

Priority Issues for Boosting Smart Grid-Smart Customers in Taiwan*

Wen-Ling SUN

Deputy Director General, Science & Technology Law Institute, Institute for Information Industry, Taiwan
wensun@iii.org.tw

Abstract. There is no doubt that smart grids are the essential part of the energy policies all over the world. This article starts with an overview of the smart grid policy framework and its latest progress of deployment in Taiwan. It points out the difficulties of how to adequately urge Taiwan Power Company to deploy the target amounts of Advanced Metering Infrastructure (AMI) and how to encourage residential customers to install smart meters or join the AMI-related pilot programs. Accordingly, it contends possible solutions for wide rollout of smart meters. To sum up, it makes preliminary legislation suggestions in order to boost smart grid-smart customers in Taiwan.

Аннотация. «Умные сети электроснабжения» (smart grids), без сомнения, являются существенным элементом энергетической политики во многих странах мира. Данная статья начинается с обзора государственной политики Тайваня в этой области и последних достижений в ее практическом осуществлении, затрагивает проблемы взаимодействия с Тайваньской энергетической компанией в развертывании измерительной инфраструктуры нового поколения (AMI), вопросы стимулирования населения к участию в пилотных программах по AMI и установке «умных» (smart) счетчиков электроэнергии. В статье представляются возможные решения существующих проблем, а также законодательные предложения с целью роста числа пользователей «умных сетей электроснабжения» в Тайване.

Key words: Smart grid, AMI, smart meters, smart customers, energy efficiency.

1. INTRODUCTION: SMART GRID AND ITS SMART CUSTOMERS

According to the Smart Grid Master Plan, smart grid is defined as “an integrated electricity network of smart generation, transmission, distribution and consumers enabled by technologies of information, communication and automation”. It emphasizes on “automation, security and close coordination of supply and demand side to achieve policy goals of enhancing efficiency of electricity system operation, quality of electricity power supply and reliability of electricity grid, and promoting wide application of renewable energy, energy saving and carbon reduction”. As for end-use electricity consumers, smart grid-smart customers will be able to know how much electricity they use, when they use it, and how much it costs in a shorter-period (e.g. every 15 minutes) or real-time basis. Nevertheless, to realize this, the first step is to install smart meters, one component of Advanced Metering Infrastructure (AMI), at consumers’ premises.

This article attempts to introduce the latest progress and difficulties of deployment of smart grid and smart meters under the framework of the Smart Grid Master Plan in Taiwan. In this respect, this article argues that solutions might be sought from the prospective of smart grid-smart customer policy.

1. OVERVIEW OF SMART GRID POLICY FRAMEWORK AND THE LATEST PROGRESS OF DEPLOYMENT

2.1 SMART GRID-RELATED ENERGY POLICIES

The “New Energy Policy of Taiwan” promulgated in November 2011 establishes the policy purposes “to ensure nuclear energy security, steadily reduce nuclear energy dependence, create a friendly low-carbon green energy environment, and gradually move towards a nuclear-free homeland”. According to this policy, both demand-side and supply-side measures are needed “to further promote energy savings and carbon reduction and build a low

* Приоритетные вопросы развития «умных сетей электроснабжения» в Тайване.

carbon green energy development environment". As for the supply side, it has been noted that the government will deploy smart meters, promote the smart grid, and enhance efficiency of electric power system in order to ensure stable power supply.

In October 2012, the Bureau of Energy of the Ministry of Economic Affairs (BOE, MOEA) issued the "Guideline on Energy Development" (the Guideline) in accordance with the Paragraph 2 of Article 1 of the "Energy Management Law". The Guideline makes it clear that the smart grid requires policies not only on supply side or demand side. Instead, the Guideline highlights the policy need on "system side" to achieve the balance of supply and demand side and then enhance energy efficiency. In this prospective, the Guideline indicates the following tasks: to plan and deploy fundamental infrastructure for the smart grid, to enhance efficiency of the adjustment of power system, to enhance efficiency of the management of the electricity grid, and to adopt demand-side management. Meanwhile, the Executive Yuan (the executive branch of the Taiwan's government) approved the "Smart Grid Master Plan".

