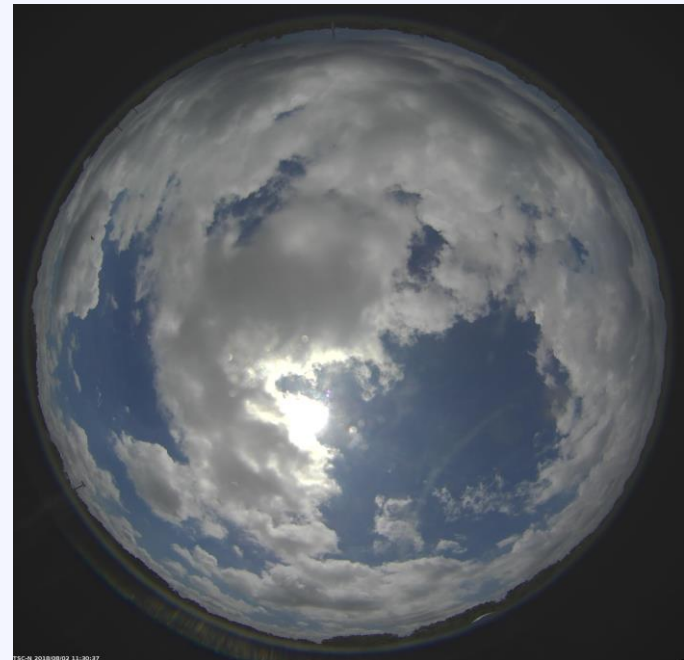


Advanced Solar and Load Forecasting Incorporating HD Sky Imaging: Phase II

ESIG 2019 Meteorology & Market Design for Grid Services Workshop

Paul Kalb, Brookhaven National Lab

Denver, CO June 4 - June 6, 2019



Project Description

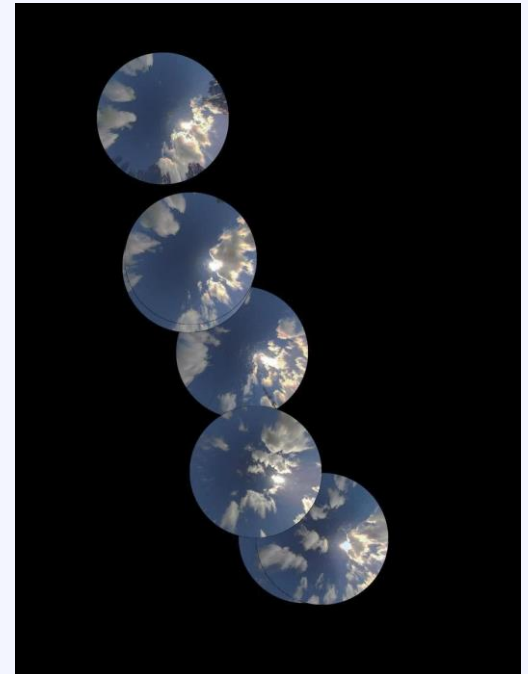
- BNL developed a ground-based imaging system for nowcasting at solar generating facilities with support from DOE SETO (2016).
- NYPA requested BNL scale up system to include rooftop distributed solar resources (DSR) in addition to generating facilities to meet the growing needs of utilities, ISOs, and generators to forecast solar production. A multi-phase R&D effort was begun:
 - *Phase I: Engineering design and siting (NYPA; 6/17)*
 - *Phase II: Initial regional scale-up (DOE/NYPA; 12/18)*
 - *Phase III: Second regional scale-up and long-term performance (DOE/NYPA/NYSERDA; beginning 7/19)*
- NCAR using WRF Solar and other models for day(s) ahead
- EPRI leads model validation and tech transfer tasks



