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Energy Big Data Analytics

"Unlocking the benefits of Smart metering and Smart Grid Technologies"

Brussels, 5 May 2015

INTRODUCTION

Smart metering and smart grid technologies, currently under deployment in Europe, are transforming the Utility industry and the customer experience in search of a new energy deal that supports a more collaborative, eco-friendly, stable, reliable and cost efficient system as a whole.

These technologies, while continuing to support effectively key services such as meter reading for invoicing purposes have drastically changed the volume of information made available to both Utilities and Customers. In order to unlock the full value, Utilities need now to develop new Big Data Analytics capabilities.

This paper is directed at both the Utilities Industry and policymakers to stress how important Energy Big Data Analytics capabilities are to unlock the smart metering and smart grid investments value, and stress how critical it is to ensure viable regulatory environments are organized not to hinder taking advantage of this sector digital transformation opportunity.

BIG DATA ANALYTICS

The key characteristics of Big Data are:

- Volume: the immense amounts of data, approximately 1 000 to 10 000 times more data than before,
- Velocity: data is made available in real, near real time, or on a daily basis where it used to be collected a few times a year),
- Variety: the various amounts of new data from multiple data sources, both presenting structured and unstructured data, from network devices measurements, to web site navigation logs or even images and videos,
- Veracity: with the increasing volume of information made available, data is becoming less reliable and may hinder effective analytics.

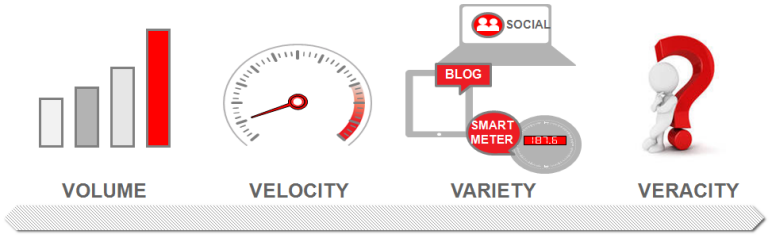

Figure 1: Key Characteristics of Big Data Environment

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Big Data Analytics technologies refer to the set of technologies which can help capture, organize and analyze massive quantity of information as it flows and provide meaningful insight to provide a better service, at a lesser cost. It may also just simply make possible the integration of more and more disruptive grid uses such as distribution connected renewable generation or electric vehicles. **Big Data Analytics is the intelligence brought to data** to transform into actionable insights for the industry. Taking advantage of multiple data sources - smart meter data feeds, home automation and demand control systems, customer experience through varied channels including web and mobile devices, meteorological data streams, socio demographic insight - Big Data Analytics is the game changer to empower delivering real benefits to society.

NEW IMPROVED SERVICES FOR THE END USERS & ENHANCED EFFICIENCY FOR OPERATORS

New Data sources may include among others:

- **Traditional Utilities data** on customers and service connection and assets,
- **Smart meter data** allowing better insight on customer usage and service quality,
- **Smart grid devices data** bringing extended information and control over Utilities grids,
- **Customer interaction** channels data over voice, internet, mobile
- **Home automation** and intelligent home devices data feeds,
- **New technologies** requiring additional monitoring – Electric Vehicles, Wind Generation, City Lighting monitoring, Photo Voltaic panels, micro-grids integration…
- Localised **weather data**,
- **Socio-demographic** information and other publicly available information;

The ability to capture, manage, and analyse these sets of information in a meaningful and coherent manner will require appropriate Big Data Analytics capabilities, which allow delivering value across Utilities operations based on among others the below cases:

- **Anticipate failures of distribution assets**, such as transformers, before they occur, to structure proactive maintenance operations, improving service quality at lower cost;
- **Improve balance of generation and demand at all times** – including at local distribution level – through better timely forecasting and demand response management, postponing the need for capital investments in networks;
- **Improve energy planning forecasts to decrease energy costs** on markets, allowing conventional and distributed generation plants to be used efficiently in their best operating conditions;
- **Improve Customer Service Quality**, identifying power cuts more accurately at the moment they occur for faster restoration, and before a customer calls the Utility;
- **Enable optimization** and control **of delocalized generation** at the time during which the system is able to accept them to facilitate the connection of massive number of Electrical Vehicles and Renewable Energy Sources;

- **Supporting optimized Low Voltage distribution network operation,** previously largely not monitored, including applications for voltage optimization, outage management, extended network monitoring and better connection services,
- **Enable better way of consuming**, proposing Energy Use advisory based on anonymous customer benchmarking and Energy saving advocacy, including in home management devices
- **Structure effective Energy Saving policies and campaigns** to foster rational use of energy resources and enable adoption of energy management services and technologies;
- **Improve customer service with error free metering and billing** services and identifying / anticipating consumptions anomalies as early as possible;
- **Allowing Utilities to identify and reduce losses accurately** enabling them to address them and reduce the overall overhead cost charged on the user community;

