We ARRA Gittin' the Smart Grid Here Soon, Y'all: The Stimulus Act and Duke Energy's Smart Grid Development in North Carolina

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Introduction

There has been a lot of buzz in recent years concerning the need for and preliminary development of a national "smart grid." Congress addressed the issue in the Energy Independence and Security Act of 2007 (EISA).[1] The EISA states, "It is the policy of the United States to support the modernization of the Nation's electricity transmission and distribution system to maintain a reliable and secure electricity infrastructure that can meet future demand growth and to achieve each of the following, which together characterize a Smart Grid."[2] President Obama is also a proponent of modernizing the electric grid, stating his goal to "build a new electricity grid that [lays] down more than 3,000 miles of transmission lines to convey [renewable] energy from coast to coast."[3] North Carolina lawmakers and businesses generally have been slow to react, however, and grid upgrade opportunities abound in the state. By one measure of smart grid implementation, the estimated penetration of advanced metering, North Carolina is behind South Carolina, Georgia, and Tennessee.[4] As of yet, the General Assembly has not addressed the issue directly, though two relevant bills have stalled in committee as the 2011 Session comes to an end.[5] Regulation will need to catch up, however, as some utilities, Duke Energy (Duke) in particular, are finally moving forward with smart grid development in North Carolina.

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[1] Energy Independence and Security Act of 2007, Pub. L. No. 110-140, 121 Stat. 1492 (2007).
[2] *Id.* at § 1301.
[3] Steven Ferrey, *Restructuring a Green Grid: Legal Challenges to Accommodate New Renewable Energy Infrastructure*, 39 ENVTL. L. 977, 984 (2009).
[4] FEDERAL ENERGY REGULATORY COMMISSION, ASSESSMENT OF DEMAND RESPONSE & ADVANCED METERING STAFF REPORT, 11 (February 2011), *available at* http://www.ferc.gov/legal/staff-reports/2010-dr-report.pdf.
[5] S. B. 1440, 2009-2010 Sess. (N.C. 2010). S. B. 671, 2011-2012 Sess. (N.C. 2011).

The American Recovery and Reinvestment Act of 2009

On February 17, 2009, President Obama signed into law The American Recovery and Reinvestment Act of 2009 (ARRA).[6] Among other things, the Act set aside federal money for businesses, including Duke Energy, to use to keep and create jobs. With these funds, Duke is investing in the creation of a "smart grid" in North Carolina, which will modernize the state's transmission and distribution system and help ease its transition into the 21st century of energy.[7] This paper will update the reader on Duke's efforts to bring the smart grid to North Carolina using the federal stimulus money, amidst an uncertain regulatory climate. When such legislation concerning the smart grid does come into effect, environmental and energy lawyers practicing in North Carolina will need to take notice.

Congress passed the ARRA in response to the most significant recession in United States history since the Great Depression.[8] In order to create and retain jobs, Congress expanded spending in certain sectors, including energy, particularly "green" energy.[9] Of the $840 billion allocated under the Act, $39.7 billion was set aside for energy-related spending, not including research.[10] Within that allotment, the Office of Electricity Delivery and Energy Reliability, which is the branch of the Department of Energy that oversees our electrical grids, received $4.5 billion to modernize the grid.[11] More specifically, the ARRA led to the creation of the Smart Grid Investment Grant Program and the Smart Grid Demonstration Program, which have the

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[6] American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, 123 Stat. 115 (2009).
[7] *Smart Grid: Frequently Asked Questions*, DUKE ENERGY, http://www.duke-energy.com/about-us/smart-grid-faq.asp (last visited Oct. 25, 2011).
[8] Chris Isidore, *The Great Recession*, CNNMONEY.COM (March 25, 2009), http://money.cnn.com/2009/03/25/news/economy/depression_comparisons/.
[9] American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, § 3, 123 Stat. 115, 116 (2007).
[10] *Breakdown of Funding*, RECOVERY.GOV, http://www.recovery.gov/Transparency/fundingoverview/Pages/fundingbreakdown.aspx (last visited Oct. 25, 2011).
[11] Stoel Rivers, LLP, *Energy Law Alert: Stimulus Bill Funding Opportunities for Smart Grid, Energy Storage and Other Energy Technologies*, STOEL RIVERS LLP (March 6, 2009), http://www.stoel.com/showalert.aspx?Show=4919.

purpose of initiating smart grid development and demonstration on a national scale.[12] This modernization of our electricity transmission and distribution systems signifies the transition to the smart grid.

