Comments of the New America Foundation's Open Technology Initiative

submitted to

U.S. Department of Energy

regarding

Request for Information on

Addressing Policy and Logistical Challenges to Smart Grid Implementation

November 1, 2010

The New America Foundation's Open Technology Initiative ("NAF") respectfully submits these comments in response to the United States Department of Energy's ("DOE") Request for Information (RFI) entitled "Addressing Policy and Logistical Challenges to Smart Grid Implementation."[1] NAF will address the following sections in the RFI:

- *Definition and Scope*
- *Interactions With and Implications for Consumers*
- *Assessing and Allocating Costs and Benefits*
- *Utilities, Device Manufacturers and Energy Management Firms*
- *Long Term Issues: Managing a Grid With High Penetration of New Technologies*
- *Reliability and Cyber-Security*
- *Managing Transitions and Overall Questions*

Introduction and Summary

In the comments below, NAF will address the current challenges in the Smart Grid infrastructure build out funded by the Department of Energy (DOE) and render solutions in the light of public interest, open standards, an interoperable platform and future-proofing the nation's 21st century "Smart Grid" electricity infrastructure. The $11 billion set aside for modernizing the electric grid under the American Recovery and Reinvestment Act of 2009[2] is in the process of being depleted on obsolete and redundant deployments. Of the 100 projects that received ARRA funding under the Smart Grid Investment Grant (SGIG) Program, 31 were solely advanced metering infrastructure projects and 39 were integrated systems projects which also include smart meters.[3] Over 2 million smart meters have already been installed in the country with even

1 *See* 75 Fed. Reg. 57006 (September 17, 2010)
2 DOE, Recovery Act, http://www.oe.energy.gov/recovery/1225.htm#1
3 Smartgrid.Gov, Smart Grid Investment Grant Program, http://www.smartgrid.gov/smartgrid_projects?category=4

more mass-scale deployments underway.[4] But too many of these deployments have failed due to installation errors, inaccurate meter readings, increased risk burden on consumers, and a lack of consumer outreach and education. The result is that smart meters are increasingly viewed with scorn by a growing number of consumers. Other projects, supporting transmission, distribution, customer systems, equipment manufacturing and integrated systems are also facing challenges due to the lack of approved industry standards.

The Smart Grid is "expected to save consumers more than $20 billion over the next decade on their utility bills", said President Obama at a speech in Florida.[5] However, on-ground developments are demonstrating entirely contradictory results. In California[6] and Texas[7], utilities billed consumers much "higher" amounts after smart meter rollouts, while the SmartGridCity in Boulder, CO recently handed consumers a $44.5 million bill at the order of the PUC to pay for the utility's poor planning.[8] These failed projects exhibit that ARRA funds are being wasted on erroneous rollouts that fail to take into account reasonable cost/benefit analysis and place the risks almost exclusively on ratepayers while all the benefits accrue to utilities through higher revenues and operational efficiencies. Immediate federal and state action to re-evaluate current steps towards the Smart Grid build out is crucial to protects consumers and ensure that the Smart Grid fulfills its promise.

The Smart Grid provides opportunities to provide two-way information flow between consumers and producers of electricity, support for distributed (micro-generation) and renewable energy, increased energy efficiency across the system, and deployment of an open and interoperable platform than can aid and empower the public with access and the ability to become active producers and consumers. Yet, the current vision seems to be driven by utility aims and is constrained to smart meters that often do not even provide consumers with access to real-time usage data. It is essential that the distribution grid and consumers be integrated into deployments to benefit from increased energy efficiency and truly form an interconnected electrical grid.

NAF advises that the DOE should first create a gradual, multistep roadmap for a Smart Grid national project before large scale deployments occur across the country. We strongly recommend that to achieve its goals, the Smart Grid must empower consumers with information and communication. The Smart Grid must be built on an open and interoperable platform that avoids vendor lockin, path dependencies, and obsolescence – only an open and interoperable system can integrate all components of the Smart Grid and maintain network robustness over time.

