SDGE connected

A Sempra Energy utility℠

Electric Distribution Operations

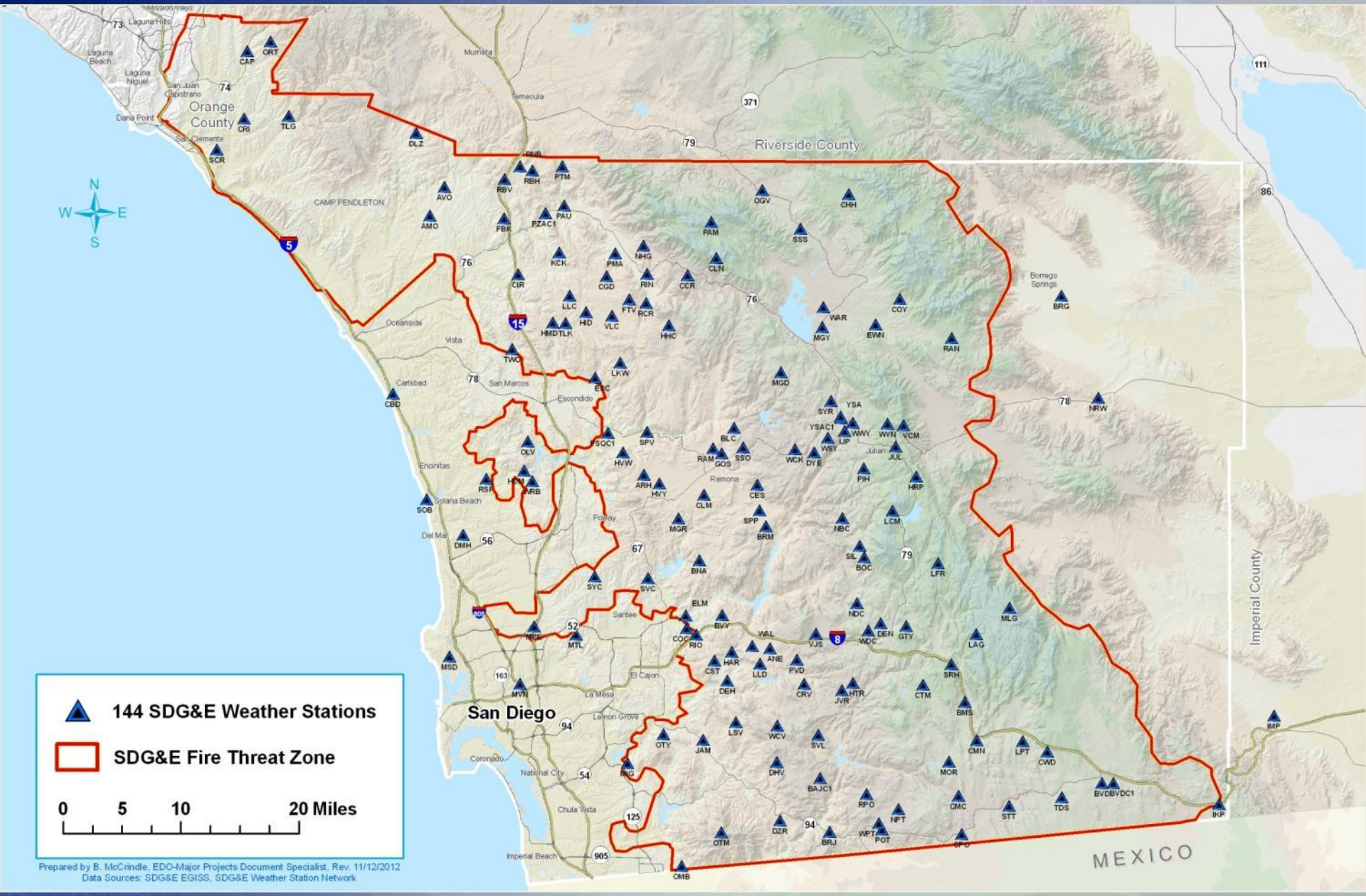
SDG&E Meteorology

