UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Smart Grid Policy **)** **Docket No. PL09-4-000**

COMMENTS OF NATIONAL RURAL ELECTRIC COOPERATIVE ASSOCIATION

On March 19, 2009, the Federal Energy Regulatory Commission ("FERC" or "Commission") issued a Proposed Policy Statement and Action Plan regarding "Smart Grid" policy.[1] Pursuant to the notice of the Commission's proposed policy statement and action plan published in the Federal Register, the National Rural Electric Cooperative Association ("NRECA") respectfully submits these comments.[2]

Introduction and Summary

NRECA is the not-for-profit national service organization representing approximately 930 not-for-profit, member-owned rural electric cooperatives. The great majority of these cooperatives are distribution cooperatives, which provide retail electric service to over 42 million consumer-owners in 47 states. Kilowatt-hour sales by rural electric cooperatives account for approximately 10% of total electricity sales in the United States. NRECA's members also include approximately 65 generation and transmission ("G&T") cooperatives, which supply wholesale power to their distribution cooperative owner-members. Both distribution and G&T cooperatives were formed to provide reliable electric service to their owner-members at the lowest reasonable cost.

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[1] *Smart Grid Policy*, 126 FERC ¶ 61,253, Docket No. PL09-4-000 (Mar. 19, 2009).

[2] Smart Grid Policy, 74 Fed. Reg. 13,152 (Mar. 26, 2009) ("Smart Grid Policy").

As a preliminary matter, it is important to recognize the lack of a clear or consistent definition of "Smart Grid." In the Smart Grid Policy, the Commission understandably left the term "Smart Grid" undefined. At this early stage as the industry sorts out how to apply advances in communications technology to the electric power system, any definition would serve to limit rather than expand possible benefits and improvements. While it is common to speak of the "Smart Grid" as a single thing or as a thing that will exist in the future, in fact, neither characterization is accurate. Smart grid comprises many diverse technologies and approaches that can be deployed at every point in the process of delivering electric power, from the power plant all the way to appliances in the home. Pieces of the Smart Grid are already in place; many have been in place for some time.

NRECA and its members firmly support the use and expansion of both Smart Grid technologies and demand response as tools that can help cooperatives and the electric industry as a whole meet their fundamental goal of providing consumers with safe, reliable, and affordable power. Cooperatives are implementing Smart Grid technologies in order to help improve service quality, increase reliability, and to obtain operational efficiencies that allow cooperatives to reduce system energy use, to lessen environmental impacts, and to save money for their consumer-members. For those reasons, cooperatives lead the industry in these areas.

NRECA's internal analysis indicates that approximately half of cooperatives have installed at least some advanced metering infrastructure ("AMI") on their systems. And, as the Commission staff recently recognized in the 2008 Assessment of Demand Response and Advanced Metering, cooperatives are far out in front of other industry sectors in the total penetration of AMI:

> Cooperatives deployed approximately 2.4 million advanced meters, accounting for 41 percent of the 5.8 million increase in advanced metering penetration since 2006. This deployment by cooperatives represents an increase of 360 percent

> from 3.8 percent penetration in 2006 to 16.4 percent in 2008. Over the same period, investor-owned utilities deployed approximately three million advanced meters, accounting for 46 percent of the 5.8 million total increase in advanced metering since the 2006 FERC Survey. Advanced metering penetration for investor-owned utilities shows an increase of 1,081 percent, from 0.2 percent penetration in 2006 to 2.7 percent in 2008.[3]

The great majority of cooperatives have also begun to integrate their AMI and other distribution automation technology with other systems. For example, approximately 79% of cooperatives with AMI/AMR have at least begun to integrate their AMI/AMR systems with their Customer Information Systems ("CIS"), 26% with their Geographic Information Systems ("GIS"), and 23% with their Outage Management Systems ("OMS"). Two good examples are New Hampshire Electric Cooperative ("New Hampshire Electric") and Mid-Carolina Electric Cooperative ("Mid-Carolina Electric") in South Carolina.

New Hampshire Electric, a statewide utility that has a patchwork of territory all over the state, has combined a wide array of communications technologies, including SCADA, outage reporting, GIS and an Interactive Voice Response ("IVR"), into a system that can be controlled and monitored with accuracy from the central office. This past winter, New Hampshire Electric's OMS allowed New Hampshire Electric to recover from a severe ice storm faster than any of the other utilities in the state. The OMS imposes outage information onto the GIS system, giving New Hampshire Electric "predictive intelligence." New Hampshire Electric was able to inform consumer members when to expect power *even before they called to ask*.

New Hampshire Electric now plans to overhaul its system, deploying AMI system-wide and building its own telecommunications infrastructure. While New Hampshire Electric already has an extensive demand-response system, the new meters will allow the cooperative to send price signals to its commercial and industrial members.

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3 2008 Assessment of Demand Response and Advanced Metering, Staff Report, p 8 (December 2008).

Mid-Carolina Electric has deployed AMI system-wide. The 50,000 smart meters provide hourly readings to the cooperative, giving the utility a detailed, almost real-time picture of the system and how each meter is shaping the load. The data can provide information on devices such as transformers. While Mid-Carolina Electric currently controls 5 percent of its load using an old radio system, it anticipates using the AMI system to manage its demand response program. Unlike the radio system, AMI lets Mid-Carolina Electric know not just that the signal to turn off a device has been sent but that it has been acted upon.

Mid-Carolina Electric also anticipates establishing an interface with the SCADA system, which has been in place since 1983. The new system would enable the cooperative to install intermediate devices that allow the utility to reroute power remotely in the event of an outage, limiting the number of members affected. The new system will enhance Mid-Carolina Electric's efficiency with better and more accurate line-loss prevention technology.

Cooperatives have also led the industry in promoting interoperability of system elements. About a decade ago, NRECA's research and development group organized a number of vendors to work on developing standards for software targeted to cooperatives, now called "MultiSpeak." While MultiSpeak specifications were initially developed for software used by distribution cooperatives, the MultiSpeak Initiative is now testing a new version intended to harmonize MultiSpeak with standards used by transmission and wholesale power utilities. As of today, more than 300 utilities, including municipal utilities and investor-owned utilities, are using MultiSpeak interfaces developed in connection with the MultiSpeak Initiative.

NRECA's member cooperatives are also ahead of the industry in developing and operating demand response programs. In the 2008 Assessment of Demand Response and Advanced Metering, Commission staff concluded that cooperatives have 18% of the nation's demand response capability.[4] That number is especially significant in view of the fact that cooperatives sell only 10% of the energy in the U.S.

