



**ACCELERATING  
SUCCESSFUL SMART  
GRID PILOTS  
EXECUTIVE SUMMARY**

**World Economic Forum**  
in partnership with Accenture

This World Economic Forum report was developed by the Forum's Energy Industry Partnership in collaboration with Accenture and with the input from a steering board of project champions and a task force of experts.

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### About the Smart Grid project

The Smart Grid project is driven by the Energy and ICT Industry Partner Communities and supported by the resources Partner, Accenture. In 2009, the Forum began researching the opportunities and challenges surrounding smart grid, publishing a report entitled *Accelerating Smart Grid Investments*. Building on this report and a series of workshops, including a private session at the World Economic Forum Annual Meeting 2010 in Davos, the Forum launched the second phase of the smart grid project in June 2010.

In 2010, the Smart Grid project is bringing together key stakeholders across the smart grid value chain and combining research and dialogue to:

- Provide a platform for public and private stakeholders across the smart grid value chain to collect and share practical knowledge and insights on what it takes to create successful and larger smart grid pilot projects and move forward smart grid developments
- Fill the current knowledge gaps on what can be learned from existing pilot projects to define success criteria and a value case for future pilot projects and create recommendations to inform investment and policy-making as well as roadmaps of smart grid roll-out
- Explore ways of implementing the recommendations from the project, particularly the opportunity to catalyse concrete partnerships for action

This report is a key milestone in this effort.

### About the Smart Grid Steering Board and Task Force

The project is guided by a steering board of project champions, and a project task force of experts. Steering Board and Task Force members contributed to building the report by providing insight and input throughout the research and publication process.

The views expressed in this publication do not necessarily reflect those of the World Economic Forum, Accenture, the Smart Grid Steering Board and Task Force members or the Industry Partner companies.

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## Abstract

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Over the last 12 months, the utility industry has witnessed progress on two fronts: the recognition by governments of the importance of fiscal stimulus in kick-starting the transition to the low-carbon economy and the centrality of smart grids as an enabler for a set of low-carbon technologies and solutions. As a result, there has been a substantial increase in the number of smart grid pilots being implemented, with industry estimates at around 90 pilots globally<sup>1</sup>. For this report, over 60 industry and policy/regulatory stakeholders were engaged to identify the factors that determine the success, or otherwise, of smart grid pilots.

The global analysis identified a number of issues across the pilot life cycle that are preventing pilots from reaching their full potential. Our report presents several recommendations for stakeholders: the crucial role of the regulator in incentivizing smart grid pilots by providing clarity over funding and stranded assets; the need for the utility to apply rigor to pilot scoping with a mixture of consumer-centric and grid-centric technologies and to develop compelling consumer value propositions and outreach programmes while understanding operating model and business model implications of smart technologies; and the need for cross-industry collaboration to form multidisciplinary consortia and to increase international knowledge exchange.

<sup>1</sup> World Economic Forum Smart Grid Project Task Force & Steering Board (July 2010)

# Executive Summary

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In the 12 months since the publication of the joint World Economic Forum and Accenture report, *Accelerating Smart Grid Investments*, and the presentation of the Forum's Smart Grid Task Force on Low-Carbon Prosperity recommendations to world leaders, there has been a significant increase in funding committed to smart grid pilots. Governments have begun to recognize the centrality of smart grids as an enabler for a set of low-carbon technologies, and are increasingly viewing smart grids as a strategic infrastructure investment that will enable their long-term economic prosperity and help them to achieve their carbon emission reduction targets. Over the last year, China alone has spent US\$ 7.3 billion<sup>2</sup> on smart grid developments, while the US has directed US\$ 4.5 billion of its fiscal stimulus package<sup>3</sup> to smart grid activities.

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***A "smart grid" is a digital, self-healing energy system that delivers electricity or gas from generation sources, including distributed renewable, to points of consumption. It is capable of optimizing power delivery and facilitating two-way communication across the grid, enabling end-user energy management, minimizing power disruptions and transporting only the required amount of power. The result is lower cost to the utility and the customer, more reliable power and reduced carbon emissions.***

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## INDUSTRY DEVELOPMENTS

Over the last 12 months, we have seen significant growth in the number of projects being undertaken; the prevailing industry estimate is that 90 smart grid pilots are in progress today, with at least as many in the pipeline<sup>4</sup>. The pilots have been predominantly focused in North America, Australia and Europe; however, we are now seeing considerable activity in South America, South Africa, China, India, Japan and South Korea. The scope of these pilots shows the continued dominance of advanced meter reading (AMI – smart metering); however, we are beginning to see more smart grid projects that are focused on network optimization and dealing with the challenges of accommodating a broad spectrum of low-carbon technologies.