EDO Major Projects

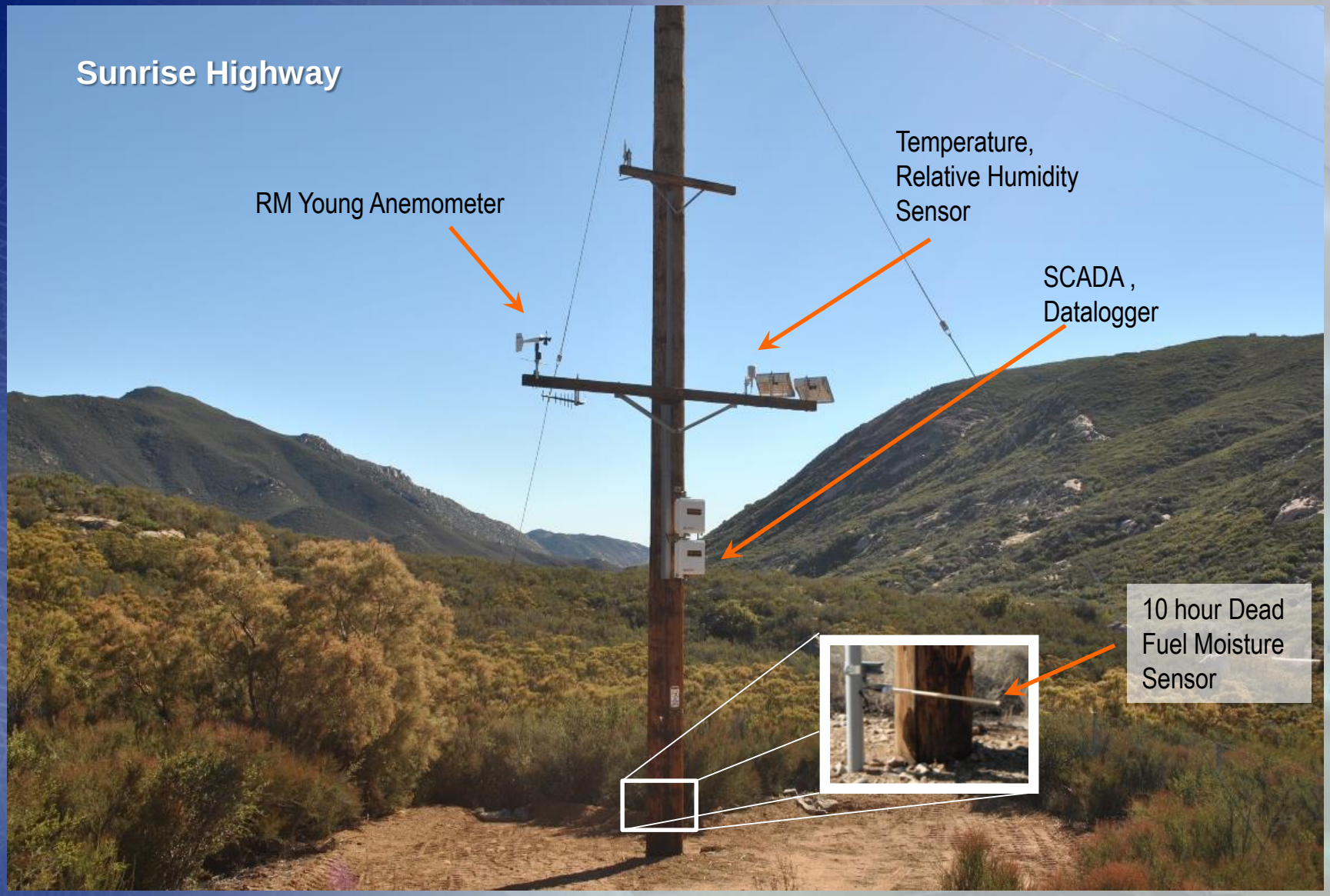
OCTOBER 2007 WILDFIRES

In 2007, wildfires burned 368,340 acres (13% of San Diego County)

