FirstEnergy's use of Ensembles

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6th NCEP ensemble user workshop
National Weather Service NCEP

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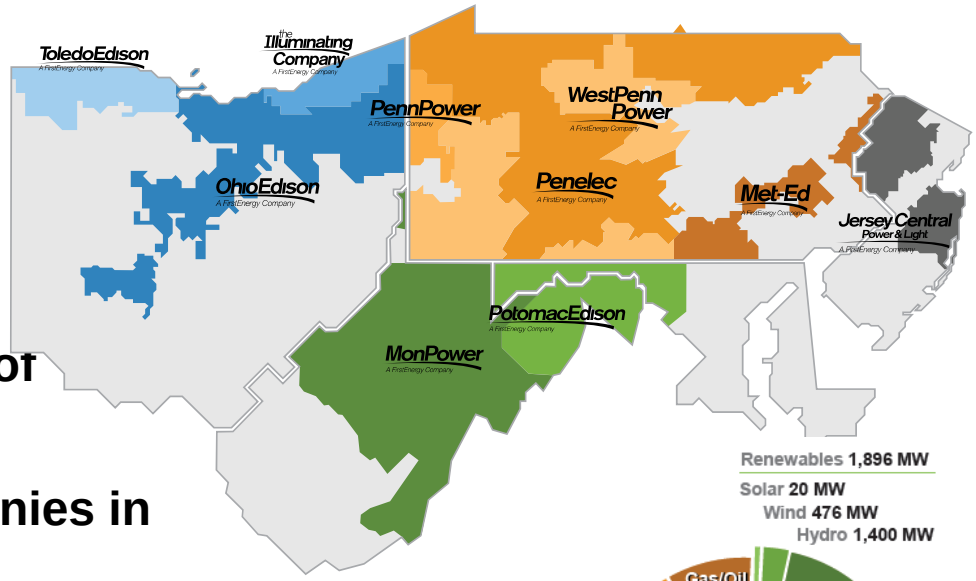
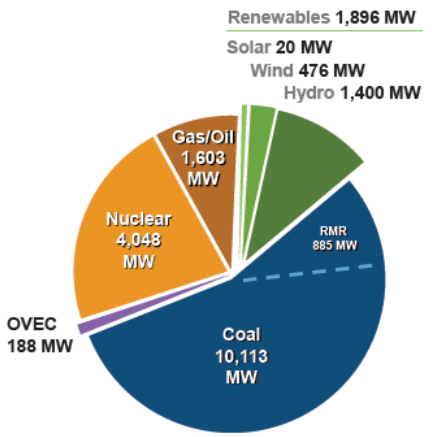
Outline

- **Introduction to FirstEnergy (FE) and FE Weather**
- **Short range forecasting (SREF and WRF)**
- **Medium and Long range forecasting (NAEFS, GEFS, ECMWF mean)**
- **Summary**
- **Questions and Answers**

About FirstEnergy (FE)

- **Headquartered in Akron, Ohio**
- **One of the largest investor-owned electric systems in the U.S. based on 6 million customers served**
- **Approximately 18,000 megawatts of generating capacity**
- **10 electric utility operating companies in six states**
- **65,000-square-mile service area**
- **24,000+ miles of high-voltage transmission lines**





Learn more by visiting www.firstenergycorp.com

Need for Internal Meteorological Support

- **Assess the atmosphere's impact on FirstEnergy**
  - Physical: Personnel (safety) and property (reliability/cash)
  - Financial: Capitol strategies (resource management)

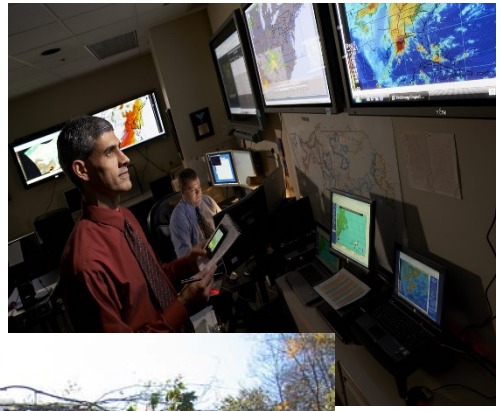
- **Assess FirstEnergy's impact on the atmosphere**
  - FirstEnergy's environmental footprint (air quality) present and future

- **Capital Expenditures caused by storms for**

  2013: $52 million.

