

PREVENTING THE IMPENDING DEATH OF PRIVACY BY THE SMART GRID

BY

DUSTIN VERGASON*

This Comment discusses the benefits of the continuing evolution of a smarter electricity grid and how to overcome the negative effects these advancements will have on privacy. Ensuring both utilities and consumers can utilize the full range of smart technologies to better control and manage electrical usage could have enormous impact on the integration of more renewable power sources and assist in slowing climate change. The installation of smarter electrical meters and more internet-connected appliances can give utilities and their customers increasing information about the best time to use electricity. In many areas of the country, utilities have installed, and are continuing to install, digital smart meters capable of communicating incremental and real-time usage back to the utilities. This information can be used in a variety of beneficial ways including grid management, future system planning, and energy efficiency programs. However, this information comes at a huge cost to customers' privacy. Incremental electricity usage data for individual homes can reveal an incredible amount of data on what is happening in the customer's home. Fears over this invasion of privacy has led to opposition in many areas of the country where utilities have installed or attempted to install smart meters. Privacy advocates have raised alarm by stoking fears of governmental and corporate invasion of privacy within the home and have ultimately been successful preventing some smart meter installation.

Juxtaposed against these privacy concerns is the need to combat climate change and advance renewable energy development. Not only will a smarter grid allow utilities to create a more stable and efficient grid, it will also allow consumers to see the real time cost of electricity which could encourage improved, more efficient usage. Knowledge of the costs of electricity at different times of the day would give consumers the option to shift power usage to times where demand is

*2020 Graduate of Lewis and Clark Law School in Portland, Oregon. I would like to thank Professor Lisa Benjamin and Professor Melissa Powers for providing guidance and input on this Comment. I would also like to thank my wife, Heather, for her support, understanding, and patience.

less and cost of power lower. Increased integration of renewable power would be greatly aided by this, as would the reliability of the nation's aging electrical grid. Taking full advantage of a smarter grid would greatly enhance carbon-neutral power sources and is vital to combatting climate change.

This Comment argues that consumers can both have their cake and eat it too. Privacy can be adequately protected with carefully drafted laws while still allowing utilities and consumers to gain the advantages of a smarter grid. Antiquated privacy laws in many states either lack the privacy protections needed to adequately protect utility customers or have strict privacy protections that do not allow proper use of smart grid technology. Requiring balanced privacy protections for consumers will improve the implementation of the smart grid and reduce the large-scale opposition from privacy groups that has sprung up in many areas. This will allow utilities and consumers to take advantage of the smart grid technology to make informed choices on electricity usage and reduce climate impacts of electricity, all without having to surrender privacy within the home.

| | | |
|------|--|-----|
| I. | INTRODUCTION | 551 |
| II. | THE CURRENT AND POTENTIAL FUTURE STATE OF THE SMART GRID | 554 |
| | A. <i>The Rise of Smart Meters</i> | 555 |
| | B. <i>The Battle Between Privacy Advocates and the Smart Meter</i> | 557 |
| | C. <i>The Naperville Case and Its Implications</i> | 559 |
| | D. <i>The Future of Smart Grid Technology</i> | 562 |
| III. | ADVANTAGES AND BENEFITS OF A SMART GRID..... | 564 |
| | A. <i>How Utilities Benefit from a Smarter Grid</i> | 565 |
| | 1. <i>Grid Reliability, Stability, and Resilience</i> | 565 |
| | 2. <i>Integration of Renewables</i> | 566 |
| | 3. <i>Investment and Cost Savings</i> | 567 |
| | B. <i>How Consumers Benefit from a Smarter Grid</i> | 567 |
| | C. <i>Advertising and Revenue Generation</i> | 568 |
| IV. | THE STATE OF PRIVACY LAWS AND A SOLUTION | 569 |
| | A. <i>Different State and Federal Privacy Laws</i> | 570 |
| | B. <i>Local Options</i> | 571 |
| | 1. <i>Why Opting Out Is Not a Solution</i> | 572 |
| | 2. <i>Anonymity and Security of Information</i> | 573 |
| | 3. <i>Exceptions for Efficiency Programs</i> | 574 |
| | C. <i>A Balanced Solution</i> | 574 |
| V. | CONCLUSION | 575 |

I. INTRODUCTION

Our own information . . . is being weaponized against us with military efficiency. Every day, billions of dollars change hands and countless decisions are made on the basis of our likes and dislikes, our friends and families, our relationships and conversations, our wishes and fears, our hopes and dreams. These scraps of data, each one harmless enough on its own, are carefully assembled, synthesized, traded and sold.

– Apple CEO Tim Cook¹

Decarbonizing the nation’s power grid is critical to fighting climate change. This involves relying more on renewable power sources, such as wind and solar, instead of coal or natural gas. It also involves electrifying our transportation grid to eliminate gasoline and other fossil fuels from automobiles. This great challenge will require changes in technology and how society utilizes that technology. An important part of this decarbonizing effort usually ignored is the smart grid. Composed of two-way communication between consumers of electricity and the utility and other communication devices, a smarter grid can greatly aid the shift from carbon-based power to renewables.² The potential advantages of installing a smart grid are enormous. In 2010, the Pacific Northwest National Laboratory, a group funded by the Department of Energy, published a study finding that the smart grid had the potential to reduce total carbon emissions by 12% by 2030.³ The study found that, by fully utilizing the smart grid, the nation could eliminate sixty-six typical carbon coal plants’ worth of power and carbon emissions each year—enough to power 70 million homes.⁴ The efficiencies and improved grid reliability could also ease the transition for transportation to electric vehicles by lessening the amount of required expensive transmission infrastructure.⁵ The smart grid can greatly aid the nation in the battle against climate change.

Unfortunately, the early adoption of smart meters, one of the major technologies of the smart grid, has slowed substantially over the last few years as opposition from privacy advocates has risen.⁶ Smart meters and other smart grid technology allow utilities to gather an immense amount

¹ Tim Cook, Keynote Address at the International Conference of Data Protection and Privacy Commissioners (Oct. 24, 2018).

² *The Smart Grid and Renewable Energy*, INST. OF ELECTRICAL & ELECTRONICS ENGINEERS, <https://perma.cc/3BVN-7247> (last visited Feb. 8, 2021).

³ PAC. NW. NAT’L LAB., *THE SMART GRID: AN ESTIMATION OF THE ENERGY AND CO2 BENEFITS*, at v (Jan. 2010), <https://perma.cc/7UXQ-P8WR>.

⁴ *Smart Grid Could Reduce Emissions by 12 Percent*, PAC. NORTHWEST NAT’L LABORATORY (Jan. 28, 2010), <https://perma.cc/XHK9-QY3Z>.

⁵ *Id.* at 3.25.

⁶ Robert Walton, *Smart Meter Deployments Slow as Questions Emerge Over Cost Effectiveness, Saturation*, UTIL. DIVE (Nov. 28, 2018), <https://perma.cc/Q8H2-NUN3>.

of information about individual home usage. The information can include real-time information about what appliances are on in the home and what residents within the home are doing.⁷ The plethora of information gathered by these smart devices raises a lot of privacy concerns. Privacy advocates have argued that this information could be used by the government for criminal prosecutions.⁸ It could also be used by third parties for advertising purposes.⁹ More nefarious uses can include blackmail, use by thieves to determine when residents are home, stalking, domestic abuse, and more.¹⁰ Questions also arise about who owns the information collected. Could it be used in court to prove infidelity in divorce proceedings? Could utilities sell the information for targeted advertising by companies such as Amazon or Google? Could insurance companies use it to demonstrate an unhealthy lifestyle or higher risks based on electricity usage and then adjust rates accordingly? Could manufacturers use it to invalidate a warranty showing the product was used beyond the warranty requirements? The massive amount of information generated by smart meters and smart appliances should be deeply concerning for consumers. The variety of uses that the information could enable has been highlighted by privacy groups and used to slow or stop smart meter installation in several areas.¹¹ Sadly, while this may protect consumers from privacy invasions or nefarious uses, both the consumers and the utilities lose the benefits of having a smarter grid.

Finding a middle ground where privacy can be properly protected and a smart grid fully implemented is crucial to reducing our carbon emissions in the electrical grid, thus combatting climate change. Because of the profit incentives in selling this information for utilities and their third-party vendors, it is unlikely they will properly protect consumers. State and local laws have had some success at protecting privacy,¹² but many more have either proven woefully deficient by allowing privacy invasions¹³ or, on the opposite end of the spectrum, preventing the

⁷ *Are There Privacy Concerns With Smart Meters*, RADIATION HEALTH RISKS, <https://perma.cc/XSP9-JP5H> (last visited Feb. 9, 2021).

⁸ Samuel J. Harvey, *Smart Meters, Smarter Regulation: Balancing Privacy and Innovation in the Electric Grid*, 61 U.C.L.A. L. REV. 2068, 2082 (2014).

⁹ *Id.* at 2079.

¹⁰ Cheryl Dancy Balough, *Privacy Implications of Smart Meters*, 86 CHI.-KENT L. REV. 161, 168 (2011).

