

A Call to Action: Implementing the Smart Grid Initiatives in President Obama's Stimulus Plan

Executive Summary

This White Paper is offered by an independent industry expert to help key decision makers in the U.S. Government, U.S. electric utilities, utility regulators and industry vendors understand how the Smart Grid Initiatives of the Stimulus Plan can be achieved through Smart Metering.

This White Paper examines the challenges associated with deploying a Smart Grid across the United States as part of President Obama's Stimulus Plan.

The key focus of the Stimulus Plan is to rapidly create good jobs for the large number of Americans who are unemployed. This document projects the impact that focused investments in Smart Grid could have on employment.

This document suggests that initial efforts should focus on Smart Metering because:

- Many new jobs could be added quickly.
- Products are available, mature and widely deployed.
- A Smart Grid cannot exist without key features of Smart Metering.
- Smart Meters enable consumers to deliver energy into the grid as well as to consume energy from the grid. This feature opens the door for many secondary benefits (such as efficiency and environmental improvements) that will provide long-term benefits to the United States.

The Smart Metering Industry has already started proactively working to support the Stimulus Plan:

- Refocusing and growing its own staff to be able to deliver and support more of its products as needed by U.S. utilities, and
- Assisting utilities, regulators, installation companies and the Department of Energy so that projects will be ready when the Stimulus funding is available.

The legislative and administrative branches of the U.S. government are rapidly moving forward with the Stimulus Plan. The Smart Metering industry recognizes that time is critical and waiting to start Smart Grid projects further delays our nation's recovery.

The Smart Metering industry is confident that it is ready now to supply its share of Smart Grid technology. The vendors in this industry are proud to offer its services to achieve the objectives of President Obama as he leads the fight to solve our economic crisis.

The Smart Grid Challenge

As utilities get Smart Grids over the next few years, they will finally have the tools that permit them to dynamically operate their networks intelligently.

A Smart Grid is more than a collection of “smart devices.” It is an interconnected network of smart components managed by an operations system (OS) that enables intelligent decisions. The OS receives inputs from sensors and measurement devices that are located throughout the power grid starting from where energy is input and extending to where the energy is consumed.

Smart grids must be extremely flexible because users can both consume energy and deliver energy into the grid. Without the ability to support such flexibility, the network cannot be “Smart.”

Electric utility networks have been gradually converting to Smart Grids over the past few years. Though the progress has been steady, it has also been slow. The inclusion of funding for Smart Grid initiatives in President Obama’s Economic Stimulus Plan will change the dynamics of this evolution.

The Stimulus Plan provides \$4.5 Billion for the Smart Grid to be matched 50-50 by utilities (an additional \$4.5 Billion) over the next two years. Though \$9 Billion is a large number, it is a small fraction of the total cost to upgrade America’s energy grid. So where should the money be spent to provide the greatest benefit?

The choices are further complicated because the concept of a Smart Grid is still in its infancy. We know that it must be “smart;” we know that it must contain sensors and measuring devices; we know that it must be controlled by robust software systems. However, the “art” of optimally managing power grids is still evolving.

The Smart Grid industry is well aware that the funding has been provided for a separate purpose – to quickly create large numbers of new jobs. Deploying Smart Grids is just one of many ways to achieve this end.

Thus, it is clear that this money must be spent to both maximize employment and provide key infrastructure needed for Smart Grids.

Maximizing Employment

There are many types of devices that could be part of a Smart Grid. From an employment perspective, there probably isn’t much of a difference in the manufacturing of these devices. However, there is one clear choice when the installation of these devices is considered – the installation of Smart Meters. Unlike all other equipment in the outside plant, the installation of meters is done by a workforce that requires only a minimal amount of training. In all other instances, the installation crews require extensive training, and for some devices this could take years.

It is unlikely that enough installers could be trained for widespread replacement of distribution or transmission plant electronics and have a significant impact on nationwide employment. Replacing devices such as transformers, capacitor banks, reclosers, etc.

require highly trained staff. In many instances, these crews also require expensive equipment, such as bucket trucks. Though most utilities have crews that perform this work, the crews represent a small percentage of the utility staff. Though non-utility contract companies are available to support such work, their staffs are too small to address a nationwide installation at the level needed for the Stimulus Plan. Yes, such devices will gradually be updated and some of these updates should be supported by the Stimulus Plan, but the focus should be on installing meters.

