How to be smart about smart

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The advent over the past ten years or so of intelligent devices which can be deployed on the electrical generation and distribution system has led to many benefits or potential benefits being considered. As a result large investments in so-called smart devices has taken place in many utilities with varying degrees of success. The issue the utility faces is how to define and manage this deluge of technology and data in order to ensure benefits arise.

In defining a smart grid or smart utility, the utility needs to be careful not to limit that definition to certain components such as smart meters. It is necessary to define the smart grid or smart technology as widely as possible. A smart grid is thus a more instrumented grid which gathers, interprets and acts on information. The "grid" includes supply chain logistics, generation, transmission, distribution and customer premises [1].

The reason to define the smart component as widely as possible is to ensure that the processes, specifications and security systems which are put in place to manage smart technology cover all instances of the technology. For example, if the definition of smart is limited to that of meters, the communications protocol, back-end integration, data architecture and use of the data by other areas of the organisation may not be put in place. If small devices such as condition monitoring equipment on transformers is excluded, one may end up with devices in substations which are not integrated with the approved architecture. As such you may find servers being present in substations that can easily be hacked due to suitable security systems not being in place.

In addition to the definition of equipment, there is a need to define the requirements for all smart devices. Smart devices should therefore be seen as devices which are intelligent and can communicate with one another or other systems. These can be installed anywhere on the network from generation to the customer. It is important that, when these are installed in the network, they comply with certain specifications such as communications and security protocols and that they can integrate into a predefined information technology and operational technology architecture. This approach is termed a "well-founded" approach. The aim is to ensure that whatever is installed, is compatible to the overall specifications and infrastructure. In addition the data, analytics and information needs to be stored in a well-defined place. Users of the information need to be defined from the beginning. There also needs to be an assigned person or section that will maintain the data and information.

Once the foundation is in place it is possible to build on that foundation with devices in an incremental manner. For example it may not be possible due to funding or other constraints to install a full customer back-end system for demand response and time-of-use tariffs at one time. It is possible to define the end-state and a roadmap to get there, for example, by installing two quadrant meters initially with the capability of installing four quadrant meters at a later stage without having to redesign the architecture. This approach is termed a "well-founded incremental" approach.

One important item to consider is to determine who owns the data. With advanced metering infrastructure (AMI) type of applications, it is possible that all technology is proprietary and not open architecture. The suppliers of the equipment will offer services to read, process and export information to your systems. If this is the case there is a risk that sensitive customer information may be managed by an external source. If the external source were to part ways with the utility the data could be used to the detriment of the utility. This needs to be taken into account up front. With proprietary designs it is also necessary to understand the implications on maintenance and operations. For some suppliers there is a different communication protocol per meter version let alone between manufacturers. If a meter needs to be replaced the technician needs to know the meter manufacturer and version of the meter to ensure it can communicate with the concentrator or other devices. This can prove to be a logistical nightmare.

An open protocol system that can accommodate any meter from any manufacturer and can ensure that the data and information is managed by the utility is the preferred way to go with regard to smart devices. This may not be possible at present in all cases. Where it is not possible a strategy needs to be in place to secure data and manage maintenance until the devices can be replaced with open protocol devices.

Another major point is to ensure that there is enough bandwidth from the generator to the customer to manage the data, analytics and information. As a rule of thumb to determine the bandwidth required, work out the likely maximum you will expect to use and double it. Without adequate bandwidth it is impossible to realise the benefits of smart systems.

Conclusion

To be really smart about being smart one should follow these guidelines:

Define smart systems as widely as possible to ensure they apply to all devices.

Follow a well-founded incremental approach to ensure that whatever is installed can be integrated into the wider architecture with the correct security and communication protocols.

Be aware of proprietary designs from a security and maintenance point of view. Open protocol is preferred if possible with data managed in-house.

Install as much bandwidth as possible as no benefits can be realised without sufficient bandwidth.

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