The Electricity Journal 31 (2018) 12–15

Contents lists available at ScienceDirect

The Electricity Journal

journal homepage: www.elsevier.com/locate/tej

Reforming reliability standards: A perspective from economics

William Watson*

Econalytics, LLC, Richmond, VA, United States

ARTICLE INFO

Keywords:
Efficiency
NERC
Positive externality
Public good
Reliability standards
Representative agent

ABSTRACT

The NERC Construct for the development, implementation and enforcement of the NERC reliability standards is analyzed from the perspectives of the economics of the public sector. The public policy solutions to the inherent market failures in providing for electric reliability in the NERC Construct are found to be at odds with the theory of the public sector. Recommendations for change in the NERC Construct are developed and postulated.

1. Introduction

It has been over 10 years since the Energy Policy Act of 2005 (EPACT05) transformed voluntary electric system reliability standards into mandatory standards subject to enforcement, with significant monetary penalties for non-compliance. However, like the reliability standards that prior to June 2007 were voluntary, the practical and theoretical underpinnings giving rise to these mandatory and enforceable provisions of EPACT05 have their beginnings much earlier. Much has changed. The focus of this paper is to examine these practical and theoretical underpinnings from an economist's perspective in order to cast light on their efficiency and to provide recommendations for improvements.

Section 2 discusses the underpinnings of the regulatory construct of electric system reliability. Section 3 addresses the NERC Construct with its regulatory apparatus and funding. Section 4 compares the NERC Construct to a framework that economic theory suggests as a better policy to correct the inherent market inefficiencies. Section 5 addresses the use of representative agents. Finally, Section 6 provides conclusions and policy recommendations.

2. The underpinnings of NERC

The practical underpinning for the adopted model of mandatory reliability standards had its beginning with the inception of the predecessor of NERC in 1962[1] and provided the basis for a regulatory framework after the Northeast blackout of 1965. This major blackout event, more than any other, demonstrated that the efficiency gains over the 30 years prior to 1965 from ever-larger generating stations, reserve sharing arrangements, and interconnected transmission systems, had created an interdependent, networked electric grid. This interdependent, networked electric grid had morphed out of a system of isolated, independent electric systems that was the original business model for electric utilities. Since this event, much has happened to underscore the fact that the United States electric grid is, indeed, highly networked and interdependent.[2] In many respects, this networked and interdependent electric grid takes on the characteristics of a public good. Economists define a public good as neither excludable nor rival in consumption. In other words, as an electric consumer, I cannot be excluded from consuming any additional reliability provided on the electric grid, nor, in most cases, can I be denied consumption of reliability because others are using it. A market for a service that is characterized as a public good has an inherent market failure in that, left to its own devices, it will underprovide the good in question, in this case, electric system reliability.

While not entirely independent of the public goods argument above, the recognition that the electric grid is a networked system also provides a theoretical underpinning for mandatory reliability standards as initiated by EPACT05. This is the premise that the provision of electric system reliability creates what economists term positive externalities. This situation arises when two things happen: (1) when an economic agent seeking a more reliable source of electric service provides for changes that produce more reliability in the delivery of electricity through this interdependent networked system, and (2) when others

* Corresponding author.
E-mail address: wfwatson924@gmail.com.

[1] The predecessor of NERC was the North American Power Systems Interconnection Committee (NAPSIC), which developed the initial recommendations for standardization.

[2] This is further underscored in that the structure of regulation that implements EPACT05 recognizes a North American grid and allows for our neighboring electric grids to be a part of the regulatory structure.

https://doi.org/10.1016/j.tej.2018.03.005

experience a positive benefit from this act without having to pay for the increase in reliability. Economists call these other beneficiaries “free riders.” Given this characterization, left to its own devices and with the prospect of high transaction costs to find and arrange for free riders to pay for this increase in reliability, an unregulated market for electric reliability will underprovide the socially optimal amount of electric system reliability.

Another theoretical underpinning for the adopted model of mandatory reliability standards assumes that the market can be modeled using a representative agent. This representative agent is endowed with a set level of income and wealth and sees the same level of choice options. In other words, the representative agent is the “average” market participant. Although not without controversy, the use of a representative agent has been standard practice for economic modeling beginning with Adam Smith and continuing throughout the study of economics. The general assumption of a representative agent in policy analysis often leads to conclusions that are contrary to what is desired and results in unintended consequences.

3. The NERC Construct

Implicitly recognizing these practical and theoretical underpinnings, the EPACT05 policy prescription was for the imposition of mandatory and enforceable reliability regulations. EPACT05 adopted this regulatory framework through the appointment of NERC (the North American Electric Reliability Corp.) as the electric reliability organization to administer the implementation and enforcement of mandatory reliability standards with a system of funding through assessments and fines, hereafter referred to as the NERC Construct.

