Application Of An Operational Mesoscale Modelling System For Industrial Plant Operations

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Background and Motivation

Weather-sensitive business operations are primarily reactive to short-term, local conditions due to (real or perceived) unavailability of appropriate predicted data for:

- IBM systems - utility plant operations, site operations, energy conservation and generation, safety.
- Mesoscale NWP has long shown "promise" as a potential enabler of proactive decision making for both economic and societal value.
- Can business and meteorological value be demonstrated beyond physical models?
- Can a practical and usable system be implemented at reasonable cost?
- It is not about weather but integrating forecasts into decision making to optimize facility operations.

Approach

- End-to-end integrated and automated, customizable forecasting system (user to meteorology).
- Optimized for good throughput on modest IBM Power/AIX hardware (1 hour per forecast day) to enable timely decisions.
- Modelling code derived from non-hydrostatic WRF-ARW.
- NCEP data sources (e.g., NAM, RUC, GFS) used for lateral boundaries and background fields.
- NOAA and other sources for data assimilation for initial conditions and analysis for verification.
- Sophisticated, flexible visualization and dissemination.
- Coupled to "user" and response processes & models.
- Forecast for asset-based decisions to manage weather event, pre-stage resources and labor proactively.

Issues to Consider for Facility Operations

- Predict specific events or combination of weather conditions that can affect heating and cooling systems (HVAC) with sufficient precision and lead time to enable proactive operation of central utility plant and other facilities for energy and resource optimization.
- Migration from monitoring a storm to the ability to plan resources for optimal use and minimal impact to site operations.
- Implement as a service tailored for the geographic, throughput and dissemination requirements of the facility and operations.
- Predict conditions that can lead to site and facility operational impacts, thus allowing proactive planning.

Application Case Study

Weather-Sensitive Industrial Site Operations

Building Energy Management

- Optimized use of electrical power, heat sources and water.
- Daily, accurate site-specific forecasts could ensure that all of the chillers and boilers are available and/or running before peak load.
- Forecast of afternoon conditions could enable operators personnel to shut down unneeded equipment to conserve energy.
- Accurate site forecast enables maximizing energy efficient operations by the use of off season cooling and other types of heat exchangers.
- Peak load shifting or avoidance strategies.
- Smart Building Management System applications.
- Potential for alternative energy generation and storage strategies.

Site Operations

- Weather-sensitive manufacturing and development operations.
- Outdoor events and grounds work affected by local weather conditions.
- Site personnel scheduling (arrival, departure, remote access).
- Improved efficiency and effectiveness for cold season operations.
- Reduction of cost and environmental impact.
- Potential for improved supply chain management.
- Enable more energy-efficient IT operations.

Safety

- High wind/lightning can affect outdoor activities such as roof and scaffold work, window cleaning or general construction.
- Heavy rain, ice, snow could contribute to accidents on site roads, parking lots and sidewalks.

Security

- Infrastructure and asset protection may have weather sensitivities.