¹¹ *See id.* at 163 (those concerned about privacy risks associated with smart meters submitted more than 450 comments in response to draft report written by the National Institute of Standards and Technology); *Why Stop Smart Meters?*, STOP SMART METERS!, <https://perma.cc/WHE8-GL6F> (last visited Feb. 9, 2021); *Local Group Directory*, STOP SMART METERS!, <https://perma.cc/2JZL-22JL> (last visited Feb. 9, 2021).

¹² *See* CONSTANCE DOURIS, LEXINGTON INST., BALANCING SMART GRID DATA AND CONSUMER PRIVACY 10–12, 17 (2017) (discussing laws adopted by California, Texas, Illinois, and Vermont to protect utility customers' data collected through smart grid programs).

¹³ *See* Balough, *supra* note 10, at 181–82 (noting the privacy laws in Colorado and Illinois allow government agencies to request customer information from a utility without a warrant or court order).

installation smart grid technology.¹⁴ Proper privacy laws that address smart grid information could be addressed in a nationwide solution but will most likely require a state-by-state effort. Passing a balanced privacy law that allows the full use of a smart grid while protecting consumers will stifle opposition from privacy groups while allowing utilities and consumers to fully benefit from the smart grid.

Part II of this Comment first defines the smart grid and discusses smart meter installation. Smart meter installation has been the most visible and controversial portion of the smart grid.¹⁵ The initial surge of installation of smart meters has slowed substantially due mostly to the rise of opposition by privacy advocates.¹⁶ After discussing the opposition to smart meters by privacy advocacy groups and its effect, the discussion turns to a recent Seventh Circuit court case and its implications for the smart grid and privacy discussion. This case highlights some of the issues surrounding smart meters and how they can and should be used including the legal risks utilities and consumers face in having smart meters installed. It also demonstrates how courts are poorly equipped to protect consumers in this new technological area.¹⁷ Finally, the Part deals with advances in other smart grid technology and how they will create both enormous potential advantages and risks to consumers and utilities.

Part III illuminates all the advantages that a fully implemented smart grid offers to both utilities and consumers. In addition to emission reductions and efficiencies, the smart grid has the potential to increase grid reliability and resilience,¹⁸ allow better integration of renewable power sources,¹⁹ and provide better use of the transmission system.²⁰ It also can generate cost savings for both consumers and utilities in a variety of ways. Convenience and climate change mitigation can also be factors that encourage consumers to adopt the smart grid. These benefits and advantages are worth the trouble of finding a legal solution that will protect consumers' privacy and security.

The last part, Part IV, discusses the various state and federal protections currently in place and explains that they are mostly inadequate. Possible local solutions to privacy concerns are then

¹⁴ Daniel Shea & Kate Bell, *Smart Meter Opt-Out Policies*, NAT'L CONF. OF ST. LEGISLATURES (Aug. 20, 2019), <https://perma.cc/CY58-Q8RR> (noting that several states have laws allowing customers to prevent utilities from installing smart meters).

¹⁵ Sarah Breitenbach, *Amid Health, Privacy Fears, States Are Letting People Reject 'Smart Meters,'* PEW CHARITABLE TR. (Feb. 5, 2016), <https://perma.cc/A32J-LQDH> (noting that a small, outspoken group of people oppose smart meters due to concerns about health effects).

¹⁶ See discussion *infra* Part II.B.

¹⁷ See discussion *infra* Part II.C.

¹⁸ See generally U.S. DEPT OF ENERGY, SMART GRID INVESTMENTS IMPROVE GRID RELIABILITY, RESILIENCE, AND STORM RESPONSES (2014).

¹⁹ See generally BETHANY SPEER ET AL., NAT'L RENEWABLE ENERGY LAB., U.S. DEPT OF ENERGY, THE ROLE OF SMART GRID IN INTEGRATING RENEWABLE ENERGY (2015).

²⁰ *The Smart Grid*, U.S. DEPT. OF ENERGY: SMARTGRID, <https://perma.cc/JR7E-HZP5> (last visited Feb. 20, 2021).

discussed, including opting out, anonymization, and efficiency program exemptions.²¹ These local solutions, while well meaning, fail to adequately provide consumers protection while still allowing both consumers and utilities to maximize the advantages of a smart grid.²² The Part concludes by turning to a possible solution, allowing utilities and consumers to fully utilize the smart grid while maintaining privacy and security.

II. THE CURRENT AND POTENTIAL FUTURE STATE OF THE SMART GRID

The smart grid is more than just the transmission system equipment used by the utilities or smart meters installed by utility companies to monitor electric usage in different customer locations. While digital smart meters have been a lightning rod for the privacy debate because of the amount of information they provide the utility companies, many other new technologies also provide similar control of electricity usage and data collection.²³ Smart appliances, interconnected home systems and wireless devices also raise privacy concerns by enabling consumers of electricity to monitor and control their usage remotely.²⁴ Google's "Nest" and other devices now give consumers the ability to control lighting and heating within the home.²⁵ As appliances become smarter and more connected to the internet, consumers are gaining the ability to control a wide range of electrical devices within the home.²⁶ If this active customer control were coupled with time-of-use electricity rates (charging customers based on the time in which they use power and its cost rather than a set overall price²⁷), utility customers would be able to fully utilize demand response to shift usage to less expensive times of the day and use electricity when it is cheap or provided by renewable power.²⁸ The cost of electricity varies enormously during the day, often peaking during the evening hours when

²¹ Christina Nunez, *Who's Watching? Privacy Concerns Persist as Smart Meters Roll Out*, NAT'L GEOGRAPHIC (Dec. 14, 2012), <https://perma.cc/2XZF-JZ9L>; Ariel Bleicher, *Privacy on the Smart Grid*, IEEE SPECTRUM (Oct. 5, 2010), <https://perma.cc/G4R4-CXRE>.

²² *Id.*

²³ Balough, *supra* note 10, at 161; *Smart Grid Elevated to Top Issue by Leading Privacy Watchdogs*, SMARTGRIDTODAY (Dec. 17, 2009), <https://perma.cc/R9U2-JMUZ>.

²⁴ Ian Bogost, *Home Monitoring Will Soon Monitor You*, THE ATLANTIC (Nov. 11, 2016), <https://perma.cc/7JKD-7VSW>.

²⁵ Nest devices, made by Google, allow a consumer to control temperature, lights, security and alarm systems, smoke and fire alarm systems, and answer a doorbell. *Nest Hub*, GOOGLE STORE, <https://perma.cc/9SYD-9DW6> (last visited Feb. 4, 2021).

²⁶ See Bogost, *supra* note 24 (describing various devices either currently available or in development that expand the realm of smart devices).

²⁷ For more information on time of use rates see *What are TOU Rates?*, CAL. PUB. UTIL. COMMISSION, <https://perma.cc/L57Z-ARKZ> (last visited Feb. 20, 2021).

²⁸ *Electricity Monthly Update: With Data for October 2011*, U.S. ENERGY INFO. ADMIN., <https://perma.cc/Y4GC-9VBE> (last visited Feb. 21, 2021) [hereinafter *October 2011 Electricity Monthly Update*].

consumers come home.²⁹ This has led to the “duck curve”³⁰ problem in states with higher penetration of renewables, with utilities often having to shift to carbon intensive power production to meet the high demand during the peak periods.³¹ If consumers were charged according to time of use and were aware of those rates, the higher prices could encourage a shift of usage to other hours, allowing utilities to avoid carbon intensive power production and integrate more renewables.³²

The smart grid currently consists of connected devices which allow electricity usage to be monitored closely (like smart meters) and controlled in some way (such as remote light and heat control).³³ These devices and the information they collect, ever developing and improving, are changing the way utilities manage their grids and how consumers use electricity. In 2009, President Obama announced the Smart Grid Investment Grants, which provided \$3.4 billion to various companies, utilities and municipalities to expand installation of smart meters and associated smart devices.³⁴ Almost every state received some award of money to install and expand the smart grid—and they began to do so.³⁵

A. *The Rise of Smart Meters*

The primary focus of the federal and state governments in the smart grid advancement has been the installation of smart meters or advanced metering infrastructure (AMI) installations.³⁶ Smart meters enable

²⁹ Joshua Rhodes, *Texas Electric Grid Sets New System-Wide All-Time Peak Demand Record, Twice*, FORBES (July 19, 2018), <https://perma.cc/WKJ7-U3H7> (discussing the reasons for \$4,000/MWh peaks during high usage times in the Electric Reliability Council of Texas (ERCOT) grid in Texas).

³⁰ *Solar Energy's Duck Curve*, INST. OF ENERGY RES., <https://perma.cc/BTQ8-ATX7> (last visited Feb. 8, 2021) (The “duck curve” is a graph showing the imbalance between peak demand for power and renewable power generation.).

³¹ See, e.g., *California Wholesale Electricity Prices Are Higher at the Beginning and End of Day*, U.S. ENERGY INFO. ADMIN. (July 24, 2017), <https://perma.cc/AMJ8-TNFZ>; INST. OF ENERGY RES., *supra*, note 30.

