July 12, 2010

U.S. Department of Energy
Office of the General Counsel
Attn: NBP RFI: Communications Requirements
1000 Independence Avenue, SW
Room 6A245
Washington, DC 20585

Re: DOE Request for Information – Implementing the National Broadband Plan by Studying the Communications Requirements of Electric Utilities to Inform Federal Smart Grid Policy

I. Introduction

DTE Energy Company appreciates the opportunity to respond to the Department of Energy's (DOE) Request for Information on the subject of *Implementing the National Broadband Plan by Studying the Communications Requirements of Electric Utilities to Inform Federal Smart Grid Policy*, which was published at 75 Federal Register 26206 on May 11, 2010.

DTE Energy Company is one of the nation's largest diversified energy companies. Headquartered in Detroit, Michigan, DTE Energy is involved in the development and management of energy-related businesses and services nationwide. Its largest operating units are Detroit Edison, an electric utility serving 2.1 million customers in Southeastern Michigan, and MichCon, a natural gas utility serving 1.2 million customers in Michigan. The DTE Energy portfolio also includes non-utility energy businesses operating in 26 states which focus on power and industrial projects, coal and gas midstream, unconventional gas production and energy trading.

DTE Energy is demonstrating its commitment to creating value for its customers and shareholders through its SmartCurrents[1] program, which will implement Smart Grid technology at all levels of its electrical and gas distribution systems. This $170 million initiative seeks to lower the long-term cost of energy for our customers while increasing system reliability and stimulating economic growth in the region.

[1] SmartCurrents is a registered service mark of DTE Energy Company.

II. Executive summary

DTE Energy's SmartCurrents program breaks new ground for the Company in the area of field communications. While we have been innovators among utilities in radio frequency (RF) technology for voice for over 50 years and for data for over 25 years, we have not yet had the need to reach all of our 2.7 million total customers' residences and businesses with reliable, secure wireless communications.

The SmartCurrents program requires a variety of communications methods to enable mission-critical circuit operations, advanced metering and demand response. Our management and engineering teams agree that the public networks are generally unsuitable for SmartCurrents. We feel that the safety and security of our customers and employees would be compromised if we choose to use public wireless networks for our communications.

Given the lack of a viable commercial solution, DTE Energy is building its own private communication systems as a part of SmartCurrents. The most critical design element, and the one least within our control, is the availability of suitable RF spectrum. To those ends, we are petitioning the DOE and the Federal Communications Commission (FCC) to identify and make available to the industry frequency allocations in the 700 MHz and 1.8 GHz, and protect existing allocations in the 6 GHz band.

III. Current and Future Communication Need (Question 1)

What are the current and future communications needs of utilities, including for the deployment of new Smart Grid applications, and how are these needs being met?

DTE Energy has an installed base of over 30,000 electric and gas smart meters. Additionally, we operate a network of over 2000 connected field devices such as substation RTUs, pole-top switches and gas meters, chromatographs and valves. Communication with these devices is achieved by an approximate 60% / 40% mix of public and private networks, respectively.

We will grow our smart meter count to at least 600,000 by mid-2012 and our connected field device count will rise as well. Furthermore, we expect to shift our public versus private network mix substantially toward the private option as we build out to 100% smart meters and smart circuits.

Private communications technologies we currently use include licensed VHF, UHF, Multiple Address System, microwave radio, and unlicensed spread spectrum radio in the 900, 2.4 GHz and 5.8 GHz bands. Public technologies include leased analog and digital telephone circuits, VSAT satellite and 3G cellular.

We are concerned that over-crowding in the spread spectrum bands and encroachment by other services into the 6 GHz point-to-point microwave band will impact our current and future network builds. Furthermore, the only spectrum which can support point-to-multipoint data transmission at rates of 10 Mbps and higher is unlicensed, offering us no recourse against interference. These dynamics make our petition for more utility-specific spectrum all the more urgent.

