This document is a set of comments related to and prompted by FCC document DA-09-2017A1.doc, COMMENT SOUGHT ON THE IMPLEMENTATION OF SMART GRID TECHNOLOGY, NBP Public Notice #2.

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The following sections follow the structure established in document DA-09-2017A1.doc. Each statement and associated sub-clause and questions are replicated followed by DS2 response and contribution, if any.

1. **Suitability of Communications Technologies.** Smart Grid applications are being deployed using a variety of public and private communications networks. We seek to better understand which communications networks and technologies are suitable for various Smart Grid applications.
   - **a.** What are the specific network requirements for each application in the grid (e.g., latency, bandwidth, reliability, coverage, others)? If these differ by application, how do they differ? We welcome detailed Smart Grid network requirement analyses.

DS2 Response to 1.a.:

Smart grid systems enhance and open up a number of applications and services for electricity delivery and distribution and networks designed to acquire and deliver metering information. Some of these systems include remote reading of metrological registers in the meters, advanced tariffs control of services delivery with associated payment systems, remote disablement and enablement of supply, tampering detection, communicating and/or controlling devices within the home/building, in-home display providing energy consumption information, monitoring of the status and quality of the electricity lines and electricity distribution apparatus, and self healing systems (detection in advance of faulty electricity lines and distribution apparatus enabling pre-emptive solving of issues before the supply of electricity is compromised).

A networking technology allowing all of these applications must be able to be updated remotely and efficiently to guarantee future-proof scalability and to be open to new applications and enhancements.

The following table summarizes the network requirements for each of these applications:

Application	Latency	Bandwidth	Reliability	Security	Coverage
Remote meter reading	Seconds	9 kbps interface to the meter and 10Mbps interface to the	100% Readings must not be lost. Delivery must be guaranteed	AES 128-bit or similar encryption is required to	100% All meters must be read remotely

Application	Latency	Bandwidth	Reliability	Security	Coverage
		network		guarantee security in the communication of the readings. A secure authentication and addressing technique are also required	
Tariffs and payment updating	Seconds	9 kbps interface to the meter and 10Mbps interface to the network	100% Readings must not be lost. Delivery must be guaranteed	AES 128-bit or similar encryption is required to guarantee security in the communication of the readings. A secure authentication and addressing technique are also required	100% All meters must be managed remotely
Remote disablement and enablement of supply	Seconds	9 kbps interface to the meter and 100 kbps interface to the network	100% Commands and acknowledgements must not be lost. Delivery must be guaranteed	AES 128-bit or similar encryption is required to guarantee security in the communication of the readings. A secure authentication and addressing technique are also required	100% All meters must be managed remotely
Tampering detection	Seconds	9 kbps interface to the meter and 100 kbps interface to the network	100% Readings must not be lost. Delivery must be guaranteed	AES 128-bit or similar encryption is required to guarantee security in the communication of the readings. A secure authentication and addressing technique are also required	100% All meters must be managed remotely
Communicating and/or controlling devices within the home/building by the Meter	Milliseconds	9 kbps interface to the meter and to the home/building device and 10Mbps interface to the network	100% Commands and acknowledgements must not be lost. Delivery must be guaranteed	AES 128-bit or similar encryption is required to guarantee security in the communication of the readings. A secure authentication and addressing technique are	100% of All devices within the home/building must be managed remotely

Application	Latency	Bandwidth	Reliability	Security	Coverage
				also required	
In-home display providing energy consumption information	Seconds	9 kbps interface to the meter and to the in-home display and 1Mbps interface to the network	100% Data packets must not be lost. Delivery must be guaranteed	AES 128-bit or similar encryption is required to guarantee security in the communication of the readings. A secure authentication and addressing technique are also required	100% All in-home displays must be managed remotely
Monitoring of the status and quality of the electricity lines and electricity distribution apparatus	Seconds	Not an important requirements	100% Readings must not be lost. Delivery must be guaranteed	AES 128-bit or similar encryption is required to guarantee security in the communication of the readings. A secure authentication and addressing technique are also required	100% All the medium voltage and low voltage electricity lines and electricity distribution apparatus must be monitored remotely
Self healing systems	Seconds	Not an important requirements	100% Readings must not be lost. Delivery must be guaranteed	AES 128-bit or similar encryption is required to guarantee security in the communication of the readings. A secure authentication and addressing technique are also required	100% All the medium voltage and low voltage electricity lines and electricity distribution apparatus must be monitored remotely
Remote update	Milliseconds	19 kbps interface to the meter and 10Mbps interface to the network	The firmware upgrade process must be reliable so that communications modules cannot get corrupted during upgrade	AES 128-bit or similar encryption is required to guarantee security in the communication of the readings. A secure authentication and addressing technique are also required	100% All meters must be managed remotely

b. Which communications technologies and networks meet these requirements? Which are best suited for Smart Grid applications? If this varies by application, why does it vary and in what way? What are the relative costs and performance benefits of different communications technologies for different applications?