2.2 THE SMART GRID MASTER PLAN

The "Smart Grid Master Plan" ("Master Plan"), drafted by BOE, MOEA, was approved by the Executive Yuan in September 2012. Since then, the deployment of smart grid in Taiwan was officially launched. The government will invest 139.9 billion New Taiwan (NT) dollars in the period of 20 years. The "Master Plan" consists of three phases and six dimensions, which are set to achieve four goals, nine effect indexes and one vision.

The Phase One of the "Master Plan" starts from 2011 to 2015 and focuses on early-stage deployment of the smart grid. The Phase Two starts from 2016 to 2020 and focuses on further spread of the smart grid. The Phase Three starts from 2021 to 2030 and focuses on wide application of the smart grid. The aim of the "Master Plan" is to achieve the goals: namely, "ensure the stability of power supply", "promote energy saving and carbon reduction", "increase the use of green energy" and "activate low-carbon industry". "To build a high quality, high efficiency and environment-friendly smart power grid in order to realize low-carbon society and sustainable development" is the ultimate vision of the "Master Plan".

The six dimensions of the "Master Plan" are based on the characteristics of how electricity power is delivered and the relationship between demand side and supply side, and divided into the following primary tasks:

1) Smart generation and adjustment: To increase the use of renewable energy; to enhance the operation efficiency and accountability of power plants.

2) Smart transmission: To enhance the efficiency and safety of power transmission.

3) Smart distribution: To enhance the efficiency and safety of power distribution; to strengthen the integration of distributed energy resource.

4) Smart customers: To build up client/end-user information infrastructure; to design services for advanced clients.

5) Smart grid industry: To develop essential system and equipment industries, as well as energy management service industry. Eight system and equipment industries have been assigned as the priority industries that will benefit from related mass investment; namely, advanced metering infrastructure (AMI), electric vehicle (EV) charging system, distribution automation system, wide area monitoring system, smart appliance, micro grid system, energy storage system and energy management system.

6) Smart grid supporting infrastructure: For R&D, to develop essential technologies to increase the use of renewable energy and rapidly balance demand and supply of electric power grid. For standards, to set up standards for smart grid equipment and the testing platform. For laws/policies, to review regulations related to electricity enterprises, to design pricing mechanism that can reflect costs of electric power supply and have incentives for power saving, and to establish the training mechanism for relevant professionals. For field trials, to establish Peng-Hu Smart Grid Demonstration Site in order to combine smart grid related technologies and industries, and verify the effect of smart grid.

During the period of the "Master Plan", there are nine effect indexes to evaluate whether the goals have been achieved; namely, to decrease the time of nation-wide black-out, to reduce the loss caused by the power lines, to improve the imbalance of power supply, to realize the intelligent transformer stations, to achieve the automation of power distribution, to build up AMI, to reduce CO₂ emission, to increase the use of renewable energy and to develop smart grid industries.

Accordingly to BOE, MOEA, the "Master Plan", which integrates automation and information and communication technologies (ICT), will improve the efficiency, reliability and quality of the power system.

MOEA was instructed by Premier Sean Chen to form a cross-ministerial "Smart Grid Promotion

Taskforce". The taskforce was formed by the following agencies: the National Science Council, Atomic Energy Council, Council for Economic Planning and Development (CEPD), Executive Yuan Board of Science and Technology, Executive Yuan Department of Economics, Energy and Agriculture, Taiwan Power Company and the MOEA's subordinate agencies. The minister of MOEA serves as the convener.

2.3 DEPLOYMENT OF AMI AND SMART METERS

An AMI system consists of three components: "a "smart meter" at customer's premise, communications network between the smart meter and the utility, and a "meter data management application" (MDMA) at the utility".

Meters can measure and record usage data at hourly intervals or more frequently, and provide usage data to both consumers and energy companies at least once daily. Data are used for billing and other purposes. As for smart meters (advanced meters) based on FERC (2012), they include "basic hourly interval meters, meters with one-way communication, and real time meters with built-in two-way communication capable of recording and transmitting instantaneous data".