³² CAL. PUB. UTIL. COMMISSION, *supra* note 27; INST. OF ENERGY RES., *supra* note 30.

³³ See U.S. DEPT. OF ENERGY: SMARTGRID, *supra* note 20 (discussing the definition of the smart grid and the various technologies that make up the smart grid).

³⁴ *President Obama Announces \$3.4 Billion Investment to Spur Transition to Smart Energy Grid*, U.S. DEPT OF ENERGY (Oct. 27, 2009), <https://perma.cc/4UPG-RQWY>.

³⁵ See *Recovery Act: Smart Grid Investment Grant Program*, U.S. DEPT OF ENERGY (Dec. 14, 2010), <https://perma.cc/PJ4W-UZAF> (graphically showing all the states that have received some funding from the grant program for energy modernization projects, while highlighting what types of projects have been undertaken).

³⁶ See *October 2011 Electricity Monthly Update*, *supra* note 28 (showing the increase in smart meters from 2007–2010 in residential, commercial, and industrial sectors driven by state adoption of plans requiring AMI technology, while explaining the two-way communication between utility and customer made possible); U.S. DEPT OF ENERGY: OFFICE OF ELEC. DELIVERY & ENERGY RELIABILITY, *ADVANCED METERING INFRASTRUCTURE 2,18* (2008); see, e.g., *Electricity Options*, PUB. UTIL. COMMISSION OF TEX., <https://perma.cc/39KK-P8YR> (last

utilities and their customers two-way, near real-time exchange of information about electricity usage.³⁷ Utilities no longer have to send out technicians to check meters for usage but receive that information from the smart meters using mostly radio signals.³⁸ These smart meters allow the recording and transmission of electric usage for individual residences and businesses to the utility.³⁹ Smart meters, depending on their type, can range from communicating information at hourly intervals up to real-time, instantaneous intervals.⁴⁰

The Smart Grid Investment Grants and other state support increased smart meter installation from 8.3 million in 2009⁴¹ to over 94 million in 2019 in the United States.⁴² This accounts for over half of all electric meters in the United States.⁴³ Much of the increase was in the first five years of the grant program, with installations slowing substantially and almost leveling off in the last few years.⁴⁴ Different areas of the country vary widely in installation rates with Texas leading the nation with over 86% of residences containing smart meters according to recent 2016 data.⁴⁵ Hawaii is at the other end with less than 7% of residences having smart meters as of 2016.⁴⁶ Despite the initial surge in installation, the recent slowing of installation, and the rise of opposition from privacy advocates can greatly hinder the smart grid and the goal of fighting climate change by reducing carbon sources in power production.

visited Feb. 8, 2021) (Texas legislature reducing the cost on smart meter rollout by authorizing public utilities to assess a surcharge on customers).

³⁷ See *Advanced Electric Meter Installations Rising in Homes and Businesses*, U.S. ENERGY INFO. ADMIN. (Mar. 15, 2011), <https://perma.cc/TW2K-HE4W> (“[Smart meter] technology can provide usage data to both the utility and the consumer. This capability, when combined with real-time prices, time-of-day, or other pricing options, gives consumers the information they need to alter their usage. . . .”).

³⁸ Husain Sumra, *U.S. Smart Meters Explained: What is a Smart Meter and Should You Opt Out?*, AMBIENT (July 20, 2018), <https://perma.cc/7ZWR-P53K> (explaining that since meters wirelessly send signals, employees do not have to be sent to homes to read meters).

³⁹ PUB. UTIL. COMMISSION OF TEX., *supra* note 36.

⁴⁰ *How Many Smart Meters are Installed in the United States, and Who Has Them?*, U.S. ENERGY INFO. ADMIN., <https://perma.cc/3UNU-Q87C> (last updated Nov. 12, 2020) [hereinafter *How Many Smart Meters are Installed*].

⁴¹ *More than 8 Million Smart Meters Installed in US*, PARKS ASSOCIATES (July 21, 2009), <https://perma.cc/AHY7-F7ZE> (noting that less than 8 million meters had been installed prior to the passage of Obama’s Smart Grid initiative).

⁴² *How Many Smart Meters are Installed*, *supra* note 40.

⁴³ *Nearly Half of All U.S. Electricity Customers Have Smart Meters*, U.S. ENERGY INFO. ADMIN. (Dec. 6, 2017), <https://perma.cc/JE2X-ZNQD> [hereinafter *Nearly Half of All U.S. Electricity Customers*].

⁴⁴ FED. ENERGY REGULATORY COMM’N, 2018 ASSESSMENT OF DEMAND RESPONSE AND ADVANCED METERING 3 (2018), <https://perma.cc/V64U-UR5A> (discussing that smart meter installation increasing from 6.7 million (4.7% of households) in 2008 when the program was started to almost 60 million in 2014 (41% in 2014)).

⁴⁵ *Id.* at 5.

⁴⁶ *Id.*

B. The Battle Between Privacy Advocates and the Smart Meter

As smart meter penetration rose, privacy advocates and legal scholars have questioned how much information is collected and where that information goes.⁴⁷ Since smart meters can read information in near real time and transmit that information to utilities,⁴⁸ where this information goes and who can use it is often a consumer concern.⁴⁹ This information can enable someone with access to look at different load signatures and identify which appliances are on, when consumers are home, when televisions or medical equipment are used, and many other things.⁵⁰ It is estimated that up to 3,000 data points per month can be generated by a smart meter.⁵¹ The National Institute of Standards and Technology (NIST) was charged with developing industry standards for smart grid technology.⁵² NIST treats privacy within the larger realm of cyber security and protection of information.⁵³ This approach has a major flaw. Privacy is not the same thing as security. Security focuses on protecting unauthorized parties from accessing information already collected,⁵⁴ whereas privacy concerns restricting the collection of information to authorized uses.⁵⁵ Security can be attained with or without privacy violations. For example, securing a Facebook account from unauthorized access or use does not mitigate or resolve many of the privacy concerns about how and for what purpose Facebook uses all the information it collects. Similarly, protecting the information that utilities gather from smart meters is important, but prioritizing security alone misses the underlying issues of how much information should be collected and how that information is used.

What types of information are collected and who should use it should concern most consumers. While it could be argued Facebook and privacy-intrusive devices are optional and can be given up by consumers in light

⁴⁷ See, e.g., Harvey, *supra* note 8, at 2078–80 (discussing the privacy concerns around third parties having access to AMI data, how utilities and regulator have yet to develop privacy policies that adequately account for the new types of data, and how AMI data can compromise personal information); Balough, *supra* note 10, at 164–65.

⁴⁸ Balough, *supra* note 10, at 166 (noting meters can sometimes transmit information in 15-minute or even five-minute intervals).

⁴⁹ See *id.* at 166–68 (discussing how smart meter information implicates personally identifiable information that is monitored and collected, which can be a security issue for those concerned about privacy risks).

⁵⁰ *Id.* at 167.

⁵¹ *Id.* at 168; Lee Tien, *New “Smart Meters” for Energy Use Put Privacy at Risk*, ELECTRONIC FRONTIER FOUND. (Mar. 10, 2010), <https://perma.cc/T7ZR-LQHB>.

⁵² NAT’L INST. OF STANDARDS & TECH., GUIDELINES FOR SMART GRID CYBERSECURITY: VOLUME 1 – SMART GRID CYBERSECURITY STRATEGY, ARCHITECTURE, AND HIGH-LEVEL REQUIREMENTS 4 (2014).

⁵³ *Id.*

⁵⁴ STEPHEN P. MULLIGAN ET AL., CONG. RESEARCH SERV., R45631, DATA PROTECTION LAW: AN OVERVIEW 54 (2019).

⁵⁵ *Id.*

of privacy concerns, few would argue that electricity is not a necessity of daily life in modern times. Consumers lack choice, not just in whether they use electricity, but also in who they purchase electricity from. Given the necessity of electricity, privacy groups have focused their efforts on preventing the installation of smart meters or at least requiring utilities to offer an opt-out.⁵⁶ Privacy groups have been successful in advocating for many local city and county governments to create moratoriums on smart meter installation.⁵⁷ In California, for example, four counties and countless cities have enacted a complete ban on all smart meter installations, representing a sizable amount of California's population.⁵⁸ The objectors to smart meter installation raise both health and privacy concerns when they push for these moratoria.⁵⁹ A simple Google search of smart meter opposition groups brings up a plethora of local and state groups pushing to enact bans on smart meters, often meeting success.⁶⁰ It is not a coincidence that states with the highest penetration of smart meter installations also have the strongest privacy laws governing them.⁶¹ The Texas Utilities Code states that “[a]ll meter data, including all data generated, provided, or otherwise made available, by advanced meters and meter information networks, shall belong to a customer.”⁶² The Texas code also prohibits the utility from sharing, selling, or disclosing the information collected for any purpose except providing utility service.⁶³ These strong protections have resulted in the highest penetration of smart meters installation in the country, with more than 86% of households having smart meters.⁶⁴ As Texas has shown, adopting strong privacy protections for consumers will raise less opposition from privacy advocacy groups resulting in more smart meter installation.

