Ambient Corporation's Reply comments to DOE RFI:
Addressing Policy and Logistical Challenges to Smart Grid Implementation

Introduction:

Ambient Corporation (Ambient) is pleased to submit the following comments to the US Department of Energy (DOE) in hopes that our contribution can highlight and further the understanding of the DOE on the key role that integrated communications will play in enabling utilities to deploy cost-effective long-term smart grid benefits.

Ambient Corporation has been focused on utility communications and advanced monitoring/sensing applications since 2001. As Ambient approaches 10 years dedicated to this space, it is important to note that while the relatively new term "smart grid" has gained unprecedented attention, the fundamental need to modernize the utilities' infrastructure has not changed, nor has the key role that communications will play in that transformation.

What Ambient does: *The smart grid technologies our response considers*

Ambient designs, delivers and supports The Ambient Smart Grid®, a technology agnostic platform that can incorporate the common communication technologies used in smart grid (WiFi, RF, Cellular, Zigbee, WiMAX, PLC) and allows for high speed, near real-time communications to end user applications and devices. We rely on open-standards based technologies and protocols to eliminate redundancies in cost associated with building out multiple parallel communications systems. This open architecture allows a utility to push proprietary technologies to the fringes of their smart grid architecture, eliminating the risk of stranded assets. The technology agnostic and open architecture improves the long-term cost of any smart grid deployment while offering other functional benefits.

To use language specific to the RFI, Ambient provides connectivity to smart grid applications by deploying our communication devices throughout a utility service territory that *enables* distributed automation, upgraded metering, consumer facing programs, integrating new end user equipment and applications not yet contemplated.

Ten years ago, Ambient recognized the need for dedicated communications between smart grid applications, and the utilities' Network Operations Centers (NOCs). Ambient also recognized that many of the existing smart grid applications relied on,

and would continue to rely on, different and sometimes proprietary communications protocols and technologies. Disconnected yet overlapping communications networks and a generally short-term approach to smart grid communications increases the long-term cost and reduces the overall flexibility of any smart grid deployments.

The smart grid is much more than a communications network, but almost every element of the smart grid *requires* communications. When utilities, regulators, and other stakeholders look at the smart grid, communications are often narrowly viewed as an element of the application they are enabling. We encourage the DOE to ensure that any policy definition of the smart grid recognize communications, independent of the applications they may be enabling, as a separate, equally-important element to the smart grid and any smart grid deployment.

Assessing and Allocating Costs and Benefits: *Communications Infrastructure*

A two-way, near real-time communications layer is the most essential element of the smart grid, and yet it is also one of the smart grid elements for which it is hardest to directly attribute hard-dollar benefits. If upgraded metering saves a utility $100 per day, what percentage of that savings should be attributed to the enabling communications infrastructure? How much of a smart grid deployment budget ought be allocated to this communications infrastructure?

Communications with smart grid devices represents a significant portion of any smart grid deployment budget. Demand response applications require a signal be sent to shed load. AMI meters require a communications path to the utility. Outage notification systems need to get that notification to the utility where it can be acted upon. Thus, any smart grid application from which the consumer or utility can derive value typically requires two-way, near real-time communications to function.

While partnerships and collaborations amongst smart grid technology providers are increasing, the historical model has been for a particular smart grid technology provider to include communications sufficient to enable their application alone. As a result of this approach, many utilities today have parallel, disconnected communications infrastructures that are incompatible with each other and do not offer excess capacity to expand the functionality of the network. For example, a utility that has deployed proprietary RF mesh network has traditionally been locked into a single vendor for the depreciation of the infrastructure. If this hypothetical utility wanted to try a different vendor, or incorporate new functionality (i.g. distributed automation), the utility may be forced to also consider deploying another parallel communications infrastructure.