In fact, MOEA has proposed the "National Advanced Metering Infrastructure (AMI) Deployment Plan" (the "AMI Deployment Plan"), approved by the Executive Yuan on June 23, 2010. The aim of the "AMI Deployment Plan", which is one of the key components of the "Green Energy Industry Emerging Scheme" of the Executive Yuan, is to develop new information and communication technologies (ICT) applicable to various AMI systems. The expected benefits are reducing peak load by 650 MW, saving 5% of electricity consumption (9.8 TWh), and reducing 4.39 million tons of CO₂ emissions.

The "AMI Deployment Plan" consists of two parts:

1) AMI in High-Voltage and Super-High-Voltage systems

There are 23,000 users of high voltage (from 11.4kV to 69kV) and super high voltage (higher than 69 kV) in Taiwan. They are typically industrial and commercial users, who contribute up to 58% of the total energy consumption. Since 2009, the Taiwan Power Company has started to install AMI for high voltage and super high voltage users. The goal set up for users of this category is to finish the installation of all 23,000 users by the end of 2012.

2) AMI in Low-Voltage systems

There are 12 million users of low voltage users in Taiwan. They are typically residential users,

who contribute up to 42% of the total energy consumption. The goal set up for users of this category is to finish the installation of 6 million users in four stages. In the first stage (2009–2010), the tasks are to deploy 300 smart meters in order "to validate and evaluate available technologies". In the second stage (2011–2012), the tasks are to deploy 10,000 smart meters in order "to evaluate the availability of technologies and estimate the effectiveness of time-of-use (TOU) and demand response (DR) for further deployment plan". In the third stage (2013–2015), the tasks are to deploy 1 million smart meters. In the fourth stage (since 2016), the tasks are to deploy 5 million smart meters in order "to upgrade the electric power system and achieve the balance between supply and demand".

Since the progress of AMI deployment for low-voltage users was delayed far behind in each stage, the Smart Grid Promotion Taskforce has decided to adjust the deployment goal in the third stage from "1,000,000" to "100,000". In addition, efforts will focus on developing measures such as load management and demand response and conducting the cost-benefit analysis.

MOEA has declared that the government will cover 30% of the expenses for smart grid deployment and will establish "Time of Use" (TOU) for residential consumers in 2015. Further, the Taiwan Power Company also has declared to deploy AMI at no charge for 10,000 residential consumers in 2013. However, at present, difficulties remain on how to adequately urge the Taiwan Power Company to deploy the target amounts of AMI and how to encourage residential customers to install smart meters or join the AMI-related pilot programs.

3. SMART CUSTOMERS IN TAIWAN AND POSSIBLE SOLUTIONS

3.1 SMART CUSTOMERS POLICIES

Among the total 139.9 billion NT dollars investment of the "Master Plan", the fourth dimension "Smart Customers" accounts for 95.8 billion NT dollars, which represents 68.5% of the total amount of the investment. It shows the importance of this dimension in the "Master Plan".

According to the "Master Plan", its primary tasks are divided into "client/end-user information infrastructure" and "foresight client services" in coordination with the deployment progress of AMI, including smart meters. As for "client/end-user information infrastructure", primary tasks include: deployment of AMI, demand response, internet key

exchange system for management data, pricing mechanism enabled to reflect costs of supply and offer incentives of energy saving, models of derivative energy service (e.g. EMS). As for “foresight client services”, primary tasks include: electric vehicle (G2V and V2G) and power stations for EV, and systems of distributed power supply and energy storage.

Residential consumers use about 42% of the total electricity consumption in Taiwan. How to raise the awareness of residential consumers and let them make informed decisions to save energy by virtue of assistance of technologies and service are priority issues? By installing smart meters, residential consumers are able to obtain usage data in a shorter interval of time and have more opportunities to cut their electricity bills. There is surely no one-size-fit-all solution for all consumers; however, the current challenges in Taiwan seem to lack legal obligations or policy incentives directly or indirectly contributing to deploy or install smart meters either for Taiwan Power Company or residential consumers.