IV. Basic Requirements (Question 2)

What are the basic requirements, such as security, bandwidth, reliability, coverage, latency, and backup, for smart grid communications and electric utility communications systems in general-today and tomorrow? How do these requirements impact the utilities' communication needs?

Please refer to the attached table (figure 1) and sketches (figures 2-5) which describe various Smart Grid applications and network options. Figure 2 is an overall network concept that covers multiple communications applications. Figures 3, 4 and 5 are specific examples of SCADA, distribution pole-top devices and AMI applications, respectively.

V. Additional Considerations (Questions 3)

What are other additional considerations (e.g. terrain, foliage, customer density and size of service territory)?

Our service territory presents a variety of challenges to us as communications engineers. Since our area varies from urban to rural, hilly to flat, low residential structures to high-rise office buildings, and farm field to forest, no one communications solution is completely applicable system-wide.

Given this variability, access to a range of communications technologies, and more specifically radio frequency bands, is critical to our SmartCurrents build-out.

Technologies operating in the unlicensed, spread-spectrum 900 MHz, 2.4 and 5.8 GHz bands that have short reach and make use of multipath signals are ideal for our urban areas. The licensed 700 MHz, 1.8 GHz and 6 GHz bands are a good fit for our rural segments where long distances between stations must be bridged. These three bands offer low environmental noise, favorable ray physics properties, and good propagation over distance.

VI. Use Cases for Smart Grid Applications and Other Communication Needs (Question 4)

What are the use cases for various smart gird applications and other communications needs?

The benefits utilities expect to derive from their Smart Grid developments fall into these categories: better customer service, increased system reliability and improved environmental conservation.

Automated Metering Infrastructure (AMI), Demand Response (DR) and Home Area Networks (HAN) will have a huge, positive effect on customer service. AMI affords utilities the ability to efficiently gather energy consumption data and process it for internal and customer use. DR helps utilities reduce the cost of power by curtailing customers' non-essential loads during peak demand times. HANs help enable DR by giving customers real-time data about their electric service costs and energy use.

Electrical reliability will see great advances from Smart Grid technology as real-time data is provided to operators and control systems. Distribution Automation (DA) helps sectionalize faulted circuits so that fewer customers are impacted by circuit trouble. The whereabouts of circuit trouble is also reported to repair crews with much greater accuracy than before. Improved capacitor bank and voltage regulator control helps maintain circuit voltage without wasting energy. The communication of fault oscillography data helps electrical system planners design improvements and system operators and maintenance personnel to find and clear faults. Measuring and communicating synchrophasor data helps utilities extend the load carrying capability of transmission lines without additional construction.

Smart Grid development will help enable utilities to offer environmentally-friendly energy options to customers. Electricity generated by small wind generators and photovoltaic solar cells can be sold back into the electrical grid while preventing safety issues through the use of Smart Grid communications. Plug-in electric vehicles can be recharged automatically during off-peak hours with the aid of Smart Grid-connected equipment, further reducing their carbon footprint.

Clearly, Smart Grid applications will bring economic and quality of life benefits to utility customers. However, for these benefits to be realized, effective and reliable communications networks must be provided.

VII. Technology Options (Question 5)

What are the technology options for smart grid and other utility communications?

Communications for Smart Grid build-outs can be visualized as a four-level hierarchy. At the top level, backbone communication links connect data centers, operations facilities and common carriers at a metropolitan, state or national level. The second level provides access to the backbone, connecting data aggregation points to the wider network at a city scale. At the third level, smart meters connect to data aggregation points within neighborhoods. Lastly, the fourth level engages the smart meter as an interface to a Home or Building Area Network, connecting an array of meters, controllers and display devices to the Smart Grid system.

Smart Grid communications options typically follow the broader communications market: public versus private networks, open standards like TCP/IP versus proprietary protocols. Indeed, any given utility's Smart Grid build-out may include usage of all four options.

