SMART GRID INTEROPERABILITY PANEL

Business Case for Harmonized Bidirectional and Cross-Domain Weather Exchange

A white paper developed by Smart Grid Interoperability Panel

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About the Smart Grid Interoperability Panel

Smart Grid Interoperability Panel (SGIP) orchestrates the work behind power grid modernization. SGIP was established to identify technical and interoperability standards harmonization that accelerates modernization of the grid. As a member-funded, non-profit organization, SGIP helps utilities, manufacturers and regulators address standards globally: utilities gain improved regulatory treatment for investment recovery and manufacturers obtain enhanced commercial opportunities worldwide. SGIP members stay competitive, informed and well-connected. To learn more about SGIP, visit http://sgip.org/.

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1.1 Executive Summary

Multiple existing weather exchange standards (WMO, etc…) do not uniformly address the current and future needs of a broad range of Smart Grid stakeholders in the 21st century. Having a more robust and harmonized weather exchange model increases interoperability, improves data quality, and reduces the cost of acquisition of diverse large environmental data streams which would allow more resources to be devoted to innovative uses of weather and forecast information by the Smart Grid community.

1.2 Who are we?

The Smart Grid Interoperability Panel (SGIP) [1] accelerates the implementation of interoperable smart grid devices and systems. This mission is accomplished in part by facilitating the harmonization and adoption of standards that readily enable systems, applications and devices to meet requirements and to interoperate within the Smart Grid. Through its development of requirements for standards, the SGIP helps otherwise isolated standards efforts meet the needs of an enlarged stakeholder base.

This is not a U.S. specific issue or opportunity and SGIP has many non-US based members who can benefit from this work. As weather knows no national boundaries, cooperation at a global scale is essential for the development of meteorological information data exchange standards[2].

Priority Action Plan 21: "Weather Information" was approved by SGIP to facilitate the harmonization of weather data exchange standards which will increase interoperability, improve data quality, and reduce costs.

1.3 The Challenge!

Detailed knowledge of weather – current, historical, and forecasted – can provide the basis for Smart Grid stakeholders to optimize current and future operations and to mitigate disruption and damage from adverse weather events.

According to the 2013 Federal Advisory Committee Climate Assessment[3]:

> Extreme weather events are affecting energy production and delivery facilities, causing supply disruptions of varying lengths and magnitudes and

[1] Smart Grid Interoperability Panel (SGIP), http://sgip.org

[2] The World Meteorological Organization (WMO) is a specialized agency of the United Nations and has a membership of 191 member states and territories. The International Electrotechnical Commission (IEC) is the world's leading organization for the preparation and publication of International Standards for all electrical, electronic and related technologies.

[3] "Climate Change and the American People" Chapter 4, http://ncadac.globalchange.gov/download/NCAJan11-2013-publicreviewdraft-fulldraft.pdf

affecting other infrastructure that depends on energy supply. The frequency and intensity of extreme weather events are expected to increase.

Higher summer temperatures will increase electricity use, causing higher summer peak loads, while warmer winters will decrease energy demands for heating. Net energy use is projected to increase as rising demands for cooling outpace declining heating energy demands.

Weather data comes from numerous sources – the federal government, the air traffic control system, energy utilities, commercial weather enterprises, and owners and operators of commercial buildings – and the data is of varying detail and quality. Each source today has its own information model and exchange standards for describing weather and weather related events.

The impacts of highly localized weather can have dramatic effects on energy distribution and usage that can require highly tailored preparations and responses. Many sources of weather data are also consumers of weather data from others. The integration of weather data from multiple sources offers greater detail and resolution of analysis and prediction. Single sources of weather data can limit the reliability and resiliency of communications and energy infrastructures dependent on them.

1.4 Why Harmonized Weather Standards Will Help

The benefits from exploiting weather data can include better planning, speed of reaction, quality of response, and minimization of costs due to accurate and timely application. In order to exploit weather data, it must first be acquired and analyzed. One can readily see that the cost of data acquisition itself is purely overhead and does not provide any direct value. Harmonized standards can minimize this cost of acquisition and allows resources to be directed for analysis and development of innovative uses of weather information rather than for pure data transfer and interchange.

Additionally, harmonized standards minimize the costly and brittle need for many-to-many translations[4]. Even when there are needs for translation of weather data, a single reference allows a one-to-many rather than a many-to-many transformation – a geometrically smaller problem. What's more, with a common reference the responsibility for adaptation to "other representations" migrates to the requester rather than the supplier lowering the overall cost of publishing and providing standardized weather data.