FirstEnergy Weather (FEWX)

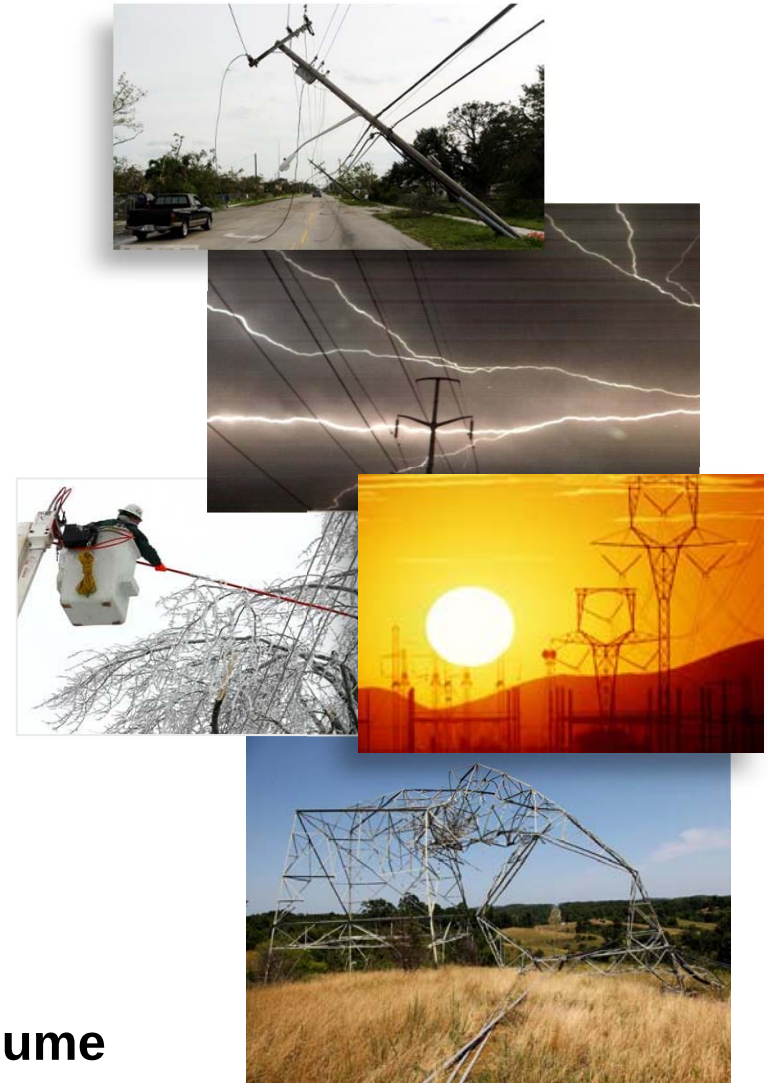
- **Operations Center in Akron**
- **Cost savings to FE ~$3M/yr**
- **Staff of two**
- **Demand from all Business Units**
- **Special emphasis on prediction of damaging weather events**
- **Additional functions: monitoring, modeling, forensic analysis, research, training, programming, special studies**



Primary Weather Concerns - Impact Weather

Power Disruptions Caused By:

- High winds
- Ice
- Snow, especially wet snow on leaves
- Lightning
- Temperature extremes
- Flooding

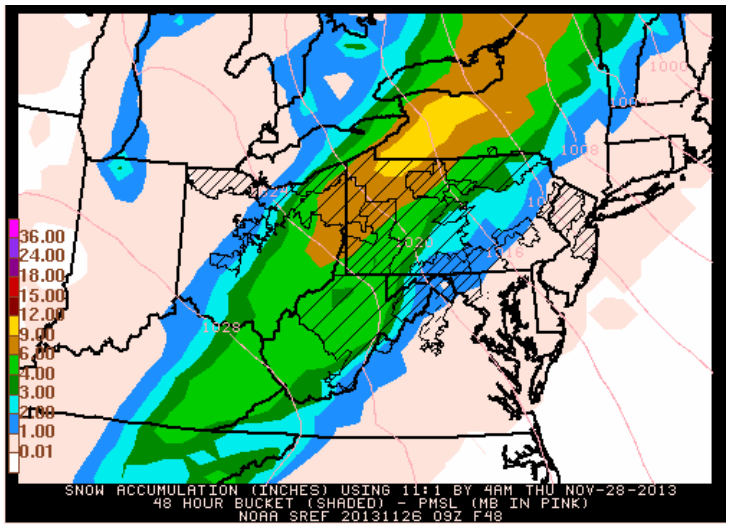


Address Safety, Reliability and Resource Management Issues:

