New Grid-Tied Photovoltaic Inverters "in-step" with PV Industry Cost Reduction and Increasing System Life and Reliability

NESEA BUILDING ENERGY 2004
March 11 -12, 2004

SOLECTRIA

Powerful Thinking.
Power Solutions.

SOLECTRIA

Key Industry Issues

- Low Inverter Reliability
- High Inverter Costs/Prices
- Lack of Supplier Continuity
  - History of inexperienced companies coming & going.
  - Forays of large companies playing & loosing interest

SOLECTRIA

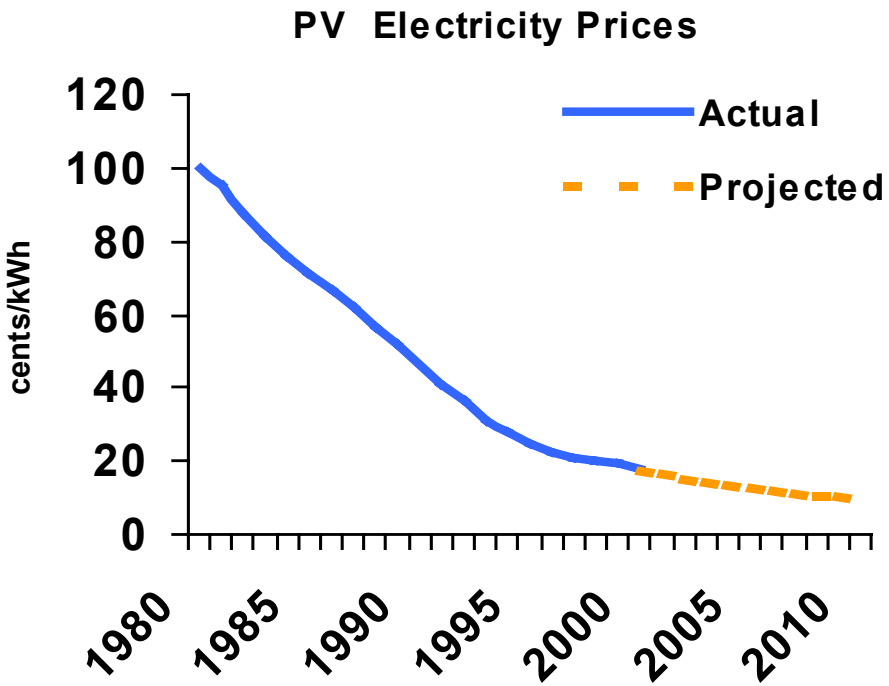
Key Drivers of Present Inverter Situation

- Very little competition
- Relatively small market
- Perceived unstable/uncertain future
  - Not yet cost competitive on the grid
  - Significantly subsidy-based