The Paragraph 1 of Article 62 of the Electricity Act provided that “Unless otherwise a flat rate has been agreed upon, electricity enterprises collecting electricity fee from users shall install electric meters and calculate the fee with the kilowatt-hour readings gauged by the meters.” Article 63 further provides that “Electricity enterprises may collect a guarantee payment or an alternative rental payment for the electric meters it installs for users as the said meter is provided by the enterprise. The said guarantee or the total amount of the said rental payment shall not exceed the market price at the time of installation of the said meter.” Pursuant to these two articles, Taiwan Power Company, as the sole electricity supplier to end-users in Taiwan, is obliged to provide all consumers meters to calculate the fees on the basis of kilowatt-hour. However, the meters are not provided for free. Taiwan Power Company is allowed to collect a guarantee payment or an alternative rental payment from consumers.

As mentioned above, the priority task of the fourth dimension of the “Master Plan” is to finish the deployment of AMI for 100% of all high- and super-high voltage consumers and about 50% of all low-voltage consumers. The fact is that the progress of deployment is delayed far from the said goal. It has been noted that major obstacles of deployment of AMI may come both from Taiwan Power Company and consumers themselves as well.

Here come the following questions:

1) Does the Taiwan Power Company have the obligation to provide “smart meters”? Whether consumers can ask the Taiwan Power Company to install smart meters at their premise? If so, who shall bear the high expenses of smart meters?

2) On the other hand, in fact, the Taiwan Power Company indeed suffered from the reluctance of consumers to install AMI. Whether the Taiwan Power Company can make the installation of smart meters to be mandatory for all or certain consumers? If so, who shall bear the high expenses of smart meters?

As for the first question, the answer is “NO” under the existing laws and regulations. Taiwan Power Company is obliged to provide “meters”, which cannot be expected to extend to “smart meters”. As for the second question, the answer is also “NO” under the existing laws and regulations.

3.2. POSSIBLE SOLUTIONS FOR WIDE ROLLOUT OF SMART METERS

This article contends that if the presumption of cost-effectiveness requirement is met, possible solutions are: Whether obligations or incentives shall be imposed or given to the Taiwan Power Company for deploying smart meters or taking other actions attributable to energy efficiency? Whether incentives or other measures shall be given to residential consumers for installing smart meters and enrolling pilot projects?

3.2.1. Lessons learned from EU Energy Efficiency Directive: Obligation of Mandatory Roll-out of Smart Meters in Certain Circumstances and Obligation of Annual Energy Saving by Volume

The EU Energy Efficiency Directive (Council Directive 2012/27/EU, 2012 O.J. (L 315) 1.) was in force since December 2012. Pursuant to the first subparagraph of Paragraph 1 of Article 9 of the Energy Efficiency Directive, member states shall provide to the end-use electric consumers “competitively priced individual meters that accurately reflect the final customers’ actual energy consumption and that provide information on actual time of use”, provided that it is “technically possible, financially reasonably and proportionate in relation to the potential energy savings”. Furthermore, the second subparagraph of Paragraph 1 of Article 9 directs member states to provide smart meters when “an existing meter is replaced” and “a new connection is made in a new building or if a building undergoes major renovations”. As for the first circumstance, the obligation can be waived only if “it is technically impossible or not cost-effective in relation to

the estimated potential savings in the long term". As for the second circumstance, since public bodies' buildings of member states are required to renovate "3% of the total floor area of heated and/or cooled buildings" each year from January 1 2014 to meet at least the minimum energy performance requirements pursuant to Article 5 of the Energy Efficiency Directive, it can be anticipated that smart meters will be installed in those public buildings in a constantly rising rate each year.

Article 7 of the Energy Efficiency Directive directs member states to set up "energy efficiency obligation schemes" to ensure that "energy distributors and/or retail energy sales companies are designated as obligated parties" bearing the obligation of achieving "a cumulative end-use energy savings target by 31 December 2020". According to the second subparagraph of paragraph, the said target "shall be at least equivalent to achieving new savings each year from 1 January 2014 to 31 December 2020 of 1.5% of the annual energy sales to final customers of all energy distributors or all retail energy sales companies by volume, averaged over the most recent three-year period prior to 1 January 2013".