Further, NAF recommends that the most efficient and effective way to attain maximum benefits from the Smart Grid is by creating a network architecture that supports community level

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4 DOE, "Smart Grid Development Initiatives by the US Department of Energy", Slide 17, http://www.cepal.org/drni/noticias/noticias/8/41128/Hauser.pdf , October 2010

5 White House, "Remarks by the President on Recovery Act Funding for Smart Grid Technology", http://www.whitehouse.gov/the-press-office/remarks-president-recovery-act-funding-smart-grid-technology , October 27, 2009

6 Smartmeters, "Lawsuit filed against PG&E for smart meter overages", http://www.smartmeters.com/the-news/682-lawsuit-filed-against-pgae-for-smart-meter-overcharges.html , November 2009

7 GreenTechGrid, "Oncor sued for fraud over smart meters", http://www.greentechmedia.com/articles/read/oncor-sued-for-fraud-over-smart-meters/ , March 31, 2010

8 Denver Business Journal, "Xcel wins right to charge for SmartGrid City", http://www.bizjournals.com/denver/news/2010/10/28/Xcel-wins-right-to-charge.html , October 28, 2010

"Microgrids". A microgrid is an integrated energy system consisting of interconnected loads and distributed energy resources which as an integrated system can operate in parallel with the grid or in an intentional island mode.[9] Microgrids support independence, consumer involvement, reliability, security, renewable energy generation, energy efficiency, and control at the community level, by empowering consumers and enabling them to become producers.[10] Despite the value potential of microgrids, only 8 of the 100 SGIG awardees propose microgrid capabilities.[11] In the U.S., pioneering efforts were carried out by the Consortium for Electric Reliability Technology Solutions (CERTS) which successfully demonstrated the CERTS Microgrid concept based on peer-to-peer and plug-and-play strategies at a full scale test bed near Columbus, Ohio.[12] DOE must facilitate more full scale Microgrid deployments at the local level which would be the best and holistic way to meet local power needs.[13] Microgrids are self-sufficient power system architectures that can aid federal investments and goals.

1. The Smart Grid should be defined as a series of microgrids that provide a more consumer-focused, energy efficient, decentralized, open, interoperable, and bidirectional electricity network which mainly function at the community level and can interconnect with all the components of the national grid.

The Smart Grid should be defined by the following goals:

- *Control* across all components of the grid, not just the meter, using digital information and communications networking will make the grid more efficient, secure, and reliable.
- *Optimization* across all components of the grid will help increase efficiencies in generation, transmission, distribution, and consumer side energy management.
- *Decentralization* of power resources by integrating renewable energy generation, energy storage, and introducing this at the community level through local microgrids.
- *Interoperability over an open and ostensible platform* to plug in smart energy applications like sensing and automation, electric vehicles (EVs), demand and supply side devices and applications.
- *Consumer empowerment* by integrating consumer behavior and devices into grid operations for electricity price control, energy usage management, energy trade, renewable energy generation, energy storage, and other future applications.

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9 DOE, "Overview of DOE Microgrid Activities", Slide 8, http://www.energy.ca.gov/pier/conferences+seminars/2006-06-23_microgrids_montreal/presentations/Presentation_7_Part1_Poonum-agrawal.pdf , June 23, 2006

10 Galvin Electricity Initiative, Smart Microgrids, http://galvinpower.org/microgrids

11 DOE, "U.S. Activities" at "Microgrids: Novel Architectures for Future Power Systems" in Paris, Slide 14, http://www.microgrids.eu/documents/Ch._Marnay_US_Activities-2.pdf ,January 29, 2010

12 CERTS, J. Eto, R. Lasseter, B. Schenkman, J, Stevens, D. Klapp, H. Volkommer, E. Linton, Hector Hurtado, J. Roy, "CERTS Microgrid Laboratory Test Bed" http://www.osti.gov/bridge/purl.cover.jsp?purl=/961832-DyRYrt/ , 2009

