Low-Cost Paralleled-Type DC Power Optimizer
Development and Demonstration

Hero-X Round 3
American Made Solar

OBJECTIVES

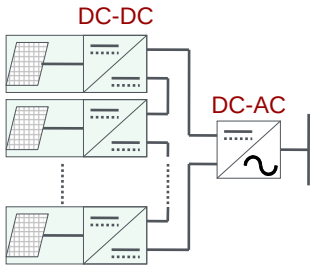
- **To develop an ultrahigh efficiency and ultra compact low-cost paralleled type DC power optimizer**
- **To configure universal DC/AC microgrid with paralleled-type DC power optimizer for solar PV applications.**

BACKGROUND

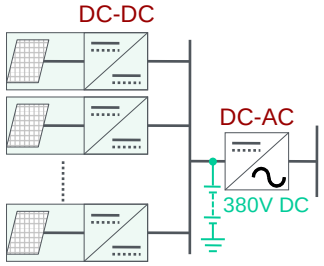
- **Solar PV DC power optimizers represented $1B market in 2018 and its CAGR is forecasted to be 11.9%. The growth is somewhat limited by the current designs that utilizes series-connecting type.**

ISSUES AND SOLUTIONS

- Issues with series-connected DC power optimizer,
  - × Output voltage may be insufficient for grid connection
  - × Non-isolated, PV panels are impacted when there is a fault
- Solutions with parallel-connected DC power optimizer,
  - ✓ Power output directly proportional to non-shaded panels
  - ✓ Flexible, not limited by the number of panels for a complete system
  - ✓ Isolated, better safety feature
  - ✓ **Form a common DC bus for energy storage and DC microgrid**



(a) Series-connected type



(b) Parallel-connected type

TECHNICAL APPROACHES AND ADVANCES

- Develop a compact DC power optimizer with the size smaller than a business card
- Utilize wide bandgap semiconductor devices for mega-hertz switching to reduce magnetic component
- Design a low-profile ultra-compact DC power optimizer with PV voltage as input and high-voltage DC (380 V, 300W) as output for paralleled connection.
- Fit the DC power optimizer into junction box for cost reduction.
- Connect high-voltage DC outputs to battery energy storage

EXPECTED OUTCOMES

- Develop and manufacture small quantity parallel-connected type power optimizers
- Install two sets of power optimizers, one being series-connected type and the other being parallel-connected type with Virginia Tech Solar House
- Demonstrate and compare the energy harvest efficiency between the two systems