Subject to this provision, it is the energy distributors or the retail energy sales companies themselves that bear the burden to achieve the said target of energy savings. Driven by this obligation, energy distributors or the retail energy sales companies are supposed to take some actions and measures, such as deploying smart meters, implementing demand response, or introducing energy service, to reduce the said amount of energy consumption of end-use consumers. In the United Kingdom, the national smart meter rollout is expected to reduce domestic consumption by 3% and peak demand by another 5%, which is equivalent to about USD 22 billion in annual savings. According to IEA (2011), in the United Kingdom, the national smart meter rollout is expected to reduce domestic consumption by 3% and peak demand by another 5%, which is equivalent to about USD 22 billion in annual savings. Since deployment of smart meters seems to be an effective way to save energy, energy distributors or the retail energy sales companies do have incentives to adopt this method.

3.2.2. Lessons Learned from US Green Button, EU Energy Efficiency Directive and Their Privacy Policies

Except financial incentives (e.g. grants, subsidies, etc.) and pricing mechanism, this article contends that there are still other measures to promote

behavioral change and eventually contribute to the willingness of installing smart meters. These measures empower consumers with more information and protect consumers' privacy at the same time.

In the United States, the White House issued "A Policy Framework for the 21st Century Grid: Enabling Our Secure Energy Future" in June 2011. The Policy Framework sets "empowering consumers and enabling informed decision making" as one of the four guiding principles. It highlights the importance of "consumer education, timely access to data, device usability, data privacy, and consumer protection".

According to Edison Foundation (2011), in September 2011, about one fourth of residential consumers had installed smart meters. At the same time, with regard to increasing access to data of energy consumption, the White House brought up the idea of "Green Button" that would provide consumers with simple online access to their detailed energy usage information. When a consumer clicks on the Green Button, the consumer's computer downloads energy usage information in a standardized human-to-machine and machine-to-machine readable electronic xml format. This kind of access will make it easier for consumers to engage with third parties offering services and products to help them understand and take actions to better manage their energy usage.

The Green Button Initiative was officially launched in January 2012. As of May 2012, 36 million smart meters have been installed, which means almost one third of residential consumers have a smart meter. As of October 2012, more than 16 million consumers have access to Green Button to download usage information by a simple click. According to the White House (2013), as of February 2013, 35 utilities joined the industry-led initiative. It is estimated that more than 36 million consumers will have access to Green Button and they will be able to use web and smart-phone apps to choose the best rate plan or to receive customized energy efficiency tips. In addition to "Green Button-Download My Data", the Obama Administration has been working to enable "Green Button-Connect My Data", which is designed to help consumers "automatically and securely transfer" their usage data to authorized third parties.

In EU, the Energy Efficiency Plan of 2011 adopted by European Commission on March 8, 2011, indicates that "consumers need clear, precise and up to date information on their energy consumption". It points out that measures should be taken to em-

power consumers with new technology and further affirms the deployment of smart meters, which member states are obligated to roll out for at least 80% of consumers by 2020, to allow consumers save energy by “gathering and communicating information about energy supply and consumption”. And this information should be presented in ways that consumers can easily understand and that can help them to improve energy efficiency.

In order to further strengthen the empowerment of end-use consumers with regard to access to information from meters and bills of energy consumption, Article 10 and Annex VII of the Energy Efficiency Directive expressly indicates the minimum requirements for billing information on actual consumption, which include billing based on actual consumption, minimum information contained in the bill and advice on energy efficiency accompanying bills and other feedback to final consumers.

Information usually accompanies concern of privacy. Indeed, it is suggested that privacy is one of the leading concerns of consumers to install smart meters. Both the United States and European Union have taken some policies to ensure that the consumers’ detailed information created by deployments of smart grid and smart meters is adequately collected, saved and used.

In the United States, the White House issued Consumer Privacy Bill of Rights Report in February 2012 and set forth the following principles: individual control; transparency; respect for context; security; access and accuracy; focused collection; and accountability. In the European Union, Expert Group 2 of Smart Grid Task Force issued a report in February 2011 suggesting to distinguish personal data and non-personal data in smart grid. Furthermore, in March 2012, European Commission’s recommendation indicated that it will establish a “data protection impact assessment template” and required member states to adopt the template and apply it to all network operators and operators of smart metering systems.