The Smart Grid

The term "smart grid" is a catchall phrase with no universal or technical definition. It is simply a metaphor for an electricity distribution infrastructure that makes use of computer-age technology. Congress formally proposed the goal of modernizing our aging grid in the EISA. Title XIII of the Act loosely defines the smart grid as "the modernization of the Nation's electricity transmission and distribution system to maintain a reliable and secure electricity infrastructure that can meet future demand growth."[13] While the Act lists many qualities of the smart grid, two of the more salient characteristics include "development and incorporation of demand response,[14] demand-side resources, and energy-efficiency resources" and deployment of "smart" technologies, characterized by real-time, automated, and interactive feedback mechanisms.[15] Additionally, the EISA promotes development of peak-shaving[16] and advanced electricity storage technologies.[17] In short, the smart grid refers to a set of technological advances that scientists and engineers are using to modernize utility electricity delivery systems.[18]

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[12] United States Department of Energy, *Guidebook for ARRA Smart Grid Program Metrics and Benefits,* SMARTGRID.GOV (June 2010), *available at* http://www.smartgrid.gov/sites/default/files/pdfs/guidebook_for_recovery_act_smart_grid_program_metrics_and_benefits.pdf.

[13] Energy Independence and Security Act of 2007, Pub. L. No. 110-140, § 1301, 121 Stat. 1492, 1783-1784 (2007).

[14] Demand response: consumers can adjust their electricity use to reflect market prices. *See* Rolf Adam and Walter Wintersteller, *What's So Smart About the Smart Grid,* STRATEGY + BUSINESS, (Sept. 2, 2008), http://www.strategy-business.com/article/li00091?gko=aa0aa.

[15] Energy Independence and Security Act of 2007, Pub. L. No. 110-140, § 1301 121 Stat. 1492, 1784 (2007).

[16] Peak shaving: through smart meters, which provide real-time pricing information to consumers, consumers the incentive to reduce their electricity usage during high-priced peak periods. *See* Adam and Wintersteller, *supra* note 14

[17] Energy Independence and Security Act of 2007, Pub. L. No. 110-140, § 1301 121 Stat. 1492, 1784 (2007).

[18] United States Department of Energy, *Smart Grid,* ENERGY.GOV, http://energy.gov/oe/technology-development/smart-grid (last visited Oct. 25, 2011).

This smart grid would replace the existing outdated and ad hoc electricity delivery infrastructure in this country. Generally speaking, an "aging power delivery infrastructure" may be defined as "any area of the utility system with an average service age greater than the design lifetime of the equipment from which it is built."[19] Much of this aging equipment was developed or last updated before the 1970s. The infrastructure is plagued by higher failure rates, and can't respond readily to emergencies.[20] The smart grid will correct many of these problems through digitization and active monitoring of transmission and delivery systems. Through increased efficiencies, it can supplement renewable energy utilization to wean our country off of fossil fuels, for the benefits of energy security and the environment.

Regulatory Concerns in North Carolina

Given its intimate tie to America's critical energy delivery infrastructure, the smart grid will inevitably face significant regulation; though the form that regulation will take in North Carolina and elsewhere is yet to be determined. Local, state, and even federal jurisdictions will probably require approval from various utility commissions for smart grid developments. In addition, the technologies must comply with existing regulations, which can vary from jurisdiction to jurisdiction.[21] The federal government's first legislation concerning smart grid development was the aforementioned Energy Independence Act of 2007. Two years later, the House of Representatives approved the American Clean Energy and Security Act of 2009 (also known as the Waxman-Markey Bill), though the bill died in the Senate. The energy bill included six sections on the smart grid.[22]

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[19] WILLIS, H. L. ET AL., AGING POWER DELIVERY INFRASTRUCTURES 1 (Marcel Dekker, Inc. 2001).
[20] *Id.* at 3.
[21] Gowlings, Lafleur Henderson LLP, *Navigating policy, legislation and tribunals,* SMARTGRIDLAW, http://www.smartgridlaw.com/regulatory/ (last updated 2011).
[22] American Clean Energy and Security Act of 2009, H. R. 2454, 111th Cong. (2009), *available at* http://www.gpo.gov/fdsys/pkg/BILLS-111hr2454ih/pdf/BILLS-111hr2454ih.pdf.

Three bills have also recently been introduced in the North Carolina General Assembly. Senate Bill 671, and its counterpart House Bill 872, entitled "Smart Grid Job Creation and Retention Act," was introduced in April 2011. Its purpose is "to provide a tax credit for research regarding technologies for the modern electric grid."[23] There is also Senate Bill 1440, introduced in May 2010, with the short title "Create Broadband-Smart Grid Task Force." This bill proposes the creation of a task force, made of members from each house as well as various members with knowledge and experience on the issues, which will essentially investigate the implementation of a smart grid in North Carolina.[24] All three bills are currently stalled in committee, though they may see activity when the General Assembly reconvenes in 2012. Any version of a smart grid that North Carolina develops in the coming years will be subject to federal and state regulations such as these, and the uncertainties hinder the process.

