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Intellectual Property ADVISORY

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The Impact of Patents on Smart Grid Objectives

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Patents Cannot Be Ignored

Following the federal government's lead under the Energy Independence and Security Act of 2007 (EISA) to create a national Smart Grid, a host of players will come together to seek the common good. Some will assume that private patent rights will not impact this effort, or that patents will be swept aside or deactivated. In fact, patent rights will create challenges to overcome before the Smart Grid becomes a reality.

Light at the End of the Tunnel. Participants no doubt will succeed in balancing the important function of patents in stimulating needed innovation against the need for nondiscriminatory access to technologies, as their predecessors have in many previous efforts to create technical and business standards. This advisory makes the case for a broad understanding of "open standards" as including technologies open to all via royalty-bearing reasonable and nondiscriminatory (RAND) licensing.

Patents Will Cover Important Smart Grid Technologies

Increased Patent Activity. An informal survey by the author of issued patents and published patent applications relating to Smart Grid technologies shows significant activity over the last decade. Fifty five patents and applications by their terminology or classification were closely related to smart or intelligent grid inventions. Many more exist that claim technologies useful or necessary to implement a Smart Grid strategy.

What Smart Grid Aspects Are Being Patented? Patented technologies extend from advanced metering to IT systems and hardware for automation of power distribution to business methods for efficient selection of power sources. In fact, patents will impact all areas of the goals for Smart Grid interoperability standards currently being developed by the National Institute of Standards and Technology (NIST): technical connectivity and interoperability, communications, data accessibility and business procedures. Some of the sample patents listed below seem targeted at concepts central to a nationwide Smart Grid strategy. Others claim particular hardware, software or business processes.

Who Is Patenting Aspects of the Smart Grid? Patent owners include giants like Siemens and General Electric, private players like GridPoint/V2 Green and SmartSynch, non-profits like ISO New England, consultants like Electric Power Group, utilities, government laboratories and individuals.

Patent Owner Rights. The owner of an issued U.S. patent has the exclusive right to make, use, sell and import what is covered by the claims of the patent. The patent owner can license or assign these rights to others. The claims at the end of the patent provide a list of required elements (or steps of a method) that

must all be present to establish infringement. Enforcement of U.S. patents (only after the patent issues) is by suit in a U.S. District Court. Although patents are presumed valid upon issuance, only time will tell whether a patent will withstand a challenge to its validity, based for example on prior technology the U.S. Patent Office did not consider in granting the patent.

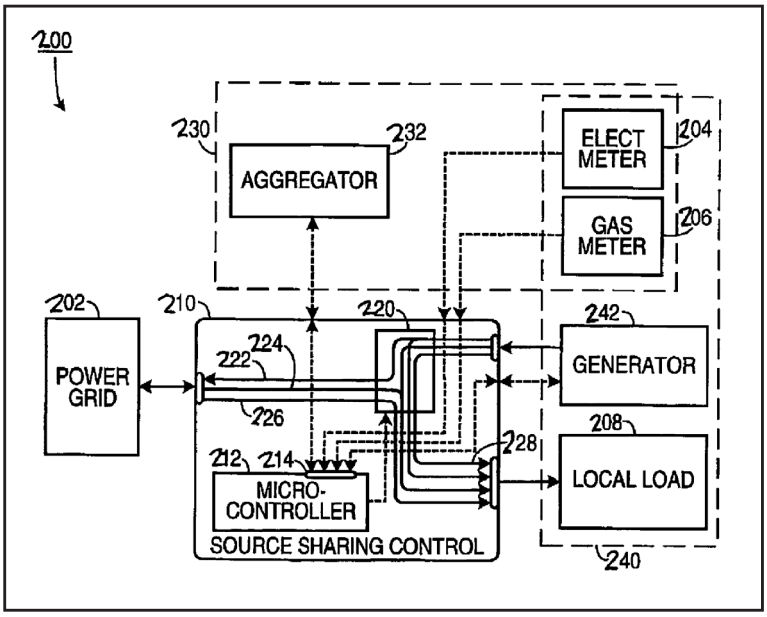
TABLE 1

Sample Smart Grid Patents		
Number (Hyperlink)	Title	Owner
7,233,843	Real-Time Performance Monitoring and Management System	Electric Power Group, LLC
7,274,975	Optimized Energy Management System	Gridpoint, Inc.
7,337,153	Resolving Energy Imbalance Requirements in Real-Time	Siemens Power Transmission & Distribution, Inc.
7,305,281	Management of a Bulk Electric Power Market	ISO New England Inc.
7,333,880	Aggregation of Distributed Energy Resources	EnerNOC, Inc.
7,376,491	Detection of Islanding in Power Grids	General Electric Company
2008/0177678	Method of Communicating Between a Utility and Its Customer Locations	Southern California Edison