Privacy groups have not only successfully pushed for moratoria on smart meter installation, they have also attempted to use the courts to

⁵⁶ NAT'L CONF. OF ST. LEGISLATURES, *supra* note 14. See also *About, STOP SMART METERS!*, <https://perma.cc/L6CZ-J258> (last visited Feb. 4, 2021) (describing itself as a grass-roots organization that provides activism consultation and advice to local groups “fighting the wireless ‘smart’ meter assault”).

⁵⁷ Chris Hooks, *As Towns Say No, Signs of Rising Resistance to Smart Meters*, N.Y. TIMES (May 18, 2013), <https://perma.cc/NH6L-DJM6>.

⁵⁸ *CA Local Governments on Board, STOP SMART METERS!*, <https://perma.cc/WB7X-Y2KP> (last visited Feb. 4, 2021).

⁵⁹ See, e.g., Christopher R. Rabe, *Place Moratorium on Smart Meters*, ALAMEDA SUN (Oct. 5, 2017), <https://perma.cc/N58W-AKXA>; NAT'L CONF. OF ST. LEGISLATURES, *supra* note 14.

⁶⁰ *Local Group Directory*, STOP SMART METERS!, *supra* note 11.

⁶¹ *Nearly Half of All U.S. Electricity Customers*, *supra* note 43; Casey Leins, *States With the Strongest Online Privacy Protections*, U.S. NEWS (Oct. 23, 2019), <https://perma.cc/X9TN-NXET>; Constance Douris, *Balancing Smart Grid Data and Consumer Privacy*, LEXINGTON INST. 8, 10–12 (June 2017), <https://perma.cc/H7MK-Q7RW>.

⁶² TEX. UTIL. CODE § 39.107(b) (2019).

⁶³ *Id.* § 39.107(k).

⁶⁴ FED. ENERGY REGULATORY COMM'N, *supra* note 44.

halt the process by bringing suit against cities that require smart meter installation.⁶⁵

C. The Naperville Case and Its Implications

A recent case, *Naperville Smart Meter Awareness v. City of Naperville*,⁶⁶ highlights many of the legal issues and privacy concerns that have arisen during smart meter installation.⁶⁷ This United States Court of Appeals for the Seventh Circuit case originated in Illinois and illuminates courts' limited legal tools, demonstrating that they are not equipped to protect consumers' privacy or consider the full impacts of the smart grid.

As described by the lower court, in 2012 the city-owned utility in Naperville, Illinois, began upgrading its analog meters to new digital smart meters.⁶⁸ The funding for the Naperville Smart Grid Initiative program came from the American Recovery and Reinvestment Act of 2009,⁶⁹ the goals of which were to increase energy efficiency, modernize the electrical grid, and reduce emissions.⁷⁰ The utility did not give a choice to customers of whether to upgrade to the new digital smart meters.⁷¹ The utility did, however, give customers the choice to pay a sizeable one-time fee and recurring monthly fee to disable the transmit functions on the meter thereby requiring a manual monthly reading by a utility employee.⁷² A group representing several citizens, called Naperville Smart Meter Awareness (NSMA), filed suit claiming these meter installations violated the Fourteenth Amendment right to due process, the Fourth Amendment's prohibition of governmental searches, and the

⁶⁵ See, e.g., *Naperville Smart Meter Awareness v. City of Naperville* (*Naperville Smart Meter Awareness I*), 114 F. Supp. 3d 606, 608 (N.D. Ill. 2015) (alleging varying violations of privacy, including those under the Fourth Amendment's prohibition against unreasonable searches, "Naperville Smart Meter Awareness . . . , an Illinois not-for-profit corporation, has sued the City of Naperville . . . over the installation of smart meters in its members' homes."), *aff'd*, 900 F.3d 521, 523, 529 (7th Cir. 2018).

⁶⁶ 900 F.3d 521, 523 (7th Cir. 2018).

⁶⁷ *Id.* at 524 (holding that "Naperville's smart meters reveal 'intimate personal details of the City's electric customers such as when people are home and when the home is vacant, sleeping routines, eating routines, specific appliance types in the home and when used, and charging data for plug-in vehicles that can be used to identify travel routines and history'" (citation omitted)).

⁶⁸ U.S. DEP'T OF ENERGY, OFFICE OF ELECT. DELIVERY & ENERGY RELIABILITY, CITY OF NAPERVILLE SMART GRID INITIATIVE 1 (2012), <https://perma.cc/9N55-B5M5>; *Naperville Smart Meter Awareness II*, 114 F. Supp. 3d at 609 ("In January 2012, the Naperville Department of Public Utilities—Electric began replacing its customers' analog electricity meters with smart meters as part of a local program called the Naperville Smart Grid Initiative.").

⁶⁹ American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, 123 Stat. 115 (codified as amended in scattered sections of Titles 6, 19, 26, and 42).

⁷⁰ U.S. DEP'T OF ENERGY, *supra* note 34.

⁷¹ *Naperville Smart Meter Awareness v. City of Naperville* (*Naperville Smart Meter Awareness I*), 69 F. Supp. 3d 830, 835 (N.D. Ill. 2014).

⁷² *Id.*

Americans with Disabilities Act (ADA).⁷³ NSMA protested the fees for those who wished to turn off the transmit option on the digital meters arguing that it “discriminate[d] against certain disabled residents who are especially threatened by health risks related to smart meters.”⁷⁴ They argued that the radio signals used by smart meters to communicate information to the utility company produce radiofrequency radiation, which could possibly interfere with medical devices and increase cancer risk.⁷⁵ NSMA also argued that some utility customers who had medical issues were forced to pay the fees, and this was discrimination based on this medical issue.⁷⁶

The initial decision by the district court never reached the merits of the ADA claims due to improper pleadings,⁷⁷ and the court dismissed the Due Process and Equal Protection claims due to a lack of identifiable “cognizable liberty or property interest.”⁷⁸ The court also dismissed the remaining claim, based on a violation of the Fourth Amendment’s prohibition against unreasonable search and seizure, because the district judge found the plaintiffs had no “reasonable expectation of privacy”⁷⁹ in electrical data turned over to the utility.⁸⁰

On review, the Seventh Circuit looked at whether the installation of smart meters violated either the Fourth Amendment or a similar clause in the Illinois Constitution.⁸¹ The court noted that the information gathered by the meters was saved for over three years, collected in fifteen-minute increments, and could be used to determine a great deal of “intimate personal details.”⁸² Rejecting the lower court’s conclusion, the Seventh Circuit found that the use of smart meters did indeed constitute a governmental search.⁸³ The court compared the smart meter collection to a thermal imaging search the Supreme Court had analyzed in *Kyllo v. United States*.⁸⁴ In *Kyllo*, law enforcement used a thermal imaging device

⁷³ *Id.* at 836; Americans with Disabilities Act, 42 U.S.C. §§ 12101–12213, 47 U.S.C. § 225 (2018).

⁷⁴ *Id.*

⁷⁵ See *Smart Meters*, AMERICAN CANCER SOC’Y, <https://perma.cc/HJ6J-N7T3> (last visited Feb. 3, 2021) (stating smart meters give off RF (radio frequency) radiation, which is possibly carcinogenic to humans); Lloyd Burrell, *Smart Meter Radiation and Medical Implants*, ELECTRICSENSE, <https://perma.cc/2TKL-3UDQ> (last updated Aug. 12, 2014) (discussing smart meters’ interference with medical devices such as pacemakers and implanted insulin devices); *Devices that May Interfere with ICDs and Pacemakers*, AM. HEART ASS’N, <https://perma.cc/RM5Z-FS75> (last updated Sept. 30, 2016) (listing devices that rely on radio signals as possible interferences with medical devices).

⁷⁶ *Naperville Smart Meter Awareness I*, 69 F. Supp. 3d at 836.

⁷⁷ *Id.* at 843.

⁷⁸ *Id.* at 839–42.

⁷⁹ *Id.* at 840.

⁸⁰ *Id.*

⁸¹ *Naperville Smart Meter Awareness v. City of Naperville (Naperville Smart Meter Awareness III)*, 900 F.3d 521, 524 (7th Cir. 2018).

⁸² *Id.*

⁸³ *Id.* at 526–27.