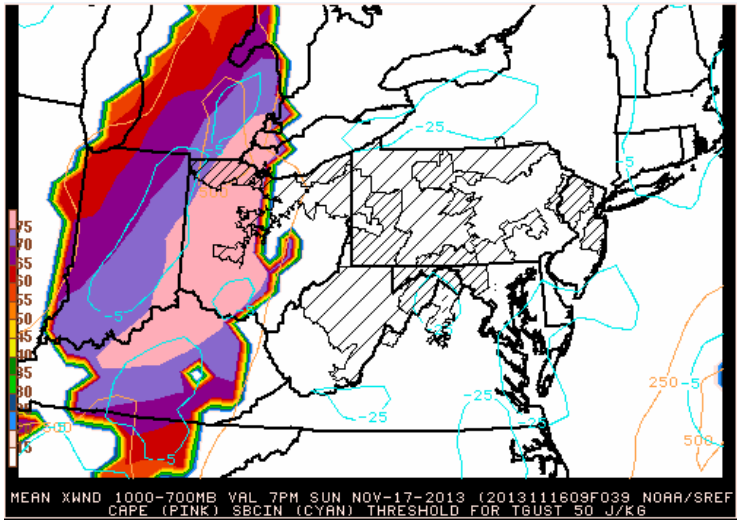
- Pre-staging of resources (crews, wires and poles)
- Also extra staffing required to meet anticipated increase in customer call volume

We utilize the SREF to identify potential threats

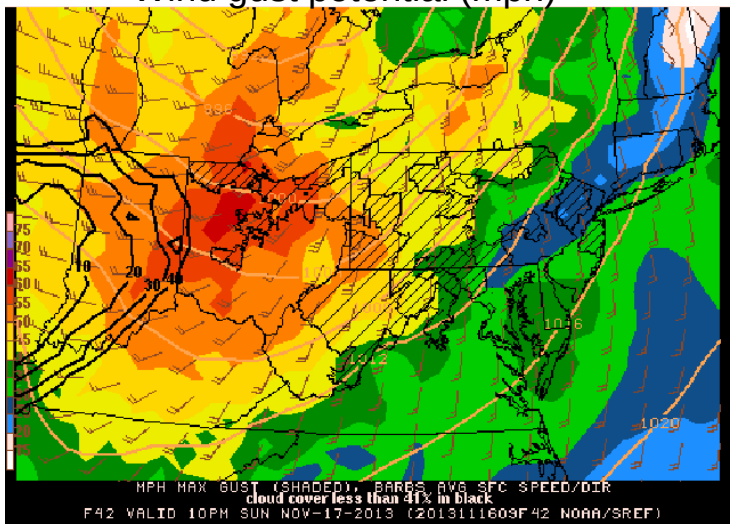
Snow fall (inches)



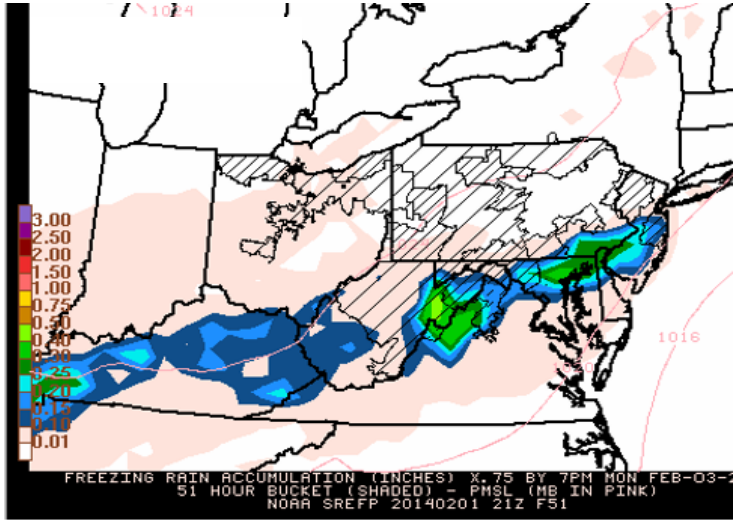
Conv. Wind gust potential (mph)