In a 2004 survey of its members, NRECA found that 40% of respondents had some kind of demand response program in place. Of those:

- 77% have programs in place for direct control of water heaters, pool heaters, and air conditioners.
- 44% have interruptible contracts with some of their consumers.
- 30% have time-of-use or real-time rates.
- 16% have arrangements for voluntary "share-the-savings" interruptions.
- 11% have another demand response program in place. Most of these involve control of irrigation loads or the ability to dispatch customer-owned generation.

It is important to note that this study was conducted in 2004. Substantial expansion of these programs has occurred in the intervening five years.

Dairyland Power Cooperative, a G&T cooperative serving 25 member cooperatives with 247,000 customers in four states, is a good example. Dairyland has an advanced demand response program that includes:

- 75,000 Residential electric water heaters
- 16,000 Residential dual fuel heating systems
- 15,000 Residential Air Conditioners
- 8,000 Residential heat storage systems
- 275 commercial and industrial generators
- 100 Peak Alert voluntary load reduction ("C&I")
- 180 Agricultural grain dryers
- 6 C&I bulk interruptible under direct control

Altogether, Dairyland can control as much as 175 MW of load, or 20%, off its winter peak of just under 870 MW. These programs have allowed Dairyland to save its members more than $11 million per year.

Dairyland is not alone. Another G&T, Minnkota Electric Cooperative, can, for example, control approximately 50% of its peak load, and another, East River Electric Cooperative, can

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4 *Id*. at p 39.

control nearly 25% of its peak load. At the April 2009 meeting of the Peak Load Management Alliance, one of Minnkota's members, Cass County Electric Cooperative, received an award for "Innovative Application of Technology" for its Incremental Pricing Plan Program.

Finally, cooperatives are also looking at ways in which to use Smart Grid technologies to expand and improve their demand response programs. Results at some cooperatives indicate that AMI allows the utility to better measure and verify the results of load control, enables the utility to locate and replace load control devices that no longer operate properly, and allows the utility to better evaluate, shape, and market demand response programs. AMI, coupled with smart thermostats, home automation networks, and smart appliances allows utilities to operate additional devices and to do so more often with less impact on consumers. For example, rather than merely turning air conditioners on or off in response to a binary signal, utilities can pre-cool homes before peak, allow temperatures to rise at an imperceptible rate, and then bring temperatures down again just as slowly. Those changes not only keep customers happier, and thus in the program, but also avoid the problem of rebound peaks.

While being at the forefront of the Smart Grid movement, cooperatives have been cautious to implement new technologies "at the pace of value." In other words, cooperatives have invested in AMI, distribution automation, and software integration where these investments make sense – where the technology helps provide consumer-owners with safe, reliable power at the lowest reasonable cost. Premature implementation of new technologies, ahead of the "pace of value" can have severe adverse consequences. These impacts will not be limited to near term issues such as decreased reliability, increased cost and other service issues. Systems experiencing poor performance resulting from immature technologies will find it more difficult to later implement improved technologies.

In the end, however, the key to successful implementation of a smarter grid is to address consumer concerns about reliability, cost, efficiency and control. The Smart Grid has to satisfy consumers' interest in the best feasible service at the lowest feasible cost. Consequently, consumers' preferences and desires need to be a primary component of the Smart Grid specification.

Comments

1. Patience is critical in the development of good interoperability standards.

NRECA understands the Commission's sense of urgency with respect to Smart Grid standards. Smart grid technologies have the potential to provide consumers with significant energy and financial savings with concomitant benefits to the environment, and utilities are making investments today. Yet, many companies are waiting to implement valuable advances in technology because the lack of standards reduces the number and quality of technology options, raises the cost of integrating those technologies with existing systems and creates a risk that investments made today could be stranded if the standards ultimately adopted by the industry are inconsistent with the products installed in the meantime.

Nevertheless, NRECA's experience developing MultiSpeak demonstrates that the standards development process cannot be unduly rushed. As Congress clearly recognized in the structure of section 1307 of the Energy Independence and Security Act of 2007 ("EISA")[5], standards have to be the product of an industry consensus-building process in which the utilities that will install and use the technologies, and the vendors that manufacture them, must work together to achieve an understanding of how best to move forward.

[5] EISA, Pub. L. No. 110-140, 121 Stat. 1492 (2007), to be codified at 15 U.S.C. § 17381.

As noted at the outset of these comments, at this time the industry still cannot even agree on a single definition of "Smart Grid." Many of the technology, software, and communications tools that will eventually comprise elements of the Smart Grid are not yet commercially available or have not yet been tested on a large scale. The industry lacks experience integrating these elements with one another on large scale. If rushed, many aspects of the interoperability standard required by section 1307 would have to be created out of whole cloth, rather through final consensus on a standard percolated and developed organically within the industry for a period of time.

Moreover, the list of potential functions for the Smart Grid is extremely broad, and it can be expected that different utilities and stakeholders will select differently amongst them, pursue them to different degrees, and use drastically different portfolios of technology, software, and communications media in order to achieve them. For interoperability standard to work well for the industry, it must not inappropriately force adoption of one approach or foreclose the ability to adopt another approach. That means that the stakeholders must all understand the potential use cases for the technology and data. That is, they must understand: the range of potential data collection equipment; the business, financial, and operational purposes for which data will be employed; the kinds of software in which data will be manipulated; the variety of different telecommunications media by which it will be transmitted; and, the forms in which it can best be stored and accessed. Once armed with that knowledge, they must then develop standards and protocols that are as likely as possible to meet those known requirements and any future, unknown requirements.

Given the early state of the industry's understanding of "Smart Grid" it will take time for the industry to reach a good understanding of the use cases for which an interoperability standard must work. While the lack of a standard does slow the maturation of the Smart Grid, a bad standard – developed with insufficient understanding of the manner in which the Smart Grid might be implemented – will do more long-term harm. Patience, although difficult, is critical.

2. Congress explicitly delegated authority to the National Institute of Standards and Technology to coordinate the development of interoperability standards.