SDG&E MESONET



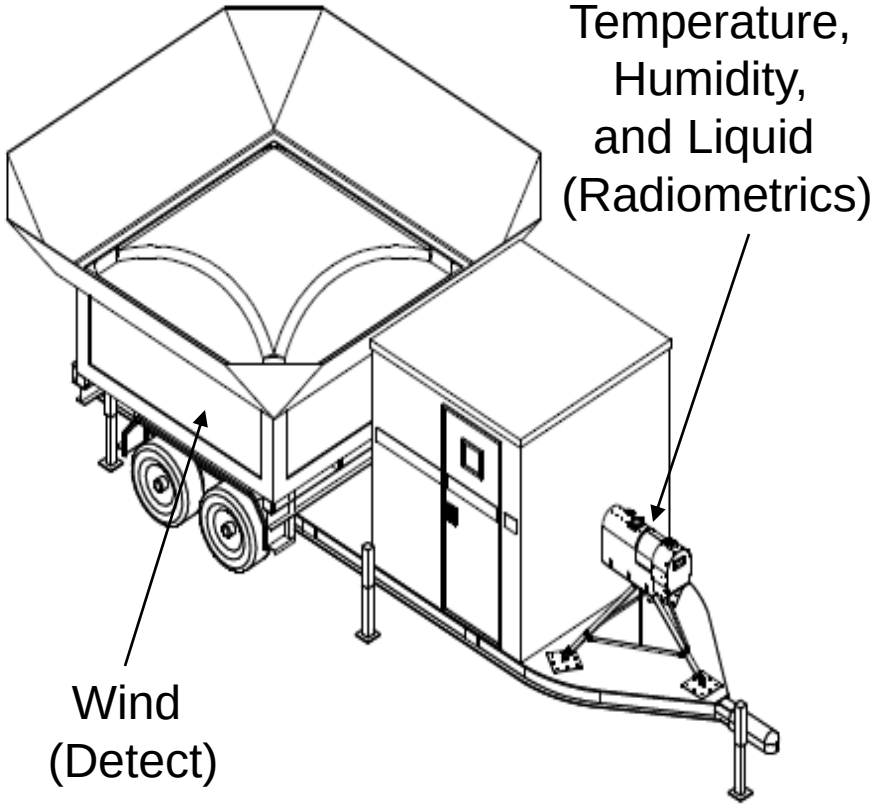
SDG&E MESONET

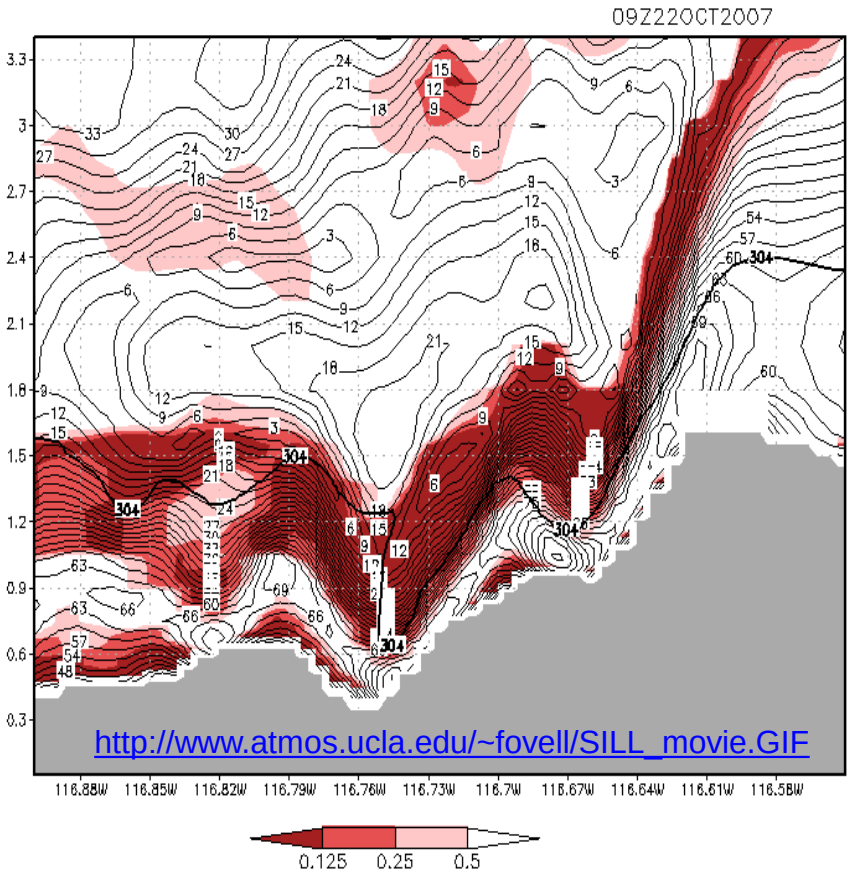


Major Projects

ATMOSPHERIC PROFILERS

- Mobile atmospheric profilers will be used to monitor and better forecast Santa Ana Winds by Fall 2013.
- Santa Ysabel profiler will be used to sample conditions within the wave
- Borrego profiler will be used to sample the upstream conditions