Reliability

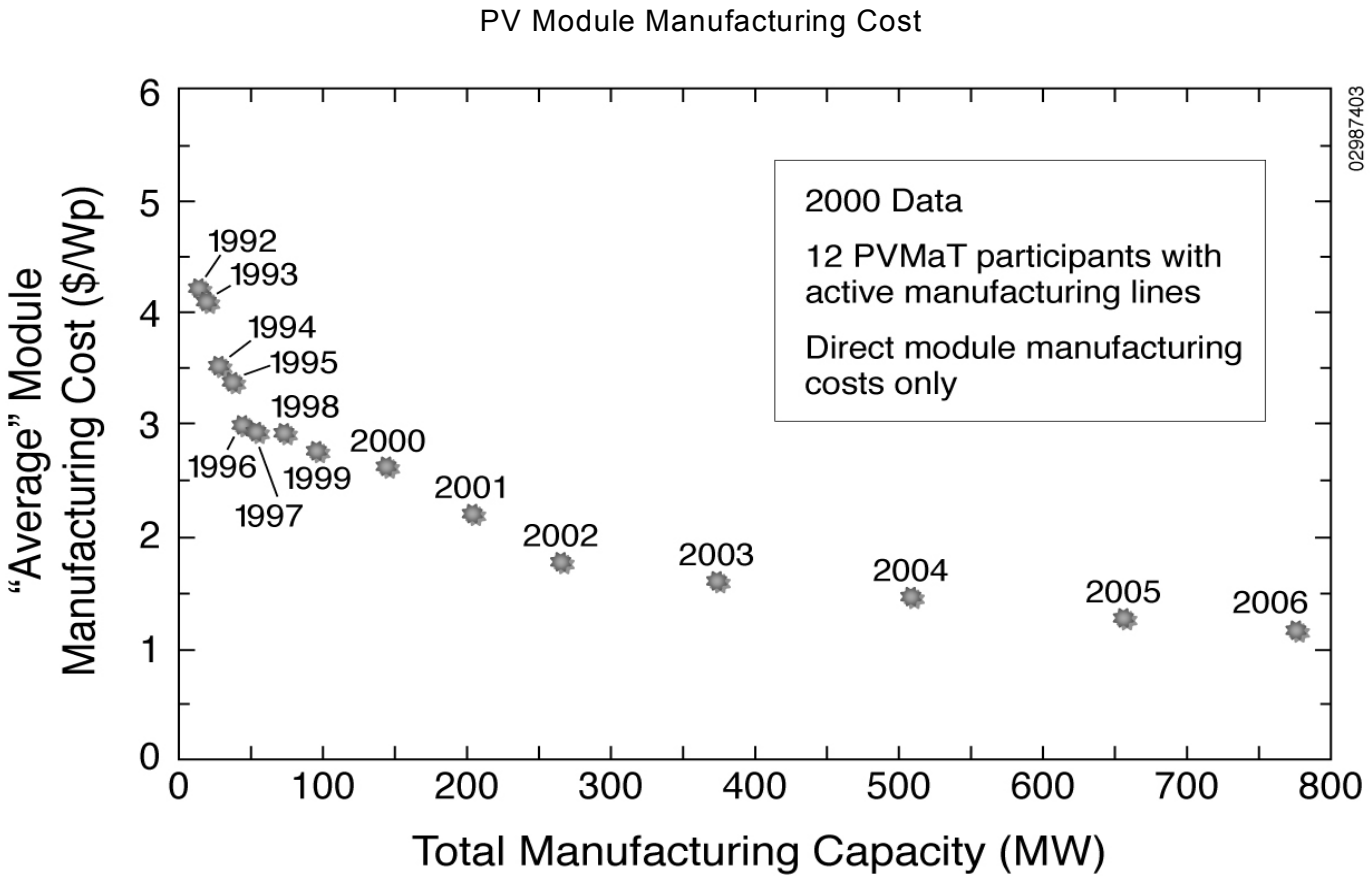
- 15 Year Design Life
- 50-60,000 Hour MTBF
  - (8-10 hour/day Operation)
- Packaging layout & cooling
- Rigorous design & manufacturing quality system (e.g. ISO 9001-2000)
- Continual improvement

PV kWh Price Trend



This data was compiled by the United States DOE.

Falling PV Costs



This data was compiled by the United States DOE.