Congress stated in section 1301 of the EISA that "[i]t 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. . . ." Congress recognized the importance of the interoperability of smart devices and equipment and smart transmission and distribution systems to the successful modernization of the Nation's transmission and distribution systems.[6] Congress explicitly assigned to the National Institute of Standards and Technology ("Institute") the task of coordinating the development of a set of standards to ensure the interoperability of Smart Grid devices and systems.[7] Section 1305(a) of the EISA states in part (emphasis supplied):

> The Director of the ***National Institute of Standards and Technology shall have primary responsibility to coordinate the development*** of a framework that includes protocols and model standards for information management to achieve interoperability of smart grid devices and systems.
> . . .
> (1) ***the Director shall seek input and cooperation from the Commission***, [the Office of Electricity Delivery and Energy Reliability] and its Smart Grid Task Force, the Smart Grid Advisory Committee, other relevant Federal and State agencies; and
> (2) the Director shall also solicit input and cooperation from private entities interested in such protocols and standards, including but not limited to Gridwise Architecture Council, the International Electric and Electronics Engineers, the National Electric Reliability Organization recognized by the Federal Energy Regulatory Commission, and National Electric Manufacturer's Association.

Congress, thus, left no doubt that the Institute is the single entity responsible for coordinating the development of interoperability standards. To be sure, Congress required the Institute to seek

[6] EISA § 1301, to be codified at 15 U.S.C. § 17381.

[7] EISA § 1305(a), to be codified at 15 U.S.C. § 17385.

input from the Commission and a variety of other Federal and State agencies and private entities, and NRECA fully supports this and encourages all entities identified in Section 1305(a) of the EISA to provide the Institute with comments regarding appropriate interoperability standards. Nevertheless, the primary role in *developing* the standards has been assigned to the Institute.

While Congress clearly delegated the responsibility of coordinating the development of interoperability standards to the Institute, Congress also clearly recognized the Commission's role in *adopting* those standards. Section 1305(d) of the EISA states:

> At any time after the Institute's work has led to sufficient consensus in the Commission's judgment, the Commission shall institute a rulemaking proceeding to adopt such standards and protocols as may be necessary to insure smart-grid functionality and interoperability in interstate transmission of electric power, and regional and wholesale electricity markets.

In other words, the Commission has the authority to initiate rulemaking proceedings to adopt the Institute's recommended or consensus standards relating to interstate transmission and regional and wholesale electricity markets. However, as the Commission is well aware, it does not have the authority to initiate rulemaking proceedings to adopt interoperability standards relating to systems and facilities used to serve retail loads. Since much Smart Grid technology involves equipment installed in households and on distribution systems, it will be important for the Commission to coordinate its adoption of Smart Grid standards with bodies adopting standards for intrastate, retail uses. On the other hand, it should not be assumed that the same interoperability standards applied to transmission systems can be applied to distribution. For example, distribution system models are single phase and contain many more elements than transmission system models.

The Commission's enthusiasm for the implementation of a national Smart Grid is commendable. NRECA is encouraged by the pro-active stance the Commission has taken in voluntarily providing its comments and input to the Institute to efficiently coordinate the development of interoperability standards pursuant to section 1305(a) of the EISA. NRECA is equally encouraged by the fact that a significant portion of the Commission's language in its Smart Grid Policy is hortatory. For example, the Commission properly "urges" and "encourages" the Institute to consider the Commission's position.[8]

NRECA is concerned, however, that occasionally the Commission may have overstepped its bounds. In paragraph 39, for example, the Commission states that it "seeks comments from States and other parties on the optimal approach to develop standards in this area, and [it] will pursue direct communications with the States on this topic through the NARUC-FERC Smart Grid Collaborative and other NARUC Committees." Likewise, in paragraph 10, the Commission seeks comments "as to whether there should be some formal process for parties to seek Commission guidance if negotiations on certain interoperability standards reach an impasse." Congress clearly directed the Institute to coordinate with Federal and State agencies and private entities interested in interoperability standards, as well as with the Commission.[9] Congress only authorized the Commission to adopt standards on which there is consensus.[10] The final Smart Grid Policy statement would benefit from clarification that the Commission recognizes the limited nature of its role in the development of standards in accordance with the directives of Congress under section 1305(a) of the EISA and, correlatively the primary role of the Institute at the developmental stage.

3. The Commission should adhere to accepted ratemaking policies in developing an interim rate policy for the implementation of Smart Grid devices and equipment.

NRECA is concerned that the interim rate policy in the Commission's proposed action plan substantially exceeds what may be required to guarantee to "advance efficiency, security,

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8 *See e.g.*, Smart Grid Policy at ¶¶ 37, 38, 42.

9 EISA § 1305(a).

10 EISA § 1305(d).

and interoperability."[11] Accepted ratemaking practice disfavors single-issue ratemaking and requires the applicant to demonstrate that its proposed charges relate to use of assets that are used and useful. The Commission's proposed interim rate policy needlessly compromises these traditional principles.

Section 205(a) of the Federal Power Act requires "[a]ll rates and charges made, demanded or received by any public utility for or in connection with the transmission or sale of electric energy . . . shall be just and reasonable. . . ."[12] The public utility seeking a rate increase bears the burden of proof to show such increase is just and reasonable.[13] In its Smart Grid Policy, the Commission proposes to allow applicants seeking to recover the costs of Smart Grid deployment to begin with a presumption that all Smart Grid devices and equipment are used and useful.[14]

> For now, we propose as an interim rate policy to accept rate filings, including single issue rate filings, submitted under FPA section 205 by public utilities to recover the costs of Smart Grid deployments involving jurisdictional facilities provided that certain showings are made. In other words, we propose to consider Smart Grid devices and equipment, including those used in a Smart Grid pilot program or demonstration project, to be used and useful for purposes of cost recovery if an applicant makes the following showings.[15]

There are few ratemaking principles as fundamental as the doctrine that facilities forming the basis for charges must be "used and useful."[16] Court and Commission precedent recognize the question of whether a device or facility is used and useful is basic to the "just and

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[11] Smart Grid Policy at ¶ 45.

[12] 16 U.S.C. § 824d(a).

[13] 16 U.S.C. § 824d(e).

[14] Smart Grid Policy at ¶ 46.

[15] *Id.*

[16] *Smyth v. Ames*, 169 U.S. 466, 546 (1898); *Tennessee Gas Pipeline v. FERC*, 606 F.2d 1094, 1109 (D.C. Cir. 1979); *Mississippi River Fuel Corp.*, 4 FPC 340, 344 (1945); *Chicago District Electric Generating Corp.*, 2 FPC 412, 420 (1941).

reasonable" analysis.[17] A device that is not used and useful to current ratepayers should not be included in a utility's rate base.[18] The Commission's proposed presumption is contrary to established precedent and would inappropriately shift the burden of proof from the applicant to establish a proposed device is used and useful to customers to establish the proposed device is not used and useful.

