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International benchmarking of electricity transmission by regulators: A contrast between theory and practice?

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HIGHLIGHTS

- We discuss how to benchmark electricity transmission.
- We report survey results from 25 national energy regulators.
- Electricity transmission benchmarking is more challenging than benchmarking distribution.
- Many regulators concede benchmarking may raise capital costs.
- Many regulators are considering new regulatory approaches.

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ABSTRACT

Benchmarking of electricity networks has a key role in sharing the benefits of efficiency improvements with consumers and ensuring regulated companies earn a fair return on their investments. This paper analyses and contrasts the theory and practice of international benchmarking of electricity transmission by regulators. We examine the literature relevant to electricity transmission benchmarking and discuss the results of a survey of 25 national electricity regulators. While new panel data techniques aimed at dealing with unobserved heterogeneity and the validity of the comparator group look intellectually promising, our survey suggests that they are in their infancy for regulatory purposes. In electricity transmission, relative to electricity distribution, choosing variables is particularly difficult, because of the large number of potential variables to choose from. Failure to apply benchmarking appropriately may negatively affect investors' willingness to invest in the future. While few of our surveyed regulators acknowledge that regulatory risk is currently an issue in transmission benchmarking, many more concede it might be. In the meantime new regulatory approaches – such as those based on tendering, negotiated settlements, a wider range of outputs or longer term grid planning – are emerging and will necessarily involve a reduced role for benchmarking.

1. Introduction

Electricity transmission utilities provide electricity transport services across high voltage wires. They often, but not always, combine their core function of the maintenance of transmission system availability, with real time system operation to synchronise electricity supply and demand within their control area. Energy regulators across the world regularly engage in benchmarking of the transmission and distribution network utilities that they are responsible for regulating (see Jamasb and Pollitt, 2001). In many jurisdictions, benchmarking is an integral part of periodic price/revenue reviews during which regulated prices/revenues are determined for a fixed period. The benchmarking of electricity transmission presents a particular challenge for regulators because, unlike in distribution, there is usually only one or a very small number of transmission utilities operating within the jurisdiction of one regulator. This reduces the scope for national comparisons of efficiency between firms with identical accounting and technical standards. This necessarily makes benchmarking transmission more challenging than benchmarking distribution and suggests that international benchmarking is something that regulators need to consider.

International benchmarking of transmission utilities implies the comparison of different entities, performing a wider range of functions than distribution utilities, while operating at a wide range of scales and in contrasting operating environments. While there are a significant number of international electricity

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companies that operate generating plants, distribution systems and retail businesses in a number of regulatory environments (e.g. the dominant EU players—EdF, RWE, EoN, Vattenfall, ENEL and Iberdrola), there are only a handful of international transmission companies (in Europe only a few companies operate in more than one country, notably TenneT, elia/50 Hz and National Grid[1]). This suggests that utilities themselves have little direct experience of international benchmarking of transmission within their business operations, in contrast to their experience in distribution[2].

This paper discusses the theoretical and practical challenges associated with the use of benchmarking for electricity transmission. We conducted a survey of electricity regulators to explore whether there is a contrast between lessons from the literature and the actual experience and practice of energy regulators with benchmarking. In the academic literature, there has been a focus on methodological improvements and a trend towards resolving problems such as unobserved heterogeneity and small sample sizes with increasingly sophisticated models. In the practical application of benchmarking methods, however, regulators are moving towards a greater use of caution and interpretation with the results of models acknowledged to be inherently imperfect.

In Section 2 we discuss the previous literature and introduce the methodological and data issues in frontier benchmarking with particular application to transmission utilities. We also provide an overview of some of the possible future directions for regulation of electricity transmission. Section 3 describes the international survey we conducted to gather information on the use of benchmarking methods for electricity transmission and on the attitudes towards future regulatory changes. Section 4 discusses the results of the survey based on the responses of 25 national energy regulators. Section 5 offers a conclusion.