In contrast, Smart Meters are installed by large staffs of people with basic training. They are rarely licensed electricians. These new employees must demonstrate the needed level of manual dexterity and survive a specialized training program of a few weeks. In almost all instances, they will be employed by non-utility firms that contract with the utilities to perform the meter installations.

Another critical area of employment is with software engineers and related system engineers. A grid cannot be “smart” without an operations system that enables the utility to react to all the data provided by sensors and measuring devices (primarily meters). In reality, each utility must upgrade or replace many of their existing software systems, and must integrate all of these systems together so they can pass information to each other. This is a long-term effort that will last beyond the funding period of the Stimulus Plan. Also, because such engineers earn much more money than installers, their impact on employment will be less. On the other hand, these are among the “best” jobs created by the Stimulus Plan, and many of these people will enjoy long-term employment.

Installers Needed

The number of installers that will be hired is a function of the number of units that can be installed. In this analysis, it is assumed that of the \$9 Billion available for Smart Grid, \$1 Billion will be used for distribution and transmission plant electronics demonstration projects and \$2 Billion will be used for software engineering associated with the Smart Grid projects. The remaining \$6 Billion would be used for Smart Meter installation.

At existing installation rates, approximately 10,000 installation jobs would be created. These jobs include team and project managers, site inspectors, work depot teams (the trucks to transport the Smart Meters must be loaded and unloaded each day), trainers, schedulers, bookkeepers, etc. Also, teams will be more efficient in California than in Vermont because there are more fair weather days in California than Vermont.

Utilities would cost-justify the Smart Meter projects for the duration of the project. Thus, these installers would still be employed for approximately two years after the Stimulus funding ends.

Software Engineers

If \$2 Billion is allocated for software systems, and if \$500 Million is the purchase cost of the software, then the rest of the money would be for software integration. If the fully loaded cost of a software engineer is \$150,000 per year, then another 10,000 junior programmers could be hired at \$60,000 per year.

These software engineers would stay employed for two to four years after the Stimulus funding ends because the system integration work would continue long after the meters are installed. In Year 4, these engineers would probably be earning approximately \$80,000 each if they see 10% annual increases, which is typical for junior engineers. The utilities would be absorbing these higher costs.

Meter Readers

In fairness, it should be noted that at the end of the Smart Meter projects many people who are currently meter readers will lose their jobs because their jobs will be automated by the Smart Grids. This has been an ongoing process for the past 25 years that is minimally impacted by this initiative. If the current rate of Automatic Meter Reading (AMR) deployments continues unaffected by the Stimulus Plan, most of the manual meter reading jobs in the U.S. would be eliminated by electric utilities within seven years. The Smart Metering initiative will cause these jobs to end within five years. The vast majority of these job losses will occur two to three years after the Stimulus Plan funding ends. It is a standard practice for most utilities to build a retraining program into their meter automation projects to enable displaced meter readers to find jobs elsewhere in the utility. Historically, the meter reading job has been an entry position for many long-term electric utility employees, and for such employees this is often a training position for other employment in the electric utility. There are approximately 2,000 meter readers in the U.S. At the most, 1,000 meter readers would lose their jobs three years after the installations end.

Is the Smart Grid Component of the Stimulus Plan Doable?

In 2008, approximately 9.1 million electric AMR units were shipped to utilities in North America, of which approximately 8 million were shipped to U.S. utilities. These include all types of automated meter reading, of which at most 2 million were Smart Meters. To achieve the employment goals set in the plan above, approximately 19 million end points would be deployed in 2009, 27 million in 2010 and approximately 4 million in the final 6 to 7 weeks remaining of the funding in 2011.

To achieve the 2009 goals, every vendor would need to accelerate and expand its projects and most pending projects would have to be quickly awarded. 2009 would have a mix of projects that are underway and would be accelerated plus new projects that would quickly start. All new projects would gradually ramp up as installers and software engineers are trained.