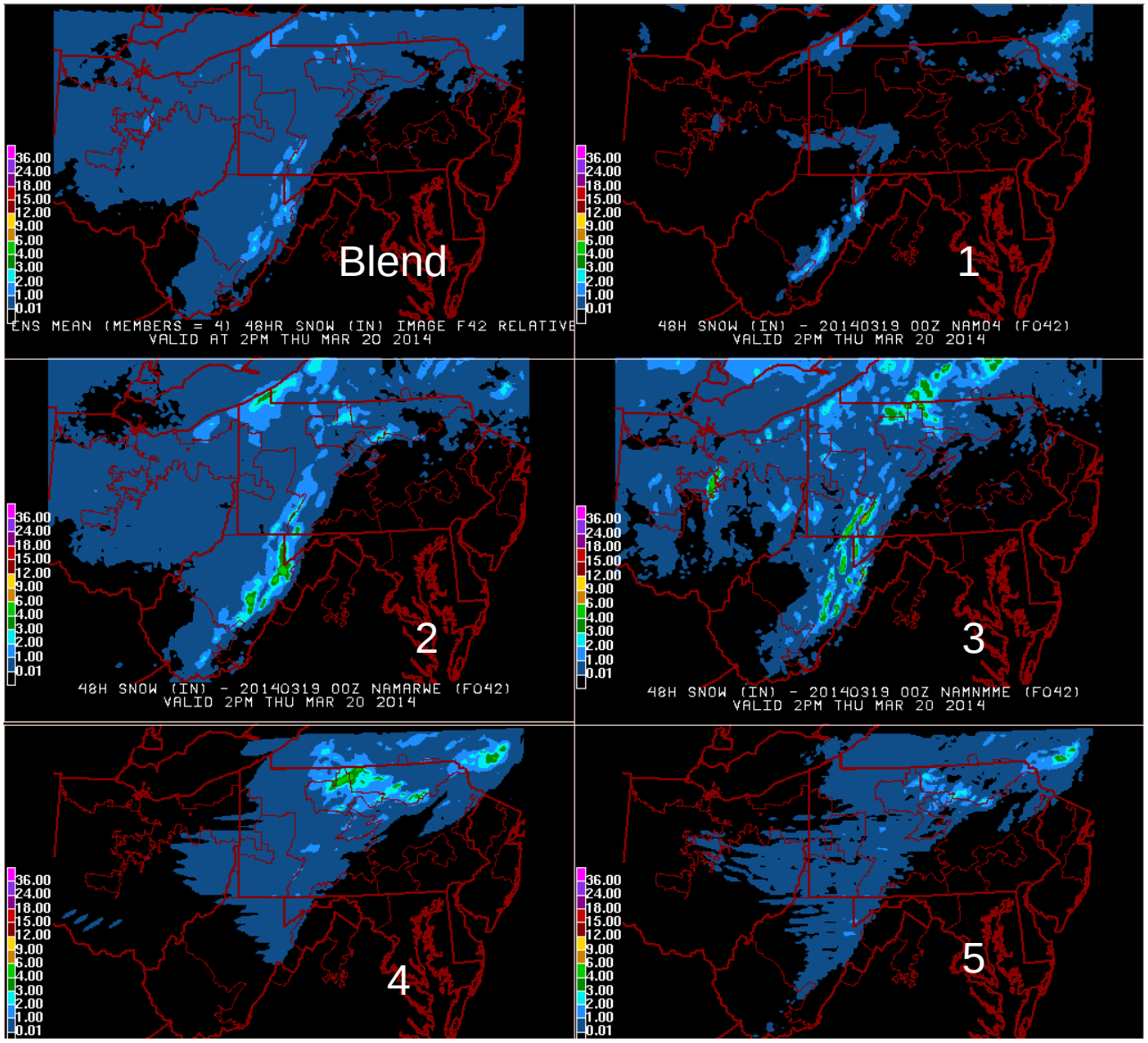
Wind gust potential (mph)



Freezing Rain (inches)



