Digital-based energy systems

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1) Digitalisation: A major lever for carbon reduction

Digitalisation is coming to every large industrial sector. In the context of the COP21 conference, a panel analysed more than 100 green solutions for reducing carbon emissions at the lowest possible cost. It found that the biggest category of levers for the reduction of emissions at the lowest possible cost would be to optimise the use of existing products through big data – in short, by making the existing technologies smarter. This means that, in the short term, this optimisation would be more successful in reducing emissions than switching to low-carbon products, developing emission capture technologies, or optimising the financing of "green" low-carbon technology.

The macro analysis of the International Energy Agency (IEA) confirms that smart energy would be the greatest lever for achieving the 2030 targets. The good news is that the hardware components of these digital-based energy systems are becoming cheaper and cheaper. As a consequence, there is more demand for software, and its cost becomes increasingly more expensive. The cost factor is therefore no longer in hardware but in software.

2) Examples of applications

a) Power Generation

The old model was a stand-alone power plant. The new model is a power plant better integrated into a network. Such a plant can be reconfigured automatically, and is able to provide immediate availability. It provides flexibility as well as better resilience and safety. Equipment can be monitored and controlled much more efficiently, and shared services can be accessed to enable greater integration.
Three processes are vital to improving production capacity, maximising uptime, and reducing costs.

- Get connected: machine and production efficiency is possible thanks to visibility and analytics.
- Get insights: this includes quality, material and production analytics, tracking, and management.
- Get optimised: this includes factory optimisation as well as dynamic routing, scheduling, and maintenance management.

Using data can lead to significant results: reduced operation and maintenance costs, reduced start-up fuel costs, improved fuel efficiency, reduced unplanned events, and improved MW output.

b) Smart Grids

Smart grids connect all the heterogeneous assets together and ensure an optimised transmission and distribution of energy by means of digital substation technology, smart cables, smart sensors, key assets, and data. Smart grids are slow to roll out, but they provide numerous benefits: cost reduction, improved operability, enhanced maintainability, increased reliability, and improved safety. Digital substation technology is more efficient and less expensive than the conventional approach and results in savings of about 10% in CAPEX and 5% in OPEX.

Data optimisation is all about finding needles of value in haystacks of data. Most companies use the available methods: either the "plug and play" methods or the context-specific methods. Transforming a business into a part of a larger ecosystem also increases its capacity for collaboration and makes it easier to leverage a large community. It is much easier to transmit data than to transmit know-how and equipment.

3) The GE Digital Foundry for Europe

The GE Digital Foundry for Europe will include 4 types of expertise: (a) software design and co-creation, (b) ecosystem and incubation, (c) industrial Internet expertise, and (d) training and Production. Expertise in software design and in ecosystems creates real value for the industry, while the latter two kinds of expertise are simply catalysers for the first two.

In conclusion, hardware is getting cheaper and cheaper. Consequently, the value of software is rising. In order to find a “needle of value in a haystack of data”, it is absolutely crucial to work with the ecosystem. Finally, this is not “business as usual”. Rather, new approaches, new talents, and new skills are key here.