DS2 Response to 1.b.:

Broadband PLC is well suited for the distribution, access, and in-home portions of the Smart Grid. Current broadband Smart Grid PLC technology is mature.

There are two types of Powerline Communication (PLC) technology deployed in Utility grids worldwide: Narrowband PLC and Broadband over Powerline (BPL).

Narrowband PLC was the first PLC technology deployed. Primary uses have been Distribution Automation and Automatic Meter Reading (AMR). Broadband over Powerline's initial focus was to provide high-speed Internet connectivity.

The introduction of the Smart Grid concept with its higher data throughput requirements and an increasing number of new requirements to communication capabilities has made Narrowband PLC unsuited and obsolete for continuing to function as a reliable and robust communications means. However, Narrowband PLC paved the way for today's Broadband over Powerline solution. The BPL solutions available today are the results of vast steps forward in technology and are well adapted to the requirements of the Smart Grid. Substantial progress has been made to make the technology virtually Plug-and-Play, while at the same time reducing its cost and minimizing its power consumption, which is what the Smart Grid is all about.

DS2's UPA-certified Smart Grid components perform in systems that cover both the Medium Voltage (MV) and Low Voltage (LV) grid, from the Primary Substation to the Meter, to inside the house of the end-user. This is possible due to the advanced PLC, networking, and outage avoidance capabilities of the technology. Through the use of flexible frequency bandplans and frequency division, it is possible to use different frequencies in different segments of the grid. For example, one frequency range can be used to make a Plug-and-Play network in the LV grid, while other frequencies are used in the MV grid. DS2's Powerline Technology can also be used for both Smart Building applications and for in-home networks to connect devices inside the office building, multi-dwelling building or single family home.

c. What types of network technologies are most commonly used in Smart Grid applications? We welcome detailed analysis of the costs, relative performance and benefits of alternative network technologies currently employed by existing Smart Grid deployments, including both "last mile," backhaul, and control network technologies.

DS2 Response to 1.c.:

Broadband PLC is one of the best-suited technologies for use in the distribution, access (last mile), and meter feed areas of the Smart Grid.

d. Are current commercial communications networks adequate for deploying Smart Grid applications? If not, what are specific examples of the ways in which current networks are inadequate? How could current networks be improved to make them adequate, and at what cost? If this adequacy varies by application, why does it vary and in what way?

DS2 Response to 1.d.:

No they are not adequate. DS2's analysis of the needs results in the following main issues:

- The existing communications networks do not have a simple end-to-end open architecture but are rather a mix of standalone technologies. Interoperability between networks and technologies is not easy and not guaranteed. We believe that using TCP/IP as the higher-level communications protocol will bring a lot of advantages to the overall Smart Grid network, including guaranteed high-level interoperability of networks and leveraging a huge amount of existing networking systems and technologies (management, security, etc.) based on TCP/IP as their underlying protocol.
- The reliability of most of the currently existing networks does not meet even a basic requirement level. Some existing networks use unlicensed, freely accessible communications resources that are used by other non-Smart Grid applications and hence are likely to suffer from congestion and potential communications failure. Some other networks rely on inadequate communications channels, such as the frequency band below 450 kHz on electricity lines, where the operating environment is too harsh and problem prone to guarantee the required level of communications service the Smart Grid requires.
- The Operating and Maintenance costs are too high with most of the existing wireless networks, due to recurrent (normally monthly) service fees charged by network operators and/or costs due to low reliability (both wireless and low frequency band technologies over the lines).

e. How reliable are commercial wireless networks for carrying Smart Grid data (both in last-mile and backhaul applications)? Are commercial wireless networks suitable for critical electricity equipment control communications? How reliably can commercial wireless networks transmit Smart Grid data during and after emergency events? What could be done to make commercial wireless networks more reliable for Smart Grid applications during such events? We welcome detailed comparisons of the reliability of commercial wireless networks and other types of networks for Smart Grid data transport.