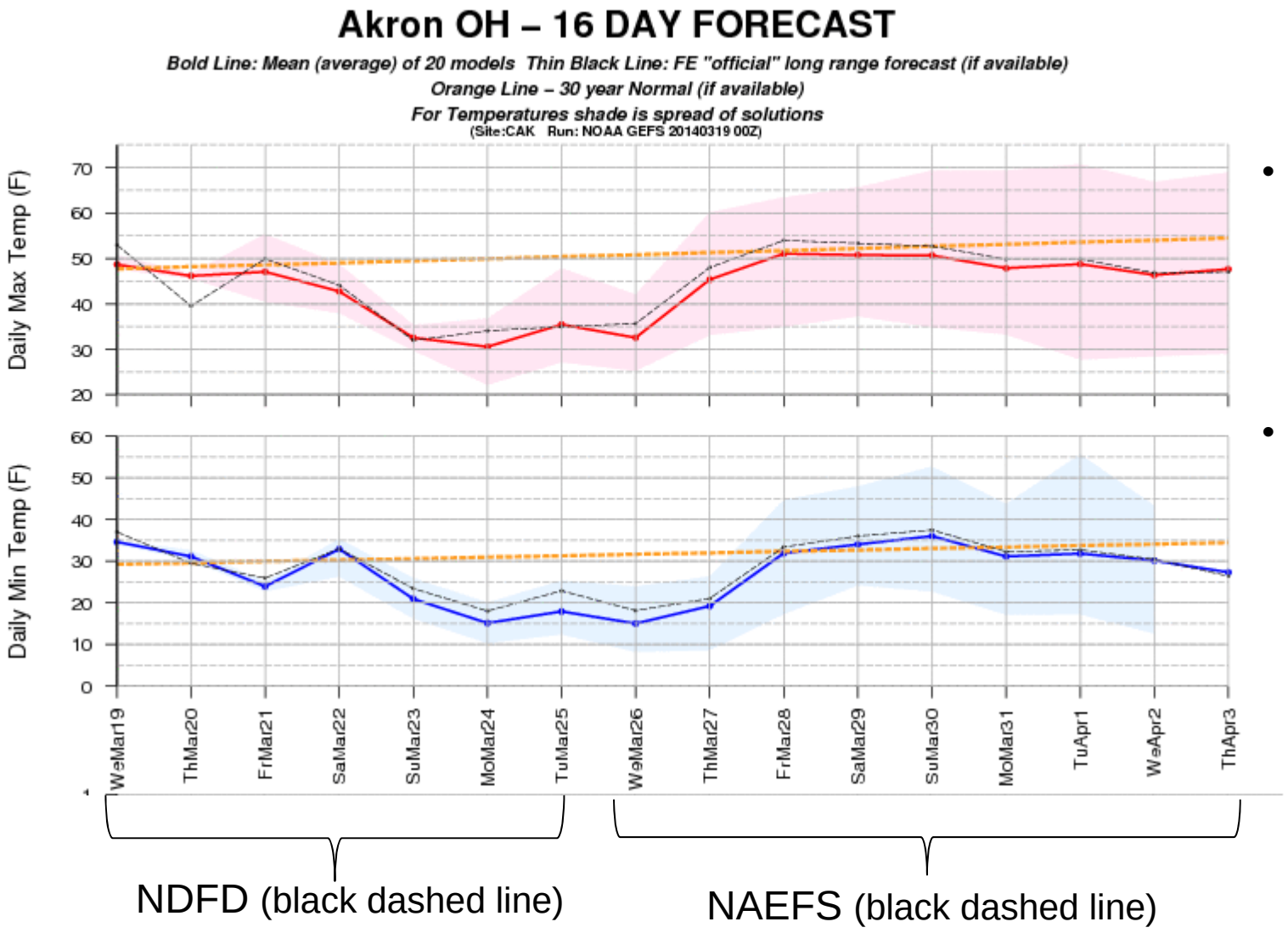
5 member high-res WRF blend



Snow Accumulation

- We set this up mainly to handle lake effect snow and higher elevation snowfall and have seen success with it.
- 5 member blend uses NAM 4 km, High-Res NAM Windows (ARW & NMM), and locally run WRF.

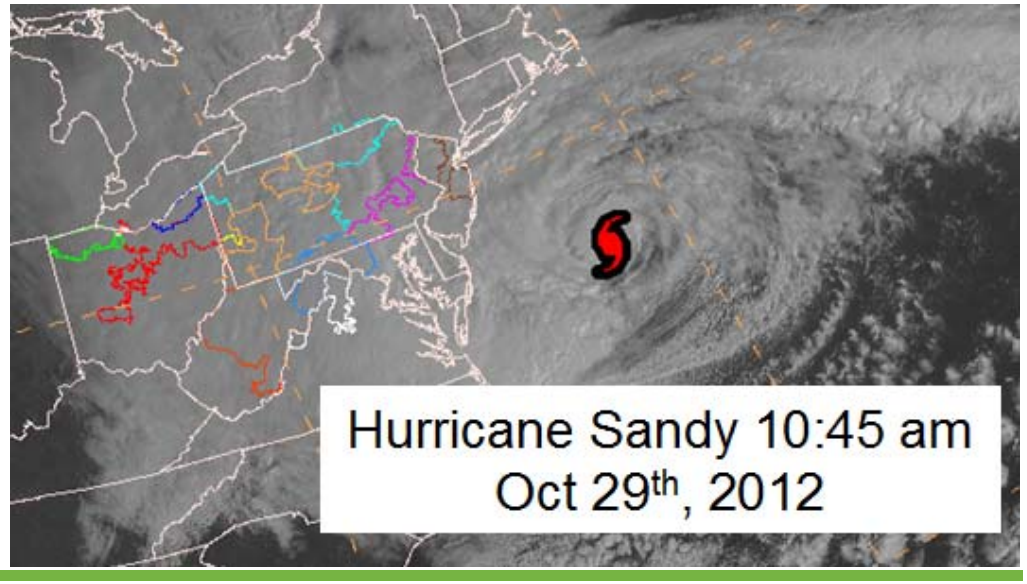
NAEFS used for extended range point forecasts



- Point forecasts are used by FirstEnergy for load forecasts for power.
- Point forecasts are also used for predictions of load on transmission lines.