As important as it is for the industry to take advantage of reasonable opportunities to adopt those technological advances that help utilities provide better service or lower the cost of power to consumers, not all investments in advanced technology will be "smart." The Smart Grid should not be viewed as an end in itself, nor should consumers be required to accept nebulous promises of future benefits. Consumers should not be required to pay for investments in the Smart Grid if they do not get clear benefits from that investment. For example, the Commission's proposed presumption could theoretically encourage a transmission owner to install synchrophasors on every transmission line, every transformer or every delivery point on the bulk-power system. Why not, if that investment is presumed used-and-useful? Of course, that expense would be imprudent. There must be an appropriate balance between such an extreme case and a transmission system that has no devices installed to provide data required for real-time operations. Consistent with Commission precedent, utilities seeking to invest in synchrophasors (or any other element of the Smart Grid) should be required to demonstrate that they found the right technological balance. Adherence to that traditional ratemaking principle

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17 *See e.g., Papago Tribal Util. Auth. v. FERC*, 773 F.2d 1056, 1060 (9th Cir. 1985) ("The test for determining whether an investment may be included in a utility's rate base is whether it is 'used and useful' in providing service to current customers."); *Anaheim v. FERC*, 669 F.2d 799, 808 (D.C. Cir. 1981) ("An item may be included in rate base only when it is 'used and useful' in providing service. . . . current ratepayers should bear only legitimate costs of providing service to them."); *Tenn. Gas Pipeline Corp.*, 606 F.2d at 1109; *New England Power Co.*, 42 FERC ¶ 61,016, at 61,018 (1988).

18 *Id.*

will ensure that the Smart Grid is implemented "at the pace of value," with new elements being integrated into the system as they become able to demonstrate value.

As for the single-issue rate filing proposal, it is contrary to long-standing court and Commission policy disfavoring single-issue ratemaking.[19] In Order No. 890, paragraph 767, the Commission clearly restated this policy:

> Allowing single-issue rate adjustments would enable a utility to increase the total rate charged by focusing solely on a single cost element, while avoiding scrutiny of all other determinants of the rate. The Commission has an obligation to ensure the justness and reasonableness of the total rate and it would be improper to allow a utility to raise rates by selectively focusing only on particular elements of its costs, while avoiding scrutiny of other rate inputs.

The Commission offers no explanation to support such a departure from precedent. Indeed, no such departure is warranted and it should not be included in the final Smart Grid Policy Statement.

Two other aspects of the Commission's treatment of rate issues in its proposed Smart Grid Policy raise concerns. In paragraph 51, the Commission proposes to permit applicants to file for recovery of "otherwise stranded costs of legacy systems that are to be replaced by smart grid equipment." The Commission indicates in paragraph 52 that it will entertain requests for rate treatments such as accelerated depreciation and abandonment authority for projects tied to Smart Grid deployments under the Commission's section 205 authority. It is not clear whether (or to what extent) these invitations are intended to change existing ratemaking policies. If they are so intended, mere fiat will not suffice to justify such changes. Some sort of basis for them

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[19] *See e.g., Carolina Power & Light Co. v. FERC*, 860 F.2d 1097, 1102 (D.C. Cir. 1988) (noting that FERC believes that wholesale rates should ordinarily be adjusted only upon a comprehensive review of cost-of-service data); *Preventing Undue Discrimination and Preference in Transmission Service*, Order No. 890, 72 Fed. Reg. 12,266 (Mar. 15, 2007) ("Order No. 890"), *order on reh'g*, Order No. 890-A, 73 Fed. Reg. 2984 (Jan. 16, 2008), *order on reh'g*, Order No. 890-B, 123 FERC ¶ 61,299 (2008); *City of Westerville, Ohio v. Columbus Southern Power Co.*, 111 FERC ¶ 61,307 (2005); *American Elec. Power Serv. Corp.*, 80 FERC ¶ 63,006 at 65,059 (1997) (noting a discrete change to a single component of AEP's cost-of-service, or a spot adjustment, is inherently unfair"), *aff'd in relevant part*, 88 FERC ¶ 61,141 (1999).

needs to be developed. Equally important, if these invitations are intended to change policy, detailed criteria for evaluating responsive rate applications need to be provided.

4. Cyber security should be a key component in modernizing the Nation's Smart Grid.

The agenda to develop a smarter grid for the Nation's electric transmission system comes at a time when the reliability and cyber security of the Nation's grid has received considerable press attention. In April 2009, numerous news sources reported that cyber spies had infiltrated the Nation's electric grid and left behind software that could disrupt the system.[20] While the press reports serve to highlight the importance of the transmission grid and the need to secure it, it is important to understand that the electric utility industry takes this responsibility seriously and has and will continue to take the necessary actions to protect the grid. With this in mind, the development of a smarter grid in any web-based expansion of the Nation's electric grid must be done in parallel with FERC-required level of cyber security protection in the North American Electric Reliability Corporation's ("NERC") Critical Infrastructure ("CIP") standards.

The evaluation and assessment of cyber security must be a part of due diligence in Smart Grid planning.

In its Smart Grid Policy, the Commission proposes at paragraph 14:

> to advise the Institute to undertake the necessary steps to assure that each standard and protocol that is developed as part of the Institute's interoperability framework is consistent with the overarching cybersecurity and reliability mandates of the EISA as well as existing reliability standards approved by the Commission pursuant to section 215 of the FPA. The Commission proposes to make consistency with cybersecurity and reliability standards a precondition to its adoption of Smart Grid standards.

NRECA agrees that the Commission is well-positioned to provide input to the Institute, in keeping with the requirements of section 1305(a) of the EISA, as to existing reliability standards

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[20] *See e.g.*, Ellen Nakashima and R. Jeffrey Smith, *Electric Utilities May be Vulnerable to Cyberattack*, Washington Post A04 (Apr. 9, 2009); Associated Press, *Electricity Grid in U.S. Penetrated by Spies*, Wall Street J. A1 (Apr. 8, 2009).

recently adopted by the Commission.[21] NRECA further agrees that the Commission is well-positioned to provide input to the Institute on cyber security threats and vulnerabilities that could impact the reliability of the bulk-power system.

5. The Commission's authority to adopt appropriate cyber security standards is limited by its authority to ensure the reliability of the bulk-power system.