Over the last year, we have observed three broad trends within the smart grid industry:

- **The rise of smart grid as an industrial imperative** – Many governments are seeing smart grid and the broader low-carbon technology industry as critical to the evolution of their manufacturing and knowledge economy. In the East Asian economies, strategic investments are being made to develop intellectual property and manufacturing capabilities in this sector with a view to growing the export market globally.
- **The broadening of the smart grid concept to intelligent cities** – The debate has also notably shifted from being a discussion on pure "smart grids" and electricity infrastructure to include intelligent infrastructure, whereby the sensing and control capabilities inherent in the smart grid are applied to multiple physical infrastructure layers within the urban environment (e.g. water, waste, buildings, etc.).
- **The emergence of new entrants in the utility value chain** – We are beginning to see a new breed of industry participants, such as consumer products, telecoms and retail companies, explore their potential roles within the industry. We have not yet seen a significant disruption in the traditional business model; however, as the new entrants develop their understanding of the industry dynamics, we expect disruptive business models to emerge.

## OPPORTUNITIES AND CHALLENGES

Our review of the first crop of pilots suggests that, while the industry has taken a significant step forward, there are clear opportunities to extract more insight and value from these investments. We see the following as the key challenges of today's smart grid pilots:

- The struggle to create strong smart grid business cases remains in environments where regulatory incentives have not evolved to reflect today's policy agenda

<sup>2</sup> "Smart Grid: China Leads Top Ten Countries in Smart Grid Federal Stimulus Investments, Zpryme Reports", Zpryme Research & Consulting press release, 27 January 2010, <http://zpryme.com/news-room/smart-grid-china-leads-top-ten-countries-in-smart-grid-federal-stimulus-investments-zpryme-reports.html>

<sup>3</sup> "Renewable Energy and Smart Grids Spurred by Economic Stimulus Act", EERE News, US Department of Energy, Energy Efficiency & Renewable Energy, 18 February 2009, [http://apps1.eere.energy.gov/news/news\\_detail.cfm/news\\_id=12244](http://apps1.eere.energy.gov/news/news_detail.cfm/news_id=12244)

<sup>4</sup> World Economic Forum Smart Grid Project Task Force & Steering Board (July 2010)

- Future legislation is uncertain and, in some cases, disaggregation of the utility value chain is increasing complexity; making it more difficult to align and allocate risk and reward
- Challenges remain around data privacy, cybersecurity, interoperability and standards
- There are examples of conflation of objectives, whereby new technologies and pricing structures are rolled out in parallel, making it difficult to understand cause and effect when customers react poorly to the change
- Pilots are encountering consumer engagement challenges, both in communicating effectively with the consumer and in delivering high-quality implementations in unpredictable field environments
- A number of smart metering pilots have struggled to convince the regulator and the consumer over the true benefit of their smart grid value propositions

In the context of the growing number of smart grid pilots, it is critical that we use this period of industry momentum to accelerate the technology development and develop the sustainable regulatory frameworks that will enable them to transition to the mainstream. By challenging the regulatory status quo at this stage, we will avoid the risk of becoming limited by the legacy frameworks to the “lowest common denominator” of smart grid.

Finally, for consumer-centric pilots it is critical that projects seek to engage and educate consumers at this point of inflection in order to generate buy-in and stimulate the necessary market demand. For smart grid to be economically and socially sustainable, customers will need to recognize the value that these technologies can provide and be willing to pay for the products and services on offer.

## LESSONS LEARNED

Pilots serve a twofold purpose:

1. They provide a mechanism for utilities and their partners to innovate in a lowered risk environment and gather data proving the value of smart grid investments.
2. They help the utility to field-test new technologies and generate capabilities and insights that will support them in the successful full-scale roll-out of smart grids.

This year’s publication is the output of a joint research effort between the World Economic Forum and Accenture with the input from the project Steering Board and Task Force members, who represent stakeholders from the entire smart grid value chain. It puts forward a number of recommendations to enable current and future pilots to reach their full potential. The research engaged utilities, vendors, communications companies, regulators, policy-makers and NGOs via workshops and one-on-one interviews. This study unearthed a number of “lessons learned” from the existing pilots, which we have broadly grouped into four sections:

## 1. Political and Regulatory Context

- **The right regulatory and policy framework for innovation and investment:** Regulators and policy-makers need to create the right environment for private sector investment in innovation and capital assets. In liberalized markets, this is further complicated by the disaggregated nature of the value chain. Regulators should pay close attention to the allocation of risk and reward across the value chain and develop regulatory frameworks that encourage investment and align incentives.
- **Drive for global standards:** Standards help provide market certainty and increase interoperability. However, if they are applied too early or are deemed too proprietary in nature, they can stifle innovation. Multiple regional standards are being developed with the consequent risk that we will see competing standards bodies. There is an opportunity to increase the level of international outreach and cooperation; increase the prevalence of open standards; and apply standards from other established industries, such as the Internet protocol and security standards, to help expedite their adoption.