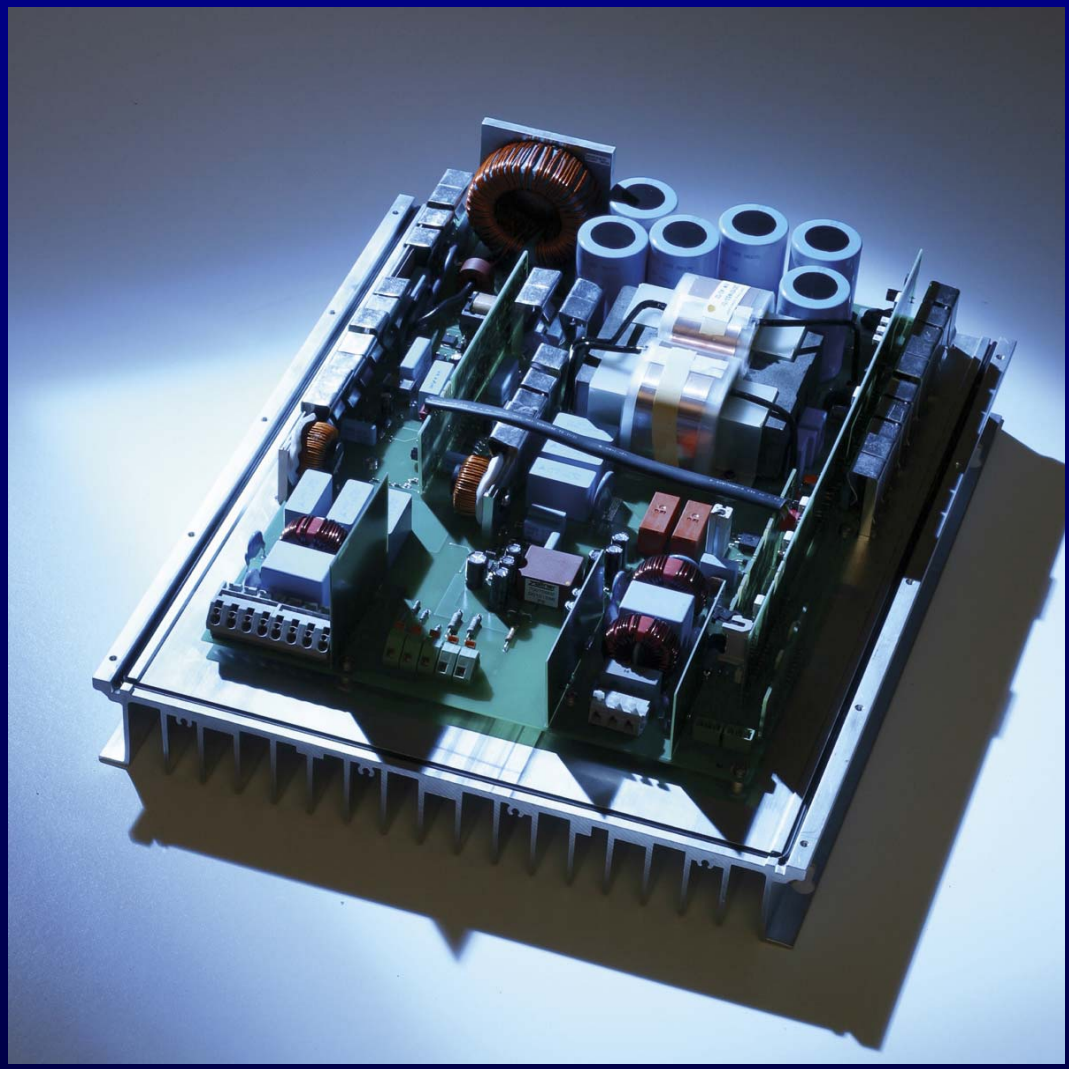
SOLECTRIA

Residential PV Inverter Cost & Reliability

- High frequency design
- Drastic reduction of hand labor
- Reduce stress on capacitors
- Inverter built on a PCB
- Automated production