NRECA commends the Commission's efforts to provide timely input to the Institute in its coordination of the development of interoperability standards with regards to the bulk-power system. In paragraphs 29-30, the Commission acknowledges its interests in adopting appropriate cyber security standards stem from its authority to ensure the reliability of the bulk-power system. Within these parameters, NRECA agrees with the Commission that:

> ***to the extent they could affect the reliability of the bulk-power system***, Smart Grid technologies must address, the following considerations: (1) the integrity of data communicated. . .; (2) the authentication of the communications. . .; (3) the prevention of unauthorized modifications to Smart Grid devices and the logging of all modifications made; (4) the physical protection of Smart Grid devices; and (5) the potential impact of unauthorized use of these Smart Grid devices on the bulk-power system.[22]

However, as discussed in section 2, it is not the Commission's role to adopt standards relating to retail customers and distribution systems. The National Association of Regulatory Utility Commissioners ("NARUC") and State agencies are better positioned to provide input to the Institute with regard to standards relating to retail customers and distribution systems.

6. The Commission should recognize that a number of NERC reliability standards may need to be developed or revised concurrently with the implementation of Smart Grid technology.

As discussed in section 4 above in regard to the development of CIP standards, the NERC process is also the appropriate vehicle for the development of any new or revised reliability

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[21] Smart Grid Policy at ¶¶ 13-14. *See Mandatory Reliability Standards for Critical Infrastructure Protection*, Order No. 706, 73 Fed. Reg. 7368 (Feb. 7, 2008), 122 FERC ¶ 61,040, *reh'g denied and clarification granted*, Order No. 706-A, 123 FERC ¶ 61,174 (2008).

[22] Smart Grid Policy at ¶ 30 (emphasis supplied).

standards. The Commission's policy should recognize that new NERC standards may need to be developed or revised for the successful operation of the bulk-power system based upon the implementation of Smart Grid technology. Once the NERC standards are developed, the Commission is then tasked with reviewing those standards. A complete statement of policy regarding development of a Smart Grid should include reference to how the Commission plans to integrate its adoption of Smart Grid standards with its adoption of corollary changes in NERC reliability standards.

7. Software models and standards developed to allow inter-system communication and coordination should be implemented at the pace of value.

NRECA recognizes the importance of inter-system communication and coordination to the successful modernization of the National Smart Grid. In fact, as has been mentioned, electric cooperatives have been at the forefront of developing a software model to enable the coordinated integration of distribution system monitoring, management, operations, and planning. Ten years ago, NRECA's Cooperative Research Network ("CRN"), a research and development vehicle for cooperatives, convened a group of industry vendors and launched the MultiSpeak Initiative to develop a set of specifications to enable the integration of automation software. At the request of users the MultiSpeak Initiative has expanded over the years and currently NRECA is working with industry vendors, international standards organizations, and the Institute to expand and strengthen MultiSpeak.

While MultiSpeak specifications were initially developed for software used by distribution cooperatives, the MultiSpeak Initiative is now testing a new version intended to harmonize MultiSpeak with standards developed by Technical Committee 57 of the International Electrochemical Commission used by transmission and wholesale power utilities. As of this year, over 300 utilities, including electric cooperatives, municipal utilities and investor-owned utilities in the United States as well as a number of utilities in North American and Europe, are using MultiSpeak interfaces developed in consultation with the 45 vendors who make up the MultiSpeak Initiative.

NRECA acknowledges and agrees with the Commission that there is an "urgent need" to develop software models for enabling inter-system communication and coordination.[23] However, software models and standards should be implemented "at the pace of value." In other words, new elements should not be integrated into the system until those elements are shown to add value to the system at a reasonable cost.

8. With more research, the successful integration of plug-in hybrid vehicles could support the reliability of the bulk-power system.

NRECA members are positioned at the forefront of the plug-in hybrid vehicle ("PHEV") movement. CRN has launched a number of projects over the past several years with the primary objective of testing and analyzing PHEV technology. Specifically, CRN has converted hybrid vehicles to PHEVs for use in cooperative fleets. These conversions have been at considerable expense to CRN since there are no commercial vendors for PHEV conversions or PHEV manufacturers at this time. Today, at least 15 electric cooperatives are using PHEVs in their fleets.

In September 2008, CRN launched a PHEV Users Group open to all NRECA member cooperatives. Through the PHEV Users Group, any cooperative can participate in CRN's PHEV research, the goals of which include "assessing how PHEVs might affect electric co-ops, consumers, and the entire electric utility industry; gaining hands-on experience with vehicle performance on a day-to-day basis; finding out if PHEVs can save co-op consumers money by charging overnight for less than the cost of gasoline or diesel fuel; and looking into the feasibility

[23] Smart Grid Policy at ¶ 16.

of PHEVs being turned into a source of distributed generation that co-ops and consumers could tap during a power outage."[24] In addition, CRN supports Plug-in Partners, a national grassroots campaign seeking to build a market for flex-fuel PHEVs.

Research efforts such as CRN's are advancing the enormous potential of PHEVs to lower gasoline consumption, decrease U.S. dependence on imported oil and reduce carbon dioxide emissions when PHEVs are recharged by electricity generated from renewable resources. At the same time, NRECA realizes the substantial challenge that the integration of PHEVs poses for electric utilities. In order for PHEVs to support the reliability of the bulk-power system, the electric industry must understand and prepare for the additional demands that PHEVs may put on all aspects of generation, transmission, and distribution. Continued research and analysis of PHEV technology is critical to the successful integration of PHEVs. NRECA and CRN are committed to that work. Recognize, of course, that until that research has been conducted, it would be premature to develop standards for the integration of PHEVs. Betty Crocker does not publish a recipe in her cookbook until it has been tested, tried, and proven.

9. The Institute should partner with NAESB or ANSI to develop appropriate use cases.

The Commission proposes the partnering of the Institute with the North American Energy Standards Board ("NAESB") in developing the "use cases" necessary to identify the functional and technical requirements the interoperability standards will need to address for the bulk-power system.[25] NRECA agrees that the Institute's pairing with NAESB or the American National Standards Institute ("ANSI") is appropriate. The interoperability standards development process will benefit most if those who will be buying and using the Smart Grid devices and products provide input into the development of the appropriate use cases.

[24] "Have Plug, Will Travel" published in Rural Electric Magazine. A copy of this article is attached as Attachment A.

[25] Smart Grid Policy at ¶ 43.

Conclusions

NRECA appreciates the opportunity to comment on the Commission's proposed Smart Grid Policy statement and looks forward to participating in the continuing dialogue on this important subject.