Public network offerings to the Smart Grid market include Metro Ethernet service for data center to data center use, leased lines for backhaul, and 3G/4G cellular data for field device communications. Public carriers typically do not operate to the Home Area Network level.

Private network solutions are similar to those in the public space. Fiber optics and high-bandwidth, point-to-point microwave is effective for backhaul communications. Mid-range wireless point-to-multipoint systems are commonly used for aggregation point to smart meter links and meter-to-meter mesh networks. Low-power, short range technologies such as ZigBee work well for Home Area Networks which connect smart meters to appliances, plug-in hybrid electric vehicles and the like.

Open communications standards such as the IEEE 802 suite help drive down the cost of technology by leveraging economies of scale in product design and manufacturing. However, with wide-spread adoption and understanding of such protocols come greater security risks and potential interoperability issues.

Closed, manufacturer-specific protocols offer tighter integration between products of the same line but come at a cost, both in price-per-unit and in human factors such as training and skill set availability. Additionally, closed protocols make it difficult to integrate products from different vendors.

DTE Energy's SmartCurrents program emphasizes open protocols running over closed, private networks. We do keep the flexibility to use proprietary protocols and public networks in applications when they are more desirable.

VIII. Recommendations for Technology Options (Question 6)

What are the recommendations for meeting current and future utility requirements, based on each use case, the technology options that are available, and other considerations?

It is likely more useful to explain Smart Grid communications technology options in terms of which tier they operate in, rather than by use case. The use cases we have discussed above operate across all four communication levels.

The first or backbone tier is well-suited to private and public communications networks operating in tandem, providing redundancy to each other. For example, DTE Energy operates its own fiber optic ring around the Detroit metro area. A portion of the ring bandwidth carries Smart Grid traffic. Simultaneously, we lease metropolitan Ethernet circuits from public carriers between the same points the fiber optic ring serves. This affords us a high level of reliability with nearly instantaneous fail-over in the event of trouble.

The second network tier, providing data collection points access to the backbone, can be achieved by either private or public networks, typically operating wirelessly. Second-level networks have moderate bandwidth requirements, but high availability requirements, both in terms of up-time and network congestion alleviation. Utility-owned networks may consist of spread-spectrum, unlicensed radio or licensed UHF or microwave radio systems. Public networks applicable to this level are 3G/4G cellular systems.

Utilities owning their own second-tier networks can provide the appropriate level of back-up power and backhaul facilities and retain control of the number of subscribers served. Public network operators have a business model based on network over-subscription and "just enough" maintenance and back-up to serve retail customers. In DTE Energy's own experience, cellular networks experience crippling congestion and failed equipment during severe weather events, just the time when we need field communications the most. Clearly, utility needs do not mesh well with commercial carrier offerings at this level.

At the third and fourth tiers, where smart meters connect to data aggregation points and home and building devices connect to smart meters, the best communication options typically are utility-owned wireless networks. These are short-range, low-bandwidth systems where commercial carriers would not provide much economic or technical advantage.

IX. Recommendations for Technology Options (Question 7)

To what extent can existing commercial networks satisfy the utilities' communications needs?

As we discussed above, the best plays for commercial carriers selling to utilities are at the backbone and access network levels. Utilities can use leased, wired, high-bandwidth connections in tandem with their own private networks to provide highly available backbone systems. Utilities may choose to use commercial cellular networks for access connections, bearing in mind the inherent risks we described. Some utilities may also use cellular as an emergency back-up or as temporary measure while they build out their own networks. Lastly, utilities may desire to use commercial networks in instances where physical and cyber security, control and management are not required, for example marketing messages and safety tips.

X. Recommendations on Improvements to Commercial Networks (Question 8)

What, if any, improvements to the commercial networks can be made to satisfy the utilities' communications needs?

The most valuable improvements commercial network operators could make to their systems are to make their cell sites AC power-independent, to increase the reliability of their backhauls to switching offices, and to provide demonstrated priority network access to utilities. These factors represent our primary objections to commercial networks as they stand today.

