6. Prioritized Actions *Note – Full text can be found at: http://nist.gov/smartgrid/InterimSmartGridRoadmapNISTRestructure.pdf*

6.1 Cross-cutting and Overarching Issues

6.1.1 Common Pricing Model Standard

Key Actions:

(1) **Develop and standardize a pricing model** – NIST should work with IEEE, IEC, OASIS, ASHRAE, NAESB and other relevant SDOs to develop an approach for developing a common pricing model to traverse the entire value chain. The model must include price, currency, delivery time, and product definition.

6.1.2 Common Time Synchronization and Management

Key Action:

(1) **Develop or adopt application or role based synchronization guidelines** –NIST should organize a meeting between standards groups IETF, NASPI, IEC TC57 and IEEE PSRC and other stakeholders with the objective of developing processes for aligning applications and guidelines around IEEE 1588, Network Time Protocol and IRIG-B and other time requirements. Ensure processes will be applicable to devices, groups of devices, regions and combinations of regions. Ensure efforts include common scheduling, non-technical data sources (weather, markets), operational issues, recovery from loss of synchronization, and post mortem analysis.

6.1.3 Common Semantic Model

Key Actions:

(1) **Develop a Common Semantic Model** – NIST should work with IEC TC57, NEMA, ASHRAE SPC 135, and OASIS to devise a common semantic model using XML Schema and XML. The objective will be to unify the models of CIM (IEC61970, IEC61968) and IEC 61850 including correspondences with ANSI C12.19 and ASHRAE 135 to form a common representation of information models constructed by these standards efforts for the Smart Grid.

Sections 6.1.3.1 and 6.1.3.2 discuss but two of a number of important cross-domain information models that should be developed.

6.1.3.1 Common Meteorological and Geospatial Models

Key Actions:

(1) **Develop or adopt generic models for weather, pricing, Geographic Information Systems (GIS), and scheduling, using the Common Semantic Model –** NIST should work with IEC TC57, NEMA, ASHRAE SPC 135, OGC/OpenGIS and OASIS to assemble and existing approaches to the representation of meteorological and geospatial information. The resulting common information would be represented in the common semantic model and then forwarded back to the individual standards bodies for harmonization

6.1.3.2 Common Scheduling Mechanism

Key Actions:

(1) **Communicate with Smart Grid stakeholders on scheduling standard –** NIST shall communicate with Smart Grid stakeholders to determine if existing scheduling specifications may be used or whether new standards need to be created.

(2.a) **If existing specifications may be used, than Create a scheduling standard –** NIST to communicate with specification owner and coordinate activities necessary to make it a Smart Grid standard. SDO shall convert specification into a Smart Grid standard.

(2.b) **On the other hand, if new standards are needed, identify a SDO to create a new Smart Grid scheduling model –** NIST communicate with IEEE, IEC, UCA, OASIS, OpenADR to identify and select scheduling model SDO. NIST shall choose a SDO based on meeting results. SDO shall develop requirements for scheduling standard. Chosen SDO develop common scheduling model that meets Smart Grid requirements.

6.1.4 Application of Internet-Based Networking Technology

Key Actions:

(1) **Educate the Smart Grid Community on the Internet Protocol Suite.** NIST should sponsor workshops to educate a wide smart grid stakeholder audience on what the Internet Protocol Suite is - its constituent protocols and technologies, their capabilities, and how their attributes should be compared to smart grid application non-functional requirements to facilitate appropriate protocol selection.

(2) **Perform a rigorous mapping of common smart grid application requirements against Internet Protocol Suite protocols**. NIST should convene

a meeting of representatives from the IETF, IEEE, and selected industry groups to organize a cross industry group to perform this analysis. The analysis should be segmented by Conceptual Model Domain and sub-domains to address domain specific requirements in addition to cross domain networking requirements. The analysis should identify those protocols that are clearly applicable in specific application contexts (e.g. use of IPV4, IPv6, and TCP in enterprise applications) in addition to identifying any existing gaps.

(3) **Develop recommended Internet Protocol Suite Network Profiles for Smart Grid domains**. NIST should direct or encourage the group doing the requirements analysis to create a standards level body within the IETF, IEEE, or other SDO to develop smart grid domain specific application profiles based on that analysis.

6.1.5 Communications Interference in Unlicensed Radio Spectrums

Key Actions:

(1) **Determine the need for dedicated spectrum** – NIST should commission a group of experts to study the issue of communications interference in unlicensed radio spectrums for smart grid applications and develop business and technical requirements on the optimal requirements for wireless spectrum usage for Smart Grid communications. The objective is to produce the necessary arguments to identify the preferred usage of spectrum throughout North America.

6.2 Priority Functionality Issues

6.2.1 Demand Response & Consumer Energy Efficiency (DRCEE)

Key Actions:

(1) **Develop or adopt standard DR signals** – NIST shall organize a meeting with IEC TC57, OASIS, NAESB, and AMI-ENT to specify a process for developing a common semantic model for standard DR signals. The effort shall ensure DR signal standards support load control, supply control, and environmental DERs.

(2) **Develop market signal standards** – NIST shall organize a meeting with policy makers, market operators/ISOs, and standards committees to develop common syntax and semantics for communicating market opportunities through the value chain and all the way to the customer. The effort shall develop policies that protect customers, but allow them to participate in the market. This is not an immediate need, but is something that requires a lot of thought and situational analysis.