⁸⁴ *Id.*; *Kyllo v. United States*, 533 U.S. 27, 29 (2001).

to peer into a suspect's home.⁸⁵ Finding the smart grid data collection much more extensive than the thermal imaging data, the Seventh Circuit found the collection to be a government search under the Fourth Amendment.⁸⁶

The court raised two interesting points that should alarm privacy advocates. First, the court noted that smart meters were not in widespread use (at the time of the case), and that, under the *Kyllo* opinion, widespread usage of invasive technology may not require a warrant under the Fourth Amendment.⁸⁷ Because smart meters are now becoming widespread,⁸⁸ the lack of a warrant requirement for a government search of customer's electricity data is deeply concerning. Second, the court noted that because the utility is owned by the government, the voluntary giving of information to a third party was not an issue.⁸⁹ Most larger utilities are privately owned, and the Fourteenth Amendment only applies to government searches.⁹⁰ Information given voluntarily to a third party, such as a privately owned utility, could normally be given to the government without constitutional concerns or restrictions.⁹¹ The court did ponder whether voluntariness would be an issue if the utility were a third party, because customers likely had no choice about turning over their data, but noted that since the utility is government-owned, there is no third party.⁹²

Finding the data collection to be a search, the Seventh Circuit then went on to look at whether it was a reasonable search and found that the government had a "significant" interest to "reduce costs, provide cheaper power to consumers, encourage energy efficiency, and increase grid stability."⁹³ According to the court, the search was unrelated to law enforcement and was minimally invasive.⁹⁴ The court did note that if the information were easily accessible to law enforcement then it may result in a different conclusion.⁹⁵

While this case did not discuss the other constitutional issues raised by NSMA, the collection of smart meter data that "reveals when people are home, when people are away, when people sleep and eat, what types of appliances are in the home, and when those appliances are used" is

⁸⁵ *Kyllo*, 533 U.S. at 29.

⁸⁶ *Naperville Smart Meter Awareness III*, 900 F.3d at 526.

⁸⁷ *Id.* at 526–27.

⁸⁸ *The Number of Electric Smart Meters Operating in Two-Way Mode Has Surpassed the Number of One-Way Smart Meters*, U.S. ENERGY INFO. ADMIN. (Apr. 27, 2015), <https://perma.cc/2G9J-9SC4>.

⁸⁹ *Naperville Smart Meter Awareness III*, 900 F.3d at 527.

⁹⁰ *Investor-Owned Utilities Served 72% of U.S. Electricity Customers in 2017*, U.S. ENERGY INFO. ADMIN. (Aug. 15, 2019), <https://perma.cc/G3QY-7GND> (indicating that most utilities are investor owned and therefore privately owned).

⁹¹ *Smith v. Maryland*, 442 U.S. 735, 743–44 (1979).

⁹² *Naperville Smart Meter Awareness III*, 900 F.3d at 527.

⁹³ *Id.* at 529.

⁹⁴ *Id.*

⁹⁵ *Id.*

much more than “minimally invasive,” as the Seventh Circuit suggested.⁹⁶ As smart meters improve and other technology that can control electricity usage becomes available, courts across the country will grapple more with these issues. How secure the information is and its availability to other agencies such as law enforcement should raise a host of constitutional and legal questions. While the *Naperville* court acknowledged that installation of smart meters can constitute a search,⁹⁷ the court believed the reasonableness of the search remains a question, depending on how that information is used.⁹⁸ Unfortunately, constitutional protections will not provide adequate safety to consumers, as the *Naperville* ruling demonstrates. To protect this information from improper use or restrict it to certain uses, consumers will most likely have to turn to legislative measures because courts like the Seventh Circuit offer little relief.

The *Naperville* case is illustrative of the ongoing battle in many parts of the country over the smart grid and its implementation. Privacy concerns over who has access to information, whether third parties or governmental actors, have led to much opposition to smart grid technology, especially smart meters. In several areas, these concerns have led to laws by communities banning smart meter installation outright or making their installation optional. Sadly, this opposition over privacy concerns may further restrict or limit future technological developments that benefit the electrical grid and reduce the use of carbon resources.

D. The Future of Smart Grid Technology

Household smart meters are only part of the smart grid currently installed in the United States.⁹⁹ Utilities have installed other equipment to digitize and control more of the electrical grid. The installation of other equipment that does not usually raise privacy concerns has continued because utilities find it economically efficient or beneficial for grid reliability and management.¹⁰⁰ Consumers will probably never realize the full impact of these new smart grid systems even though they benefit greatly from their installation. However, other smart technology that

⁹⁶ *Id.* at 526, 529.

⁹⁷ *Id.* at 525.

⁹⁸ *Id.* at 529.

⁹⁹ *Distribution Intelligence: The Smart Grid*, U.S. DEP'T OF ENERGY: SMARTGRID, <https://perma.cc/L67V-QXLJ> (last visited Feb. 5, 2021) (U.S. Government's website discussing the technologies of the smart grid and the various technologies utilities use that make up the smart grid).

¹⁰⁰ See ELEC. POWER RESEARCH INST., ADVANCED METERING INFRASTRUCTURE (AMI) (2007), <https://perma.cc/M3CM-SJ5X> (discussing the various types of smart grid technology and its benefits to utilities and consumers); see also Harvey, *supra* note 8, at 2073–74 (providing examples of other technologies and products enabled by the smart grid that benefit utilities, businesses, and consumers).

could have a huge impact on the electric grid and consumers' ability to manage their own usage is becoming available. These technologies raise many of the same privacy concerns as smart meters.

The latest technology that has already raised several privacy issues is wireless devices that can control heating, lighting, and security cameras, such as Nest or Ring systems.¹⁰¹ The ability to control lighting and heating within the home remotely can provide consumers a great many benefits by reducing their electricity consumption when they turn off lights or heat they do not currently need. Other non-electric benefits like home security and protection also factor into the adoption of this technology. However, these technologies have also shown vulnerability to hacking and abuse by third parties.¹⁰² Several recent news stories have demonstrated the dangers of having remotely connected wireless devices within the home.¹⁰³ These included a hacker who recently used a Ring camera to spy on a young girl in her bedroom and used a microphone in an attempt to force her to do destructive things.¹⁰⁴ These types of news stories demonstrate substantial privacy risk in these new technologies. While these may be isolated incidents right now, the rise of connected technology in the home will continue to put privacy concerns at the forefront of societal issues. Current widespread technologies allow some control over power usage in the home, giving consumers the ability to remotely disable some of their power usage such as lights.¹⁰⁵ When breaches occur in the security of these devices, consumer privacy groups are often empowered to halt or slow invasive technology, including smart meters. Consumers may not always differentiate between a smart meter

¹⁰¹ See e.g., Nest devices, made by Google, allow a consumer to control temperature, lights, security and alarm systems, smoke and fire alarm systems, and answer a doorbell. For more information see *Nest Hub*, *supra* note 25. For more information on Amazon-owned Ring systems see *Ring Homepage*, RING, <https://perma.cc/53G3-L5PG> (last visited Feb. 20, 2021).

¹⁰² See Daniel Wroclawski, *3,000 Ring Doorbell and Camera Accounts May Be Vulnerable to Hackers*, CONSUMER REP. (Dec. 19, 2019), <https://perma.cc/T74F-EJCK> (describing "credential stuffing" data breaches affecting Ring devices and Nest cameras).

¹⁰³ See, e.g., Michael Brice-Saddler, *Family Says Hacked Nest Camera Warned Them of North Korean Missile Attack*, WASH. POST (Jan. 22, 2019), <https://perma.cc/DTZ3-2AG2> (describing a California family's hacked Nest camera announcing three hours to evacuate the area from a North Korean ballistic missile); Alex Sundby, *Hacker Spoke to Baby, Hurling Obscenities at Couple Using Nest, Dad Says*, CBS NEWS (Jan. 31, 2019), <https://perma.cc/4A73-MWCY> (describing an Illinois family's hacked Nest camera announcing obscenities in their infant's bedroom); Elisha Fieldstadt, *Nest Camera Hacker Threatens to Kidnap Baby, Spooks Parents*, NBC NEWS (Dec. 18, 2018), <https://perma.cc/Y64Z-84WQ> (describing a Texas family's hacked Nest camera announcing expletives and threats to kidnap their infant).

¹⁰⁴ Chacour Koop, *Hacker Uses Ring Camera to Spy on Mississippi Girl in Her Bedroom: Tm Santa Claus*, CHARLOTTE OBSERVER, <https://perma.cc/Z3Y8-V9NW> (last updated Dec. 13, 2019).

¹⁰⁵ See, e.g., *Remote Control Your Lights*, SMARTHOME, <https://perma.cc/W43C-XWEK> (last visited Feb. 8, 2021) (describing how easily available technology allows for controlling of home lighting from anywhere in the world).

beaming information to a utility and its third-party supporters and other technology within the home also remotely giving out information.

Other technologies now coming onto the market can greatly enhance consumers' ability to control electrical usage. When combined with time-of-use electricity rates,¹⁰⁶ new technology could be utilized by consumers to shift usage into non-peak times when renewable power is available. For example, General Electric now sells a wide variety of appliances that can be controlled remotely, including dishwashers, refrigerators, air conditioning units, washers, dryers, microwaves, and stoves.¹⁰⁷ These new technologies allow a consumer to start an appliance such as a dishwasher or dryer from their phone at work during the non-peak times when solar power is inexpensive, rather than waiting till the evening when power is expensive and generated by a carbon-producing source.¹⁰⁸ The ability to shift power usage would have a huge benefit to renewable power. For example, solar power is only available during the day, often when consumers are at work and not using power. While future battery advancements may improve our ability to use renewable power like solar at peak times, shifting power usage and demand with a smarter grid only requires widespread adoption instead of future advancements. The benefit of smarter electricity usage to renewable power integration and grid stability is immense.¹⁰⁹ However, like smart meters, privacy concerns could stop or slow their implementation. As the smarter technology spreads, relying on companies and utilities who could sell information to third parties to protect consumers' privacy is a bit like leaving the fox in charge of the hen house.