Specifically, we would like to see all cell sites be equipped with back-up generators and enough fuel to run for 72 hours, at least one redundant link to the serving mobile telephone switching office (MTSO), and wherever possible, satellite or terrestrial radio connectivity to the MTSO.

Even if these enhancements were achieved, utilities would still be wary of commercial networks for all their communication needs due to the mismatch between our business model and theirs. Put simply, cellular carriers make money by putting as many subscribers on their systems as possible while keeping their maintenance and operations costs as low as possible. Furthermore, cellular systems are designed to meet the expectations of retail customers, who are typically more tolerant of network congestion, high latency and unavailability.

Commercial cell services would be more acceptable to utilities if carriers were held to certain standards of quality and reliability by the FCC. Service level agreements (SLAs) and private contracts are simply not enough guarantees when public safety is at risk.

Two recent incidents highlight the improvements commercial carriers need to make before their networks are suitable to utility use. The first concerns the blackout event which affected the eastern US in August 2003. Substations connected by our private networks stayed in communication with system operators for hours or days longer than those connected by telephone company leased lines. Those substations which were not in communication required much more manual intervention in the restoration process, slowing down and complicating and already difficult situation. Had the telephone companies provided adequate emergency power facilities, the leased lines would have been available to use throughout the blackout.

Also during the August 2003 blackout, commercial telephone service, both land line and cellular, was widely unavailable. Our private voice radio systems, powered by emergency generators, were the only means available for communications between field crews and office personnel.

The second incident occurred in 2008 when a Detroit area cellular switching office was taken offline for 12 hours during a power outage caused by a winter storm. During this time, DTE Energy lost connectivity to several thousand smart meters installed in a pilot program, computerized dispatching for field crews and general cell phone communications. Meter data integrity, crew productivity and customer service were all negatively impacted during this event. Once again, had the carrier provided adequate back-up power, this problem would have been averted.

Utilities need working communications systems during and after disasters in order to perform restoration work and ensure public safety. If commercial carriers are unwilling or unable to maintain their networks during disaster conditions, utilities cannot justify using their services in mission-critical applications.

XI. Future Communication Needs (Questions 9)

As the Smart Grid grows and expands, how do the electric utilities foresee their communications requirements as growing and adapting along with the expansion of Smart Grid applications?

The most critical factor that could hamper Smart Grid growth is access to bandwidth at all tiers in the communications hierarchy, especially at the access level. Metropolitan area networks are well-established and continue to grow in response to demand. Access networks, including the famous "last mile", are currently the choke point for Smart Grid communications; now and in the future, the best solution appears to be utility ownership.

Utilities need RF spectrum options in several bands in order to fit the geography of their service territories. Multiple channels within each band are needed to manage interference between users and sites. Adequate bandwidth for each channel is needed to make the system useful.

Bandwidth levels will continue to increase as new Smart Grid applications come on-line and customer interest picks up. Smart Grid networks need to be designed with plenty of bandwidth available at the outset, rather than be inserted into existing systems already at or near their carrying capacity.

XII. Response to FCC National Broadband Plan

DTE Energy agrees with many of the provisions outlined in the FCC's National Broadband Plan (NBP) of 2010. These are a few points from the Plan that we find most pertinent:

1. That additional unlicensed spectrum should be allocated for consumer and industrial use. (Recommendation 5.8.)
2. That Congress should amend the Communications Act to enable utilities to access 700 MHz spectrum, currently proposed for exclusive public safety use. (Recommendation 12.4.)
3. That the NTIA and FCC should continue their efforts to identify new uses for federal spectrum in light of Smart Grid development. (Recommendation 12.5.)
4. That the FCC should explore the reliability and resiliency of the commercial broadband network and its applicability to industrial use. (Recommendation 12.1.)

The NBP makes specific recommendations for Smart Grid communications which amplify our argument for increased access to spectrum.