CONCLUSION: PRELIMINARY LEGISLATION SUGGESTIONS

Smart grid and smart meters will fundamentally change the way the consumers use electricity. Consumers will be able to get enough information to reduce electricity consumption or to use electricity when the price is lower, provided that time-of-use rate applies. Both the United States and European Union have taken policies and correspondent

measures to empower consumers to make informed decisions of saving energy and using energy at specific time (e.g. off-peak time) or in a specific way (e.g. turn off specific appliances remotely). However, to make all these scenarios happen in our houses, the premise is to install smart meters. Accordingly, this article proposes that the government may take into account the following legislation suggestions.

Since the Taiwan Power Company is the sole electricity enterprise in charge of generation, transmission, distribution and delivery (sales) of electricity in Taiwan, there are fewer incentives for them to take actions to reduce the consumption of their customers. In this regard, this article suggests that the government may consider imposing specific obligations on the Taiwan Power Company to ensure the progress of deployment of smart grid and smart meters being on the right track. Firstly, following the second subparagraph of Paragraph 1 of Article of Energy Efficiency, Article 62 of the Electricity Act or Article 17 of Energy Management Act may add provisions to make the installation of smart meters mandatory, provided that “an existing meter is replaced” and “a new connection is made in a new building”. Secondly, following the “1.5% savings target” in Article 7 of the Energy Efficiency Directive, Energy Management Law in Taiwan may add provisions to obligate electricity enterprises in charge of distribution and delivery (sales), namely the Taiwan Power Company, to reduce certain amount of end-use electricity consumption per year. Driven by this obligation, the Taiwan Power Company will work actively on tasks, such as the deployment of smart grid and smart meters, which may significantly contribute to the compliance of the mandatory provision.

On the other hand, since most of residential consumers in Taiwan apply rate type of non-TOU (non Time-of-use), there are fewer incentives for them to change their behaviors to save electricity, either. It explains more efforts are needed to persuade residential consumers to install smart meters and/or join relevant pilot projects. In this regard, this article suggests that except financial incentives and/or pricing mechanism (e.g. application of time-of-use rate on residential consumers that install smart meters), efforts shall be taken on how to provide consumers with the “right” information and how to provide it “right”. Following the example of Green Button, the government may consider making online access to detailed electricity usage information as a requirement for consumers who install smart meters. The web portal can be established by

the Taiwan Power Company or other entities, which are interested in providing this kind of service. Further, following the “minimum requirements for billing information” in Article 10 and Annex VII of the Energy Efficiency Directive, the Electricity Act may include similar provisions.

As for the privacy concern of consumers who installs smart meters, the government may consider to follow the “data protection assessment template” mechanism taken by the European Commission. The Paragraph 2 of Article 27 of the Personal Information Protection Act in Taiwan, which was in force in October 2012, provided that “the government authority in charge of subject industry at the central government level may designate a non-government agency for setting up the plan of security measures for the personal information file or the disposal measures for the personal information after termination of business”. Subject to this provision, the MOEA may designate the Taiwan Power Company to set up appropriate data protection assessment and plan to ensure the protection of personal data collected by smart meters. In this regard, the government may consider establishing a template for the said data protection assessment.

Taken the above measures as a whole, it might indirectly encourage residential consumers to install smart meters to receive the “right” information in a “right” way.