FIG. 2

Control of Power Generation Network
7,430,459 Sept. 30, 2008

This U.S. patent of Motorola, Inc., describes monitoring prices of electricity and fuels, activating fuel cells when cheaper than a coal source, then aggregating and selling the power generated.



Standards for the Smart Grid

The Official Path. EISA mandated that NIST will coordinate model standards and protocols needed for a Smart Grid. NIST seeks to create a highly interoperable grid by maximizing use of open standards and proven, Internet-derived technologies. However, these goals may conflict with the need to utilize better technologies that are under patent protection. A balanced approach is needed. The Federal Energy Regulatory Commission (FERC) has noted, for example, that new types of storage technologies may provide value to the electric grid, and that standards makers should consider including such new technologies, even though they would not yet be sufficiently proven to be appropriate for immediate widespread use. New storage technologies are likely to be "patent pending."

Last November, NIST outlined the structure of its planned Smart Grid Interoperability Framework. Six working groups have been established to propose standards. Seeking to accommodate traditional generation and transmission, as well as renewables, distributed generation, energy storage and energy efficiency, the standards will cover enabling devices and systems including new technologies. No doubt some new technologies up for consideration will be patented or will be the subject of patent applications.

On March 19, FERC released ***Smart Grid Policy - Proposed Policy Statement and Action Plan***. Seeking public comment, FERC's goal is prioritizing the development of key interoperability standards (intersystem communication, system security, wide-area situational awareness, Smart Grid-enabled demand response capability, electric storage and electric transportation) and providing guidance to the industry regarding the need for cybersecurity.

Many Voices. NIST has the task of soliciting input from and bringing together a range of existing standards development organizations (SDOs) that, as FERC notes, rely on extensive negotiation to achieve broad industry consensus. These SDOs (a.k.a. "SSOs") include National Electrical Manufacturers Association (NEMA), Institute of Electrical & Electronics Engineers (IEEE), Independent Electrical Contractors (IEC), American National Standards Institute (ANSI), American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) and others. Once NIST builds sufficient consensus, FERC will conduct a rulemaking proceeding to adopt standards and protocols necessary to ensure Smart Grid functionality and interoperability in the interstate transmission of electric power, and regional and wholesale electricity markets.

Many other interested agencies, organizations and private interests will provide input, and have been carrying on discussions about Smart Grid standards, systems and processes outside the NIST process. For example, IBM and the Carnegie Mellon Software Engineering Institute have launched a framework called The Smart Grid Maturity Model, which provides utilities with a roadmap through their Smart Grid transformation—from technological to regulatory to organizational. On the one hand, the NIST process potentially can move faster by incorporating the valuable work of others. However, if a utility invests in the IBM/CMU process, how will it know the results will be compatible with steps the utility later takes to be consistent with new NIST coordinated standards?

Many federal government laboratories and private companies have been engaged in developing Smart Grid components and interoperability schemes. Some are filing patents on these innovations to cover their options, perhaps even as they support "open standards."

Patents vs. Free Access

Incentive to Innovate. The foundations of a Smart Grid are innovation, standardization and accessibility. Without technologies recently developed and still to be developed, participants would find it more difficult to attain the goals noted above. Without widely adopted standards, supporters of a variety of solutions would attempt to establish their proprietary versions of grid automation. No one wants to invest in choosing sides or to wait for that sort of fight to play itself out (as in Beta vs. VHS) in order to gain the collaboration needed to build a highly interoperable Smart Grid.