DS2 Response to 1.e.:

No, commercial wireless networks are not suitable for critical electricity equipment control communications and are not reliable enough for Smart

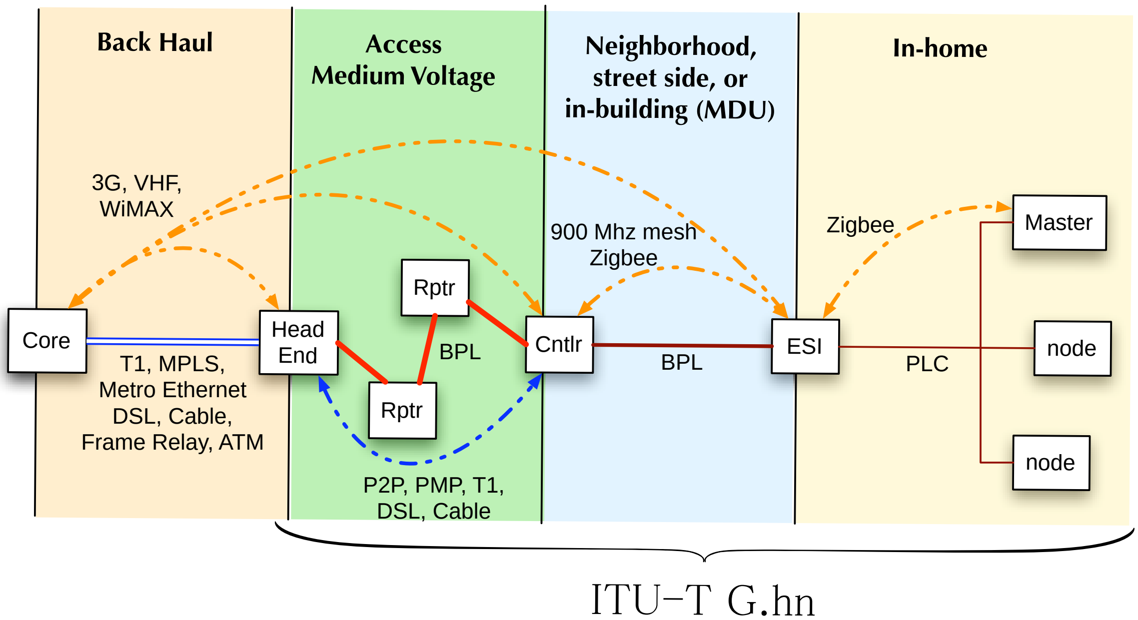
Grid communications during and after emergency events. The main reasons are similar to those explained above in 1.d: Existing wireless networks use unlicensed freely accessible communications resources or licensed resources that are used by other applications and hence are potentially likely to suffer from congestion and communications failure. Some other networks use inadequate communications channels, such as the frequency band below 450 kHz on electricity lines, with its problems as stated above. Critical communications must use Quality of Service mechanisms that guarantee the success of the communications. The exclusive use of communications resources over the lines is the simplest way to achieve this, as for instance use of the frequency band from 2 MHz to 12 MHz on low voltage electricity lines.

2. **Availability of Communications Networks.** Electric utilities offer near universal service, including in many geographies where no existing suitable communications networks currently exist (for last-mile, aggregation point data backhaul, and utility control systems). We seek to better understand the availability of existing communications networks, and how this availability may impact Smart Grid deployments.
    a. What percentage of electric substations, other key control infrastructure, and potential Smart Grid communications nodes have no access to suitable communications networks? What constitutes suitable communications networks for different types of control infrastructure? We welcome detailed analyses of substation and control infrastructure connectivity, potential connectivity gaps, and the cost-benefit of different alternatives to close potential gaps.

DS2 Response to 2.a.:

Electricity lines connect all electric substations, key control infrastructure, and potential Smart Grid communications nodes; therefore, they are able to access a suitable communications network. By using the appropriate communications technologies on the low voltage and medium voltage lines, a utility can have all of these nodes exchanging Smart Grid data.

The following figure depicts various options for Smart Grid communications networks. The ITU-T G.hn standard being finished specifies network operation over powerlines, as well as phoneline (twisted pair) and coax. The figure shows what components of the Smart Grid could be served by G.hn technology.



b. What percentage of homes have no access to suitable communications networks for Smart Grid applications (either for last-mile, or aggregation point connectivity)?