In short, the NERC Construct assigns NERC the overall job of enforcing FERC-approved electric reliability standards. The process of reliability standard development, approval, and adoption is mostly collaborative, with entities subject to regulation playing a part in the process. There are currently eight regional entities whose responsibility is to monitor and enforce the reliability standards under NERC and the Federal Energy Regulatory Commission (FERC).[3]

Thus, the NERC Construct is a system of enforceable regulations which are implemented by what is effectively a two-part tax on the process: (1) a direct levy on those entities subject to regulations to pay for the regulatory apparatus, and (2) the added cost of upgrading capital equipment and operating systems to comply with the regulations, both of which are ultimately paid for by electric consumers.[4]

Neither of these prescriptions in the NERC Construct, the imposition of regulations and the implementation of a tax, are what economic theory suggests are the appropriate policy prescriptions to correct the market failures resulting from public goods, positive externalities, and free riders.

4. Positive externalities, free riders and public goods

As stated in Section 2, the NERC Construct operates in markets where positive externalities exist. The economic definition of an externality is “the uncompensated impact of one person’s actions on the well-being of a bystander.&#8221[5]; In the provision of electric reliability, one consumer may be willing to pay for the upgrade on a networked system to achieve a more reliable delivery of electricity. Others (bystanders) who receive service from this networked system benefit from the upgrades without having to fund the upgrades. They become “free riders.” Their existence is a failure of private markets to reach an efficient solution.

The NERC Construct for reliability of the electric system assumes that all free riders are relevant and that their existence will result in electric system reliability being under-provided because it is underfunded.[6] The NERC Construct attempts to remedy this through regulation by: (1) charging its registered electric service providers (ESP) the direct cost of enforcing compliance, and (2) imposing standardized electric reliability requirements, compliance to which is to be paid for out of an ESP’s operating and capital budgets.

Standard economic theory postulates that the existence of positive externalities creates a market failure in that the socially optimal provision of the a good exceeds the privately provided optimal. The remedy for a positive externality is to subsidize the provision of the good until the socially optimal quantity is provided. Clearly, the NERC Construct deviates from this policy. The NERC Construct’s system of levied costs of compliance (which is a tax by another name) and regulation are the opposite of what economic theory proposes and are more in line with economic policy prescriptions for negative externalities.

The more practical side of the NERC Construct has divided electric system reliability into two relatively distinct components. These two components are: (1) critical infrastructure protection (CIP) standards, and (2) operations and planning (O&P) standards. This division makes sense given that CIP standards are more like public goods and O&P standards operate more like private goods with positive externalities. While there is not a clear distinction in the theory of economics, there are subtle differences, especially when it comes to policy prescriptions.

First, CIP standards focus on providing cyber and physical security for what has been referred to as the internet of things (IoT). This IoT network of devices exhibits a host of the characteristics of a public good, defined in economic-speak as non-excludable and non-rival. The classic example of a public good is the provision of national defense. There is an element of national defense in having a secure IoT. Second, the requirements of O&P standards are generally provided by individual entities operating in the private sector, where the model where externalities exist defines the market better. The classic example of a positive externality is vaccination against communicable diseases.

Despite the subtle differences in public goods and positive externalities, the policy prescriptions are the same. The existence of both conditions is considered a market failure when subject to the rigors of a freely competitive market resulting in the equilibrium provision of a good or service below the socially optimum. Both require market intervention to correct the market failure. The standard policy prescription is to subsidize the market participants so that the more optimal equilibrium is attainable. This is in direct contrast to the NERC Construct.

4.1. CIP standards

To reiterate, securing critical infrastructure can be characterized as a public good, much like national defense. As a practical matter, an electric grid that is secure from physical and cyber attack is an integral part of the defense of the nation. Also, we have seen the evolution of NERC CIP standards proceed as such a rapid pace since their inception that it is difficult for regulated entities to keep up.[7]

All of this argues for change in the NERC Construct as to CIP standards. Ideally, the implementation of CIP standard requirements should be subsidized from revenues derived from a non-market participant source. Given the public good characterization of the physical and

[3] The Southwest Power Pool is in the process of dissolution with transfer of its responsibilities to Midwest Regional Organization and SERC. The process is anticipated to be complete in July 2018. This will leave seven regional entities operating in the NERC Construct.

[4] These costs, and others, are estimated in Watson (2017).

[5] Gregory Mankiw, Principles of Economics, 7th edition (2015). Cengage Learning. p. 196.

[6] The question of whether all free riders are relevant is another topic. In general, if there are even some relevant free riders, then the result of under-provision holds. For more on this topic, see Kiesling and Giberson (2004).

[7] This is also seen by the many technical feasibility exceptions to compliance that arise because of outdated cyber systems and assets still in use.