Many voices call for "open" standards for the Smart Grid. They should be careful to distinguish between the necessary characteristic of universal availability and the much less important goal that all included technologies be royalty-free. FERC's policy proposal (referring to a Gridwise Architecture Council publication) defines an "open architecture" as publicly known, so any and all vendors can build hardware or software that fits within that architecture, and the architecture stands outside the control of any single individual or group of vendors. A closed architecture blocks many vendors from adoption. An open architecture gives every vendor the opportunity to build interchangeable hardware or software that works with other elements within the system.

The elements of this definition are compatible with RAND licensing that provides a reasonable royalty to intellectual property (IP) holders but nondiscriminatory accessibility to all. Surely the absence of any reference to royalties or the lack thereof in the definition was intentional.

Reports have claimed Secretary Chu advocates free sharing of IP with other countries in areas of clean technology. It remains to be seen whether his comments actually tied "for free" to the concept of sharing. The administration is not likely to adopt a policy of forcing private IP into the public domain.

Sufficient innovation and standardization are required for rapid technological growth, suggests one commentator. If innovators are to invest in development, they need an expectation of a reasonable return, to keep risk and reward in balance. (See below, I*P Review*, 27 Jan 09.)

Advocates of Open Access to IP. Sometimes an industry group can assemble participants holding patents "essential" to a standard, and convince all to license the pooled patents on a royalty-free basis. As in the case of Bluetooth technology, this approach can work when the participants need a standard to allow compatibility between different devices they will build and sell individually, particularly if the patent is not on their primary products. Thus, free licensing of a patent on a particular grid connection technology might enlarge the grid and increase the overall market for various proprietary solutions sharing common connectivity to the larger grid. An owner of one of those solutions who also owns the connector patent might well license it royalty-free. But if the owner of the patent mainly sells grid connectors, she is less likely to see a benefit to making a royalty-free license available to other connector vendors.

A royalty-free standard is also more problematic where key innovators are consultants and service providers, some of whom own patents for a system, and all of whom want to provide similar systems to utilities. If they share their hard-won solutions with competitors, royalty-free, the float-all-boats effect is likely to be outweighed by the loss of patent owner's market share.

Southern California Edison applied for a Smart Grid use-case patent for the announced purpose of assuring it would be able to keep the technology open. SCE offers a royalty-free license under its patent application. Unlike RAND licensing (with or without a royalty), based on whether a patent is essential to an industry

standard, SCE in its license requires a covenant not to sue that leverages its patent application to assure that SCE will be free to use all aspects of its own use cases. SCE also promotes the Smart Grid Open Source repository proposed by EPRI.

Eco Patent Commons. IBM, Nokia, Sony, Pitney Bowes, Bosch, Xerox and Dupont have set up an organization to which they donate patents on environmentally friendly technology, and which licenses the patents to anyone at no cost. However, the members are not expected to donate broad or important patents. Reports of patents donated thus far fail to note any Smart Grid technology. This approach is quite different from RAND licensing of patents "essential" to a standard.

No Free Lunch. A standards process provides the potential to make needed innovations available to all on a nondiscriminatory basis while rewarding IP owners with a reasonable royalty. Otherwise, the owner of a key technology may choose a private licensing program under which only a small number of licensees access the technology. Leave such a key technology out of the Smart Grid plan and the result is a "dumbed down" standard. This is the risk of accepting *only* royalty-free technology.

History provides examples of relatively "patent free" standards that arguably do not include enough recent technology to allow the industry to provide important features without buying additional patent licenses. For example, in their framework for the initial Radio Frequency Identification (RFID) standards, EPCGlobal, MIT and the Uniform Code Council attempted to require participants in the standards-making process to contribute innovations royalty-free. Much of the industry refused, forcing the organizers to adopt a patent policy that allows a participant to opt out prior to adoption of a standard incorporating their patented (or patent pending) technology. However, no RFID technology subject to a royalty can be incorporated. Patent owners held significant patented technology out of the standards, leading to adoption of standards that do not address important advances covered by patents. With customers such as WalMart demanding implementation, the standards arguably fall short of placing the industry on an even playing field.

Air traffic control arguably provides an example of the effect of too strong an adherence to "proven" technology in standards adoption. Implementation of much improved Automatic Dependent Surveillance - Broadcast (ADS-B) technology has been delayed for years in favor of continuing a requirement for Traffic Collision Avoidance System (TCAS) units.