13 Galvin Electric Initiative, "The Value of Smart Distribution and Microgrids", Page 4, http://galvinpower.org/sites/default/files/ValuesRpt_Microgrids0113%20%282%29.pdf , January 2010

Scope:

- Effectively, the Smart Grid must be decentralized for regular operations and control and scale across utility, state, region, and nation levels.
- With the help of community level Microgrids, consumers will become active participants in electricity generation, storage, and consumption.
- Microgrids will be local parts of the larger Smart Grid with the ability to independently function to meet the service area's needs as well as plug into the larger grid when there is a demand surge on main grid and disconnect when there is an outage or threat on the main grid.
- The Microgrid and the Smart Grid must be based on an open platform with the key interfaces being fully interoperable and standardized. IP-based networking should be used to connect the transmission, distribution, and consumer pieces of the Smart Grid.
- All components of the Smart Grid including consumer side equipment and applications must be based on open standards allowing for future-proof integration and the easy plug-in of new technologies.

2. When new dynamic use technologies such as Time of Use pricing are utilized, consumer protection and education policies must be mandated.

The vast majority of federally funded initiatives for smart grid have focused on the deployment of smart meters. Meters have been touted as essential to developing the Smart Grid and empowering consumers with information about usage and pricing. Utilities claim that dynamic pricing with or without demand response will benefit consumers.[14] The industry calls this a high risk-high reward model.[15] A study released by Institute for Energy Efficiency (IEE) on pilot programs in District of Columbia, Connecticut and Maryland suggests that low income consumers will benefit from dynamic pricing and demand response while they also say that the magnitude of benefits was still not clear.[16] It is important to note however that in this review by IEE, which is an industry-funded institute under the Edison Foundation, the definition of low income was not uniform across all pilot programs since each program's low income definition differed per the jurisdiction.[17] In contrast, a recent report from National Association of State Utility Consumer Advocates and other public interest groups, examining smart meter pilot programs in California, Maryland, Connecticut and District of Columbia found that the benefits of dynamic pricing and demand response for low income consumers are generally insignificant than compared with the benefits for other residential consumers[18]. With such differing conclusions from the same pilot programs, the case for benefits of dynamic pricing and Advanced Metering Infrastructure (AMI) for low income consumers is largely unclear.

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[14] IEE, "The Impact of Dynamic Pricing on Low Income Customers", Page 4, http://www.edisonfoundation.net/iee/reports/IEE_LowIncomeDynamicPricing_0610.pdf , September 2010

[15] *Ibid*

[16] *Ibid.*

[17] *Ibid*, Page 26

[18] NASUCA, "The Need for Essential Consumer Protections", Page 8 http://www.nasuca.org/archive/White%20Paper-Final.pdf , August 2010

Consumers will be the main source of funding of Smart Grid projects. The national transition towards a Smart Grid will affect consumers' electricity rates, usage, and billing while different components of the Smart Grid infrastructure will require their assistance and premises. Even though the consumer is such a critical element of this digital electric network, a survey conducted shows that 70% of American consumers are unaware of the "Smart Grid" phrase.[19] This is an alarmingly large number for a project that cannot become a reality without the consumer and mandates the immediate requirement for consumer education and empowerment. During the survey when the Smart Grid concept was explained to the consumers, their immediate expectation was cost-control.[20] However, deployments have proved otherwise with numerous consumers billed much "higher" for their electricity usage as a result of erroneous rollouts of smart meters across the country. Although dynamic pricing and/or Time of Use (TOU) pricing are potentially beneficial for users with consumption flexibility, it is challenging for the elderly and poor who cannot shift their energy usage nor invest in more efficient appliances. Most pilot programs have not even factored supplying consumers with tools to control their electricity usage. NAF recommends:

a) Consumer Education and Involvement

Research has shown that consumer adoption and involvement is crucial for the overall success of the Smart Grid and its complementary applications and components like advanced metering, energy management and home automation technologies.[21] It is essential that consumers understand the mechanism, uses, benefits, application, costs and other facets of the Smart Grid, with special focus on the demand side components. Additionally, Microgrid implementation will demand that consumers become active energy producers and consumers. As a consequence, Smart Grid policy must encourage the following:

- Utilities must work closely with municipalities, commissions, and community based organizations to understand consumer needs and demographics to devise consumer education and adoption programs and use these community mechanisms to educate and empower consumers.