There is also disagreement between the body that would implement and enforce these regulations, the North Carolina Utilities Commission (Utilities Commission), and the state's major utilities, including Duke Energy. Specifically, the two sides disagree on proposals of smart grid disclosure. Presumably to protect trade secrets, Duke and Dominion propose only retrospective impact reports of smart grid development during the planning process, whereas the Utilities Commission proposes submission of plans by each utility, and that the plans should be kept up-to-date.[25] This debate has legal implications that will also impact the manner in which the General Assembly and Utilities Commission will regulate the smart grid in North Carolina.

Duke Energy and the Smart Grid in Ohio

[23] S. B. 671, 2011-2012 Sess. (N.C. 2011).
[24] S. B. 1440, 2009-2010 Sess. (N.C. 2010).
[25] Munro, Stephen, *NC Utilities and Regulators At Odds Over Smart Grid Reporting,* GREEN TECH GRID (March 10, 2010), http://www.greentechmedia.com/articles/read/nc-utilities-and-regulators-at-odds-over-smart-grid-reporting/.

Duke Energy began a Smart Grid Investment Grant Program (Grant Program) with the federal funding it received as part of the ARRA.[26] The Grant Program is a "comprehensive grid modernization undertaking" that will bring transformative changes to its customers across five states, including North Carolina. The planned "modernization" includes installation of "open, interoperable two-way communications networks, . . . communications infrastructure for metering, . . . [and] advanced distribution automation applications" as well as development of "dynamic pricing programs" and introduction of "home area networking and plug-in electric vehicle support."[27]

As part of this program, and having received tacit regulatory approval by the state of Ohio, Duke began implementing smart grid technologies in the greater Cincinnati area in 2010.[28] The utility installed "smarter" digital meters[29] in addition to automated electric distribution infrastructure and a more advanced communications network with associated computer systems.[30] The utility plans to finish this implementation in Ohio by 2015, by which point it will have installed more than 700,000 electric meters, 450,000 gas meters, and 130,000 communication nodes[31].[32] As of August 2011, Duke has actually installed about 230,000 electric

[26] *Grants – Award Summary,* RECOVERY.GOV (April 1 – June 30, 2011), http://www.recovery.gov/Transparency/RecipientReportedData/pages/RecipientProjectSummary508.aspx?AwardIdSur=80625&AwardType=Grants.
[27] *Id.*
[28] *Id.*
[29] Smart meter: a digital device that collects energy-use data (like a traditional meter), but also transmits and receives data, such as energy usage. *See* SDGE, *Frequently Asked Questions,* http://sdge.com/sites/default/files/documents/smartMeterFAQ.pdf (last visited Dec. 18, 2011).
[30] *Grants – Award Summary,* RECOVERY.GOV (April 1 – June 30, 2011), http://www.recovery.gov/Transparency/RecipientReportedData/pages/RecipientProjectSummary508.aspx?AwardIdSur=80625&AwardType=Grants.
[31] Communication node: an interconnection point that acts as a network gateway and both processes and analyzes data collected from smart meters. Each transformer is connected to a carrier network and a communication node. http://gigaom.com/cleantech/duke-energy-embraces-cellular-for-smart-grid/.
[32] *Smart Grid: Frequently Asked Questions*, DUKE ENERGY, http://www.duke-energy.com/about-us/smart-grid-faq.asp (last visited Oct. 25, 2011).

meters, 165,000 gas meters, and 44,000 communication nodes.[33] Of the roughly $200 million Duke received in grants from the Department of Energy, the utility has spent $72 million as of June 30, 2011.[34] Clearly, Duke is moving ahead with its smart grid plans, despite the absence of a regulatory framework.

In addition to infrastructure improvements, Duke received grant money for employee training as it pertains to grid revitalization, which the company has also implemented in Ohio.[35] The Smart Grid Workforce Training Project will create training manuals for both electrical operations and field safety for Duke employees and other contracted workers.[36] Furthermore, the utility will make informational packages available for local and state emergency response crews who help restore power after major storms in Duke's customer area.[37] The training modules will focus primarily on installing and operating the new automated meters and the related communication systems.[38] Once these preliminary implementation and training phases are complete in Ohio, Duke plans to continue smart grid development elsewhere, including North Carolina. It is unclear how Duke's implementation in North Carolina will compare to its efforts in Ohio. While the Public Utilities Commission of Ohio seems to quietly encourage utilities such as Duke taking the initiative with the smart grid,[39] the North Carolina Utilities Commission currently appears to be more passive and has no mention of any "smart" technology in its rules,