Also note that the current economic situation is beginning to cause a slowdown for some existing projects. The Stimulus Plan is expected to halt this slowdown and instead lead to further employment for each of those specific projects.

Any factor that discriminates against any of the major Smart Meter vendors would prevent this employment goal to be reached. The approach discussed in this White Paper does not make any assumption about the market share of any vendor. However, it does assume that every vendor will be producing products at its maximum capacity.

Making “Smart Investments”

Where the Stimulus Plan funds are spent can have a positive or negative impact on parts of the electric utility industry. Though most of the positive impacts are obvious, the negative impacts can be as important, and need to be examined.

There is not enough money in the Stimulus Plan to fund widespread replacement of transformers, reclosers capacitor banks, substations, etc. in electric utility distribution and transmission plants. Furthermore, if such projects were funded, most utilities would not have the resources to complete such projects after the federal funding ceased.

Furthermore, consider the expected replacement cycle of electric network equipment. The replacement cycle is directly related to the expected life of a device. Though the lifetime of each type of equipment is different, most transformers, capacitor banks, reclosers, etc. have a typical useable life of more than 25 years. For simplicity, if we assume that the lifetime is exactly 25 years and we assume that they have been deployed evenly spaced over a 25 year cycle, then each year the utility would replace 4% of these devices. If Stimulus funding were used to replace many of the older devices, this would look like a windfall for the utilities. However, 25 years from now a crisis would occur, as all of these devices would reach the end of their useful life at once and need to be simultaneously replaced. Thus, a massive investment today would lead to the need for a massive reinvestment by the utilities (or federal government) again 25 years from now. This crisis would be avoided if the utilities were left to deal with the 4% investment that they expect and already have in their budgets.

Another problem would also occur. The vendors of these devices would have a much lower financial incentive to invest in further development of these products over the next several years because most of the replacements would have already been done and future sales would significantly drop. Because sales are driven by expected product lifetimes, front-loading the sales would lead to windfall profits that are almost never banked. Remember what was stated earlier – the concept of Smart Grid is still being developed. So if equipment is widely replaced before products mature, the financial incentive to help them mature could be significantly reduced.

A “smarter” approach is to use the data from Smart Meters to identify where distribution plant equipment could most efficient be replaced. Specifically, Smart Meters could help a utility understand true circuit and asset performance, which coupled with age information and historical usage could point where to optimally replace equipment.

Wouldn't these problems also happen for Smart Meters? The answer is No. The metering industry has changed dramatically over the past 25 years. The expected lifetime of a meter has changed from 25 years to closer to 10 years. It would probably take five years to fully replace existing meters in the U.S. with Smart Meters at the rate in the Stimulus Plan. However, after the Stimulus Funds are expended, at least 60% of the meters will not have been replaced, and replacement rates would gradually drop as the funding disappears. Also, the Smart Metering industry has spread from the U.S. to other countries, so the companies in this industry would actually see sales growth as other

countries get on the Smart Meter bandwagon. Thus, not only would product development continue, the U.S. would benefit from enhancements created by the same companies but for use in other countries.

Simply stated, Stimulus Plan funding should only be used for industries that can sustain growth. We cannot build our economy long-term if we cripple key parts of it for short-term gains.

Being Proactive

The Stimulus Plan has been initiated to quickly create as many new jobs as possible for American workers. For the electric utility industry to do its part, work must start immediately so that employment can begin as soon as the legislation is signed and the funding guidelines are set.

The funding from the Stimulus Plan is intended to exist for only two years after the President signs the legislation. Almost all of the metering projects will extend beyond that time window. It is reasonable to assume that the metering projects will continue beyond the funding period because they are projects that are already needed and have been anticipated for several years. The Stimulus funding primarily changes the business case for each project, shortening the payback period and providing start-up funding. Once the new business case is established, the projects will continue to completion because the primary benefits can only be achieved when the projects are complete.

Because the goal is to create jobs quickly, funding will likely cease at the two year point to encourage utilities to front-load the work. **Any time wasted in starting a project is time that will not be funded at the end of the project.** Every industry participant has an incentive to start work as quickly as possible.