## 2. Scoping Phase

### ***Be clear about the test parameters and understand when customers will be engaged***

- **Clarity and ambition in design:** It is essential that pilots invest in creating and documenting clear test parameters and hypotheses that they intend to prove, or disprove, through the implementation phase. We encourage utilities to trial holistic and ambitious smart grid pilots that demonstrate the value of the technologies within a broader system context. Designers should be mindful of the risk of conflating objectives and ensure that pilots are divided into sequential, yet iterative, phases examining technology, operating models and business models.
- **Grid vs consumer pilots’ capabilities:** Most pilots will contain a mixture of consumer-facing and network-facing technologies. Consumer-facing pilots may confront additional challenges around consumer acceptance and behavioural change, where proactive consumer engagement programmes can play a critical role in securing the long-term success of a pilot. Each interaction with the customer can be critical to the longer-term success of the pilot.

### ***Collaborate to develop commercial capability that trials new operating and business models***

- **Successful commercial collaboration:** The creation of successful commercial consortia will become a point of competitive differentiation in the transition towards the low-carbon economy. Utilities will benefit from using pilots as a test bed to put in place the commercial and legal frameworks to bring these different capabilities together.

- **Experiment with new operating and business models:** Once technology is robust and interoperability is proven, there is an opportunity for pilots to help utilities understand what changes they will need to make to their operating and business models to maximize the value of new technologies.

#### **Develop consumer insight**

- **Segment consumers by behaviour:** In the planning stages we recommend that pilots undertake behavioural segmentation analysis, looking carefully at the three major groups: residential; small and medium enterprises; and commercial and industrial. By segmenting these customer groups, utilities and their partners can develop product and service offerings that meet the customer needs and create “pull” for smart grid offerings.
- **Target business customers:** Business customers are often more sensitive to price and open to innovative product and service offerings that help increase profitability. Furthermore, early adopters in the residential sector often take their cue from technologies that they are made aware of in the work environment.

#### **3. Execution**

- **Engage and educate consumers:** Consumer outreach programmes and ongoing product/service support are critical during pilots that directly impact the customer. Within these outreach programmes, utilities need to communicate messages in clear, common language; adopting new techniques, channels and incentive schemes to build trust and to explain the value proposition to consumers in their everyday lives.
- **Re-engineer in the field:** The most successful pilots encourage collective problem solving in the field, eliciting and responding to consumer feedback and ensuring the skills and flexibility are in place to successfully re-engineer improvements in technology and the business process. This is particularly important in consumer-facing pilots, where any lapse in performance has the potential for a long-term, detrimental impact on the consumer’s perception of smart grid and their relationship with their energy provider.

#### **4. Dissemination of the Lessons Learned**

- **Share lessons from the field:** Today’s knowledge exchange remains limited. The recent launch of the Department of Energy’s beta version Smart Grid Information Clearinghouse<sup>5</sup> demonstrates the way forward; however, it remains focused on the US market. A larger, international data set with contextual data, such as customer demographics and network topology, may enable utilities to benchmark themselves more effectively and make stronger value cases.

- **Inform the regulatory/policy environment:** An opportunity exists for utilities to make the case for change in their own regulatory frameworks. Data and knowledge gleaned from the pilot programmes will provide empirical data that can be used to create policy and regulatory frameworks that align incentives and encourage private-sector investment.

#### **Key Takeaways for All Stakeholders across Three Key Timescales**

##### **1. Short term: Lay the foundations for success**

- a. Policy-makers and Regulators** – Create the right conditions for innovation and certainty over funding and regulatory treatment while driving alignment on standards
- b. Utilities and Partners** – Develop broad-based consortia, focus on creating a stable technology platform and engage consumers where they are likely to be personally affected

##### **2. Medium term: Reshape the agenda and roll-out proven technologies**

- c. Policy-makers and Regulators** – Review the regulatory framework to align incentives and encourage private-sector investment
- d. Utilities and Partners** – Use initial data to help shape the regulatory agenda; pilot changes to the operating model and processes; share data and use simulation to make the value case for roll-out of “proven” technologies

##### **3. Longer term: Change the model**

- e. Policy-makers and Regulators** – Reward utility innovation and encourage participation of new entrants that may offer new business models
- f. Utilities and Partners** – Position the value case for full-scale roll-out of technologies as the economics improve; and innovate around the business model to offer customers greater value and behavioural segmentation data to target a greater proportion of customers with differentiated product and service offerings

<sup>5</sup> “Secretary Chu Announces More than \$57 Million in Recovery Act Funding to Advance Smart Grid Development”, Department of Energy press release, 20 July 2009, [www.energy.gov/7670.htm](http://www.energy.gov/7670.htm)



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