REFERENCES

- The White House (February 2013), *A Policy Framework for the 21st Century Grid: A Progress Report*, at 7.
- Institute for Electric Efficiency, Edison Foundation (May 2012), *Utility-scale Smart Meter Deployments, Plans, & Proposals-IEE Report*, at 1.
- Commission Recommendation of 9 March 2012 on Preparations for the Rollout of Smart Metering Systems, 2012 O.J. (L75) 9, 11.
- U.S. FEDERAL ENERGY REGULATORY COMMISSION [FERC] (2012), *Assessment of Demand Response and Advanced Metering*, at 7.
- The White House (2012), *Consumer Data Privacy in a Networked World: A Framework for Protecting Privacy and Promoting Innovation in the Global Digital Economy*, at 1.
- International Energy Agency [IEA] (2011), *Smart Grid-Smart Customer Policy Needs*, at 8.
- The White House (2011), *A Policy Framework for the 21st Century Grid: Enabling Our Secure Energy Future*, at V.
- Smart Grid Task Force [SGTF] (2011), *Expert Group 2: Regulatory Recommendations for Data Safety, Data Handling and Data Protection*, at 28–29.
- Pei-San Huang, TOU Will Apply to Residential Consumers in 2015, CHINA TIMES, Nov. 14, 2012, at A11.
- Mao-Jean, Wang, Smart Meters-10,000 Consumers Will Be Able to Install for Free in 2013, UNITED DAILY NEWS, Nov. 25, 2012, at A11.
- The Executive Yuan of ROC, “Smart Grid Master Plan (2012)”, http://web3.moeaboe.gov.tw/ECW/populace/content/SubMenu.aspx?menu_id=1946 [accessed 30 July 2013].
- The Bureau of Energy, MOEA, “The New Energy Policy of Taiwan (2011)”, http://web3.moeaboe.gov.tw/ECW/populace/news/News.aspx?kind=2&menu_id=56&news_id=2433 [accessed 30 July 2013].
- What’s New: Taiwan Launched Smart Grid Deployment (19 Nov. 2012), MOEA Website, http://www.moea.gov.tw/Mns/english/news/News.aspx?kind=6&menu_id=176&news_id=28433 [accessed 30 July 2013].
- Press Release: Smart Grid Taskforce to Be Established (27 Aug. 2012), The Executive Yuan of ROC Website, http://www.ey.gov.tw/en/News_Content2.aspx?n=1C6028CA080A27B3&sms=E0588283EFAA02AD&s=72BCCF053E016FFF [accessed 30 July 2013].
- Chinese Taipei Advanced Metering Infrastructure (AMI) Road Map, APEC Energy Working Group-Energy Smart Communities Initiative Website, http://esci-ksp.org/?project=chinese-taipei-advanced-metering-infrastructure-ami-road-map&task_id=639 [accessed 30 July 2013].
- News: MOEA Helps ICT Move on to Smart Grid Industry, Invest in Taiwan Website, http://investtaiwan.nat.gov.tw/news/news_eng_display.jsp?newsid=944&nowpage=1&Q_ANSWER=&MID=8 [accessed 30 July 2013].
- Advanced Metering Infrastructure (AMI) pilot projects and National AMI Deployment Plan in Chinese Taipei, APEC Energy Working Group-Energy Smart Communities Initiative Website, <http://esci-ksp.org/?project=advanced-metering-infrastructure-ami-pilot-project-and-national-ami-deployment-plan-in-chinese-taipei> [accessed 30 July 2013].
- National AMI Deployment Plan, APEC Energy Working Group-Energy Smart Communities Initiative Website, <http://esci-ksp.org/wp/wp-content/uploads/formidable/National-AMI-Deployment-Plan.pdf> [accessed 30 July 2013].
- Increase Accountability of Power Grid and Efficiency of Power Generation and Transmission, MOEA of ROC Website, http://www.moea.gov.tw/AD/Ad04/content/ContentDetail.aspx?menu_id=4598 [accessed 30 July 2013].
- What’s New: AMI Deployment Plan Supported by BOE Stimulates Development of Smart Meter Industry and International Collaborations (22 Feb. 22 2012), MOEA of ROC Website, http://www.moea.gov.tw/Mns/english/news/News.aspx?kind=6&menu_id=176&news_id=25939 [accessed 30 July 2013].
- Modeling a Green Energy Challenge after a Blue Button, The White House Blog website, <http://www.whitehouse.gov/blog/2011/09/15/modeling-green-energy-challenge-after-blue-button> [accessed 30 July 2013].
- Pricing Chart for Low-voltage Consumers (valid since 10 June 2012), Taiwan Power Company Website, http://www.taipower.com.tw/content/q_service/images/main_3_6_3.pdf [accessed 30 July 2013].