The following are some economically beneficial results of Harmonized Bidirectional and Cross-Domain Weather Exchange:

[4] Although mapping is a solution to help bridge data from many sources, a certain loss of data occurs and the integrity is not always maintained. Mapping is a halfway solution to harmonization and is not efficient or consistently reliable.

- For acquirers of services, standardization or harmonization reduces the occurrence of vendor lock-in due to compatibility as opposed to from availability of unique and excellent services.
- The opportunity for value-added services is increased by the ubiquitous availability of sourced data.
- Microclimate data availability can enrich the quality and precision of weather data providing for better analysis at lower cost.
- Localized microclimate data down to the customer premise combined with regional data can provide cost-effective and accurate localized energy efficiency analyses.
- Additional sources of weather that can be easily integrated create the opportunity for a large ecosystem of service providers. Today's divergent sources of weather data impede the ecosystem due to the high cost of acquiring and integrating data.
- A well-established harmonized reference reduces uncertainty about data quality. Combining information from varying sources of differing quality can result in a net more accurate forecast and analysis. This in turn can reduce the liability for predictions based on its use. Higher resolution and metadata can be available than could be cost justified due to ease of integration.
- Standardized data allow deployment of services across territories without additional cost and tailoring.
- More accurate and quantitative availability of weather data can improve resilience including minimizing outage times and restorations. The costs of outages can be reduced through better preparation and coordination of first responders.

1.5 What Will Drive This Forward?

There are many examples of how the U.S. federal government has promoted technology to help spur innovation or benefit the national and global economy. The U.S. government continues to promote the benefits of standardized data. Namely, the Open Data Initiative[5] of the White House's Office of Science and Technology Policy (OSTP) has promoted the availability of public and private data sets with the goal of enhancing American prosperity through value-added ecosystems of companies exploiting the availability of data on behalf of consumers and businesses. Efforts such as Blue Button[6] for health records and Green Button[7] for Energy Usage Information have shown the benefits of

[5] http://www.whitehouse.gov/open, http://www.data.gov/, http://www.whitehouse.gov/administration/eop/ostp/initiatives#Openness
[6] http://bluebuttonplus.org/
[7] http://www.greenbuttondata.org/

government cheer leading and private industry uptake of interoperable data standards.

The private sector can exploit the “low-impedance” and widespread availability of standardized weather data to invent new applications and services and speed time to market.

There are three major vulnerabilities to critical infrastructure which includes the Smart Grid – physical, cyber, and natural. The resiliency requirements of operators of critical infrastructure will drive participation towards achievement of the goals of this priority action plan.

In the interconnected highly networked world, harmonized standards have greater relevance and penetration because they minimize cost of use, produce greater efficiencies and give users more choice of product, often at a lower cost. Broad availability of products and services producing and consuming standardized weather data should result in substantial cost savings for utilities. Users of all levels in all domains will demand greater depth and consistency of weather data from their providers.

This collaboration can provide a model for collaborations in related fields where other Smart Grid data is combined with weather data.

Points recorded in notes from February 27th meeting. All points were incorporated into the two page draft above.

- X Go beyond utilities to the customer and the buildings –
- X Bidirectional allows new sources of weather data microclimate
- X If I am building a photovoltaic on my home, I need to estimate savings.
- X If data is bidirectional, both parties can benefit.
- X Ability to predetermine building susceptibility to weather forecasts
- X Combine source of weather both local remote services?
- X We would like to able to buy equipment commodity priced that could provide common sensing of local microclimate weather data for example for distribution in the power system.
- X Getting information from multiple sources – NWS and my next door neighbor. You might want to weigh the different sources as to relevance. Access to multidata and to source and sink it.
- X Without commonality, you have gateways that add up cost, complexity and inaccuracies.
- X Standards can help reduce risk due to consistency and description of accuracy and precision as well as uncertainty

- X An ecosystem of opportunists exploiting weather (source or sink) can benefit from consistency
- X Emphasis on mixing larger scale weather with microclimate sources
- Benefits of harmonization includes the metadata – what is the quality of data
- X Commercial weather producers constantly get asked for specialized formats of data. 1 to n vs n to n translations
- X Example of time – if you use UTC than people can translate to what they need. If not, many to many translations
- X Challenges in overcoming the “camps” such as communities, product lines. We have many choices.
- X Motivation for change – users demand more consistency; need key stakeholders to ask for more collaboration
- X When you are dealing in a space with both utility and DER suppliers, we are hoping that more innovative products come from mixing data. Suppliers who want to provide services can deploy them across territories without additional tailoring.
- X Government could have a role in motivating collaboration