(3) **Develop DER discovery and profiling standards** – NIST shall coordinate a meeting with IEC TC57, OASIS, NAESB, and AMI-ENT for developing standard mechanisms for DER device discovery and profiling, persistence checks, and registry updates. The effort shall develop standard mechanisms for DER device discovery and profiling, persistence checks, and registry updates.

6.2.2 Wide Area Situational Awareness

Key actions:

(1) **Develop application or role based synchronization guidelines** –NIST should organize a meeting between NASPI, IEC TC57 WG10 and IEEE PSRC with the objective of dealing with applications and guidelines around IEEE 1588, Network Time Protocol and IRIG-B as applied to power systems. Ensure efforts are applicable to devices, groups of devices, regions and combinations of regions. Ensure efforts include recovery from loss of synchronization.

(2) **Develop map of IEC 61850 objects to DNP3** – IEC TC57 and DNP3 Users Group need to create mapping to provide for support of DNP3 protocols with the objectives of minimizing impact of existing installed asset base.

(3) **Develop and extend IEC 61850 and IEC 61970 for data and messaging** – IEC TC57 WG19 should direct efforts of WG10 and WG13 to extend IEC 61850 from the substation to other substations and to the control centers as well as develop interoperable messaging for IEC 61970. Ensure standards support lossless model exchange between actors (substations and control centers, and others) and create standardized mechanism for mapping information models to communication formats and messages. Drive efforts toward use for near real time updates of power system models as this allows tools based on those models to support the presumed dynamism of demand response and storage. Include support for market signals, weather and other non-technical actionable information.

6.2.3 Electric Storage

Key actions:

(1) **Develop storage device electrical interconnection guidelines**. NIST should issue a request to IEEE SCC 21 that the IEEE 1547 working group recruit domain experts in energy storage devices and update or augment the 1547 standards series as appropriate to accommodate energy storage system specific requirements. Coordination with UL and SAE may be required for electric vehicle based storage systems.

(2) **Develop storage device specific common information model**. NIST should issue a request to IEC TC 57 WG17 to recruit domain experts in energy storage devices and update or augment the 61850-7-420 standard as appropriate to accommodate energy storage system specific requirements.

6.2.4 Electric Transportation

Key actions:

(1) **Develop and standardize common object models** – SAE is developing the requirements as well as providing the definitions for data exchanges of PEVs, chargers, metering equipment, registration equipment, and other PEV-related equipment. However, they need to pass these data requirements and definitions to a standards organization for mapping into actual object models. NIST shall communicate with SAE, IEEE, IEC, UCA, OASIS to identify and select SDO for pricing model (see Section 6.1.1), DR signal standards (see Section 6.2.1), and scheduling standard (see Section 6.1.3.2).

6.2.5 Advanced Metering Infrastructure

Key Actions:

(1) **Translate ANSI C12.19 into the form of the common semantic model (See section 6.1.3)** -- NIST should work with NEMA to take on this task. The objective is to allow the lossless translation from the common form to the various syntactic representations prevalent in each Domain. Details will include the representation of the Decade/Table/Element model, as well as, the table-independent representation of key measurements of a revenue meter.

(2) **Extend ANSIC12.19 and ANSI C12.22 to support common cyber security requirements** – NIST should complete a common set of cyber security requirements through its Cyber Security Task Group. When complete NIST should engage NEMA in a normalization activity to capture results into ANSI C12.22 and C12.19 so that they have the capabilities to satisfy the requirements.

(3) **Define a conformance classification for ANSI C12.22 to constrain its scope** – NIST should work with NEMA to define, in their conformance testing standard C12.23, a set of conformance classifications that permit the varied capabilities of C12.22 to be selected and specified. Then work with UCAIug to define an implementation agreement to select subsets of ANSI C12.22 for use when integrating with other Smart Grid standard protocols.

(4) **Design one or more standard meter profiles using ANSI C12.19 Exchange Data Language** – NIST should work with NEMA to utilize EDL to represent one or more meter profiles with distinct information locations and formats to simplify client access to commonly shared information.

6.2.6 Distribution Grid Management Initiatives

Key Actions:

(1) **Accelerate the work of developing the Common Information Model (CIM)** for distribution applications, including integration of a CIM profile for MultiSpeak interoperability. Use the IEC TC57 WG 14 roadmap as a starting point for this effort.

(2) **Develop neutral hosted vendor interoperability testing to demonstrate interoperability based on the CIM profiles.** Ensure that requirements developed by groups such as UCAIug AMI-ENT are included. Ensure that profiles account for capabilities inherent in both.

(3) **Amend and extend IEC 61968, IEC 61850, and IEEE 1547 –** NIST should bring together IEC TC57 WG14, WG10, IEEE SCC21 and OASIS architects to develop the framework for the amendment and extension of these standards to account for device profiles and discovery. Ensure that web services methods are harmonized among the candidate standards. Ensure that the standards are scalable for systems such as AMI and HAN.

(4) **Develop processes to model PEV impact on the grid operations along with impacts of other widespread distributed resource impacts (local storage, high penetration PV, demand response as a distribution resource, etc.) –** NIST to work with DOE to explore the business and technical impact of these widely distributed resources (including aspects of PEV as highly portable demand/storage) on the grid with the objective of mitigating severe contingencies due to the widespread adoption and use of these technologies. Ensure that work includes transactional elements (settlement when charging/discharging away from "home").

6.2.7 Cyber Security Strategy

The key actions are to complete the tasks identified in Section **Error! Reference source not found.** of this document.