- With grassroots knowledge of community based organizations and state advocates, information can be conveyed through the consumer's perspective, befitting each community. The message to the consumer must be "engagement, control, trust, and empowerment".

- Consumer trust is paramount. Today, the utility-consumer relationship is not at all interactive except in the case of an outage or bill conflict, which is mostly an unpleasant instance. Here, trust is absent. Trust can be developed only through transparency, communication, involvement and accountability from the utility's end. However, currently the utility has no incentive to work with consumers. It is essential that the consumer collaboration and benefits be built into the system.

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19 Ecoalign , "Separating Smart Grid from Smart Meters? Consumer Perceptions and Expectations of Sma rt Grid", page 2, http://www.ecoalign.com/node/360 , May 2010

20 *Ibid*

21 ACEEE, Karen Ehrhardt-Martinez, Kat A. Donnelly, John A "Skip" Laitner, "Advanced Metering Initiatives and Residential Feedback Programs: A Meta-Review for Household Electricity-Saving Opportunities", Page 84, http://www.aceee.org/research-report/e105 , June 2010

b) Dynamic Pricing Structures/Demand Response

- The value proposition for a consumer must be cost reduction and savings. This would foster widespread adoption of Smart Grid technologies and energy efficiency measures.

- It is essential that if dynamic pricing is implemented, it must be voluntary and consumers must be provided with a choice of rate options allowing them to opt-in for programs to shift their energy use.[22] The intelligent nature of the new electricity network would allow for various rate options to be built in for consumers.

- Moreover, utilities must provide consumers with easy access to real-time information and other tools that help them to manage their energy usage.

c) Low Income & Special Needs Consumer: Protection Programs

In the case of low income households, elderly customers, and customers with health concerns that depend on electricity, their ability to adapt to dynamic pricing is more challenging than the rest of the population.[23] Usage patterns for low-income households are already generally lower than regular households.[24] They often live in older and less insulated homes and use older and energy inefficient appliances. They mostly pay a higher portion of their earnings towards their electricity bills even while they use less electricity in comparison to consumers who have washer/dryer, multiple TVs, Play Stations, home theatre systems, to name a few gadgets.

Understanding how low income household bills will be impacted with dynamic pricing and smart meter deployment is essential. Many of the consumers will not be in a position to shift energy usage based on the dynamic rates of electricity especially since they are stay-at-home consumers.[25] Special accommodations will need to be made for these consumers who would need electricity even during peak rate periods. For example, the fear of unaffordable higher bills should not force these consumers to avoid using heat or cooling; a scenario that would inevitably lead to adverse health impacts. [26]

This requires that consumer protections be developed to adapt to these new technologies:

- Smart metering technology aids remote disconnection with just the flip of a switch at the utility's end. Remote disconnection for non-payment without a site visit must not be allowed. This must not be used as a means to save money by avoiding the need for a utility official to visit the consumer's premises before disconnection of service.

- Pre-payment is an option that would attract the budget conscious consumer. However, this would enable easy disconnection of service. This is a by-product of smart metering that can adversely affect low-income consumers who may not be able to afford electric service once they run out of pre-paid credit.

- Direct Load Management or dynamic pricing programs must be completely voluntary as this would adversely affect all stay-at-home consumers during peak periods.

- Bill protection programs must be provided when a consumer opts-in for dynamic pricing.

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22 NASUCA, Page 14, *Supra note18*
23 *Ibid*, Page 15
24 *Ibid,* Page 16
25 *Ibid,* Page 10
26 *Ibid*

- Renters must be provided with bill protection programs and landlords must be incentivized to upgrade homes and appliances.