XIII. Response to Utilities Telecommunication Council Recommendations

DTE Energy is in agreement with the Utilities Telecommunication Council's (UTC) position that 30 MHz of spectrum below 2 GHz should be granted exclusively to utilities. This spectrum should be allocated over multiple bands to support a variety of mobile and fixed services in rural and urban environments. UTC is reiterating this assertion in its own comments to the DOE on this RFI.

XIV. Response to Edison Electric Institute Comments

DTE Energy is in agreement with the comments made by Edison Electric Institute (EEI) in response to the subject Request for Information.

XV. Conclusion

Utilities occupy a unique position in society. Our mission is to support basic living conditions for the people, businesses and institutions we serve. Our systems are completely tied to the geographic regions in which we operate. Our livelihood is based on building, maintaining and operating infrastructure. The networks which monitor and control this infrastructure are vital to our mission, rather than a luxury or a source of entertainment.

To place utility operations in the same category as text messages, Twitter updates and YouTube videos trivializes what we do and could impact public safety.

With those points made, we adduce the necessity of utility-controlled RF spectrum for the purpose of effecting metropolitan- and community-level communications to support Smart Grid applications.

Respectfully submitted,

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Figure 1: DTE Energy Use Case Application Technology Table

Use Case Applications:	Suitable Technologies: Tier 1 Backbone Very High Bandwidth Very High Reliability Very Low Latency	Tier 2a Backbone High Bandwidth High Reliability Low Latency	Tier 2b RAN PTM Medium Bandwidth High Reliability Moderate Latency	Tier 3 LAN/NAN Low Bandwidth Medium Reliability	Tier 4 HAN Low Bandwidth Medium Reliability
AMI: Meter Reading (Gas & Electric) Outage Notification Load Disconnect/Control Time of Use Pricing PHEV	**Private:** Fiber Loop Licensed: High Capacity Microwave **Commercial:** Metro Ethernet T1, Frame Relay, MPLS	**Private:** Unlicensed: 3.65 & 5.8 GHz Licensed: 1.8 GHz 11 GHz **Commercial:** Metro Ethernet T1, Frame Relay, MPLS	**Private:** Unlicensed: 900 MHz, 2.4 & 3.65 GHz Licensed: 700 MHz & 1.8 GHz **Commercial:** 3 & 4 G Cellular Dial-up metering	**Private:** 900 MHz Unlicensed Mesh **Commercial:** none	**Private:** 2.4 GHz 802.15 & ZigBee **Commercial:** none
Distribution: Substation SCADA Fault Data Pole-Top-Recloser Pole-Top-Switch Pole-Top-Capacitor Control Voltage Regulator	(Same as AMI above)	(Same as AMI above)	**Private:** Unlicensed: 900 MHz, 2.4 & 3.65 GHz Licensed: 700 MHz & 1.8 GHz **Commercial:** none	(not applicable)	(not applicable)
Network Management Manage all of the above end devices Manage all of the above Communication node devices	(Same as AMI above)	(Same as AMI above)	(Same as AMI above)	(Same as AMI above)	(not applicable)
Workforce Mobile Data: Overhead and Underground Lines Crews Customer Field Service Representatives Gas Distribution Crews	(Same as AMI above)	(not applicable)	**Private:** Unlicensed: 2.4 & 3.65 GHz Licensed: 700 MHz 450 MHz narrowband **Commercial:** 3 & 4 G Cellular	(not applicable)	(not applicable)

Notes:

Current options that are at Risk of Interference and/or Congestion (yellow highlight)

Suggested Licensed Wideband Frequencies to reduce the above Risk (green highlight)

