits fabricated at
JX Crystals Inc

JX CRYSTALS
Intelligent Alternative Energy

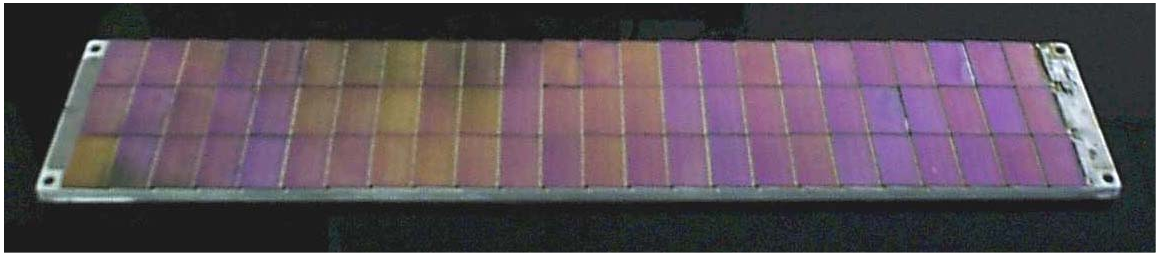


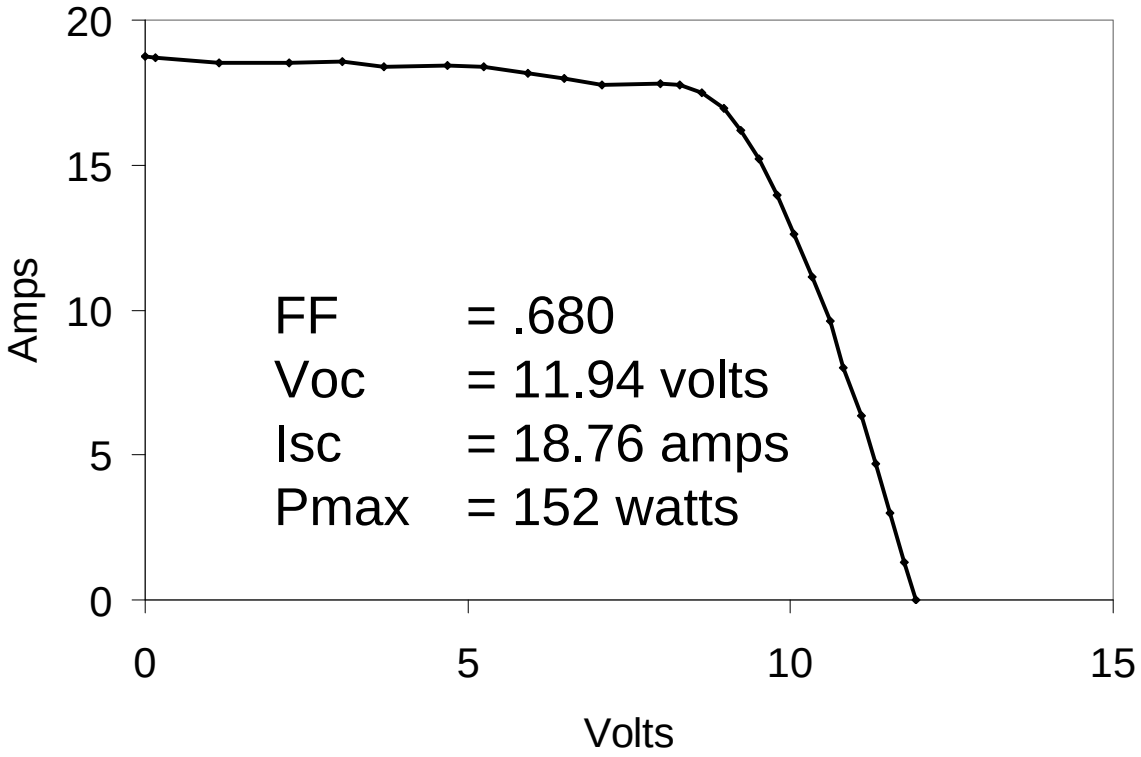
Integrated IR Cell & Circuit Production at JXC