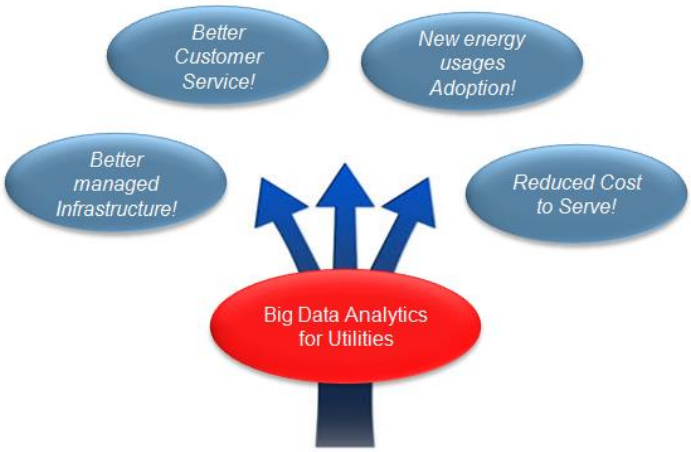

Figure 2: Delivering Benefits through Big Data Analytics

Where customer data is managed in the above cases, privacy is a key and genuine concern. Many industries, such as the banking industry, the telecom industry, have already seen similar 'data explosions' and are successfully operating based on the European Privacy framework - all these best practices can be supported to ensure high levels of customer privacy protection, including where appropriate, customer consent and opt-in / out choices.

KEY ENABLERS & TECHNOLOGIES

So what's needed to enable the above services and efficiencies? A broad set of technologies are available today on the market. Despite the steep evolutionary change required, Utilities and governments can benefit from other industry best practices to ensure this is being implemented.

Key Enablers

- Data if handled properly is an opportunity for consumers and industry alike, and is instrumental to enable stakeholders to improve their own operations and deliver new services and benefits for consumers;

- Data circulation, including within services providers, based on the legal framework for protection of privacy is critical and should be enabled by new Energy Market Rules;
- It is key to allow Utilities to focus on ICT supportive technologies allowing generate benefits out of deployed "smart devices";

Technologies

New amazing technology has emerged over the last years that offer new opportunities to industry: it addresses different challenges and will contribute to create the capabilities and value that 21st century Utilities will generate from Smart grid big data through:

- Integrating faster larger quantities of data
- Managing efficiently large sets of miscellaneous set of data through database technologies
- Mining efficiently complex, varied and large quantities of data
- Presenting and restitution: Business Intelligence, Portals, Mobile Device support, Dynamic data exploration, Geo-spatial...
- Faster and Easier Adoption and Deployment: benefiting from engineered solutions and Cloud services.

Enabling Utilities to efficiently extract insight within this context will further encourage adoption of new smart grid technologies and devices, further enabling them toward the digital transition of the European Electricity grid.

RECOMMENDATIONS

The success of the new energy transition relies on industry's ability to adopt Big Data Advanced Analytics technologies; It is key that both Utilities and policy makers take full ownership to enable this Digital transition. Utilities as key actors and stakeholders in the delivery of benefits to the community, and policy makers to insure suitable regulatory framework enables an agile and structured development, including:

- Encouraging adoption of new Energy Market arrangements documenting, defining and structuring data interchanges between key players, including Network Operators, Meter Operators, and Retailers to share – within the boundaries of private data protection – the data capital created by Smart Metering and Smart Grid Initiatives and allow the industry to deliver the value of the data;
- Encouraging adoption of Big Data across the industry –supporting Smart Metering and Smart Grid Analytics use across Utilities operations from Predictive Asset Maintenance, to Energy Efficiency, and Renewable adoption and integration among many others;
- Encouraging re-use of other industries best practices and standards, such as the Telecom, Banking and eCommerce industries, to insure consumers privacy and security rights, while enabling new services through agile access to data; Working so that the ongoing work on European Data protection legislation may deliver both a more reliable data protection environment for citizens at the same than enabling Big Data application allowing companies and administration to deliver better and more added value services;

- Finally, structure and organize adequate innovation funding:
    - To develop innovation projects, technologies and expertise including in the field of advanced analytical modelling in support of Predictive Analytics in big data environments (such as predicting electricity consumption, assets failure or energy shortages, ...) and through large scale demonstrators;
    - To address benefit areas across the complete Utility value chain from generation, transport and distribution networks and retail operations to help optimizing the Energy supply to customers;
    - To enable innovation currently available in Big Data technologies, across the stack, such as Compression, Aggregation, In-Memory, on premise or on the Cloud Solutions, and leaning towards the Internet of Things enabling complete new energy services;
    - To develop an overarching business case related to the benefits of Big Data Analytics, and fund Customers campaigns for better citizen awareness of the opportunities of Big Data Analytics put in practice within European Privacy Framework;

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