Figure 2: DTE SmartCurrent Network Concept

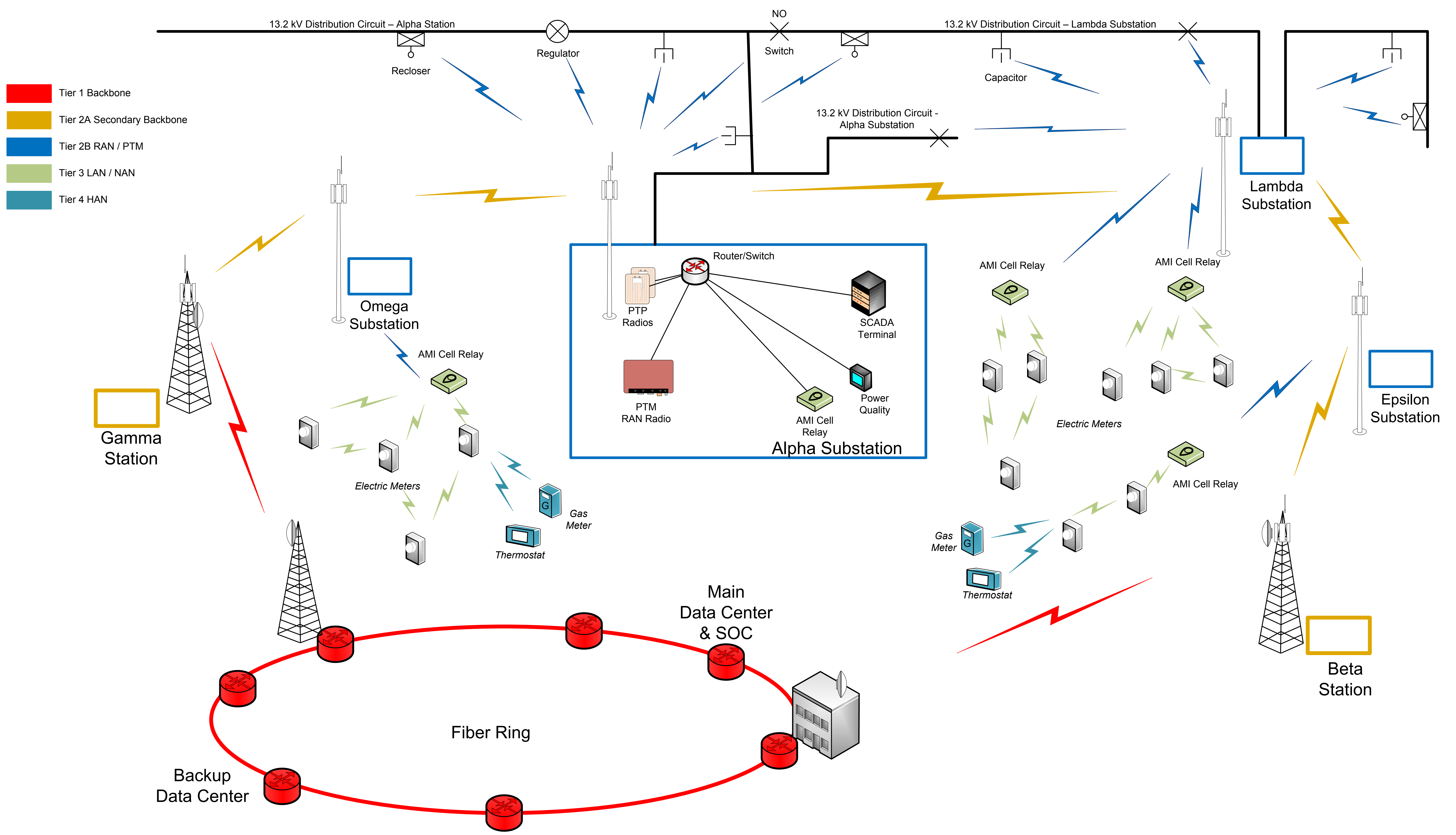

Figure 3: Use Case Application - SCADA