Respectfully submitted,

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ATTACHMENT A

CLOSING THE REALITY GAP ON CLIMATE CHANGE

In the first and largest project of its kind, electric co-ops are testing whether plug-in hybrid electric vehicles can wean our nation off foreign oil, curb greenhouse gas emissions, and increase off-peak electric sales

By **Peter Nye**

HAVE PLUG, WILL

As prices continue to shoot up at gas pumps, Alan Shedd, commercial-industrial marketing engineer at Jackson Electric Membership Corporation in Jefferson, Ga., draws stares and questions from strangers who spot the eye-catching graphics of the Toyota Prius plug-in hybrid electric vehicle (PHEV) he drives for the co-op.

"People stop me in the parking lot of grocery stores, rest stops, and elsewhere and ask if it really gets 100 miles per gallon as painted right above the gas tank," he remarks. "Often, they want to know how to get one."

Of course, PHEVs won't be commercially available for at least a few years. Jackson EMC's model joins only about 100 now cruising about the country, all retrofitted by a handful of shops in what's essentially become a fledgling cottage industry.

But information Shedd collects while driving the PHEV as part of his duties for the 200,000 member distribution co-op, located 50 miles northeast of Atlanta, will be evaluated as part of a two-year study being conducted by NRECA's Cooperative Research Network (CRN). Three other electric co-ops are also participating in the project: Basin Electric Power Cooperative, a multistate generation and transmission (G&T) co-op headquartered in Bismarck, N.D., and two distribution systems, Four County Electric Membership Corporation in Burgaw, N.C., and Salem Electric in Salem, Ore.

Dan Allen, vice president of Four County EMC in North Carolina, gets 70 miles per gallon from the Toyota Prius hybrid he converted to a plug-in. A monitor mounted on the dashboard displays in real time the status of various operating components.

PHOTOGRAPHS BY ED THOMPSON

TRAVEL

"This program has a lot of spunk," asserts Ed Torrero, CRN executive director. "It is the first and largest set of PHEV tests now under way nationally, a distinction for electric co-ops. We offer diversity spread over a large geographic area."

CRN goals include assessing how PHEVs might affect electric co-ops, consumers, and the entire electric utility industry; gaining hands-on experience with vehicle performance on a day-to-day basis; finding out if PHEVs can save co-op consumers money by charging overnight for less than the cost of gasoline or diesel fuel; and looking into the feasibility of PHEVs being turned into a source of distributed generation that co-ops and consumers could tap during a power outage.

PHEV primer

Shedd, who has experience designing and building electric cars and has taught high school classes about the technology, started the PHEV effort rolling last February with a cross-country trek from Monrovia, Calif.—where his 2004 Prius gasoline-electric hybrid with 60,000 miles was turned into a plug-in by the engineering firm EnergyCS—to Jackson EMC headquarters. He has since logged an additional 30,000 miles.

The EnergyCS conversion, which cost roughly $30,000 and took place over four days, included putting in a plug-in charging system accessed above the left rear bumper, disassembling part of the car's interior, mounting extra restraints to hold down the larger battery, and installing software that operates a special data-collection monitor sitting atop the dashboard.

"For a geek like me, the monitor is great—like having a video game in my car," Shedd, a member of the CRN Renewable Energy & Distributed Generation Membership Advisory Group, declares. "I watch in real time what goes on 'under the hood'—miles per gallon and how much electricity and gas get used."

Compared with conventional cars, a factory-built hybrid—such as the Toyota Prius or Ford Escape SUV—achieves better gas mileage around town and when driven at lower speeds because its 1.3-kWh nickel-metal hydride battery/electric motor and gasoline engine both provide power. The battery constantly gets recharged by the engine and regenerative braking system.

In Shedd's PHEV, the nickel-metal hydride battery was replaced with a custom-built 9-kWh lithium-ion model—a much larger version of those used in cell phones and laptops—that delivers more electric power and better fuel economy. When the battery runs down to the point where a one-third charge remains, the PHEV starts acting like a regular hybrid, using the gasoline engine to maintain that level. But the engine and brakes don't recharge the battery much further. Instead, a full charge requires a regular 110-V outlet.

"When plugged in, a PHEV can recharge in four hours," says Torrero. "Doing so consumes around 4 kilowatt-hours, or about 40 cents, of electricity. It's cheaper to fully recharge the battery this way than using the gasoline engine."

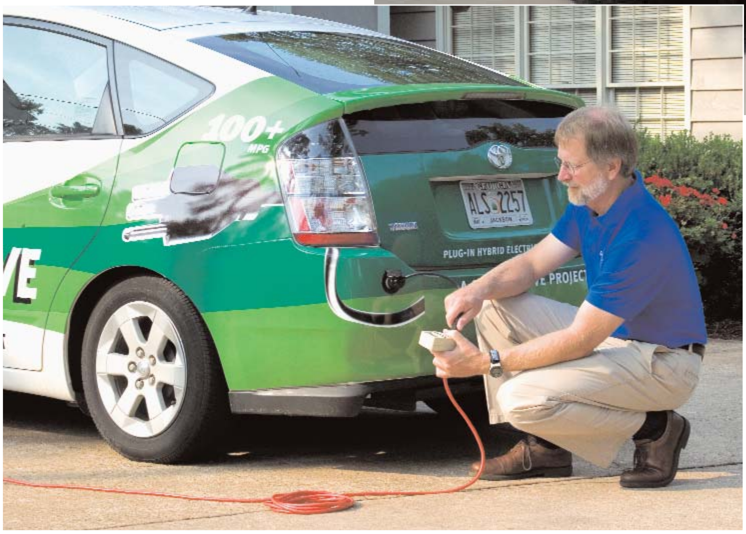
The lithium-ion batteries, which cost more than the car itself, also offer greater range. "On my drive to work, around 30 miles, I can get 100 miles per gallon—I'm using electricity most of the time and little gas," Shedd indicates. "When the batteries run down and the gas engine kicks in, the PHEV averages 50 miles per gallon."

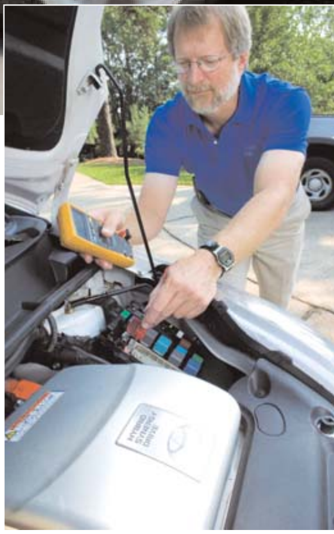
As Shedd prepared to get behind the wheel in California for his cross-country drive to the Peach State, EnergyCS engineers suggested he first stop by a local Home Depot store and buy an extension cord.