III. ADVANTAGES AND BENEFITS OF A SMART GRID

If privacy and security concerns can be alleviated or reduced in implementing a new, smarter grid, both utilities and consumers can benefit in numerous ways. If both the utilities and consumers know how they will benefit, less opposition to the implementation of a smarter grid will arise. Adequate security and privacy laws will allow the utilities and consumers to fully utilize the benefits of a smarter grid without strong opposition by privacy advocates.

¹⁰⁶ CAL. PUB. UTIL. COMMISSION, *supra* note 27.

¹⁰⁷ See *Smart Appliances*, G.E. APPLIANCES, <https://perma.cc/JTK6-QVQ7> (last visited Feb. 3, 2021) (showing the variety of appliances that can connect remotely and the benefits of being able to control them with your phone).

¹⁰⁸ See *5 Benefits of Smart Appliances in your Home*, SOUTHWEST APPLIANCE (Oct. 3, 2017), <https://perma.cc/TQW8-4QCL> (explaining various methods of conserving energy and saving money using smart appliances).

¹⁰⁹ See discussion *infra* Part III.

A. How Utilities Benefit from a Smarter Grid

A smarter grid could benefit utilities a great deal by enhancing grid reliability and stability, providing greater access to demand response, promoting grid resilience, and providing long-term investment opportunities.¹¹⁰ By having greater information about exact usage, utilities can better predict when power is used, and allow consumers to modify their habits based on price.¹¹¹ This would allow the electricity system to be much better utilized. Shifting power usage not only allows more consistent transmission usage, it also allows for a plethora of possibilities for renewable power sources to further expand. Utilities would be freer to invest in renewable projects since they could be integrated into the grid more easily and used more fully. The transmission and power grid would also be more fully utilized by spreading out the load from peak times. The electrification of our transportation systems and the spread of electric vehicles will place a greater demand on electricity. Using our current system more efficiently reduces the need for expensive transmission expansion projects needed to support transportation electrification. Additionally, lower operation and maintenance costs in a balanced system will also benefit utilities.

1. Grid Reliability, Stability, and Resilience

The United States' electrical grid has long been recognized as aging and in need of upgrades.¹¹² The nation's grid was not originally designed to handle renewable power sources and much of the grid is over fifty years old.¹¹³ In 2013, the American Society of Civil Engineers gave America's energy infrastructure a D+ grade primarily due to the grid's advanced age.¹¹⁴ As utilities manage an aging grid, the ability to quickly diagnose issues through smarter grid technology provides greater stability and reliability.¹¹⁵ These smarter systems allow faster communication and can

¹¹⁰ See discussion *infra* Parts III.A., III.A.3.

¹¹¹ Christos Ruci, *How Predictive Analytics are Redefining the Energy Sector*, AGILE THOUGHT, <https://perma.cc/5JHK-G8SD> (last visited Feb. 5, 2021).

¹¹² See AMY ABEL, CONG. RESEARCH SERV., RL32075, ELECTRIC RELIABILITY: OPTIONS FOR ELECTRIC TRANSMISSION INFRASTRUCTURE IMPROVEMENTS 5–6 (2006) (explaining that investment in infrastructure has not kept up with increases in electricity demand); U.S. DEP'T OF ENERGY, NATIONAL TRANSMISSION GRID STUDY, at xi-xiii (2002) (explaining the weaknesses of the U.S. electrical grid); see also Alison C. Graab, *The Smart Grid: A Smart Solution to a Complicated Problem*, 52 WM. & MARY L. REV. 2051, 2052 (2011) (the "United States delivers electricity to consumers over a transmission system that has not been updated since the 1970s."); Harvey, *supra* note 8, at 2071–72.

¹¹³ Graab, *supra* note 112, at 2052.

¹¹⁴ See AM. SOC'Y OF CIVIL ENGR'S, 2013 REPORT CARD FOR AMERICA'S INFRASTRUCTURE 3–4 (2013), <https://perma.cc/Y9QA-Y7JH> ("Many of our roads, bridges, water systems, and our national electric grid were put into place over fifty years ago, and these systems are simply overwhelmed or worn out.")

¹¹⁵ U.S. DEPT. OF ENERGY: SMARTGRID, *supra* note 20.

minimize blackouts, detect and isolate outages, and deal with emergency situations like natural disasters.¹¹⁶ Instead of overtaxing an aging grid, utility operators can utilize real-time information to determine how to best produce and deliver power to its customers. Additionally, if consumers are incentivized by cost savings to shift usage to lower demand times by time-of-use rates, utilities will get a more evenly balanced use of grid resources. This will also ease the burden on transmission and permit more stability as the electrification of the nation's transportation system increases.

2. *Integration of Renewables*

One of the larger challenges to reducing climate change is the transition off fossil fuels for power production. Renewable sources of power such as wind and solar are often touted as the solution to getting rid of natural gas-and coal-fired power plants.¹¹⁷ Wind and solar power generation are different than traditional fossil fuel power plants in that they are variable and do not always provide predictable, consistent power. The wind must be blowing or the sun shining for these power sources to be utilized and the times in which they are producing power is often not when that power is needed.¹¹⁸ Having a smarter grid allows the utilities to more accurately predict power usage and quickly dispatch these renewable power sources where they are needed.¹¹⁹

The effects of a smart grid on consumers would also make renewable power easier to integrate. Consumers currently have little to no knowledge when power is plentiful and inexpensive. This results in plentiful wind power that may be available at times with little demand and no wind at times when demand is high, forcing utilities to utilize fossil fuel peak plants to meet those high demands. A smart grid that allows consumers to see power prices using time-of-use rates and technology that allows consumers to shift some of their usage to non-peak times will allow the utility to line up demand for power with renewable power supply. While improved future battery technology may help make renewable power less variable with advances in storage, current smart grid technology could allow consumers to use that variable power when it is produced rather than requiring batteries. Smart home appliances and technology can shift some of that electricity usage to times when solar or wind power is available. This would provide a better return on investment for renewable plants and further encourage their construction and integration.

¹¹⁶ *Id.*

¹¹⁷ See, e.g., Paul Verduyssen, *Renewable Energy Integration Costs: Who Pays and How Much*, 1 WASH. J. ENV'T L. & POL'Y 181, 184–86 (2011) (discussing the issues with renewable integration to achieve clean energy).

¹¹⁸ *Id.* at 189.

¹¹⁹ *Id.* at 193–95.

3. Investment and Cost Savings

Utilities face increased competition from independent power producers and resistance from environmental groups to building large-scale transmission infrastructure.¹²⁰ The loss of monopoly over power production in many areas has left utilities with declining revenues.¹²¹ Investment in a smart grid could provide utilities with a vital role as our society transitions away from fossil fuels and larger, centralized power plants.¹²² Combined with increased infrastructure for electric vehicles, the smart grid may provide utilities with continued revenue as the grid becomes more efficient and fully used. Smart meter installation has been pervasive because it helps the utilities save on monthly employee visits to read each customer meter.¹²³ The ability to collect real-time information and limit outages also helps utilities save on emergency maintenance and other unforeseen costs.¹²⁴ A smart grid that can better direct power to where it is needed or align supply and demand of power will also save on transmission line losses, congestion costs, and other demand response programs.¹²⁵

These benefits illustrate why utilities almost never oppose smart meter installation. They benefit by making their grids more reliable and resilient. The smart grid helps utilities better integrate their renewable resources and comply with renewable portfolio standards in states that have them. More importantly, the utilities save in maintenance and service costs.

B. How Consumers Benefit from a Smarter Grid

The adoption of smart grid technology by consumers is often based on whether consumers see a financial or personal benefit.¹²⁶ Utilities often offer smart meter installation as a benefit to consumers in the form of lower bills when the utility no longer has to physically check meters.¹²⁷ When consumers are charged time-of-use rates, the benefit of knowing how much power is used allows consumers to modify habits to save money. This also gives consumers a predictable bill at the end of the

¹²⁰ Roberta F. Mann, *Smart Incentives for the Smart Grid*, 43 N.M. L. REV. 127, 133 (2013).

¹²¹ Vercruyssen, *supra* note 117, at 201.

¹²² Mann, *supra* note 120, at 134.

¹²³ *Id.* at 151.

¹²⁴ Harvey, *supra* note 8, at 2073.

¹²⁵ *Id.* at 2073–74.

¹²⁶ See discussion *supra* Part III.

¹²⁷ See, e.g., *Understanding Your Energy Use with SmartMeter*, PG&E, <https://perma.cc/2ATL-GPZZ> (last visited Feb. 6, 2021) (showing consumers how they can save money with smart meters and make “smarter choices about . . . consumption”); *The Benefits of Smart Meters*, CAL. PUB. UTILS. COMM’N, <https://perma.cc/B6UV-MPDN> (last visited Feb. 6, 2021).

month as they are more aware of their usage and what it will cost. These financial benefits are usually the focus of utilities as they give customers incentives to not oppose smart meter installation.