3. Cost and benefit analysis for consumers must be mandated for smart grid investments financed by ratepayers.

- A comprehensive plan with a cost-benefit analysis must be mandatory before investments are made in mass deployments. Costs must include full-scale consumer education and outreach programs, equipment charges, operational and maintenance charges, a risk buffer in case of overruns etc. A complete granular analysis of costs is essential when public money goes into building public infrastructure. This would help to anticipate obstacles that may lead to cost-overruns and help the utility take appropriate steps to curb costs. In the current market, when a utility makes a poor decision, the PUC penalizes the ratepayer who ends up paying for the cost overruns,[27] unlike other markets where the companies are held responsible for their incompetence.

- Benefits to consumers must be quantified to the maximum extent possible. With multiple cost-benefit analyses frameworks available through organizations like National Energy Technology Laboratory (NETL), pilot programs must implement these frameworks and collect information to identify best practices.[28]

- Transparency in project progress from initiation until completion must be mandatory. Since this is the initial phase of the infrastructure rollout, lessons learned from on-ground cases can help projects in-progress to anticipate and adapt to challenges accordingly. An example of the lack of project transparency and cost benefit analysis led to the considerable problems with America's first SmartGridCity in Boulder, Colorado:

> Xcel Energy's SmartGridCity in Boulder, Colorado began with a projected capital expenditure of $15.3million in 2008. However, cost-overruns as a result of the unanticipated difficulty of constructing the system's fiber, slapped a grave price tag of $44.5million (almost tripling the initial cost), excluding the cost of operating and maintaining the grid. To recover the cost, Xcel demands that rate-payers (only 43% of residents have been plugged into the SmartGridCity with smart meters) pick up the entire check for the cost-overruns, which the Colorado Public Utilities Commission approved first but finally withdrew support and ordered a review.[29] However on October 28th the PUC approved the cost of $44.5 million to be charged to consumers to cover cost overruns of the project.[30]

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[27] Denver Business Journal, "Xcel wins right to charge for SmartGrid City", http://www.bizjournals.com/denver/news/2010/10/28/Xcel-wins-right-to-charge.html , October 28, 2010

[28] NETL, "Cost and Benefit Analysis Framework", http://www.smartgridnews.com/artman/uploads/1/cost_benefit_analysis_framework.pdf

[29] World Economic Forum, "Accelerating Successful Smart Grid Pilots" Report, Page 18, http://www3.weforum.org/docs/WEF_EN_SmartGrids_Pilots_Report_2010.pdf, 2010; Daily Camera, "Regulators to hold hearings on SmartGridCity, http://www.dailycamera.com/ci_15947173?source=rss ; Daily Camera, " State regulators question prudence of Boulder's Smart Grid", http://www.dailycamera.com/news/ci_15594606

[30] *See*, *Supra note 27*

- Transparency and accountability would also help to make a stronger case to the PUC and/or consumer in the case of unanticipated obstacles. This works in the best interest of everyone involved.

- An effective way to implement and evaluate Smart Grid projects is at the microgrid level where cost benefit analysis can be more holistic and will comprise all the components of electricity generation, transmission, delivery and consumption.[31] Some microgrid development projects across the country that should be examined are Borrego Springs, CA, Albuquerque, NM, and Philadelphia, PA to name a few.[32]

4. Federal and state policies should facilitate a collaborative environment for consumers, utilities, device manufacturers and energy management firms to empower consumers and transform the grid into a two- way energy and information flow.

Federal

- Federal actors like Congress, DOE, FERC, NIST, and FCC must mandate appropriate incentives for industry by encouraging a regulatory environment that fosters innovation and private sector involvement across all components of Smart Grid infrastructure and services.

- Incentives for industry must be aligned with strong consumer protection and empowerment policies. Regulators should facilitate consumer behavior studies, pilot programs across all components of the Smart Grid, and granular cost-benefit analyses of pilot programs and collect information from across Smart Grid programs to create informed policies and best practices.