DS2 Response to 2.b.:

DS2 has no comment on this at this time.

c. In areas where suitable communications networks exist, are there other impediments preventing the use of these networks for Smart Grid communications?

DS2 Response to 2.c.:

DS2 has no comment on this at this time.

d. How does the availability of a suitable broadband network (wireless, wireline or other) impact the cost of deploying Smart Grid applications in a particular geographical area? In areas with no existing networks, is this a major barrier to Smart Grid deployment? We welcome detailed economic analyses showing how the presence (or lack) of existing communications networks impacts Smart Grid deployment costs.

DS2 Response to 2.d.:

DS2 has no comment on this at this time.

3. **Spectrum.** Currently, Smart Grid systems are deployed using a variety of communications technologies, including public and private wireless networks, using licensed and unlicensed spectrum. We seek to better

understand how wireless spectrum is or could be used for Smart Grid applications.

a. How widely used is licensed spectrum for Smart Grid applications (utility-owned, leased, or vendor-operated)? For which applications is this spectrum used? We welcome detailed analyses of current licensed spectrum use in Smart Grid applications, including frequencies and channels.

DS2 Response to 3.a.:

The frequency band below 450 kHz has been reserved on electricity lines for utility applications and is used currently to some extent for lower requirements applications. However, the communications technologies using this channel are not suitable for Smart Grid communications due the reasons explained in 1.d. The FCC has allowed use of frequencies, other than those set aside and notched out of service, in the 2 MHz and above frequencies for BPL applications. While there are some concerns over radio interaction of BPL, its use has been generally trouble-free globally and should be pursued by the FCC as the best choice for Smart Grid distribution, access, and meter feed lines.

b. How widely used is unlicensed spectrum? For which applications is this spectrum used? We welcome detailed analyses of current unlicensed spectrum use in Smart Grid applications, including frequencies and channels.

DS2 Response to 3.b.:

The frequency band above 450 kHz on electricity lines is for free use. Using a bandwidth of 10 MHz, from 2 MHz to 12 MHz is the most suitable for the required quality of Smart Grid communications.

c. Have wireless Smart Grid applications using unlicensed spectrum encountered interference problems? If so, what are the nature, frequency, and potential impact of these problems, and how have they been resolved?

DS2 Response to 3.c.:

DS2 has no comment on this at this time.

d. What techniques have been successfully used to overcome interference problems, particularly in unlicensed bands?

DS2 Response to 3.d.:

DS2 has no comment on this at this time.

e. Are current spectrum bands currently used by power utilities enough to meet the needs of Smart Grid communications? We welcome detailed studies and discussion showing that the current spectrum is or is not sufficient.

DS2 Response to 3.e.:

The only band that has been specified for powerline communication is the lower frequencies up to 450 kHz. These frequencies are acceptable for

Narrowband PLC but are not enough to support a Broadband PLC network. To provide the basic features in terms of latency, bandwidth, noise avoidance, and robustness required of a BPL, higher frequencies and a broader frequency range are needed. To release the full potential of powerline communications to meet the needs of the Smart Grid, adding enough bandwidth to do remote upgrades, receive instant feedback from anywhere in the network, and the possibility of a self-configured and self-healing network, more frequency space must be allocated.

f. Is additional spectrum required for Smart Grid applications? If so, why are current wireless solutions inadequate?

DS2 Response to 3.f.:

The capabilities of the powerline as a communication medium are closely related to the frequency and the bandwidth used. The wider the band used, the greater the bandwidth that can be realized; however, as the band widens, the frequency used must increase. Broadband Powerline technology is most commonly used in frequencies from 2 – 30 MHz yet it has also been used in even higher frequencies up to 80 MHz. The attenuation of the signal does however increase drastically with the frequency and this is very important to consider. *Refer to 2 to 12 MHz*

i. Coverage: What current and future nodes of the Smart Grid are not and will not be in the coverage area of commercial mobile operators or of existing utility-run private networks? We welcome detailed descriptions of the location, number and connectivity required of each node not expected to be in coverage.

DS2 Response to 3.f.i.:

DS2 has no comment on this at this time.

ii. Throughput: What is the expected throughput required by different communications nodes of the Smart Grid, today and in the future, and why will/won't commercial mobile networks and/or private utility owned networks on existing spectrum be able to support such throughputs? We welcome detailed studies on the location and throughput requirements and characteristics of each communications node in the Smart Grid.