Scale-up by 20x

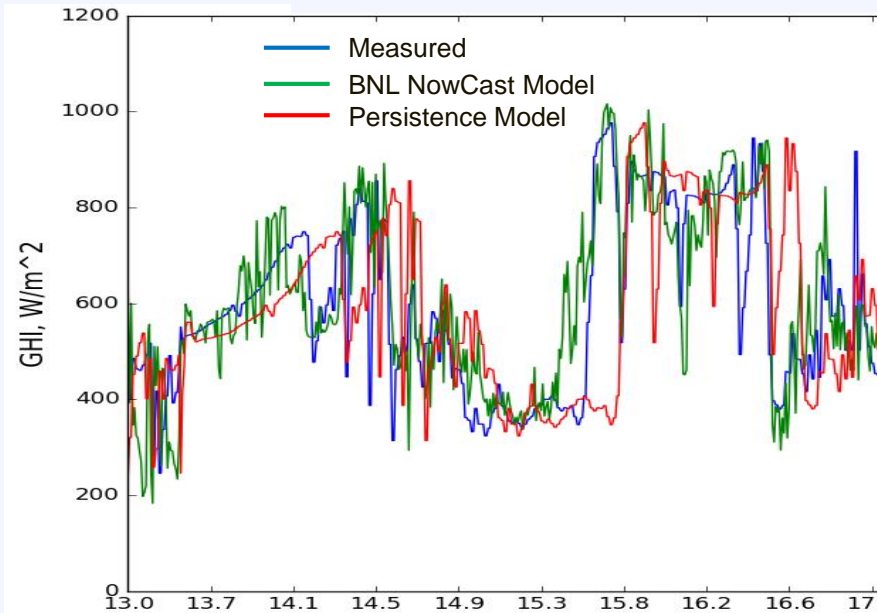
Nowcasting Technology Description

- Off-the-shelf HD cameras were adapted to enable broad, low-cost deployment. Customized software was written to identify & track clouds, estimate impact on GHI, and “stitch together” data from multiple imager networks, thus greatly expanding the forecast region.



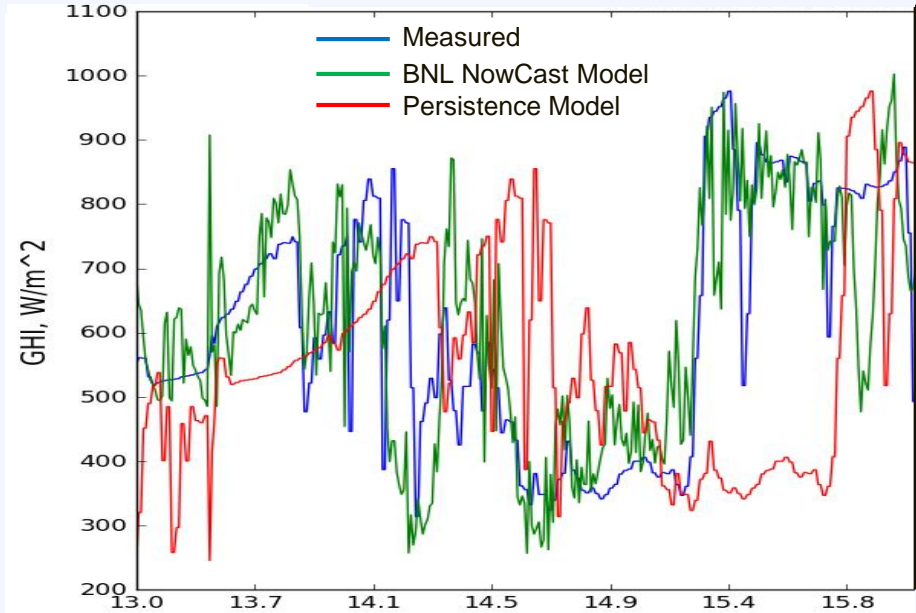
Major Results to Date

10 minute NowCast at LISF



UTC Time, 9/27/18

30 minute NowCast at LISF



UTC Time, 9/15/18

- Based on one month preliminary data, the BNL NowCasting model provides much better predictions on the timing of the GHI ramps than persistence
- BNL NowCast model outperforms the persistence model for all forecast time windows (*20 – 50% lower MAE for 10 and 30 min time horizons*).
- Reliability and performance will be measured against both persistence and “smart persistence” as the baseline comparison for one full year

Path Forward

- Phase III continues and expands the work with:
 - *An additional region (Albany NY) to examine performance under diverse weather/cloud conditions*
 - *Performance testing across all four seasons*
 - *Support from a 3rd sponsor (NYSERDA)*
 - *An additional collaborating institution (U of A)*
 - *Buy-in from NYISO and Central Hudson utility*
- On-going discussions with a large ISO and forecast provider on tech transfer
- Stretch goals include further spatial expansion of the networks, possible use of satellite data and use of DSR output as surrogate for GHI data