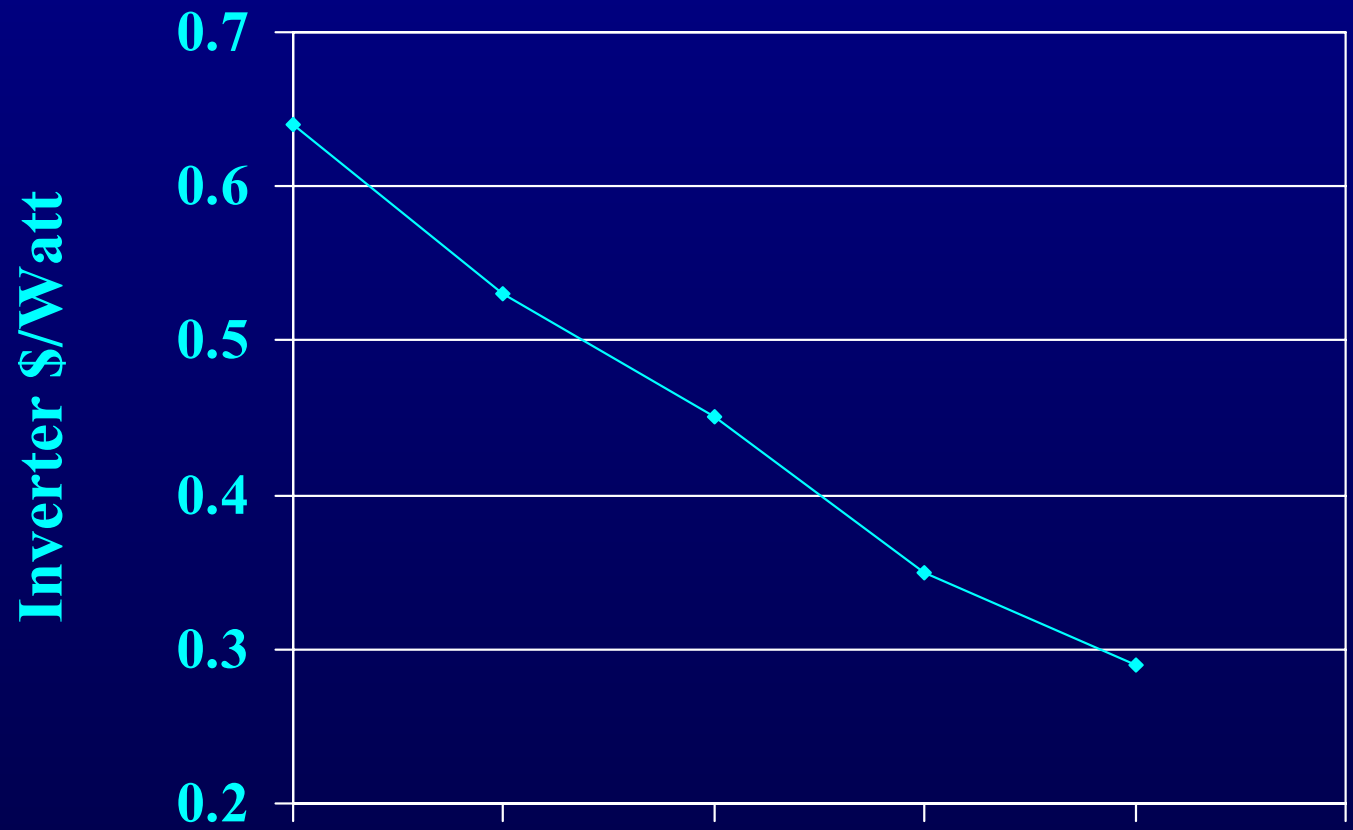
SOLECTRIA

Example Advanced Residential PV Inverter Design



SOLECTRIA

Residential PV Inverter Volume Price

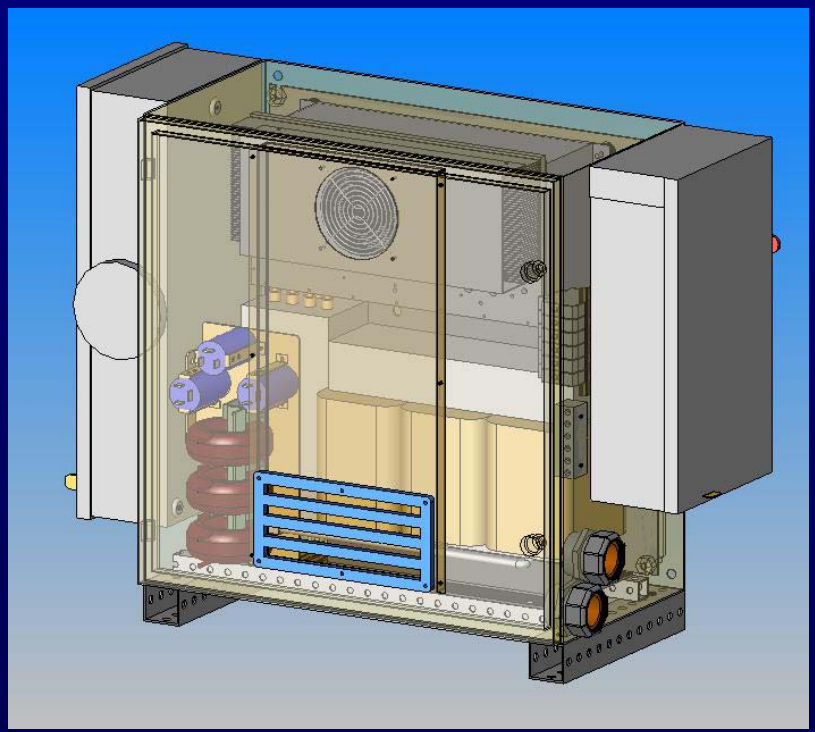


Commercial PV Inverter Cost

- **Fully integrated designs reduce installed costs**
  - **Connect PV strings**
  - **Connect AC line**
  - **Ready to run**
- **Inverter power electronics used in high volume, harsh applications**