DS2 Response to 3.f.ii.:

The following are all application-level throughputs.
The interface from the in-home display to the home network will require low speeds of around 10 kbps for the exchange of energy consumption information. The home network will need to aggregate the communications from the in-home display, appliances, thermostats as well as take into account overlapping neighboring

networks where appropriate (multi-dwelling buildings). The required minimum throughput for the home network will be 1 Mbps.
The interface from the electricity meter to the home network will require low throughput of around 10 kbps, same as the interface from the electricity meter to the low voltage network. However, the speed of the network interfaces themselves will be much higher.
The required throughput for the home network will be of 10 Mbps approximately.
The low voltage network needs to aggregate the communications from all electricity meters supplied by the same medium-to-low voltage transformer. The number of meters in this network can be as low as 1 or 2 in rural areas and as large as 200 in high-density areas. The throughput for the low voltage component of the network will be 10 Mbps at a minimum.
A minimum of 10 Mbps will therefore also be the throughput requirement for the interface between the low voltage and the medium voltage networks.
The medium voltage network will need to aggregate the communications from all the medium-to-low voltage transformers supplied by the same high-to-medium voltage transformer. The number of medium-to-low voltage transformers in the network can be as few as 5 in high-density areas and as large as 20 in rural areas. The required throughput for the medium voltage network will be 100 Mbps approximately.
Therefore, 100 Mbps will also be the requirement for the interface between the medium voltage networks and the point of presence for the backhaul network.
The backbone network can be fiber optics (most high-voltage lines already have fiber optic lines running with them) or any other high-throughput broadband access line.

iii. Latency: What are the maximum latency limits for communications to/from different nodes of the Smart Grid for different applications, why will/won't commercial mobile networks be able to support such requirements, and how could private utility networks address the same challenge differently?

DS2 Response to 3.f.iii.:

There is a clear difference in the requirements of the applications used for Distribution Automation and for AMI. Using Broadband Powerline Communication for the Smart Grid, the Distribution Network would be the MV grid between the secondary substations, while the AMI network would be from the secondary substations to the meters. The home area network would be from the meters to any appliance or a display device inside the house.

As of today, the requirements for AMI are somewhat relaxed. Applications for Distribution Automation, such as SCADA, require a latency of 100s of ms. Currently, a meter reading is not a time sensitive task so it would only require a response time in seconds. However as new and more demanding applications are added to AMI it is expected that the latency requirement for this network will be low.

iv. Security: What are the major security challenges, and the relative merits and deficiencies of private utility networks versus alternative solutions provided by commercial network providers, such as VPNs? Do the security requirements and the relative merits of commercial versus private networks depend on the specific Smart Grid application? If so, how?

DS2 Response to 3.f.iv.:

Smart Grid networks are shared among a number of nodes and the physical medium is easily accessible. BPL itself is a radiator type service, and so its signals may be detected. Protecting the Smart Grid data is essential. Three main areas must be secured:

1. The actual data being communicated must be encrypted to avoid hacking and interception. The encryption technology must be robust enough to resist contemporary computing capabilities and sophisticated cracking applications. 128-bit AES or similar is required.
2. The Smart Grid nodes, especially those connected to the low voltage electricity lines, must be securely authenticated prior to being able to exchange Smart Grid data and communicate with any other node on the Grid.
3. Using TCP/IP networking protocol will allow using a vast amount of existing security protocols, such as VPN, RADIUS, etc.

v. Coordination: Are there benefits or technical requirements to coordinate potential allocation of spectrum to the Smart Grid communications with other countries? What are they?

DS2 Response to 3.f.v.:

International Standards, as those developed by the ITU, are required to avoid barriers to market access, foster multiple sourcing of technology and lower costs. The currently under development ITU-T G.hn standard defines frequency bandplans up to 100 MHZ (with FM radio and international ham band notching included). This sort of standard enables a broad ecosystem of technologies and systems to develop and be capable of meeting the needs of the Smart Grid, with the only requirement for coordination being the local regulatory agencies (such as FCC) maintaining a close watch over these frequencies and ensuring little if any interference is radiated (and detected) under normal operating scenarios into the ham bands and that other technologies that may cause interference to BPL are monitored closely as well to ensure they do not inappropriately radiate interference into the Smart Grid BPL networks.

vi. Spectrum allocation: Are there any specific requirements associated with Smart Grid communications that require or rule out any specific band, duplexing scheme (e.g., FDD vs. TDD), channel width, or any other requirements or constraints?