"I bought two cords—one 25 feet long, the other 50 feet," he recalls. "Usually I can find an outlet within that length."

Driving 2,800 miles in three days, Shedd discovered that inexpensive motels allowed him to park directly in front of the room so he could stretch the cord from inside.

"I put a little duct tape down on the sidewalk so nobody would trip over it," he recounts. "At one motel, I discovered the only available outside plug was blocked by another guest's car. So I drove around and found a different motel with an outlet where I could park."





Eye-catching graphics allow Alan Shedd, commercial-industrial marketing engineer at Jackson EMC, to quickly communicate the advantages of the Georgia co-op's plug-in hybrid electric vehicle. Information he collects while driving the car will be evaluated as part of a two-year study being conducted by NRECA's Cooperative Research Network.

Last October, Shedd cruised to Washington, D.C., to show lawmakers—and the media—how PHEVs work. At an upscale Capitol Hill hotel, he was treated to parking his vehicle at the valet stand.

"The attendants were very interested in how it worked," he marvels. "I stressed that on longer trips, or at speeds faster than 35 miles per hour, the gasoline engine runs more of the time to deliver additional energy. But since it's cheaper to 'burn' electricity, you can run the car overall for the equivalent of buying gasoline at 80 cents per gallon. And battery power doesn't produce any tailpipe emissions."

Enhancing load balance

A joint 18-month study by the Electric Power Research Institute (EPRI), a non-profit utility-sponsored consortium based in Palo Alto, Calif., whose members include electric co-ops, and the Natural Resources Defense Council (NRDC), an environmental advocacy group headquartered in New York City, released last July finds that greater use of PHEVs promises huge environmental benefits.

"Widespread adoption can reduce greenhouse gas emissions [blamed for contributing to global climate change] from vehicles by more than 450 million metric tons annually by 2050—equivalent to removing 82.5 million passenger cars from the road," points out Mark Duvall, EPRI director of electric transportation. "Combined, the country's electric and transportation sectors account for nearly three-quarters of all U.S. greenhouse gas emissions from human activity. Electricity generation alone represents the biggest chunk, about 40 percent—mostly from carbon dioxide being released when fossil fuels like coal and natural gas are burned."

In the 2007 report *Electricity Technology in a Carbon-Constrained Future*, EPRI spelled out how electric utilities can help the United States slash carbon dioxide emissions below 1990 levels within 22 years—even as they take on about 40 percent more load, half of which will be generated by coal—if aggressive steps are taken in seven principal areas, including making PHEVs commercially available. The study assumes that PHEVs will hit the market around 2010 and comprise 10 percent of new vehicle sales by 2017 and 30 percent by 2027—a schedule that would require significant market transformation.

In addition to lowering gasoline consumption—and U.S. dependence on imported oil—by about 3 million to 4 million barrels per day (20 percent of current consumption), PHEVs further cut carbon dioxide emissions when batteries are recharged by electricity generated from renewable resources. EPRI estimates 50,000 MW of addi-

PHOTOGRAPHS BY ROBB MAAG / LSIPHOTO.COM

tional green power will be developed by 2020, with the total then rising by about 2,000 MW a year through 2030.

According to a study by the U.S. Department of Energy Pacific Northwest National Laboratory in Richland, Wash., the nation's existing power grid could fuel as many as 180 million PHEVs. Duvall calculates that PHEV batteries would be charged three-quarters of the time during off-peak periods, raising electric demand between 3 percent and 4 percent and better balancing utility loads. The end result: greater system efficiencies that could help hold down costs.

"Plug-ins have the potential to create the greatest end-use product, and greatest challenge, for electric utilities since air conditioning was introduced in the 1950s," Torrero relates. "Air conditioning load grew much faster than expected and caught a lot of utilities unprepared, including electric co-ops. We need an early understanding to get ahead of any unintended consequences."

Torrero contends that if PHEVs become popular, they will put extra demands on all aspects of electric co-op operations, from residential transformer sizing to distribution system and generation capacity. "But PHEVs also represent an opportunity for new off-peak load growth, increased kilowatt-hour sales, and lower transportation costs for co-ops and their consumers."

Conversion fly-in

Even though the Achilles heel of PHEVs remains energy storage, Torrero feels confident that entrepreneurs in the market will soon achieve the long-awaited "battery physics breakthrough." One of these firms, A123 Systems, founded in 2001 in suburban Boston, Mass., produces a 225-lb. lithium-ion battery pack that features conductive material made from thin layers of nanophosphate, licensed from the Massachusetts Institute of Technology.

"The batteries are made up of more than thousands of individual cells, each the size of a roll of quarters," Torrero explains.

Basin Electric Power, serving 125 member co-ops in nine states, created a media event late last October when one of its two Ford Escapes was converted to a PHEV during the Great Plains Energy Expo & Trade Show in the Bismarck Civic Center Exhibit Hall. Experts flown in from A123 Systems and its subsidiary, Hymotion out of Toronto, Canada—which makes custom-engineered Battery Range Extender Modules that can be installed in the spare-tire well—modified the SUV in about six hours. Watching the process take place were North Dakota Governor John Hoeven (R), U.S. Sen. Byron Dorgan (D-N.D.), U.S. Energy Secretary Samuel Bodman, Basin Electric Power CEO/General Manager Ron Harper, and students from a local automotive vocational-tech school.

"The retrofit added an 8 kilowatt-hour lithium-ion battery to supplement the Escape's 330-volt nickel-metal hydride battery," comments Chris VandeVenter, Basin Electric Power legislative representative. "Working together, the gasoline engine and electric motor produce a combined 155 horsepower. We initiated the process in response to a 2006 membership resolution that endorsed the national grassroots campaign of Plug-In Partners. [CRN has also joined more than 500 cities, businesses, utilities, auto manufacturers, and battery developers in support of Plug-In Partners, a coalition seeking to build a market for flex-fuel, plug-in hybrid vehicles.] The resolution tied in nicely with discussions we already had under way to improve the efficiency of our vehicle fleet."

In fall 2006, Ron Rebenitsch, Basin Electric Power manager of alternative technologies and chairman of the CRN Renewable Energy & Distributed Generation Membership Advisory Group, asked VandeVenter to take charge of the Basin Electric Power conversion. CRN had just approved the PHEV research project, and VandeVenter then contacted Hymotion, the only company at the time performing conversions on Ford Escapes. However, the G&T needed to get in line behind Internet giant Google, which had previously hired Hymotion to adapt its growing fleet of hybrids into PHEVs.