Global Ensembles

- **FE's combined use of NDFD and NAEFS for 16 day hourly point forecasts has replaced a paid for service.**
- **FirstEnergy relies on NAEFS, GEFS, and the ECMWF Ensemble Mean for routine hazardous outlook briefings and forecasts provided to senior executives and storm planning decision staff.**



Conclusion/Summary

- **FE relies on ensembles operationally – especially the SREF and NAEFS.**
- **FE also uses GEFS and to a lesser extent the ECMWF ensemble mean.**
- **We look forward to seeing the ensembles move to higher resolutions.**
- **We would like to thank NCEP and NOAA for allowing us to attend this workshop.**

Questions & Answers

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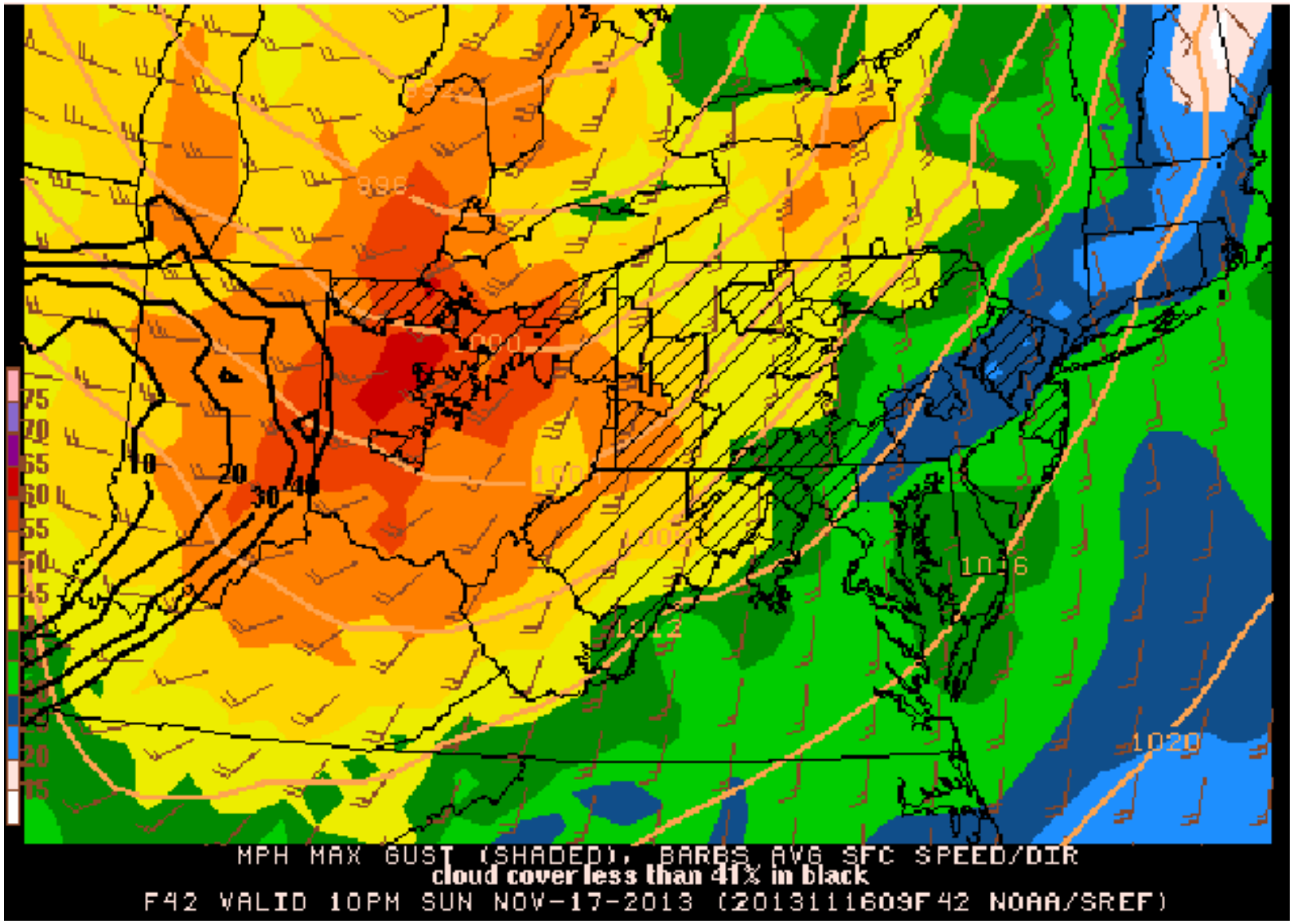
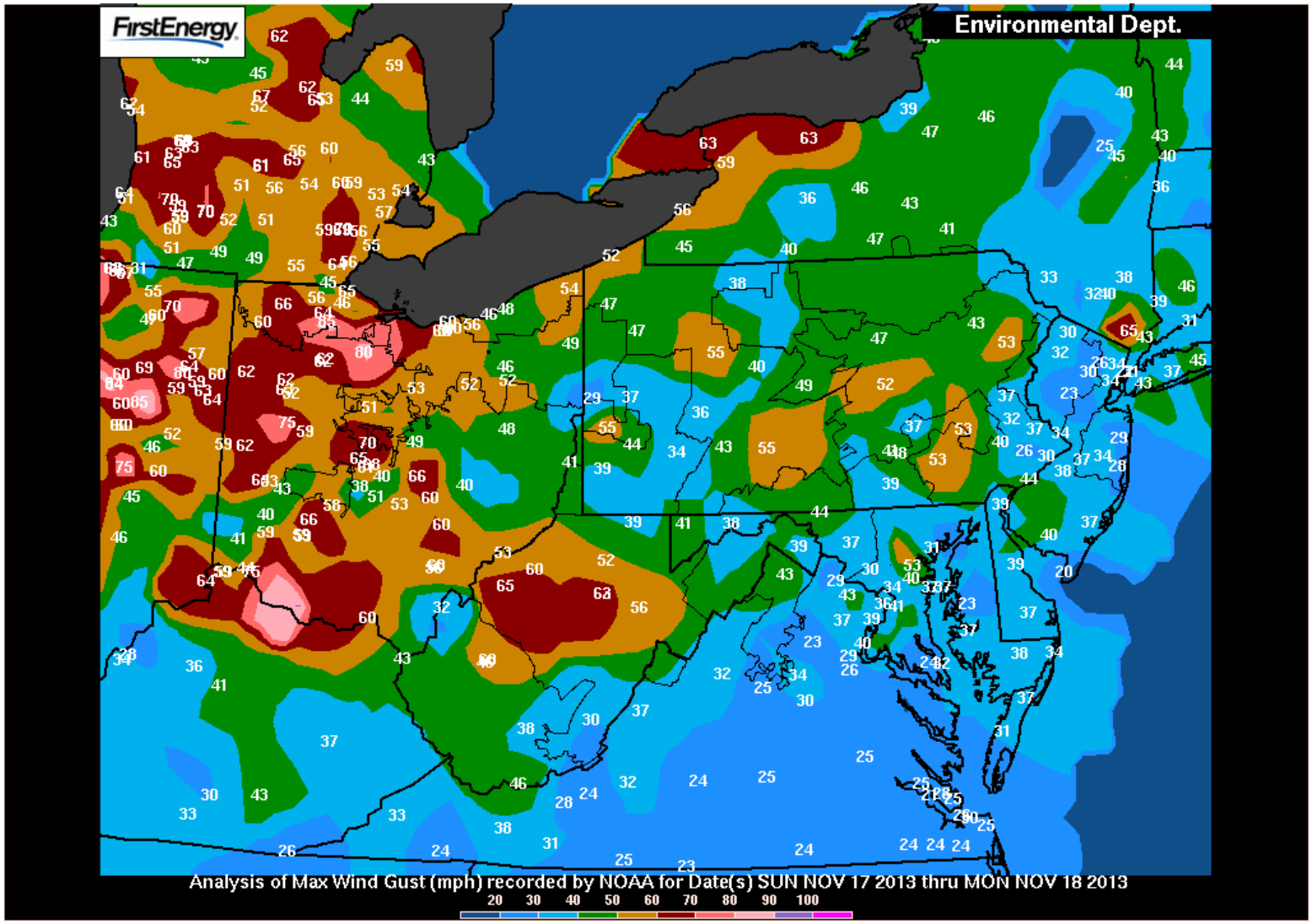
SREF(15) Maximum Non-Convective Gust Potential

