SOLAR ENERGY
TECHNOLOGIES OFFICE
U.S. Department Of Energy

# Overview of DOE Solar Forecasting II FOA

Solar Forecasting II Kickoff

July 2018

Tassos Golnas

# Current Funding Programs in Systems Integration

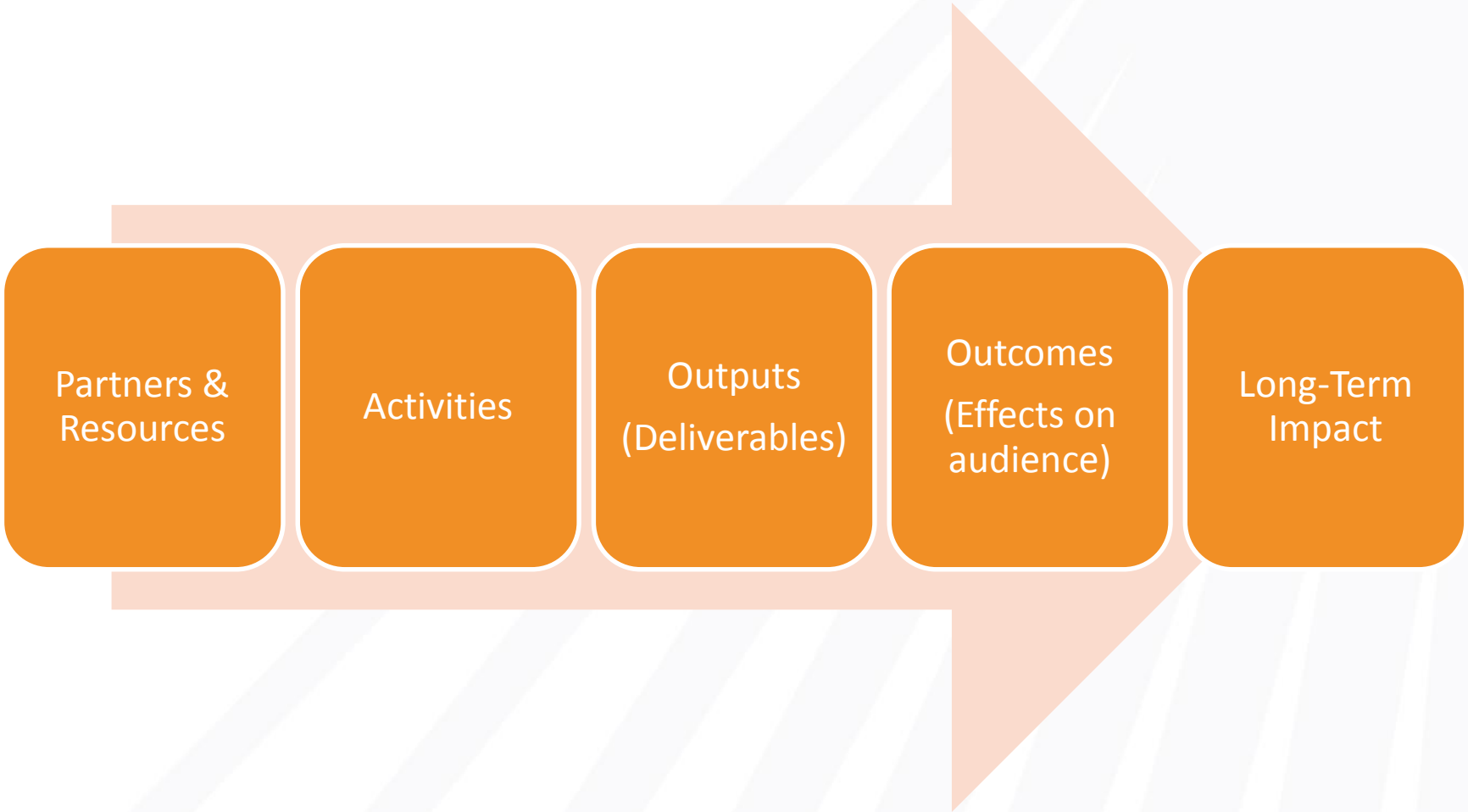
| Funding Program | Year | Amount Awarded |
|---|---|---|
| Power Electronics | 2018* | $20M |
| Solar Forecasting 2 | 2017 | $12M |
| Resilient Distribution Systems Lab Call | 2017 | $10M |
| Enabling Extreme Real-Time Grid Integration of Solar Energy (ENERGISE) | 2017 | $30M |
| Grid Modernization Lab Consortium (GMLC) | 2016 | $10M |
| Sustainable and Holistic Integration of Energy Storage and Solar PV (SHINES) | 2016 | $18M |
| SuNLaMP (Lab Call) | 2015 | $59M |