DS2 Response to 3.f.vi.:

When considering the most optimum frequency band for powerline communication it is of utmost importance to consider the signal frequency attenuation versus distance.

The higher the frequency used the higher the attenuation. Our experience, based on over 10 years of deployments and field trials in powerline grids worldwide using both overhead and underground cables, shows that it is recommendable to use the lower frequencies when you want to assure robust connectivity in the network.

To make a bandwidth/range allocation, our suggestion is to specify the frequencies from 2 – 12 MHz for powerline communication only. Using this frequency band it will make it possible to deploy a Plug-and-Play network with 100s of nodes in the same LV cell, while at the same time keeping the latency low enough to get response from every node in the network in the matter of 100s of ms and providing enough bandwidth to do multiple meter firmware upgrades at the same time. Especially in underground cables the attenuation of the powerline will be too high to guarantee that the signal will reach all the accessible points of the network with the required performance.

g. If spectrum were to be allocated for Smart Grid applications, how would this impact current, announced and planned Smart Grid deployments? How many solutions would use allocated spectrum vs. current solutions? Which Smart Grid applications would likely be most impacted?

DS2 Response to 3.g.:

DS2 has no comment on this at this time.

4. **Real-time Data.** The Smart Grid promises to enable utility companies and their customers to reduce U.S. energy consumption using a variety of technologies and methods. Some of the most promising of these methods use demand response, in which utility companies can directly control loads within the home or business to better manage demand, or give price signals to encourage load shedding. Other methods reduce energy consumption simply by providing consumers access to their consumption information, via in-home

displays, web portals, or other methods. Central to all of these techniques is energy consumption and pricing data.

a. In current Smart Meter deployments, what percentage of customers has access to real-time consumption and/or pricing data? How is this access provided?

DS2 Response to 4.a.:

DS2 has no comment on this at this time.

b. What are the methods by which consumers can access this data (e.g., via Smart Meter, via a utility website, via third-party websites, etc.)? What are the relative merits and risks of each method?

DS2 Response to 4.b.:

For the Utility there are mainly two methods to share data with the consumer; through an in-home display or through a web interface.

Through the in-home display the user can get “near” real-time data from the meter without the Utility having to process it first. However, this will require the installation of a Home Area Network of some sort, either wireless or wired.

For data displayed through a web interface to be real time a very fast AMI network is required, with performance similar to that of Broadband Powerline, as well as a very efficient data processing system.

For a Home Area Network it is important to consider what type of data should be shared, and that will basically depend on the number of measurement devices connected to the network. If it is only meter data that should be shared, only a connection between the meter and the in-home display will be necessary. The connection could be direct, such as a network that included a node within the meter and one in the in-home display. Or it could be where the meter is connected via the BPL distribution network to a central server location that the in-home display could query via messages sent through the home network, over the Internet, to the server, and then response data sent back providing usage statistics.

This would be the first step and a next step would be to get measurements from other important devices in the home as well. To do this a Home Area Network is necessary to interconnect all the devices. Using the same technology that can provide high-speed in-home networking is possible through devices based on the ITU-T G.hn specification. The same equipment based on the ITU G.hn standard is able to provide both a high performance home network and a simple interface to measure the consumption of the devices where it is embedded or connected. Making it possible to achieve a truly connected and energy efficient home.

c. How should third-party application developers and device makers use this data? How can strong privacy and security requirements be satisfied without stifling innovation?

DS2 Response to 4.c.:

DS2 has no comment on this at this time.

d. What uses of real-time consumption and pricing data have been shown most effective at reducing peak load and total consumption? We welcome detailed analyses of the relative merits and risks of these methods.

DS2 Response to 4.d.:

DS2 has no comment on this at this time.

e. Are there benefits to providing consumers more granular consumption data? We welcome studies that examine how consumer or business behavior varies with the type and frequency of energy consumption data.

DS2 Response to 4.e.:

DS2 has no comment on this at this time.

f. What are the implications of opening real-time consumption data to consumers and the energy management devices and applications they choose to connect?