"Hymotion engineers perfected the conversion process with Google, and we were next," VandeVenter reports. "We've assigned the PHEV to our government relations department and make it available to others as needed to enhance its exposure."

No golf cart

When Dan Allen, vice president of Four County EMC in Burgaw, N.C., first started driving his Toyota Prius PHEV last fall, he expected it to handle as sluggish as a golf cart.

"That's not the case," he admits. "It has a lot of pick-up. I'm impressed."

He's also satisfied with fuel savings from commutes around the co-op's service territory, which includes more than 5,400 miles of lines in the southeastern corner of the Tar Heel State.

"Our fleet vehicles [pickups and cars] average about 20 miles per gallon," Allen suggests. "Last April, we bought a Prius hybrid which gets 46 to 48 miles per gallon. Now, with the Prius converted to a PHEV [by A123 Systems and Hymotion], I can get 70 miles per gallon. If I used it just for local trips no longer than 30 miles or so, I'd never have to fill up at a gas station."

Four County EMC volunteered for CRN's PHEV endeavor. "We wanted to be part of the solution about global warming," Allen maintains. "This car demonstrates our commitment, and we let our members know of its success. We drive it in parades. It's the subject of two middle school projects. We visit local high schools and talk with the students about green power, plug-ins, and the conversion. That gives us the opportunity to talk about cooperatives, Touchstone Energy®, and to tell our youngsters what we do."

The latest co-op to join the PHEV family, Salem Electric in northwestern Oregon, did so "to find ways to use electricity for transportation, and we wanted to test the new hybrids," notes Roger Kuhlman, the co-op's manager of engineering & operations and a member of the CRN Renewable Energy & Distributed Generation Membership Advisory Group. Salem Electric's service territory spans 17 square miles and embraces 18,000 consumers.

"A lot of our trips are under 30 miles," Kuhlman discloses. "At the same time, we have hills, so we need a boost from the gas engine. The PHEV will give us the optimum of gas and electric power."

In 2006, the co-op bought a Ford Escape hybrid that more than doubled the miles per gallon as compared to a Ford Explorer SUV. Kuhlman had the vehicle converted last month by Hybrids Plus of Boulder, Colo., and then drove it to the CRN Renewable Energy & Distributed Generation Membership Advisory Group meeting in Phoenix, Ariz.

Chris VandeVenter, Basin Electric Power Cooperative legislative representative, uses the wholesale power supplier's Ford Escape SUV plug-in as a co-op "innovation ambassador."

PHOTOGRPAPHS BY MARK LUINENBURG

"We're a bit skeptical but plan to put the plug-in through its paces reading meters, meeting with members, and maintaining our electric system," he insists. "If it does work, hopefully car manufacturers will get on board and make them in bigger numbers and lower costs."

Back to the future

From Shedd's years of talks before classrooms, civic clubs, and lawmakers about hybrids and plug-ins, he observes that people often confuse them with electric vehicles (EVs), typically perceived as slow.

"The reality is that electric motors generate a lot of torque at lower speeds, better than gasoline combustion engines that produce maximum torque at high speeds," he says. "An electric vehicle, such as the all-electric $98,000 Tesla Roadster, puts out a huge amount of power right off the line—from zero to 60 in four seconds."

The world land speed record for an EV, incidentally, tops 300 mph, and EV dragsters are allowed on most tracks that hold National Hot Rod Association events. The Portland, Ore., International Raceway provides 240-V outlets that charge 10 EV dragsters at a time. EV dragsters, though, don't usually race heats against gas-combustion rivals because spectators accustomed to the roar of engines find the quiet EV dragsters underwhelming.

Ferdinand Porsche, renowned for designing the Volkswagen (and whose son made the sports car company famous), built an electric car and drove it 38 miles at the Paris Exhibition of 1900. Porsche and Vienna coach builder Jacob Lohner added an internal-combustion gas engine to charge the batteries. The Lohner-Porsche prototype hybrid reached a top speed of 35 mph.

In the United States, electric cars were more popular than their gasoline-powered cousins at the start of the 20th century because gas engines required drivers to turn a dirty hand crank on the front of the vehicle to get the engine started.

"Electric cars appealed to women because they didn't have to get out of the car or risk breaking an arm from a cantankerous crank," Shedd mentions.

By 1920, thanks to the arrival of the starter motor, more roads being paved (allowing for excursions beyond the range of batteries), and relatively cheap gasoline prices, electric cars were pushed aside. Now, with crude oil prices crowding $100 per barrel and anxieties over global warming climbing, EVs, hybrids, and PHEVs are finding new life.

"Going electric" may also be a key to economic survival. Authors Ian Carson and Vijay V. Vaitheeswaran of *Zoom: The Global Race to Fuel the Car of the Future* (Twelve Press) warn of potential geopolitical calamity if rates of car ownership rise in developing nations like China (from nine personal vehicles per thousand eligible drivers today) and India (11 for every 1,000) to even half of the U.S. total (1,148 for every thousand) and gasoline remains the fuel of choice—100 million more barrels of oil per day, greater than the 86 million barrels now used daily worldwide, will be required.

Bob Gibson, CRN manager of the PHEV demonstration project, believes PHEV conversions could pick up this year when Hymotion offers Battery Range Extender Modules for second-generation Priuses and Escapes that could be installed for about $10,000 at a local garage.

"Conversions represent an intermediate step toward getting PHEVs mass produced," Gibson concludes. "The future becomes reality when automobile manufacturers mass produce PHEVs in volume, like any other car or light truck." ■

This article represents the seventh and final installment in a series on how electric co-ops are looking out for their consumers and working to control power costs in an environmentally responsible fashion. Aimed at "closing the reality gap" on public understanding about climate change, the series examines ways electric co-ops are addressing seven Electric Power Research Institute recommendations that will allow the electric utility industry to slow, halt, and eventually decrease carbon dioxide emissions to 1990 levels by 2030 while still meeting demand for affordable, reliable electricity. The seven recommendations (some of which are still on the drawing table) are: boosting energy efficiency, improving the operating efficiency of coal-fired power plants, investing in renewable energy, expanding nuclear power capacity, capturing and storing carbon produced by coal-fired power plants, adding distributed generation resources, and putting plug-in hybrid electric vehicles on the road.