- Regulators must mandate that all components of the Smart Grid be interoperable and open for future integration and innovation. Successful technology demonstrations should lead to standards development and lessons learnt must be shared across all projects in the nation. NIST can update the standards portfolio with the results of technology demonstrations.

- Regulators must mandate full-scale consumer adoption programs as part of deployments.

- Incentives that encourage utilities to sell more power and build new power plants must be broken. Instead utilities must be incentivized to engage in clean energy, energy efficiency, and consumer empowerment activities.

- Tools that would help to incentivize Smart Grid build out and adoption are Renewable Portfolio Standards (RPS), Renewable Energy and Energy Efficiency Production Incentives for Corporate and Resident, Green Power and Green Pricing, Open and

[31] More Microgrids, "Advanced Architectures and Control Concepts for More Microgrids", Business Cases for Microgrids, Pages 15-21, http://www.microgrids.eu/documents/682.pdf , December 2009

[32] Galvin Electricity Initiative, Microgrid Projects, http://galvinpower.org/microgrid-projects

Green Code and Standards, Efficiency Certificate and Labeling, Systems Benefit Charge and Disclosure.[33]

- Consumer facing devices must be made available at competitive rates across stores in all states. These devices must be made available through tax credits, rebates, zero per cent financing, etc with the help of State and Federal agencies. These measures will help facilitate adoption as well as incent energy efficient device manufacturing.

- Create a national information sharing platform for all actors of the Smart Grid to use as reference and learning. A good initiative of this is the Smart Grid Information Clearinghouse (SGIC) funded by the DOE and maintained by Virginia Tech University.[34]

- An auditing system must be created to verify that information is being shared across all segments of the Smart Grid. Granular analyses will help make the right policy decisions based on results on the ground.

- On-ground projects must be audited for project progress, challenges, and cost-benefit analysis. This would also help promote accountability.

- Promote the concept of micro energy generation or Microgrids, among states and consumers.

State

States are more involved with the consumer through PUCs, which have the responsibility to evaluate business plans developed by the utilities before authorizing the release of federal funding awards.

- State must mandate a thorough cost-benefit analysis and ensure that benefits for consumers outweigh the costs to consumers.

- It must ensure that deployments be consumer centric and tailored to suit the demographic profile of the service area.

- It must mandate information sharing and interoperability across the state's electricity grids.

- State must promote self-sustaining Microgrids. The Microgrid has the option of connection and disconnection to/from the main grid in the case of an outage, security threat, congestion or any extreme condition. It supports community level independence in transmission, distribution, outage control, security, outreach, education, and involvement. This empowers the consumer, community and the utility in extreme case scenarios.

- State should promote innovation and involvement at the municipal level through a collaborative regulatory environment.

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[33] DOE, Energy Efficiency and Renewable Energy State Activities and Partnerships, http://apps1.eere.energy.gov/states/state_policy.cfm

[34] SGIC, http://www.sgiclearinghouse.org/

- To address massive deployment cost-overruns, the State should mandate that first pilot programs be deployed before a mass implementation proceeds. Recently in the U.S., advanced metering infrastructure programs have suffered from serious issues:

> In Bakersfield, California, an investment of $2.2 billion and the deployment objective of 10 million smart meters landed Pacific Gas and Electric (PG&E) in a class action lawsuit. The smart meters installed by PG&E resulted in erroneous meter readings that overcharged consumers from regular bills of about $200 to about $500-$600 per month. The California Public Utilities Commission has instructed PG&E to get an independent third party expert to test the meters and verify the billing accuracy of the deployed meters.[35]

> In Maryland, Baltimore Gas & Electric (BGE) won a $200 million stimulus grant award from the Department of Energy (DOE) but was rejected by the Maryland Public Service Commission on the grounds of not considering the well-being of "most vulnerable customers, such as low-income households, elderly customers, customers with medical needs for electricity that cannot be shifted to off-peak hours or other customers who are stay-at-home." BGE's proposal included the rollout of smart meters and the use of Time of Use (TOU) pricing structures without concrete customer education plans or in-home orbs or displays to help empower consumers to change their behavior BGE was required to submit an amended proposal with a more consumer-oriented cost-benefit analysis and risk sharing on part of the company and its stakeholders.[36]

- Shortfalls and overruns must not be the sole responsibility of the consumer. State PUCs must mandate that utilities investing in smart grid infrastructure bear a much larger share of the risk for cost overruns, particularly in clear cases where higher revenues and cost savings will accrue to the utility as a result of the investment.

