The Systems Integration (SI) subprogram supports early-stage research, development, and field validation for technologies and solutions that advance the reliable, resilient, secure and affordable integration of solar energy onto the U.S. electric grid.
Addressing Near- and Long-Term Technical Challenges for High Penetration of Solar

Wind and Solar in Synchronous AC Power Systems as a Percent of Instantaneous Power and Annual Energy

2017 and 2018 Updates

% Wind and Solar

% Instantaneous Power

% Annual Energy

System Size (GW)

Ta’u Island

King Island

Maui

Ireland

ERCOT

WECC

Ben Kroposki / NREL
A System Approach for Solar Grid Integration Research

Focus Areas

- PV and Power System Modeling
- Integration with Energy Storage
- Power Electronics
- Solar Forecasting
- Situation Awareness
- Grid Services
- Cybersecurity
- Resilient Distribution and Microgrid
- Long-Term Resource Planning
- Real-Time Operation and Control
- Codes and Standards
- Stakeholder Collaboration

Solar Resource Data: NSRDB

Grid Services: AGC following

Advance Control: Grid Forming Inverters

System Modeling: Frequency Control

energy.gov/solar-office
DOE Grid Modernization Initiative

Focus Areas:
- Devices and integrated systems
- Sensing and measurement
- System operations and control
- Design and planning tools
- Security and resilience
- Institutional support

Multi-Lab Collaboration:
- MYPP
- GMLC Lab Call (2016)
- Resilient Distribution System (2017)
- GMLC Lab Call (2019)

Multi-Lab Collaboration:
- $220M
- 88 projects
- Foundational
- Program specific
- Regional partnerships

Multi-Lab Collaboration:
- $32M
- Resilient distribution systems
- 6 field validation projects
- 1 valuation analysis team
- Utility and industry partners
- Focus on DERs

Multi-Lab Collaboration:
- pending