*Pending Awards

# "Logic Model" for Solar Forecasting 2 Program

| Inputs: Means for Achieving Outcomes | | | | Outcomes & Impact | |
|---|---|---|---|---|---|
| Program Partners & Resources[1] (entities to which funding is directed) | DOE & Partner Activities (actions by program partners that lead to outputs) | Target Audiences (entities impacted by outputs) | Outputs (awardee activities) | Short Term Outcomes (short-term effect of outputs on target audiences) | Long Term Impact (long-term effect of outputs on target audiences and broader community) |
| **Program Partners**<br>Topic 1<br>Entities with experience creating/implementing test frameworks that can operate impartially[2]<br><br>Topic 2<br>Entities with experience and expertise in solar irradiance forecasting[3]<br><br>Topic 3<br>Entities with experience in solar irradiance, solar power, or load modeling<br><br>Balancing authorities or independent power producers<br><br>**Resources**<br>Cost share funding | **DOE Activities**<br>Workshops<br><br>Request for Information<br><br>Funding opportunity announcement<br><br>Merit review and selection<br><br>Award negotiation<br><br>Active project management<br><br>Accomplishment tracking<br><br>**Partner Activities**<br>Concept Paper<br><br>Full Application including Statement of Project Objectives<br><br>Project work | Independent power producers<br><br>Balancing authorities<br><br>Forecasting community | Topic 1<br>Test framework<br><br>Topic 2<br>Forecasting model addressing day-ahead and/or intra-day horizons and at least one of the following:<br>1) cloudy conditions, or<br>2) large-scale weather events associated with ramp onsets<br><br>Topic 3<br>Irradiance-solar power models with probabilistic output<br><br>Decision-making process for unit commitment and economic dispatch<br><br>Demonstration of decision-making process in development environment<br><br>All Topics<br>Results of Topic 2/3 activities assessed using validation test framework<br><br>Awardee reports (e.g. RPPR1, RPPR2)<br><br>Publications, conference presentations, workshops, etc. | Topic 1<br>Test framework used by relevant stakeholders (i.e. users and providers of forecasting models) beyond the award expiration date<br><br>Topic 2<br>Improved forecasting model accuracy<br><br>Improved understanding of factors impacting solar irradiance<br><br>Topic 3<br>Increased awareness of and confidence in forecasting models among energy management stakeholders<br><br>Increased rate of integration of forecasting models into energy management systems | Transparent set of rules and specifications used by industry and academia to test forecasting models<br><br>Reduced balancing, dispatch, and unit commitment costs associated with forecasting errors and need for expensive, fast-ramping reserves<br><br>Improved reliability of the grid through load certainty and more precise balancing of supply and load<br><br>SunShot 2020 and 2030 goals of reduced solar LCOE |

# Logic Model Structure



# Outputs, Outcomes and Long Term Impact

| Outputs | Short Term Outcomes | Long Term Impact |
|---|---|---|
| • Test framework<br>• Forecasting model addressing day-ahead and/or intra-day horizons and at least one of the following:<br>1) cloudy conditions, or<br>2) ramp onsets<br>• Irradiance-solar power models with probabilistic output<br>• Decision-making process for unit commitment and economic dispatch<br>• Demonstration of decision-making process in development environment | • Test framework used by relevant stakeholders (i.e. users and providers of forecasting models) beyond the award expiration date<br>• Improved forecasting model accuracy<br>• Improved understanding of factors impacting solar irradiance<br>• Increased awareness of and confidence in forecasting models among energy management stakeholders<br>• Increased rate of integration of forecasting models into energy management systems | • Transparent set of rules and specifications used by industry and academia to test forecasting models<br>• Reduced balancing, dispatch, and unit commitment costs associated with forecasting errors and need for expensive, fast-ramping reserves<br>• Improved reliability of the grid through load certainty and more precise balancing of supply and load<br>• SunShot 2020 and 2030 goals of reduced solar LCOE |

# Survey to generate baseline of forecast usage

- If you are a **forecast user**, please complete the survey (average time to complete is 5 minutes):
  - https://www.surveymonkey.com/r/solarforecast-survey
- **Survey will close on Monday 7/16**

# Agenda

| 8:00 – 8:30 | Sign-in | |
|---|---|---|
| 8:30 – 9:15 | Welcome from SETO | Charlie Gay, Guohui Yuan, Tassos Golnas |
| 9:15 – 9:45 | Development of WRF-Solar v2—Improving Solar Forecasts | Larry Berg - PNNL |
| 9:45 – 10:15 | Probabilistic Cloud Optimized Day-Ahead Forecasting System based on WRF-Solar | Manajit Sengupta - NREL |
| 10:15 – 10:30 | Break | |
| 10:30 – 11:00 | Advancing the WRF-Solar Model to Improve Solar Irradiance Forecast in Cloudy Environments | Wuyin Lin - BNL |
| 11:00 – 11:30 | HAIMOS Ensemble Forecasts for Intra-day and Day-Ahead GHI, DNI and Ramps | Carlos Coimbra - University of California – San Diego |
| 11:30 – 12:00 | Solar Uncertainty Management and Mitigation for Exceptional Reliability in Grid Operations (SUMMER-GO) | Bri-Mathias Hodge - NREL |
| 12:00 – 13:15 | Lunch Break | |
| 13:15 – 13:45 | Coordinated Ramping Product and Regulation Reserve Procurements in CAISO and MISO using Multi-Scale Probabilistic Solar Power Forecasts | Ben Hobbs - Johns Hopkins University |
| 13:45 – 14:15 | Probabilistic Forecasts and Operational Tools to Improve Solar Integration | Aidan Tuohy - EPRI |
| 14:15 – 14:45 | Open Source Evaluation Framework for Solar Forecasting | Will Holmgren - University of Arizona |
| 14:45 – 15:00 | Break | |
| 15:00 – 16:30 | Briefing on Stakeholder Engagement Workshop and Discussion | Moderated by Will Holmgren and Tassos Golnas |
| 16:30 – 16:45 | Concluding remarks | Tassos Golnas |