5. Managing a grid with high penetration of new technologies in the future will be possible only with an open and interoperable platform and with localized control and integration at the Microgrid level.

With an open and interoperable platform, the Smart Grid will be able to accommodate the future integration of new technologies. Open standards will also draw investments and innovation into the industry more effectively. The best way to integrate all forms of future load like multiple renewable energy sources at consumer premises and electric vehicles into the grid would be by implementing microgrids across communities in U.S.[37] Microgrids can be built to hold and

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35 World Economic Forum, "Accelerating Successful Smart Grid Pilots" Report, Page 18, http://www3.weforum.org/docs/WEF_EN_SmartGrids_Pilots_Report_2010.pdf, 2010; Greentech Media, "PG&E Sued Over Smart Meters, Slows Down Bakersfield Deployment", http://www.greentechmedia.com/articles/read/pge-sued-over-smart-meters-slows-down-bakersfield-deployment/ , November 2009; Smartmeters, "Lawsuit filed against PG&E for smart meter overages", http://www.smartmeters.com/the-news/682-lawsuit-filed-against-pgae-for-smart-meter-overcharges.html , November 2009

36 WEF, Page 18, *Supra Note 35*

37 Powermag, "Microgrids promise improved power quality and reliability", CERTS Microgrid section, http://www.powermag.com/print/issues/cover_stories/Microgrids-promise-improved-power-quality-and-reliability_134.html , June 15, 2008

regulate capacity relative to the particular service area.[38] It will be easier, more efficient and effective to upgrade infrastructure one community at a time as per the need. Microgrids will help empower consumers at the local level in the efficient production and consumption of electricity. This also helps in easier adoption of new technologies and devices as the microgrid would give the sense of ownership to the consumer and incentive him/her to upgrade and plug-in effortlessly.

The main barrier to Electric Vehicles (EVs) on the grid is that for its full fledged usage and benefit realization, a complete Smart Grid build out is necessary. Microgrids can make this a reality in the nearer future. Automobile companies like Toyota, Nissan, and Chevrolet, are rolling out EVs whose relevance and success depend heavily on the Smart Grid infrastructure. Pike Research forecasts that about 841,000 plug-in cars and trucks will be driven on U.S. roads by 2015.[39] Another barrier to EVs is the problem of charging when all EVs may plug into the Grid at the same time (low cost induced) for charging. Again this can be solved with the help of a Microgrid. With local information and control, microgrids can regulate the charging of EVs during alternative time frames to reduce grid load using consumer usage timeframe information or use power from other renewable sources to charge the EV battery in case of an overload. Many localized solutions would be available with the help of the microgrid.

6. Reliability and cyber-security can be introduced into the smart grid through microgrids built on an open, interoperable and IP-based platform.

- Smart Microgrids will help introduce reliability into the system since they have the ability to stand alone, back up another microgrid or back up the main Grid. With sensing and automation built into the system, these microgrids can also prevent power shortages or outages. [40]

- Often proprietary based smart meter and Smart Grid infrastructure rely upon security through obscurity. Open source Internet Protocol (IP) based systems will help to introduce reliability and cyber-security in the system through allowing flaws to be exposed and fixed before deployment.