The cost of deploying and maintaining separate communications networks, each dedicated to a single application, is impractical. There are many smart grid applications and technology providers, and very few utilities are going to implement

every smart grid technology at the same time. As we see with the allocation of Smart Grid Investment Grants, many utilities are looking to focus on one application. Today's clear smart grid driver is AMI. As utilities look to build out communications for their first smart grid application, the utility, as well as its regulators and consumers, need to understand that investing in a robust communications infrastructure now can save them from the costs associated with two or three distinct communications infrastructures.

The RFI specifically asks if smart grid technologies should be connected or use the same communications standard across a utility, state, or region. It is our belief that connecting smart grid applications through shared communications infrastructures is an important long-term strategy to cost-effectively deploying communications, and also contributes to future proofing smart grid deployment. Rather than mandate a protocol or technology, however, Ambient recommends the adoption of guidelines that help utilities deploy today but with long-term cost considerations in mind, and that long-term considerations be allowed by regulators. This need was well articulated in the NY PSC CASE 09-M-0074 – In the Matter of Advanced Metering Infrastructure; Order Adopting Minimum Functional Requirements for Advanced Metering Infrastructure Systems.

Each smart grid application has its own associated requirements as to bandwidth, latency and redundancy. Different utilities will be interested in using varying technologies; likewise, different utilities using the same technologies may have divergent uses or expectations from that technology. Creating and defining a minimum functional requirement for smart grid communications infrastructures will ensure that utilities deploy long-term smart grid strategies that reduce costs for all stakeholders.

AMR to AMI to Smart Grid:

The advantages of a flexible open-standards based technology are both forward-looking and backwards-compatible. The smart grid is about using technology to extract value out of the existing grid infrastructure. People viewing one communications network for each application have lamented the obsolescence of AMR networks in favor of AMI, and there is talk of smart grid making AMI obsolete. Communications is the key enabler of all of these technologies. Therefore, well-conceived communications architectures will protect all stakeholders from obsolescence and the associated costs.

There are millions of AMR meters currently deployed that have been included into regulatory rate base, and some view these meters as obsolete due to their unidirectional communications. Deploying obsolete technology or having many years of depreciation left on these assets is an ongoing concern for all parties investigating or embarking upon a smart grid deployment. This fear stems from a short-term and fundamentally flawed view of smart grid architectures, which aims

at completely replacing existing infrastructure in favor of the newer more functional technology.

Flexible communications architectures have the ability to convert AMR systems into an integrated fixed network, providing interval meter read data to the utility and thereby allowing for time of use pricing. To answer directly the RFI's question of how AMR technology compares to AMI technology, Ambient believes system AMR systems can be incorporated into comprehensive smart grid deployments delivering to the utility very comparable information to an AMI system.

Long Term Issues: ***Managing a Grid with High Penetration of New Technology***

One of the aims of smart grid technology is to extract value from the existing grid infrastructures, regardless of the assets or level of previous investment. No utility or smart grid technology provider believes it realistic or prudent to implement all available smart grid technologies to all utilities and consumers; however, all utilities can benefit from targeted smart grid technologies, and in the long-term – they will.

It is important to keep in mind that while there are smart grid technologies, there is no single smart grid. Smart grid deployments must be viewed individually and in an applications-specific manor. Herein lies the difficulty of building consistent cost benefit analyses across diverse utilities, and under different regulatory operating environments.

Yet what utilities and regulators can do is ensure that any smart grid technologies considered and deployed today will be compatible with what comes next, much of which stems from the enabling communications layer. As technologies continue to improve, our understanding of smart grid will evolve – as will what we expect from a smart grid. Many parallels have been drawn between the Internet in 1990 and the Internet's capacity today—that is, that our current understanding and expectations of smart grid's potential are comparable to that of the Internet two decades ago.

Indeed, deploying a robust and technologically agnostic communications platform will give the grid the flexibility it will need to deal with transitions that are likely in the next few decades. Such a platform allows the integration of the many different technologies – both from various vendors that are available today and those soon to be available.

To avoid long-term cost overruns, utilities and regulators can establish incentives to make sure that second and third parallel communications infrastructures will not need to be deployed where one robust network would have sufficed.