Beyond smart meters, having all appliances and home items connected can give consumers a great deal of benefits. This interconnectivity gives consumers convenience to run certain tasks like dishwashers and dryers remotely while also saving money in power cost. When consumers adopt new technology, it is often for convenience, and not just to save a few dollars on a utility bill.¹²⁸ Having consumers able to easily access their electrical usage information may encourage the adoption of smart grid technology because the technology will make their lives more convenient.

The fact that smart meter technology can be used to fight climate change is another factor that may encourage consumers to adopt the technology. Information about when utilities are forced to use fossil fuel sources to keep power flowing would allow its customers to modify their usage to benefit the environment. More consumers are environmentally conscious and would favor a smarter grid that results in less carbon emissions and environmental costs. The reduction in carbon power sources will give consumers an incentive to allow greater smart grid integration.

C. Advertising and Revenue Generation

One other possible benefit to consider is the possibility of revenue generation from the sale of smart meter information. While this would be opposed by privacy advocacy groups, it should be discussed as a possibility that some consumers and utilities may want. Facebook, Google, and Amazon make a substantial amount of money selling consumer information and providing those consumers with free services as a result.¹²⁹ Many consumers enjoy using Facebook and accept the cost, the sale of their information for advertising, of those free services. If consumers were offered a lower cost of power, they might accept a sale of their information to groups that do targeted advertising. Revenue generation from advertising involves tailoring advertising choices or offering products based on search histories and customer data.

Utilities are in a perfect position to take advantage of this information and generate revenue that could be shared with customers. An advertiser, knowing that a consumer just ran the laundry machine, could place soap or related advertisements onto their television or computer. This information is very valuable. Recent estimates for Facebook estimate that each North American user is worth roughly

¹²⁸ Harvey, *supra* note 8, at 2073.

¹²⁹ Samuel Gibbs, *How Much Are You Worth to Facebook?*, GUARDIAN (Jan. 28, 2016), <https://perma.cc/FQ2Z-75F2> (showing that the average revenue per Facebook user for Q4 2015 was \$3.73).

fourteen dollars in advertising revenue per quarter from selling their information.¹³⁰ Considering how many customers utilities have and the amount of personal information that could be collected from smart grid technology, utilities could get substantial amounts of income from advertising revenue. As utilities face a crunch in power sales and market pressure, this will be an easy way to generate extra income. While this would probably have to be an opt-in program to satisfy legal and privacy concerns, the utilization of the information collected by the smart grid for revenue generation is a potential benefit. Privacy groups would probably challenge this type of revenue generation. In areas with inadequate privacy and utility laws, utilities could take advantage of this without informing or requiring consumer consent. As many consumers are not usually aware of how much information is collected and sold based on their usage of phone and internet applications, the utilities could similarly bury proper legal language in their terms and conditions and sell the information to third party advertisers. Only proper privacy laws that protect consumers would guarantee this will not occur.

IV. THE STATE OF PRIVACY LAWS AND A SOLUTION

Current privacy laws governing the smart grid vary widely by state. Federal laws, while good at protecting privacy in some circumstances, currently do not apply to most utilities as most are private companies.¹³¹ Instead, it has largely been left to states to determine how to protect consumers while allowing smart grid advances. This section will look first at how federal laws fail to apply to the smart grid and give a few current state models for how consumers are given privacy. This will illustrate how utilities in different regions use and take advantage of privacy laws. These state laws can be enacted through legislatures or public utility commissions depending on the delegated power within each state.

This section will then discuss some of the local options that have arisen, mostly in states where privacy protections are lacking. These local options include allowing consumers to opt out of smart meter installation, usually requiring an additional fee or monthly charge for opting out.¹³² They also include anonymity requirements when the information is collected and used, with exceptions to some policies when that information is used by third parties to develop energy efficiency and demand response programs.¹³³ This section will conclude with possible

¹³⁰ *Id.*

¹³¹ *Electric Power Industry Overview 2007*, U.S. ENERGY INFO. ADMIN., <https://perma.cc/5BGS-5HD7> (last visited Feb. 9, 2021) (stating that only nine electric utilities are run by the federal government).

¹³² NAT'L CONF. OF ST. LEGISLATURES, *supra* note 14.

¹³³ *See, e.g.*, TEX. UTIL. CODE § 39.107(k) (2019) (“The commission by rule shall prohibit an electric utility . . . from selling . . . information generated . . . from an advanced metering system The commission shall allow an electric utility . . . to share information with an

solutions that can protect consumers while allowing full utilization of smart meter data. These involve some compromise in privacy, but protects the information collected by having strict security requirements for utilities.

A. Different State and Federal Privacy Laws

Several federal laws have been enacted over the last forty years to aid consumers in protecting their information.¹³⁴ Unfortunately, none of these laws provide proper protection for consumers when it comes to smart grid technology. The Privacy Act of 1974 requires the use of “fair information practices” based on eight principles.¹³⁵ These principles limit the types of information collected and how it is maintained and used.¹³⁶ While this could provide great protection for consumers, the Act does not have the force of law against utilities because it applies only to federal agencies.¹³⁷ Only nine of the 3200 utilities are federal utilities subject to this law.¹³⁸ If Congress extended this law to all utilities, this could be a federal option for providing privacy protection.

The Electronic Communications Privacy Act of 1986 (EPCA) also could provide some protection against some of the more severe privacy violations.¹³⁹ The Wiretap Act,¹⁴⁰ which is part of the EPCA, prohibits interception and disclosure of electronic communications and makes it crime to do so.¹⁴¹ This would allow prosecution of hackers or those who illicitly gain access to smart grid information. However, the Wiretap Act specifically exempts interception or use where “one of the parties to the communication has given prior consent to such interception.”¹⁴² Because utilities are parties to the electronic communication and consumers have consented by accepting electricity, this Act provides no real protection to consumers for disclosure of smart meter data.¹⁴³ Currently no federal statute has been applied by courts to limit smart meter data collection or use.

affiliated corporation . . . if the information is to be used only for the purpose of providing electric utility service to the customer . . .”).

¹³⁴ Privacy Act of 1974, 5 U.S.C. § 552a (2018); Electronic Communications Privacy Act of 1986, 18 U.S.C. §§ 2510–2522 (2018); Computer Fraud and Abuse Act, 18 U.S.C. § 1030.

¹³⁵ Marc Rotenberg, *Fair Information Practices and the Architecture of Privacy (What Larry Doesn't Get)*, STAN. TECH. L. REV., 2001, at 1, ¶ 42, ¶ 42 n.74, ¶ 44.

¹³⁶ *Id.* ¶ 44.

¹³⁷ Cheryl Dancey Balough, *Privacy Implications of Smart Meters*, 86 CHI.–KENT L. REV. 161, 176 (2010).

¹³⁸ *Id.*

¹³⁹ 18 U.S.C. §§ 2510–2522.

¹⁴⁰ Wiretap Act, *id.* § 2511.

¹⁴¹ *Id.* § 2511.

¹⁴² *Id.* § 2111(2).

¹⁴³ Balough, *supra* note 10, at 176–78.

State utility and privacy laws often provide better protection for consumers' privacy regarding smart meter data usage. As noted previously, Texas has enacted strict privacy usage requirements for its utilities when they install smart meters.¹⁴⁴ The code prevents the utilities from disclosing collected information and retains consumer ownership of collected information, limiting utilities' use of that information.¹⁴⁵ Illinois prevents utilities from disclosing that information to law enforcement unless the law enforcement agency specifies why the information is necessary for a law enforcement purpose, and they must do so in writing.¹⁴⁶ The Illinois code also limits disclosure to local units of government without customer authorization, but it does not prevent disclosure to a third party or disclosure by that third party to the local unit of government.¹⁴⁷ Other states, like Colorado lack any restrictions on the release of personal information.¹⁴⁸

State law can provide proper consumer protection if the law is updated as new technologies become available. If the goal is simply to benefit utilities by making sure every consumer has a smart meter installed, then Texas's Utility Code is a well written law. However, the Texas code does not address other smart grid devices like appliances or wirelessly connected devices that are not installed by the utility. As new smarter grid technology becomes available, the tight control of information under the Texas code may limit the effectiveness of that technology or limit its adoption. Revising state privacy laws to reflect current technological realities is necessary to properly take advantage of the benefits of a smarter grid.

B. Local Options

Privacy advocate groups have had more success at the local level when fighting against the installation of smart meters. The moratoria that have been enacted are always at the local level, either city or county. This makes sense as it is easier to convince neighbors and community members of the privacy issues than state officials who can be heavily lobbied by the utilities. Other than bans on smart meter installations, some local communities have enacted alternative options instead of stopping smart meter installation. These options take the form of opt-out programs, anonymization of collected information, tighter security requirements, and unique exceptions allowed for energy efficiency programs.¹⁴⁹ These types of local options have some success in assuaging

¹⁴⁴ TEX. UTIL. CODE § 39.107(b) (2013). *See supra* notes 61–64 and accompanying text.