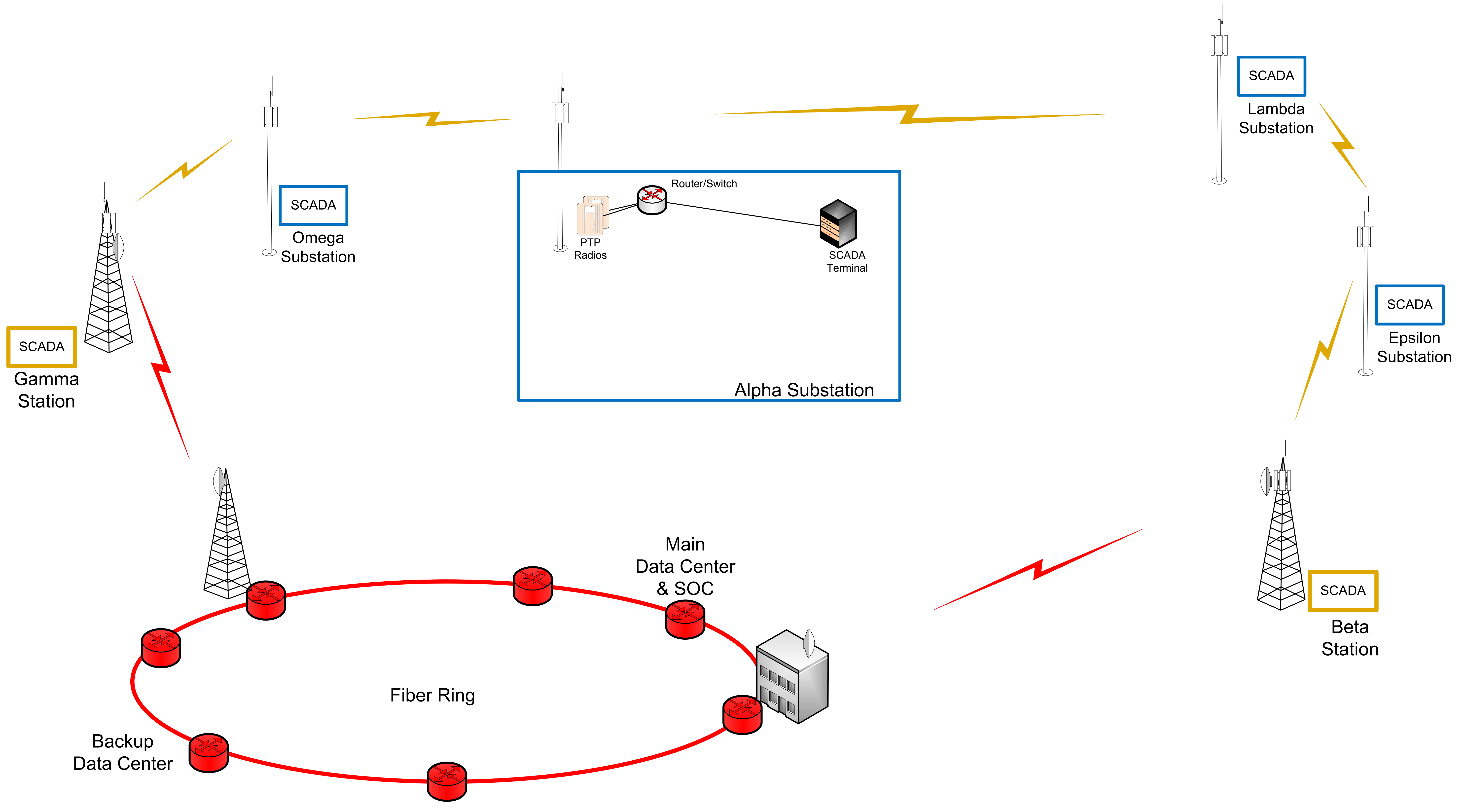

Figure 4: Use Case Application - Electrical Distribution Devices