- Information collected over the system must be stored in local and secure caches in communities and it is essential to give the consumer ownership of their data. DOE has addressed data privacy and sharing in the two reports published in October 2010 which is aligned with NAF's objective that data belongs to the consumer and that the consumer must be given the choice to decide who he/she would share this data with.[41]

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[38] Intel, Open Energy Initiative, "Using Moore's Law to make Energy Personal," Slide 11, http://galvinpower.org/sites/default/files/Intel_Open_Energy_Initiative_for_Panel_v2_5_19_10.pdf , May 2010

[39] CNET News, "Report: 3.24 million plug-in EVs sold by 2015", http://news.cnet.com/8301-11128_3-20015278-54.html , September 1, 2010

[40] Gigaom, "Microgrids: Building Blocks of the Smart Grid", http://gigaom.com/cleantech/microgrids-building-blocks-of-the-smart-grid/ , February 17, 2010

[41] DOE, "Data Access and Privacy Issues Related to Smart Grid Technologies" http://www.gc.energy.gov/documents/Broadband_Report_Data_Privacy_10_5.pdf , October 2010.

Research and funding will be necessary to facilitate better mechanisms for cyber-security. At the Federal level, guidance to promote a collaborative environment for these technologies to take final shape will be essential.

7. Managing the transition to the smart grid begins at the microgrid level where localization will help realize costs, benefits, obstacles and solutions more holistically as well as aid the sharing of best practices across communities to allow for a successful national build out.

- In a more broader perspective, the government must define a clear national vision for the Smart Grid, with a roadmap that includes all critical facets to make this vision a reality:
    - Focus deployment of smart grid infrastructure at the local level with the build-out of open and interoperable microgrids.
    - Ensure strong consumer protection and empowerment policies are essential.
    - Establish a regulatory environment that fosters innovation and private sector investment, while aligning incentives for utilities and the public to improve energy efficiency and utilize renewable energy sources.
    - Establish a broad and coherent policy vision for the 21st century Smart Grid that intertwines developments in electricity, telecom, transportation, security, and IT.
- There must be a clear roadmap for next steps, beginning with a comprehensive understanding of all components of the transition, policy development, standards approval, consumer education, investment, private sector involvement, pilot programs, and in-depth analysis of smart grid deployments.

Recommendations and Conclusion

Unprecedented investments have been dispensed into the Smart Grid vision. But the national roll out so far (of smart meters alone) has only caused consumers to become increasingly skeptical of the benefits and necessity of smart grid investments. This underscores the need for a course correction on the nation’s transformation of the electrical grid. In order to get the Smart Grid back on track, NAF has recommended the following to DOE:

1. The Smart Grid should be defined as a series of Microgrids that provide a more consumer-focused, energy efficient, decentralized, open, interoperable, and bidirectional electricity network which mainly function at the community level and can interconnect with all the components of the national Grid.

2. When new dynamic use technologies such as Time of Use pricing are utilized, consumer protection and education policies must be mandated.

3. Cost and benefit analysis for consumers must be mandated for smart grid investments financed by ratepayers.

4. Federal and state policies should facilitate a collaborative environment for consumers, utilities, device manufacturers and energy management firms to empower consumers and transform the grid into a two- way energy and information flow.

5. Managing a grid with high penetration of new technologies in the future will be possible only with an open and interoperable platform and with localized control and integration at the Microgrid level.

6. Reliability and cyber-security can be introduced into the Smart Grid through Microgrids built on an open, interoperable and IP-based platform.

7. Managing the transition to the Smart Grid begins at the Microgrid level where localized integration will help realize costs, benefits, obstacles and solutions more holistically as well as aid the sharing of best practices across communities to allow for a successful national build out.

In order move forward, DOE must develop a multi-step and incremental roadmap for the Smart Grid with the clear goals of consumer empowerment, open and interoperable technologies, energy efficiency, renewable and distributed power generation, and creating an innovative and competitive marketplace. Through focusing on a smaller but more efficient, effective, interoperable, open, secure, reliable and consumer-centric Microgrid deployments, DOE can facilitate best practices and programs to make the Smart Grid a reality.

Respectfully Submitted,

/s/

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