DS2 Response to 4.f.:

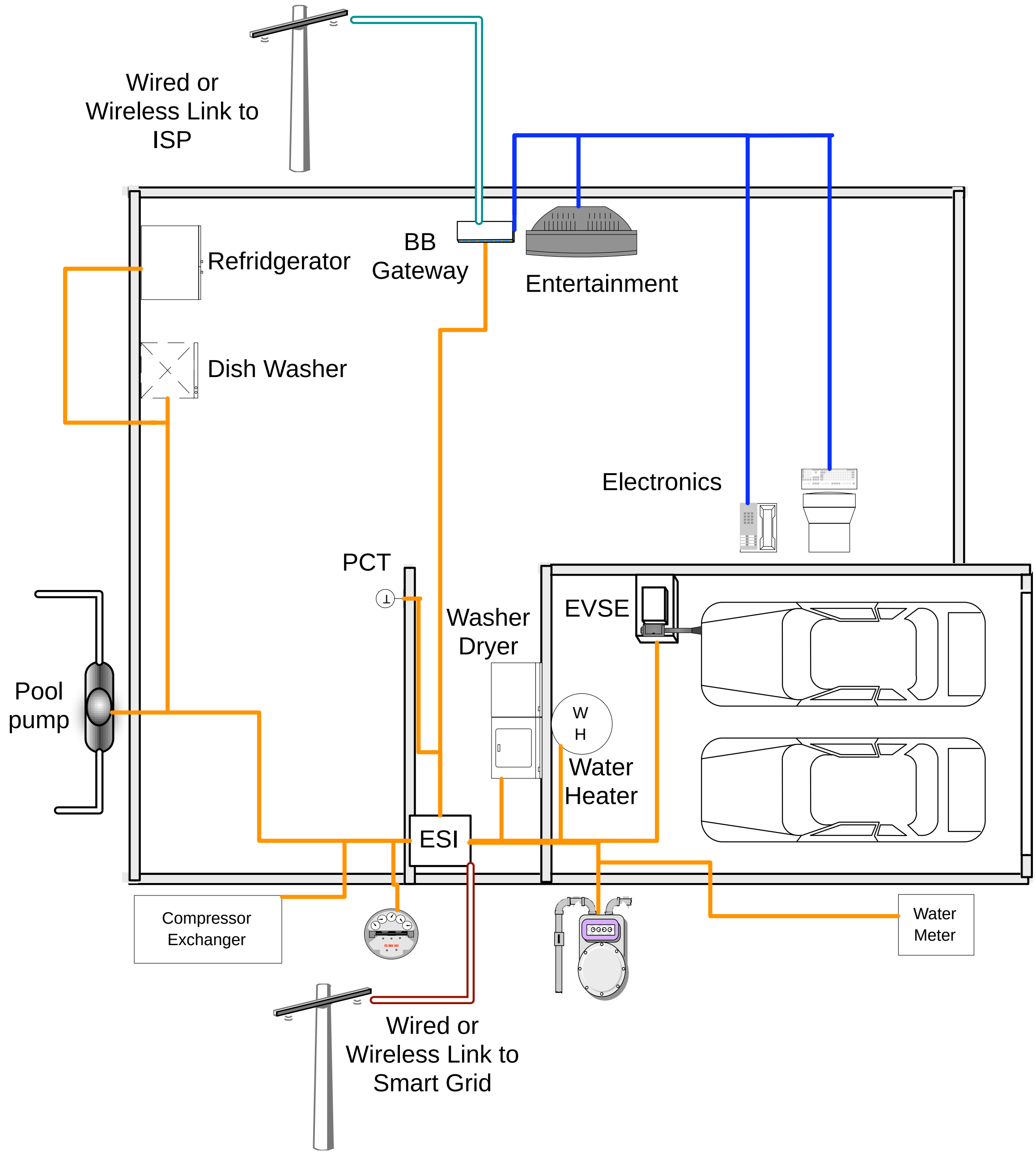
DS2 has no comment on this at this time.

5. **Home Area Networks**. We seek to understand the ways in which utilities, technology providers and consumers will connect appliances, thermostats, and energy displays to each other, to the electric meter, and to the Internet.

a. Which types of devices (e.g., appliances, thermostats, and energy displays, etc.) will be connected to Smart Meters? What types of networking technologies will be used? What type of data will be shared between Smart Meters and devices?

DS2 Response to 5.a.:

Eventually all devices that consume energy should be connected. PLC has a big advantage here as it already uses the powerline for communication. The ITU-T G.hn specification defines a home networking technology that supports the Smart Grid application. The following figure shows the in-home Smart Grid with its Energy Services Interface connecting using G.hn technology to various devices within a home (orange links), and interconnected to the home data network (blue links). There may be two physical links to the outside world or a single one with two logically separate links operating over it. G.hn would enable such a design. Further, G.hn supports TCP/IP and Ethernet protocols and works with wireless technologies such as 802.11 and Zigbee so that an in-home network may consist of a mix of technologies that would interoperate and be able to provide a seamless communications path for all Smart Grid data, management, and control.