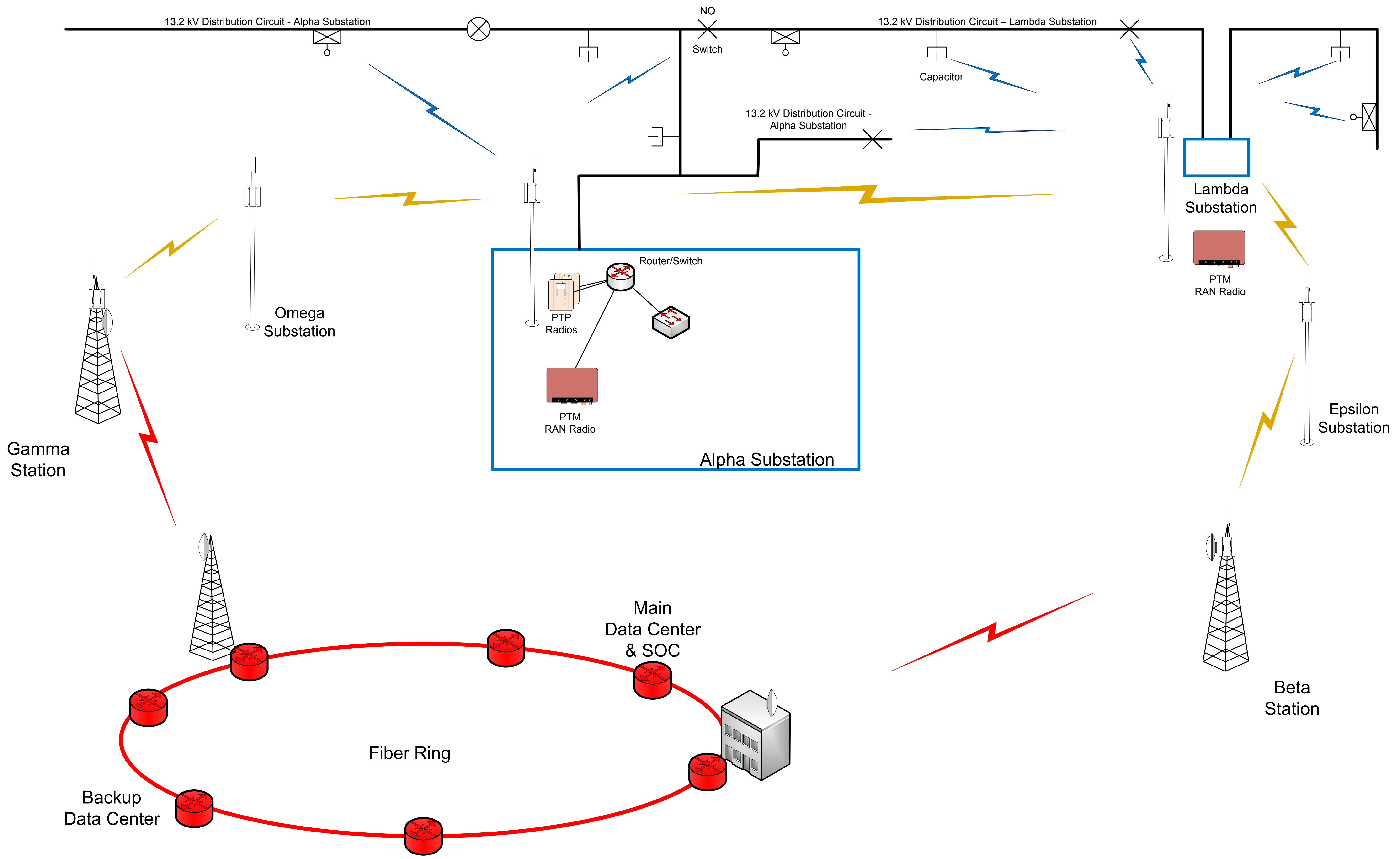

Figure 5: Use Case Applications: AMI – Electric Meter
– Gas Meter
– HAN Smart Home (Thermostat)