Action Needed Now

To be ready for these massive metering installations, the following entities must immediately take action:

Vendors:

- Plan to increase the production of their Smart Meters and be ready to activate those plans when President Obama signs the Stimulus legislation;
- Work with utilities to get their plans ready for new Smart Metering projects and to accelerate existing Smart Metering projects;
- Work with regulators to help them prepare approval plans for Smart Grid projects;
- Work with installation companies to help them expand staffs and prepare to install Smart Grid products; and
- Build websites, prepare white papers, etc. so that lessons from existing projects (including sample paperwork submitted to regulators) can be quickly shared with other projects that are beginning.

Regulators:

- Start scheduling meetings to plan how they will support the Stimulus plan, and have meetings on the agenda to pass such plans when President Obama signs the Stimulus legislation;
- Develop in advance their approval processes and prepare the guidelines that they expect utilities to meet; and
- Involve national organizations such as NARUC (National Association of Regulatory Utility Commissioners) so that guidelines can be developed that can be used by multiple jurisdictions, thus expediting the approval process.

Department of Energy:

- List the guidelines that utilities and their vendors must follow to qualify for this funding;
- Prepare requirements for the documentation that utilities must submit to receive matching funds from the Stimulus Plan;
- Permit incentives to reward vendors and installers that meet or exceed deployment schedules that are challenging;
- Reduce the roadblocks to fund Smart Meter projects. Remember, vendors and installers need to make significant up-front investments; encouraging such investments is in everyone's best interest.

Utilities:

- Finish their Smart Grid business plans;
- Pick a vendor (unfortunately, but there is no time to do pilots; so they should visit other utilities that have already deployed the technologies on their short lists and base their selection on others' experiences);
- Pick an installation company (unfortunately, but there is not enough time to install it themselves; a slow installation means that funding opportunities will be lost);
- Develop implementation plans before the projects are approved;
- Provide incentives to reward vendors and installers that meet or exceed deployment schedules that are challenging; and
- Identify funding sources for their matching monies.

Installation Companies:

- Prepare guidelines for utilities so that deployment depots can be identified early and purchase procedures can be prepared in advance;
- Identify new workers; and
- Develop training procedures so new workers can be ready to start working as early as possible.

The metering vendors have already committed to begin their part of this work now and to help other parties begin their work as well. These efforts must all be ready to start when President Obama signs the Stimulus legislation.

Conclusions

The Stimulus Plan should focus its Smart Grid funding on Smart Metering for the following reasons:

- Widespread deployment of Smart Meters can add a significant number of new jobs quickly.
- Though much of the Smart Grid industry is still in its infancy, a key part – Smart Metering – is mature and millions of end points have already been deployed.
- A key feature of Smart Grid gives customers the opportunity to deliver energy into the grid as well as to consume energy from the grid. Almost all existing customer meters do not support this feature, but Smart Meters do support it and can be delivered today.
- A Smart Grid cannot exist without Smart Metering. A key part of operating a Smart Grid is to understand in real-time what each customer is consuming from the grid and delivering into the grid. The only source of this information is Smart Metering.
- Unlike other Smart Grid investments, an investment in Smart Metering does not cripple future industry growth to provide short-term benefits, it enhances that growth.

The Smart Metering Industry has already committed itself to proactively support the Stimulus Plan. Specifically, the industry is now working on the following initiatives:

- Get their own businesses ready to deliver Smart Metering products at the volume levels needed for rapid nationwide deployment;
- Help utilities rapidly get ready to take advantage of the Stimulus funding;
- Help regulators prepare to approve Smart Grid projects;
- Help the Department of Energy process applications for Smart Grid funding; and

- Help installation companies get ready to hire and train massive numbers of new employees to work on the Smart Grid projects.

The Smart Metering industry is confident that it is ready now to supply its share of Smart Grid technology. The vendors in this industry are proud to offer its services to achieve the objectives of President Obama as he fights to solve our economic crisis. Furthermore, these vendors are already working with many other industry participants whose support is necessary to bring this bold Stimulus Plan to completion.

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