¹⁴⁵ TEX. UTIL. CODE § 39.107.

¹⁴⁶ 220 ILL. COMP. STAT. 5/5-110 (1998).

¹⁴⁷ 220 ILL. COMP. STAT. 5/16-122 (2002).

¹⁴⁸ Balough, *supra* note 10, at 182.

¹⁴⁹ *See discussion infra* Parts IV.B.1–IV.B.3.

privacy concerns and allowing installation to move forward. However, none of them are ideal for the full utilization of the smart grid.

1. *Why Opting Out Is Not A Solution*

Opt-out programs allow privacy-minded consumers to opt out of smart meter installation, usually by retaining the old manually read meter. In many states, public utility commissions have permitted utilities and communities to include opt-out provisions when they install smart meters.¹⁵⁰ These have several drawbacks for consumers. The programs almost always require an additional monthly charge for electing to keep only the analog meter.¹⁵¹ They are usually billed as additional charges for not installing a digital meter.¹⁵² Many utilities also require an upfront initial fee, sometimes quite large, to stop smart meter installation.¹⁵³ Pacific Gas & Electric (PG&E), a large utility in California, requires a \$75 fee initially plus \$10 per month to each bill.¹⁵⁴ Customers who wish to opt out may call a hotline¹⁵⁵ where an agent tries to convince them not to opt out. They also must fill out a long online form.¹⁵⁶

These fees are similar in many places. The town of Naperville, from the above-mentioned Seventh Circuit case, required residents to pay an “installation fee of \$68.35, plus an additional monthly fee of \$24.75” to obtain a smart meter that did not transmit information to the utility.¹⁵⁷ Some utilities also charge a fee for smart meter removal. For example, Pacific Power, a Pacific Northwest utility, charges a \$169 fee in addition to the monthly fee for any consumer wishing to return to an analog meter.¹⁵⁸ Oddly, the fee is refunded if the consumer reinstalls the smart meter within six months. If the fee was the actual cost to change out a meter, then consumer should be charged a similar fee to switch back.

These fees raise a big social parity issue with the opt-out programs. Many poorer residents may not be able to opt out of smart meter installation simply because they cannot afford to. Even though they value their privacy, they may not be able to pay the high initial fee or the extra monthly fee that utility companies tack onto their bill. Utilities might argue that these extra fees are necessary because they must send a technician out to physically read their meter. However, only rarely is

¹⁵⁰ NAT'L CONF. OF ST. LEGISLATURES, *supra* note 14.

¹⁵¹ See, e.g., *The SmartMeter Opt-out Program*, PG&E, <https://perma.cc/S7CW-EGS9> (last visited Feb. 20, 2021) (requiring consumers to pay 10 dollars extra per month and a one-time fee up front of \$75).

¹⁵² *Id.*

¹⁵³ *Id.*

¹⁵⁴ *Id.*

¹⁵⁵ *Id.*

¹⁵⁶ *Id.*

¹⁵⁷ *Naperville Smart Meter Awareness I*, 69 F. Supp. 3d 830, 835 (N.D. Ill. 2014). See *infra* Part II.C.

¹⁵⁸ *Smart Meters*, PAC. POWER, <https://perma.cc/C4AF-VHUUH> (last visited Feb. 20, 2021).

support given tying the extra fees to the actual cost of reading an analog meter. Some fee programs, such as PG&E's program, do factor in whether a consumer requesting an opt-out is in a lower income bracket.¹⁵⁹ Yet financial pressure may eliminate actual consumer choice when it comes to opting out for those of lower income.

Some consumers may not have a choice to retain their smart meter and be forced to pay whatever fee the utility sets. Smart meters rely on radio signals to transmit information to utilities.¹⁶⁰ Those with medical equipment and devices sensitive to interference may not be able to have a smart meter installed. One of the side issues in the town of Naperville case, discussed in Part II.C, was the discrimination against disabled persons with health risks due to proximity of a smart meter.¹⁶¹ While the court never reached this issue, if a consumer has a health issue or equipment with which radio signals may interfere, they may be required to pay the fee regardless of whether they are financially able. This would unfairly target those with medical conditions or disabilities.

Another problem with opting out is that it ultimately defeats the purpose of the smart meter program. Smart meters make the grid more reliable and efficient. They also could allow consumers to make better usage choices and choose less carbon-intensive power. The benefits of smart meters should be available for everyone, not just those who can afford to make a choice to protect their privacy. These local opt-out options may reduce privacy group opposition, as they are far from ideal.

2. Anonymity and Security of Information

Another local option is requiring anonymity when utilities collect information. Deidentification or anonymization strips any personally identifying information before the utilities can use it or disclose it to third parties.¹⁶² Utilities can then use this data to manage the grid and even offer it to third parties when needed. Research projects on energy efficiency and demand response can use the information without risk that it can be accidentally released or disclosed to unauthorized users. Many companies and governments already have programs to remove personally identifying information from accounting, health, and employee records when needed.¹⁶³ This type of anonymization could be applied to utility usage information.

¹⁵⁹ PG&E, *supra* note 151 (lowering the initial fee to 10 dollars and the monthly charge to five dollars).

¹⁶⁰ *FAQ About the SmartMeter*, PG&E, <https://perma.cc/5KUV-8C5Z> (last visited Feb. 9, 2021).

¹⁶¹ *Naperville Smart Meter Awareness I*, 69 F. Supp. 3d at 836. See discussion *infra* Part II.C.

¹⁶² Harvey, *supra* note 8, at 2079–81.

¹⁶³ ERIKA MCCALLISTER ET AL., NAT'L INST. OF STANDARDS & TECH., GUIDE TO PROTECTING THE CONFIDENTIALITY OF PERSONALLY IDENTIFIABLE INFORMATION (PII) (2010), <https://perma.cc/T8EF-YBNG>.

This approach to smart grid information has two major risks. First, the information with the personally identifying information is still generated and must be secured prior to it being stripped of personal details. If hackers or other unauthorized users could access this information, then privacy is still illusive. Second, the smart meters themselves must be secured from unauthorized access. If a thief is able to access the information directly through a poorly protected smart meter, then loss of privacy will occur. Anonymizing information can be an incredible tool to protect information, but it still depends on proper security.

3. Exceptions for Efficiency Programs

Even where utilities are prohibited from sharing information with outside parties, they often still are able to give the information to third parties when they are creating energy efficiency or demand response programs.¹⁶⁴ The Texas Utility Code, which restricts customer information disclosure and lets customers retain the ownership of their information, permits the utilities to release that information to third-party entities if they are assisting the utility in providing service.¹⁶⁵ These exceptions ensure that utilities can share information when needed, presumably without oversharing or selling that information. The risk for these types of exceptions is whether the state or local regulators actually can enforce them. Both the utility and the third party must only use the information if it aids the delivery of electricity. This requires security of information throughout this sharing process. Ensuring the third party's system is secure and the information is used correctly may be difficult for regulators to properly supervise.

C. A Balanced Solution

Finding a solution that protects consumers' privacy while still gaining the full advantages of the smart grid is difficult. Privacy is about preventing information collection whereas the smart grid collects information. These two concerns do not have to be in complete opposition. Creating limits on how a utility can use the information and what kinds of information the utility is allowed to collect are critical to getting widespread support for a smarter grid. Whether at federal or state level, laws must be enacted that create these limits and means to enforce them. Strong security measures that protect sensitive information is mandatory. Only after the information is stripped of personally identifiable information should it be transferred and used by third parties. This would severely hinder any unauthorized usage or hacking.

¹⁶⁴ TEX. UTIL. CODE § 39.107(k) (2019).

¹⁶⁵ *Id.*

The benefits and need for a smarter grid are too great to ban smart meters or other smart technology. If the nation is to successfully decarbonize and fight climate change, then the smart grid cannot be severely limited or banned. Strong privacy laws requiring full disclosure of what information is collected, how it will be used and protected, and the limitations on the use of that information should allay many of the concerns of consumers about privacy.

V. CONCLUSION

Smart grid technology can greatly aid in decarbonizing the nation's electric grid. A smarter grid assists utilities in creating a stable, reliable grid while providing consumers the ability to control their electrical usage. The smart grid also brings a great risk to privacy. Collection of smart grid information has the potential to destroy one of the last areas of privacy modern consumers have: the home. Failure to enact strong privacy laws that protect consumers may result the death of privacy. Given the amount of information that can be gleaned from smart meters and other smart technology, privacy advocate groups have fought hard against the installation of smart meters in their communities. Yet, the numerous benefits of a smart grid and the impact on reducing fossil fuel use are too important to stop using the technology. Creating laws that both protect privacy and give utilities the ability to fully utilize information created by the smart grid require a difficult but vital balance. Given the benefits and advantages to consumers and utilities, legislatures need to enact or update privacy laws that reflect an appropriate use of smart grid information. To keep the nation's grid strong and continue the decarbonization of our electricity grid, nothing less will do.