Bottom Line. Clearly, NIST's standards development effort should adopt best practices for connectivity, system architecture, system management, failure recovery, scaling, upgrading, business processes and other key interoperability technologies that are available to all and reliable. However, in light of the concerns just discussed, NIST would be well advised (a) to incorporate patented technologies needed to make the standards truly relevant to the problems and solutions envisioned for the Smart Grid, and (b) to push patent owners to accept RAND license obligations so that anyone can practice the standards at a reasonable cost. If a patented innovation does not clearly stand above competing technologies, a working group should prefer nonpatented alternatives. This approach is consistent with *first* maximizing the use of royalty-free technologies, but adopting "best" practices if available for a reasonable royalty. A broad understanding of "open standards" as including technologies open to all via royalty-bearing RAND licensing is needed.

Patents and Making Standards

Competition or Collaboration? The working groups meeting to consider what standards to propose in their respective categories will hear many proposals from companies and organizations with a vested interest in the technologies they propose. Should one not expect that IBM will seek adoption of the "framework" it is now pitching to utilities? Will the working groups become battlegrounds between competing technologies? Certainly some of these proposals will advocate patented and patent pending technologies. "[B]ecoming the standard by which an entire industry bases its innovation can be a lucrative IP prize . . . [and can] bring considerable reward, not just in terms of financial benefit of the licensing, but also the network effects, the sheer number of users and the share of the market." [IP Review, 27 Jan 09]

Ambush Prevention. Will the working groups know that a technology is subject to issued or pending patent rights before adopting it in a standard? Probably so, depending on the patent policy adopted by NIST for participants in the working groups and how that policy is interpreted. If the patent policy expressly requires disclosure of patents or pending patent applications relating to a standard under development, or a court finds that the participants' understanding was that the policy requires disclosure, then those who participate will be obligated to disclose their relevant patent rights. This might be the case if NIST refers to the ANSI Patent Policy and Guidelines as updated in September 2008, but an express disclosure requirement would be preferable.

In one recent decision involving Broadcom and Qualcomm, the court considered a patent policy that, by its words, only encouraged disclosure of patent rights. But the court found that participants in the standards development process understood that the policy did require disclosure of patent rights that reasonably might be necessary to practice the standards. The patent owner Qualcomm participated in the process but failed to disclose such rights. In light of this inequitable conduct, the court ruled Qualcomm's entire patent unenforceable against standard-compliant products.

Coping with Discovered Patents. Under the ANSI Patent Policy, once the standards development organization discovers a patent claim whose use would be required for compliance with the proposed standard, the patent owner generally must either disclaim that it holds or anticipates holding such an essential patent claim, or provide an assurance that it will license the patent claim to anyone for practicing the standard, either royalty-free or on reasonable basis, the terms and conditions of the license being free of any unfair discrimination (a RAND or FRAND license). The patent owner's alternative is likely adoption of a standard without the patented technology.

Facing the Challenge. The NIST working groups will receive input from an array of organizations and companies like Smart Grid Task Force, FERC/NARUC, Gridwise Alliance, IEEE, GWAC, NERC, IEC, AEP, EEI, PJM, SCE, Xcel, EPRI, NETL, PNNL and NEMA. The challenge facing the working groups is to sift through the biases of those advocating various technologies helpful to their own sponsors, and to adopt as standards the best technologies for accomplishing Smart Grid goals.

The Patent Pool Alternative

Patent owners sometimes agree to pool their patents and license them to each other or to third parties. The MPEG patent pools are a well-known example. If the patent pool allows interested parties to practice a certain technology without having to obtain a license from each patent owner individually, it can be pro-competitive.

Patent owners sometimes form pools at the end of a standards development process, to provide a convenient way for users to obtain RAND licenses. In other cases, as in the case of the Bluetooth patent pool, the pool is formed to establish a standard as well as to allow users access to the patented technology. In the case of the Smart Grid, a patent pool might be formed to facilitate RAND licensing, but formation of patent pools outside the NIST process seems unlikely.