GaSb IR Crystals, wafers, cells and circuits made at JXC

JXC 72 Cell Circuit and Current vs. Voltage Analysis

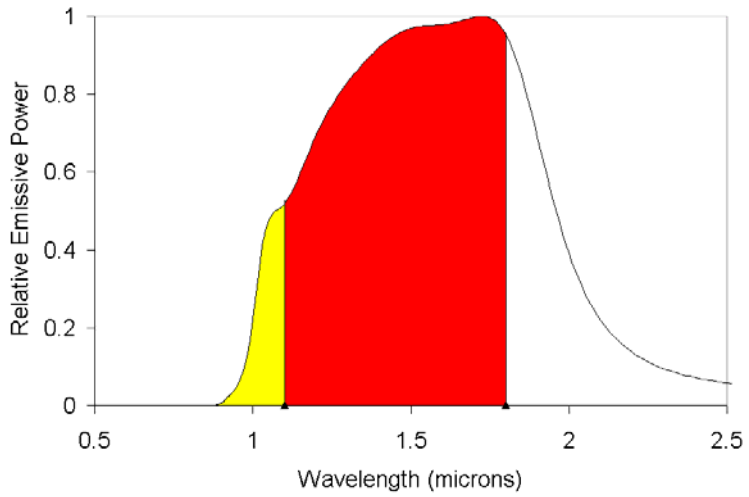




72 GaSb cells shingle-mounted on a circuit measuring

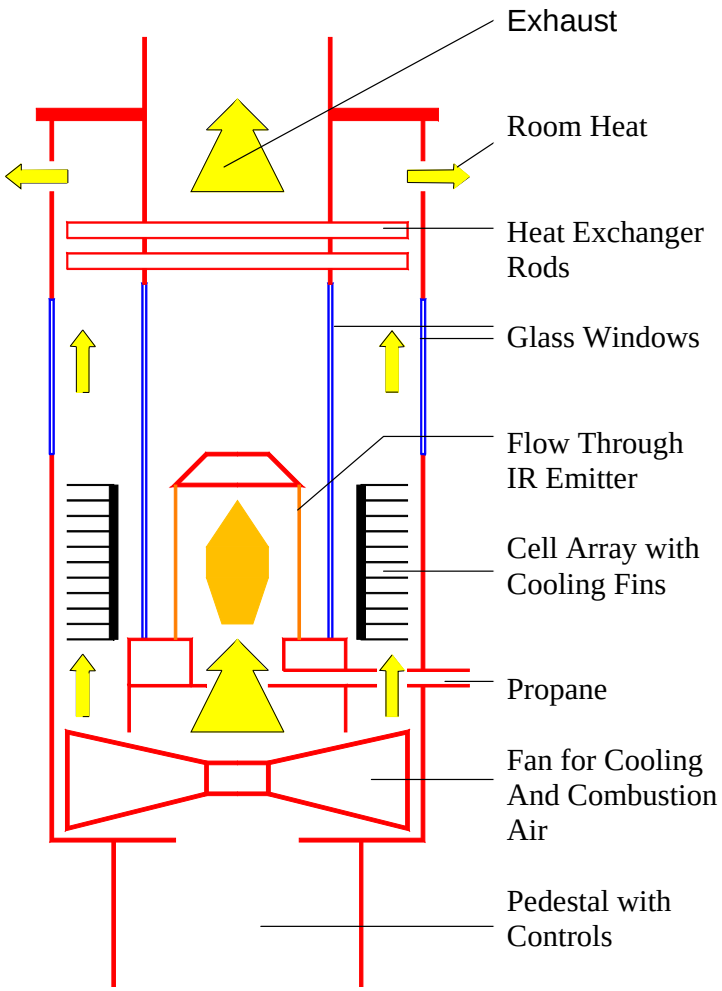
5 cm * 26 cm

New Infrared Cell Is Enabling for TPV Combined Heat and Electric Power for the Home



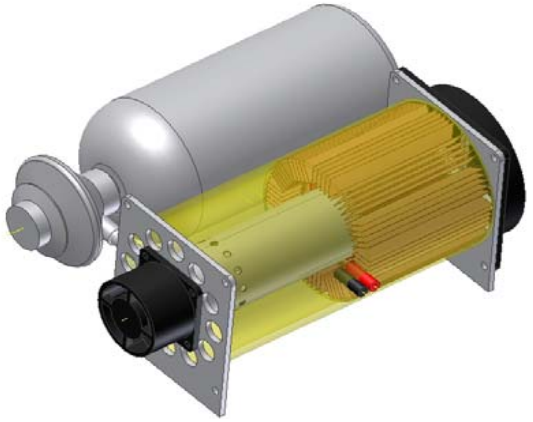
With spectra from man-made heat source, new IR cell responds in red region whereas standard silicon solar cell responds only in yellow region.

JX Crystals Midnight Sun™ TPV Stove

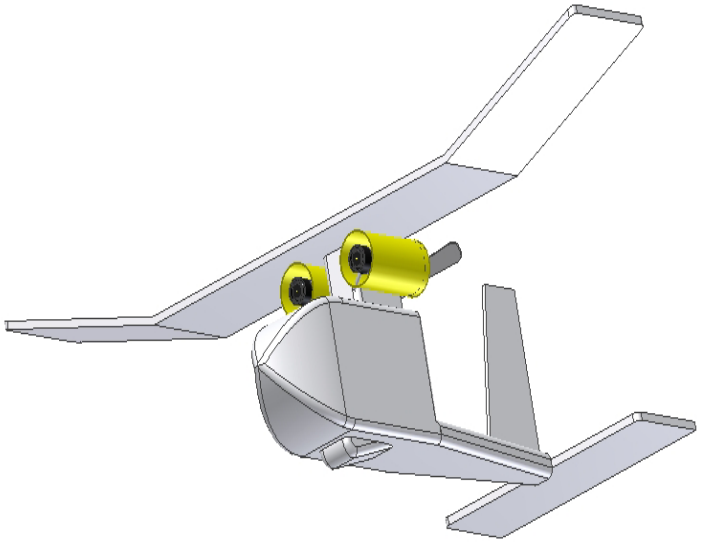


TPV Military Applications

- **Small portable lightweight 20 W TPV battery replacement with adjacent fuel cylinder.**



- **Raven UAV with two 50 W lightweight quiet TPV power cylinders for electric power for extended flight duration.**



Overall Conclusions

JXC fabricates GaSb IR Cells that are enabling for TPV.

TPV technology converts hydrocarbon fuels into electricity.

TPV has advantages over conventional generators in being quieter and lower weight.

TPV could dramatically reduce reliance on primary batteries, providing a quiet and efficient option for recharging portable electronic devices in the field.

TPV can be used in home and industrial furnaces for combined heat and electric power.