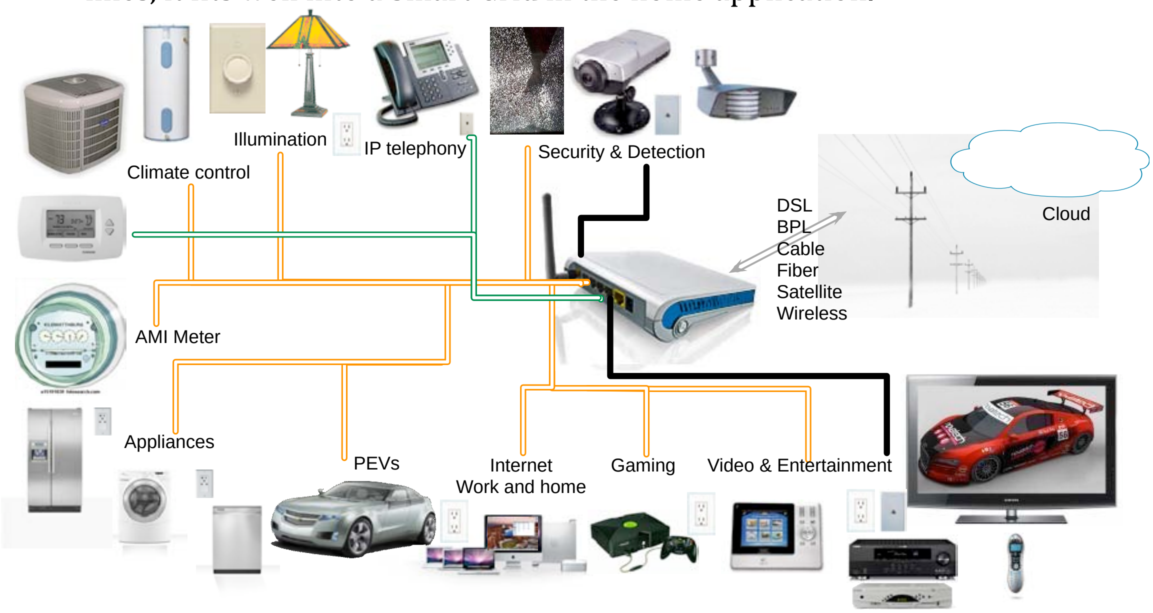


b. Which types of devices (e.g., appliances, thermostats, and energy displays, etc.) will be connected to the Internet? What types of networking technologies will be used? What type of data will be shared between these devices and the Internet?

DS2 Response to 5.b.:

In the scenario shown in the figure above, with the inter-linkage of the in-home data and Smart Grid networks, all devices would be connected to the Internet, if that were what the utility/Service Provider wanted. Various options to restrict/manage the connectivity to and from each device would be controlled and abuse/attacks fended off. Further, with the robust security level of G.hn, there is no probability of data confidentiality being compromised.

The following figure depicts the G.hn eco-system in a home. As G.hn provides networking over more than powerlines (it supports networking over coax and phoneline cable as well), powered and dry pair, ac lines as well as dc lines, it fits well into a Smart Grid in the home application.



c. We welcome analyses that examine the role of broadband requirements for Home Area Networks that manage energy loads or deliver other energy management services.

DS2 Response to 5.c.:

As mentioned in 4b it is very feasible to use the same cost effective technology for a high-speed home network and a home measurement tool. Through the use of a network node interface and its associated Application Programming Interface (API), any consumption measurement application can easily be integrated into the same solution.

When we consider the usage of Home Area Networks (HANs) there is also a second area that should be contemplated, Neighboring Networks. As the number of HANs increases there will be a higher probability of issues related to interference and security. DS2 has already seen such in densely populated areas (and not so densely as well) where multiple 802.xx wireless networks are close to each other and detect one another as "interference." It is anticipated that a situation will come about where all homes (single family units or multi-dwelling units) have a network. DS2 strongly recommends that preparations be made for this eventuality.

The ITU-T group developing the G.hn standard has already considered this and, apart from the powerline advantage of it being difficult to access in itself, mechanisms have been implemented to automatically avoid interference from neighboring networks. Neighboring networks are automatically detected by the network's devices, which adapt their transmitted signals so that security issues are avoided and interference is minimized.