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[33] Shifra Mincer, *Duke Gets The Jump On Smart Grid,* AOL ENERGY (Aug. 10, 2011), http://energy.aol.com/2011/08/10/duke-gets-the-jump-on-smart-grid/.
[34] *Grants – Award Summary,* RECOVERY.GOV (April 1 – June 30, 2011), http://www.recovery.gov/Transparency/RecipientReportedData/pages/RecipientProjectSummary508.aspx?AwardIdSur=80625&AwardType=Grants.
[35] US Dep't of Energy, *Duke Energy Smart Grid Workforce Training*, SMARTGRID.GOV (Dec. 2010), http://www.smartgrid.gov/sites/default/files/duke-energy-oe0000399.pdf.
[36] *Id.*
[37] *Id.*
[38] *Id.*
[39] Public Utilities Commission, *Smart Grid in Ohio,* OHIO.GOV http://www.puco.ohio.gov/puco/index.cfm/consumer-information/consumer-topics/smart-grid-in-ohio/ (last visited Oct. 30, 2010).

which may slow development.[40] However, it is possible that Duke will use its experience in southwest Ohio to expedite and improve the process in North Carolina.

Duke Energy and the Smart Grid in North Carolina

Duke has made a small amount of progress with the smart grid in North Carolina, particularly through a small pilot program in south Charlotte.[41] About 100 homes served by the McAlpine Creek substation are being tested for two smart grid energy-management systems.[42] Despite a few initial technical difficulties, the technology seems to be working; customers are reported as saving an average of 8% on their monthly electric bills through lower consumption.[43] Summer tests involved customers manipulating their thermostats during particularly hot days, cutting demand during peak hours by up to 52%.[44]

Looking to the near future, Duke Energy Carolinas, Duke's subsidiary serving the Carolinas, received $3.9 million and spent nearly one-third of that for a "comprehensive communications modernization undertaking" which will implement special measurement devices in various transmission substations.[45] The award will also go towards upgrading the present network to current, internet-based standards.[46] Duke Energy Carolinas was also awarded an additional $7.9 million, and has spent $3.9 million, to install forty-five phasor measurement

[40] Public Utilities Act, N. C. Gen. Stat. § 62 (1963).
[41] John Downey, *Duke Energy's smart-grid test in Charlotte generates mixed results*, CHARLOTTE BUSINESS JOURNAL (Jan. 21, 2011), http://www.bizjournals.com/charlotte/print-edition/2011/01/21/mixed-results-on-smart-grid.html?page=all.
[42] *Id.*
[43] *Id.*
[44] *Id.*
[45] *Grants – Award Summary – Duke Energy Carolinas, LLC,* RECOVERY.GOV (April 1 – June 30, 2011), http://www.recovery.gov/Transparency/RecipientReportedData/pages/RecipientProjectSummary508.aspx?AwardIdSur=103264.
[46] *Id.*

units[47] in substations throughout the state and upgrade communications software and infrastructure at the corporate control center.[48]

It is clear that North Carolina will see the development of a smart grid in the very near future. Duke Energy has already begun the process with pilot programs in Charlotte, building from experience in the Cincinnati area.[49] However, the regulatory climate remains unclear, and until the General Assembly and Utilities Commission pass and implement legislation and regulation, smart grid technology and businesses (and the resulting jobs), will be slow to arrive. When a regulatory framework does emerge, however, attorneys doing any energy-related work in the state will need to be prepared.

[47] Phasor measurement unit: "a power system device capable of measuring the synchronized voltage and current phasor in a power system" Phadke, chair, et al., State Estimation and Voltage Security Monitoring Using Synchronized Phasor Measurements (July 2, 2001) (unpublished doctoral dissertation, Virginia Polytechnic Institute and State University), *available at* http://citeseerx.ist.psu.edu/viewdoc/download;jsessionid=3B975B94733D906CA197813C53C2BD86?doi=10.1.1.2.7959&rep=rep1&type=pdf.

[48] US Dep't of Energy, *Recovery Act Selections for Smart Grid Investment Grant Awards – By Category* ENERGY.GOV, 6, http://energy.gov/sites/prod/files/edg/media/SGIGSelections_Category.pdf (last visited Oct. 30, 2011).

[49] John Downey, *Duke Energy's smart-grid test in Charlotte generates mixed results*, CHARLOTTE BUSINESS JOURNAL (Jan. 21, 2011), http://www.bizjournals.com/charlotte/print-edition/2011/01/21/mixed-results-on-smart-grid.html?page=all.