Hi-Res Modeling using WRF

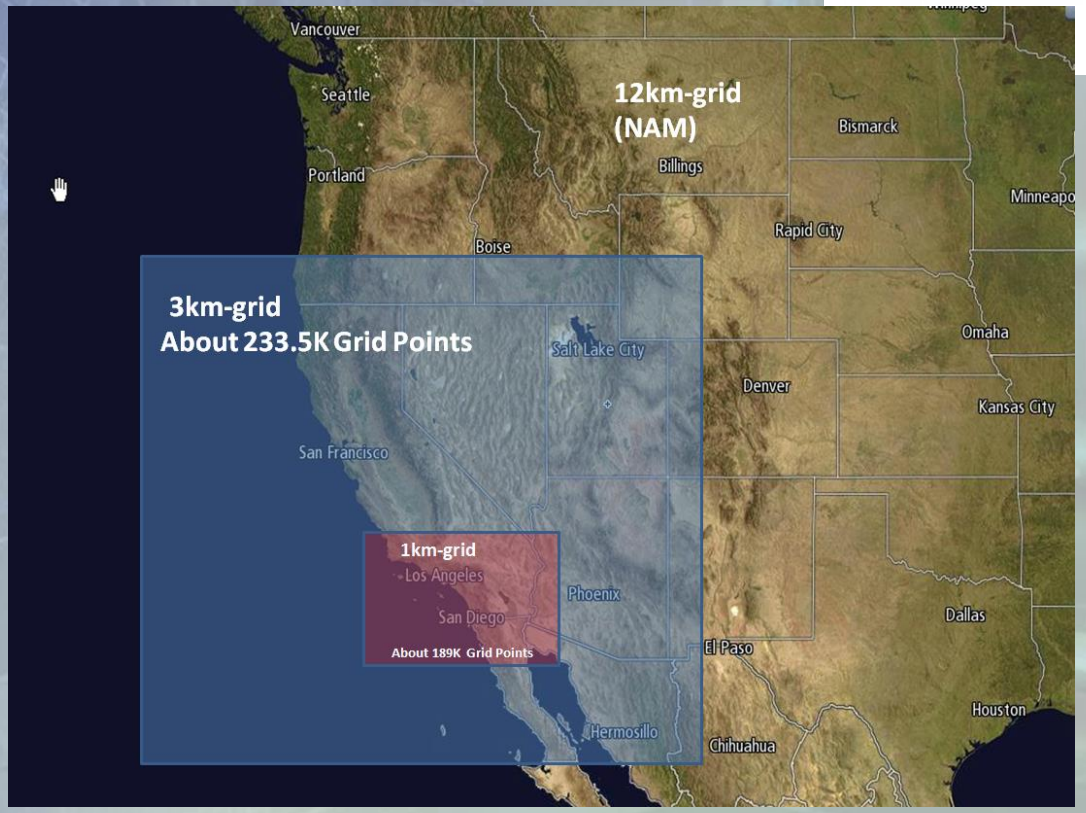
Hardware:

- PSSC Labs PowerWulf Vortex Cluster
- 344 total processor cores (320 Compute Cores / 640 Threads based on the Intel E5-2690), 1,408GB System RAM 1,280GB RAM for Compute Nodes) and 28TB Accessible 6Gbps RAID Storage, 28TB Accessible 6Gbps Backup RAID Storage