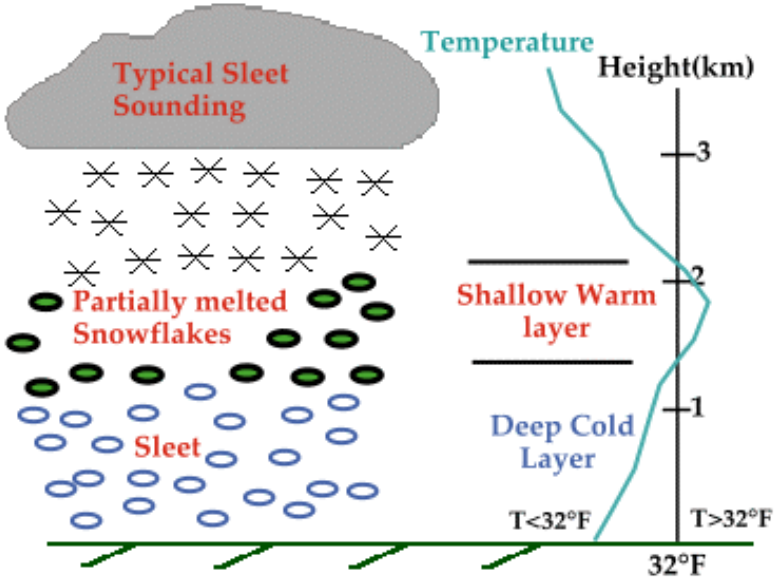


Nov 17 2013 Max Recorded Wind Speeds



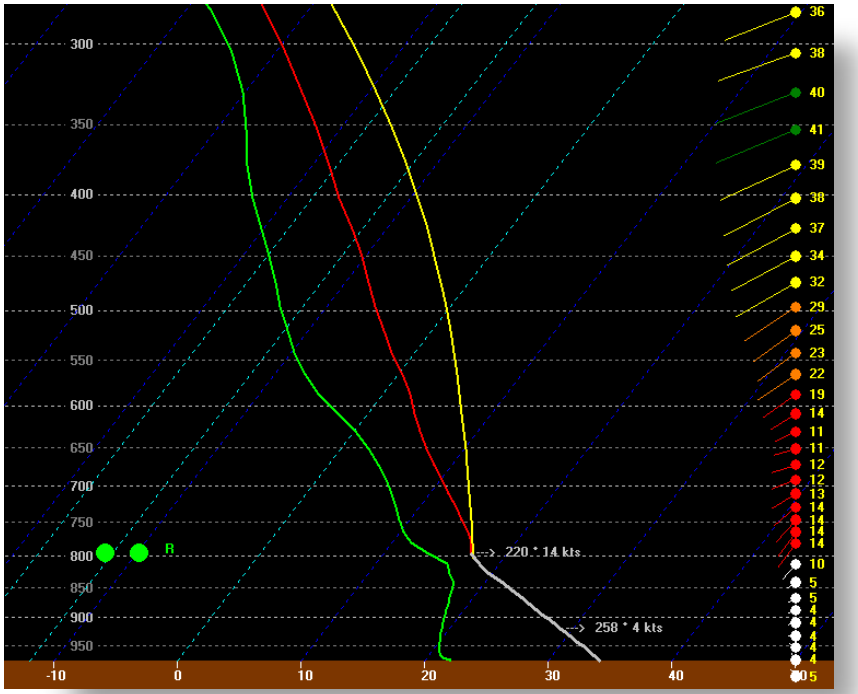
SREF Application – Winter Precipitation

- **Simple approach – multiply three hour melted QPF by precip type (binary flag at every fhr for snow, rain, sleet and freezing rain)**
- **Three hour components summed (GEMPAK) to create the following for each precip type (every cycle)**
  - Three hour totals
  - "Model run" totals
  - Running 24 hour totals
- **Will improve when one hour SREF output utilized**
- **Examples of wind and snow loops will follow the verification plots**



SREF Application – Wind (Non-Convective)

- **Momentum Transfer Method (BUFKIT) approach applied to each SREF member**
- **"Height of gust layer" found when (working from surface upward) the lapse rate becomes greater than 70% of that for a standard atmosphere (~-4.5 deg /km too stable to mix beyond this threshold)**
- **Within this layer two parameters are calculated:**
  - "Typical gust" (mean of the wind speed in the gust layer)
  - "Max gust" (max wind speed in the gust layer)



- **Assessed from surface to 700mb for every member at every grid point for every forecast hour (GEMPAK) and every cycle**
- **Very powerful tool for pre-storm planning**