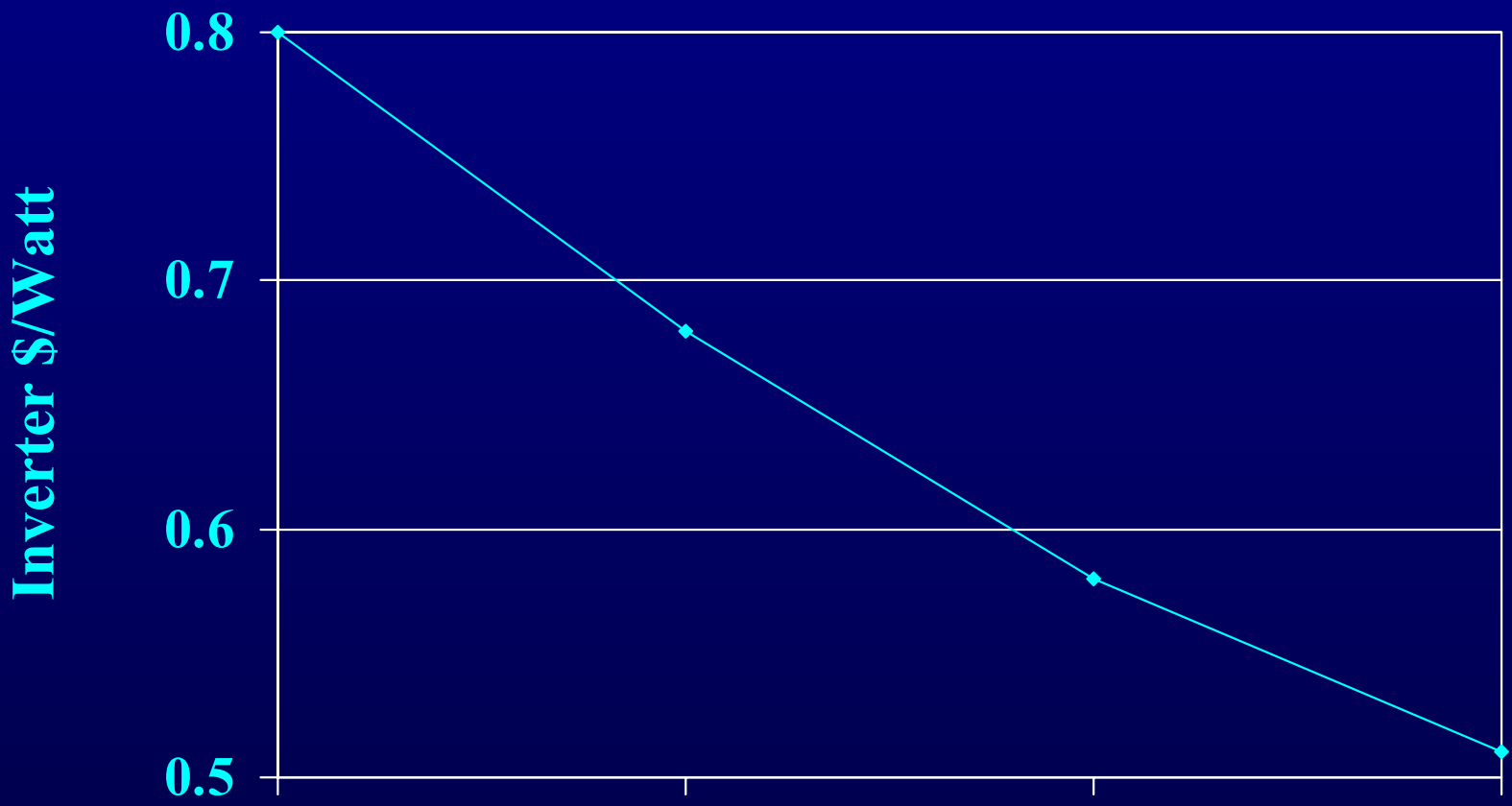
SOLECTRIA

Example 10-20 kW Integrated Commercial PV Inverter



SOLECTRIA

10kW Integrated Inverter Price Projections



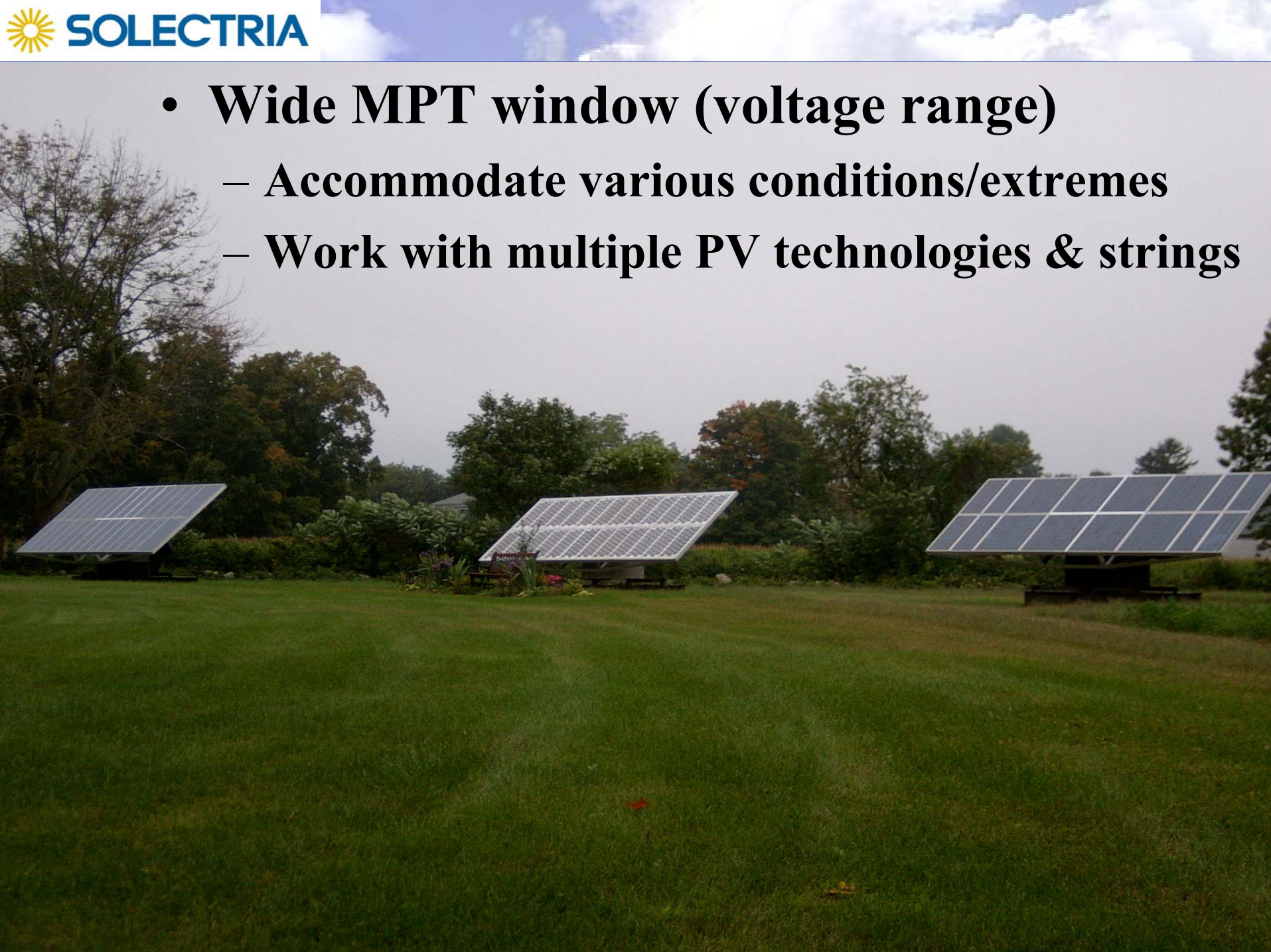
Efficiency

- Powerful, low cost DSPs, precision MPT algorithms
- Low loss trench-gate IGBTs
- High frequency magnetics can be optimized for higher efficiency
  - Low weight, additional benefit for shipping & installation costs