Weather modeling is being done in collaboration with UCSD, UCLA , Multiple Fire Agencies and the National Weather Service

Using WRF fluid dynamics calculations to generate forecasts of:

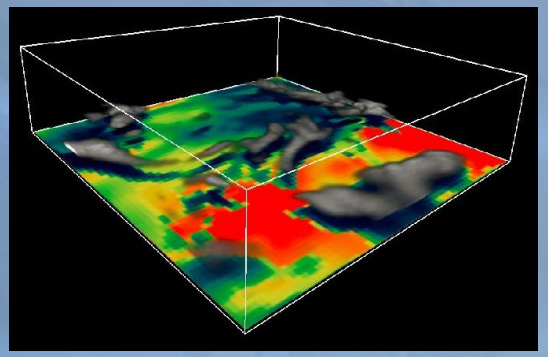
- Wind Speed
- Temperature
- Humidity
- Cloud Cover
- Solar Radiation
- And many more…



Collaboration with UCSD

California Solar Initiative:

- Very high resolution numerical weather prediction for Day-Ahead Marine Layer Forecasts (Kleissl, NOAA, D'Agostino)
- Apply weather research and forecasting (WRF) model to SDG&E territory at 400 m resolution and 5 minute time step. Assimilate satellite cloud and SDG&E weather station data into WRF model using 4D-VAR. Compare the performance of probabilistic model against other solar forecasting models



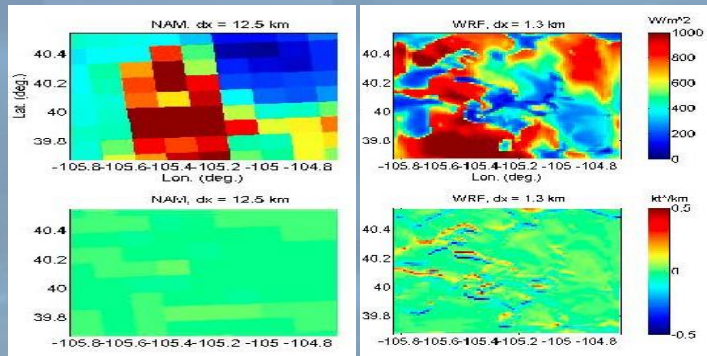
Above: Snapshot of 1.3 km resolution WRF simulation over coastal CA. Clouds (grey) are overlaid onto global horizontal irradiance (GHI).

Mathiesen and Kleissl, 2011, Mathiesen *et al.*, 2012

- Provided operation support and input into the research
- Providing access to the UCSD Triton Supercomputer Resource
- Providing access to our SDG&E Supercomputer

Synching efforts with Smart Grid

- Currently surveying Smart Grid Engineers to better understand how we can be delivering our forecasts
- Traveling to Salt Lake City, UT and Boulder, CO to meet with federal agencies to explore future collaborations



Rightt: GHI fields from the 12 km NAM (left) versus the 1.3 km WRF (right). The additional detail is also evident in the ramp spatial ramp rates (bottom).

OUR VISION…

- High quality weather forecasts will be critical to the successful integration of renewable energy into a smarter grid.
- High quality weather forecasts will remain critical to the companies operations during times of high fire danger…ensuring company preparedness.

Next Steps….

Fire Preparedness:

- Assimilate all of our SDG&E Weather Data into the models to create better initialization for Santa Ana Wind forecasts
- Use SDG&E Data to adjust model parameters and micro-physics to improve forecasts
- Use SDG&E model output to support fire agencies and first responders
- Use SDG&E model output to collaborate with UCSD on fire behavior modeling (NSF)
- Use SDG&E model output to support the Santa Ana Classification System

Renewables Forecasting:

- Assimilate all of our SDG&E Weather Data and satellite data into the models to create better model initialization for renewable generation forecasts
- Use SDG&E model output to forecast incoming solar radiation for many different areas and time steps supporting both localized and distributed generation
- Use SDG&E model output to leverage our position as we continue to apply for federal funding and grants

Forecast Delivery Enhancements:

- We envision all of our weather data and model output being continuously fed into a data cloud from the forecast model, from where it will be directly incorporated into operations through systems such as GIS and VISA.