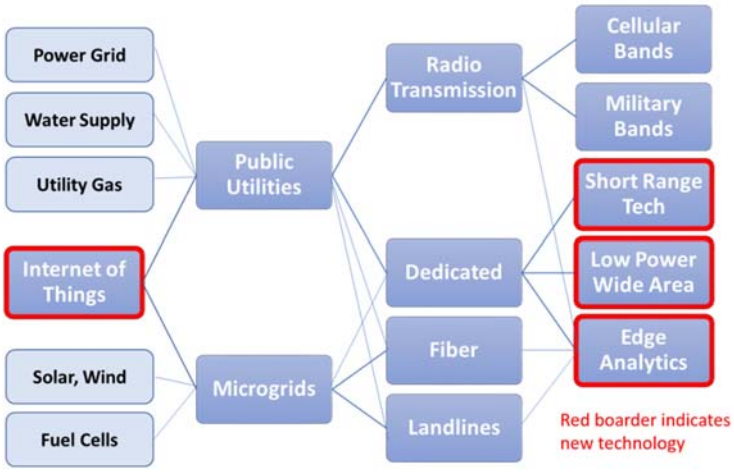
Connectivity of Energy and Utilities Devices (IoT)

April 2018 Tech Brief for Construction and Utilities Talent Networks



Superset of Smart Grid Technologies

Enabled by the development of low cost, addressable **sensors**, the **Internet of Things (IoT) for the energy and utilities industries** includes hardware, software, services and connectivity technology. The infographic above considers IoT connectivity. Key factors driving utilities to adopt these technologies are:

- Need to increase efficiency; avoiding waste is cheaper than increasing generation/water capacity
- Competition from those using next-generation smart meters, setting up advanced infrastructure and using real-time information and analytics
- Need to adhere to increasingly strict reforms and regulations

Labor Force Takeaway

A lack of IoT know-how at established utilities puts them at a disadvantage when facing tech-roadmapping and purchasing decisions. On the flip side, it provides an opportunity for upskilling and/or a career pathway focused on IoT implementation specifically for water, gas and electric utilities.

Honeywell is the only NJ company in this space; although they are not a core IoT provider. Near neighbor, **IBM, is using its Watson technology** to manage assets, facilities and provide continuous engineering. Both could provide educational material. Other companies servicing this market are mentioned later in this brief.

IoT as a career path has one great advantage: the ability to obtain relevant experience outside of a corporate/startup setting. **Google Home** (or **Amazon Echo**) and **smart LED bulbs** are priced within reach of most who would want to take this path. Self-study counts in any field as new and fast growing as IoT.

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Using IoT to manage water/gas/electric grids

IoT applications in electricity and utility gas are driven largely by the exponential increase in energy demand, precipitating an urgency to increase efficiency rather than to build out additional capacity. Global energy demand is expected to see an exponential rise by 37% by 2040, according to the **International Energy Agency**. An increase in water demand derives from growing populations and climate change. Utilities around the world will feel the strain.

Smart metering, water conserving home appliances and electronic sleep modes are all familiar. Connectivity of cameras and thermostats through the internet along with control by virtual assistance like Alexa are understood and are gaining acceptance. The ability to connect makes them "smart." Similarly, the "things" in Industrial IoT "things" are sensors or small computers. Each sensor is dedicated to communicating with a particular gas turbine, electronic switch, solar panel array, coal-fired generator, flow controls at a dam, or other utility-scale machine.

Between these sensor/machine nodes are software, services and connectivity technology. As important as software and services are, they are not specific to utilities. Connectivity between utility hardware has much tougher specifications to meet and more choices to consider than do smart city or smart home build-outs.

Connectivity technology and edge analytics distinguish IoT for utilities. Specialists are needed, even within the IoT service space. Purchasing agents must be well informed.

Getting back to the IoT sensors – the choice of connectivity determines the technology of sensors, since their job is to translate between the language spoken by the gas turbine and the language spoken by the control software, miles away at headquarters. Unlike humans, who speak rapidly and with extensive tonal range, machines are happy to speak in a slow monotone. Cellular encoding technology is wasted on industrial equipment. Worse, cellular soaks up power, as anyone with an old cell phone will remind you. Hence there is a race to come up with low power, long reach, high capacity-to-network and simple encoding "languages." (Complexity drives costs up.) Enter LPWA and new Bluetooth-like technology. At present, there is a rainforest of choices.

Low Power Wide Area (LPWA) network technologies, such as narrowband-IoT and LTE CAT-M, can be deployed within bands used for voice traffic or at other frequencies on the electromagnetic spectrum. Verizon deployed LTE CAT-M throughout its network in **first quarter of 2017**, and AT&T launched the **same in May 2017** using licensed spectrum. LPWA technologies are distinct from short range technologies **like Bluetooth** and ZigBee, as well as Wi-Fi and traditional cellular encoding. Some LPWA technologies are standards based; others are proprietary such as Ingenu and Sigfox.

Companies such as **Microsoft**, **Cisco**, **Amazon**, **SAP** and **Comcast** are acquiring tech companies that serve the machine-to-machine (M2M) space, of which utilities may be considered a subset. Prominent companies that are ***not* likely to be acquired in the short term**, because of their large installed base are **Ingenu**, **Sigfox**, and **ZigBee**. Most analysts are betting on standards-based tech for Smart City applications based in price sensitivity. Utilities though may want to pick a niche technology for their own reasons.

Another distinction is the where and how analytics are performed. **IoT edge analytics** is typically applicable for oil rigs, mines, and power plants, which operate in low bandwidth (monotone), low latency (slow) environments. Edge analytics can be applied not just to sensor data, but to richer forms of data, such as video analytics.

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