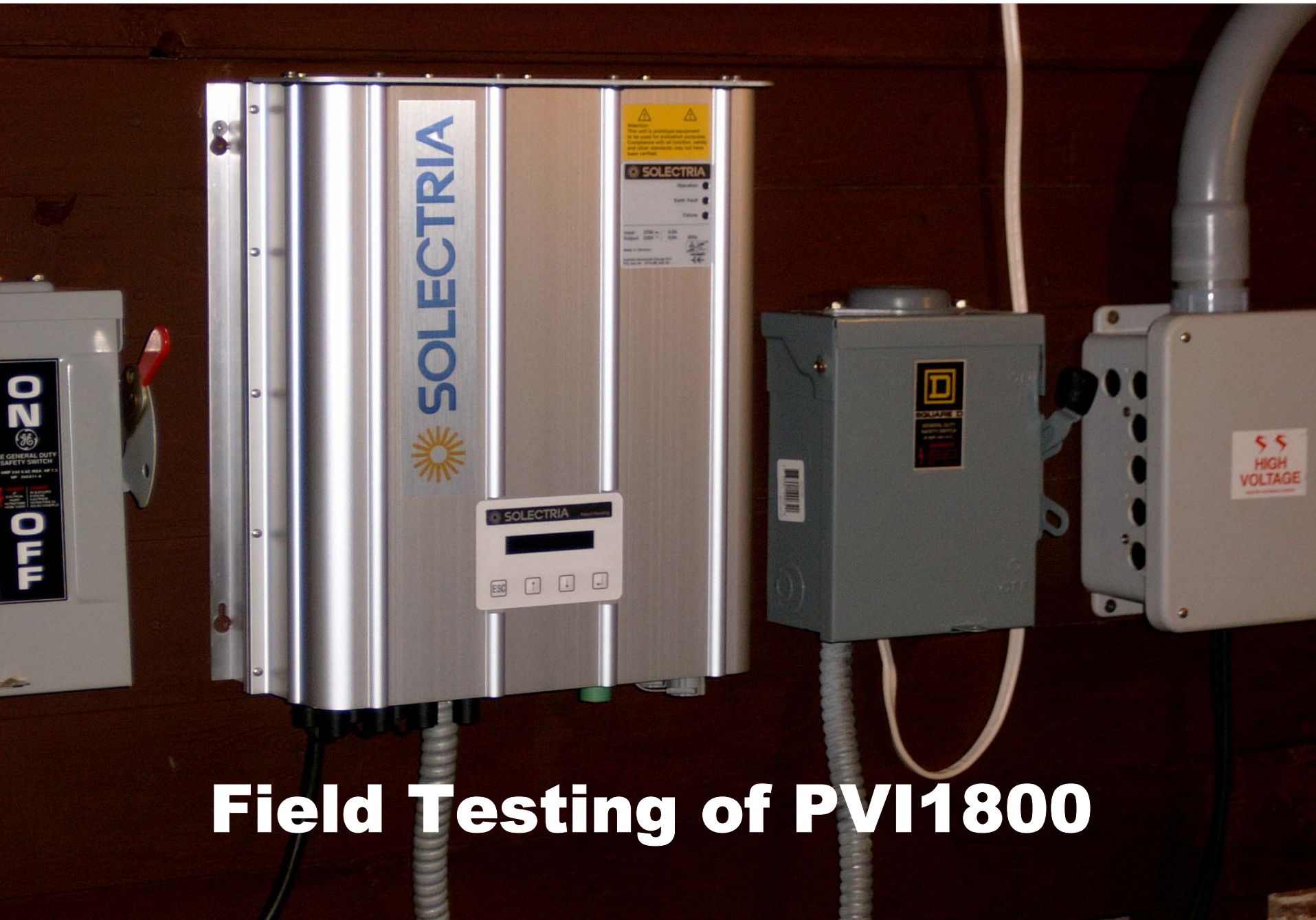
Packaging

- Passive and fan-cooled residential designs
  - Large heat sink
  - All aluminum construction
  - Low temperature rise
  - 1800W unit no fan, 2500W unit w/fan
- Fan cooled, 10-20kW commercial units
  - Layout for cooling of all parts with one long life brushless fan

- **Wide MPT window (voltage range)**
  - **Accommodate various conditions/extremes**
  - **Work with multiple PV technologies & strings**



SOLECTRIA



Field Testing of PVI1800

Question
&
Answer

SOLECTRIA

Powerful Thinking.

Power Solutions.