Federal Government's Role in Managing the Patent Impact

Limits on Government Power. Short of congressional act, the U.S. government has no power to declare Smart Grid patents unenforceable or royalty-free. Action to accomplish such an unadvisable goal is no more likely that an act of Congress banning patents on machines for treating cancer. Patent incentives to stimulate innovation are too valuable.

The U.S. government does have the right to practice any U.S. patent, itself or through government contractors, in exchange for a royalty determined by the United States Court of Federal Claims, if the parties cannot settle on a royalty. A federal judge recently ordered NASA to pay Boeing a multi-million dollar judgment for infringing a Boeing patent covering techniques used in building the space shuttle.

NIST, in 1994, found that a patent owned by Silvio Micali threatened the administration's voluntary key escrow encryption program for telecommunications security. To remove this "perceived barrier" to the program, NIST entered into a license agreement with Micali granting to anyone, inside or outside the government, the right to use key escrow encryption systems developed for authorized government law enforcement purposes.

On the other hand, the federal government and its research laboratories often obtain patents on inventions of government employees.

State governments also must deal with patent owners. For example, in the early 1990s, a negative air technology adopted in many asbestos removal specifications was charged with infringement of a patent. State governments were known to require that asbestos removal contractors obtain a license under the patent.

Effect of U.S. Government Funding. Many Smart Grid inventors have and will obtain the benefit of government funding for their development efforts. Under the Bayh-Dole Act, generally a government contractor may elect to retain title to the patent, subject to a royalty-free license to the government and the possibility of "march in" rights in certain circumstances. A government funded patent must state: "The U.S. Government has a paid-up license in this invention and the right in limited circumstances to require the patent owner to license others on reasonable terms as provided for by the terms of (contract No. or Grant No.) awarded by (Agency)."

Companies Prepare for the Patent Impact

While monitoring or perhaps participating in the NIST standards making process, companies should take steps to optimize their patent positions. On the one hand, companies should identify, capture and protect their own patentable inventions relating to the Smart Grid. A company with serious novel contributions that has not considered filing patent applications is now behind the pack. Deadlines for filing must be understood and met.

On the other hand, companies should take steps to avoid unintentionally infringing the patents of others. They can monitor competitor patent activity, and search for patents and published patent applications by subject matter. They can also obtain opinions on problematic patents, as well as advice on how to design around patents. Prior to making a major investment, companies should consider obtaining a "freedom-to-operate" patent study. Various tools are available for "mapping" patent landscapes in a selected field.

Links to Related Content:

Patents in Clean Technology: Trends and Implications (video presentation) at http://www.alston.com/media/CleanTech.htm

FERC Regulators Move Forward on Federal 'Smart Grid' Policy and Seek Comments http://www.alston.com/energy_advisory_smart_grid

NIST Smart Grid Interoperability Workshop Foundational Session (Nov. 2008) at http://www.nist.gov/smartgrid/NIST_GI08_Foundation%20Session%20Slides_final.pdf

Guidelines for Implementation of the ANSI Patent Policy at http://publicaa.ansi.org/sites/apdl/Documents/Standards%20Activities/American%20National%20Standards/Procedures,%20Guides,%20and%20Forms/Guidelines%20for%20Implementation%20of%20the%20ANSI%20Patent%20Policy%202008.pdf

NIST Seminar: IPR and Standards (March 10, 2008) at http://ts.nist.gov/Standards/upload/NIST%20and%20IPR%20R2.ppt

Utility Attempts to Patent Advanced Metering, Smart Grid News, Sept. 11, 2008, at http://www.smartgridnews.com/artman/publish/industry/Utility_Attempts_to_Patent_AdvancedMetering-475.html

Green patents score all-time high in 2008, IP Review, at http://www.cpaglobal.com/ip-review-online/3240/green_patents_score_alltime_high_in_2008

EPCGlobal Intellectual Property Policy at: http://www.epcglobalinc.org/what/ip_policy/

"Getting into the Groove" (. . . *becoming the standard by which an entire industry bases its innovation can be a lucrative IP prize*) IP Review, posted 27 January 2009, at http://www.cpaglobal.com/ip-review-online/3217/getting_into_the_groove

Patent Agreement Removes Perceived Barrier to Telecommunications Security System (NIST 1994) at http://www.nist.gov/public_affairs/releases/n94-28.htm

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