2. Background and future challenges: Electricity transmission benchmarking

2.1. Data issues in benchmarking transmission systems

International benchmarking of electricity transmission systems is challenging, mainly due to the need to collect data on a consistent basis from a number of countries. There has been relatively little analysis of electricity transmission benchmarking in the academic literature, compared to the large literature on electricity and gas distribution. Only five academic studies – so far – look at electricity transmission: Pollitt (1995) using DEA on US utilities; Nemoto and Goto (2006) using SFA on Japanese utilities; Llorca et al. (2013) using SFA on US utilities; and Von Geymueller (2007) using DEA on European TSOs and Von Geymueller (2009) using DEA on US utilities. There has also been no academic analysis of the effect of benchmarking on electricity transmission companies' performance. In an early review, Jamasb and Pollitt (2001) found only two jurisdictions (the Netherlands and Norway) had undertaken noteworthy international benchmarking of electricity transmission. In a recent review of benchmarking of energy networks ACCC (2012) summarises 22 DEA studies and 16 SFA of the efficiency of energy networks, all of which are on distribution utilities[3].

There have been several consultancy studies of electricity transmission benchmarking using data from groups of collaborating transmission companies, including Sumicsid (2009). This study examined the totex efficiency of construction, maintenance, planning and administration (CMPA) of European electricity TSOs. The publicly available summary of the Sumicsid study contains only limited information on the detailed results (because not all the participating companies/regulators were willing to publish their efficiency scores), however it makes use of a data envelopment analysis (DEA) approach assuming non decreasing returns to scale (NDRS). The Sumicsid study analyses the performance of 22 European transmission utilities for the period 2003–2006. The reported average efficiency after adjusting for outliers is 87%. The outputs in the analysis were a normalised grid size measure ('normalized grid metric'), population density and the amount of connected renewable capacity. The normalised grid size measure was calculated starting from 1200 different grid assets using assumed weights. This study involved a substantial data collection and standardisation exercise involving the cooperation of national regulatory agencies and regulated transmission companies with the report authors. The scale of the data exercise and the number of engineering judgements and standardisations required to arrive at a 'normalized grid metric' suggest the extreme difficulty of making international comparisons between electricity transmission operators.

Indeed, the use of assumed weights is precisely what a frontier efficiency technique such as DEA is designed to avoid. In DEA input and output weights are chosen, by the technique, for each firm individually in such a way as to give the firm the highest efficiency score possible. The arbitrary imposition of common weights for all firms to create one of the key outputs within the Sumicsid study, combined with the subsequent use of this output within DEA is contradictory.

In sum, the lack of academic studies, and the fact that all but one are on the data from one country, illustrate the difficulty of comparing electricity transmission operators.

The four main categories of challenges can be summarised as follows. First, in order to compare different countries, the boundary of transmission and other activities must be clarified. Transmission voltage levels vary between different countries, as does the classification of voltages as transmission or distribution. Standard adjustments, for example using weights for each voltage level, are unlikely to capture the local investment cost conditions or other economic realities facing firms. Transmission companies may or may not have responsibility for system operation and system planning. National Grid in the UK is a system operator and a transmission operator. However most US transmission businesses have delegated system operation to a regional transmission organisation (RTO), which is a form of independent system operator (ISO) (Pollitt, 2012).

Second, international comparisons require appropriate conversion factors which adjust for exchange rates and historic domestic inflation (see Jamasb and Pollitt, 2003, for a discussion). This is complicated in the case of electricity transmission by several factors. Some costs are wholly domestic, for example transmission line operation expenses, whereas others are internationally determined such as the price of copper in transmission cables. The value of capital assets in the regulatory asset base at any point in time reflects the time profile over which the assets were

[1] European utilities have had some experience with transmission outside Europe. The Italian transmission system operator, Terna, did own a transmission business unit in Brazil from 2003 to 2009; while National Grid owned transmission assets in Argentina from 1993 to 2004.

[2] Transmission utilities do participate in joint international benchmarking exercises, such as the private International Transmission Operation and Maintenance Survey (ITOMS) undertaken by UMS. See: http://www.umsgroup.com/partnerforums.

[3] In Tables 6.1 (p. 118–124) and 5.1 (p. 96–100). Technically, one of these studies is on transmission and distribution combined. The report also mentions two studies of transmission benchmarking, but only one of these is an academic study, on gas transmission. The other is Sumicsid (2009), discussed below.