

Network Regulation and Regulatory Institutional Reform: Revisiting the Case of Australia

Rabindra Nepal*

Flavio Menezes**

School of Economics, University of Queensland

Tooraj Jamasb***

Durham University Business School, Durham

Abstract

It is well-understood that the success of liberalizing the electricity supply industry depends crucially on the quality and design of the regulatory and institutional framework. This paper analyses the regulatory arrangements that underpin the work of the Australian Energy Regulator (AER). These arrangements are contrasted with the regulatory structure of electricity provision in Norway. A key difference between the reform processes in the two countries relates to the lack of privatization in Norway and the co-existence of private and publicly owned generators and distributors in Australia. This comparative analysis allows us to make several recommendations to improve regulatory arrangements in Australia. These include greater independence for the AER, better coordination among regulatory institutions, greater use of benchmarking analysis, greater customer involvement, and improving market transparency and privatization of government-owned corporations. However, the success of privatization will hinge upon the effectiveness of the regulatory environment.

Keywords: electricity, networks, regulation, institutions

JEL Classification: L43; L50; L94

* *Corresponding author.* Colin Clark Building, Level 6, Room 652, Email: r.nepal@uq.edu.au, Phone: +61 7 334 60798

**Colin Clark Building, Level 6, Room 622, Email: f.menezes@uq.edu.au, Phone: +61 7 336 56242

*** Durham University Business School, DH1 3LB, UK. Email: tooraj.jamasb@durham.ac.uk, Phone: +44 (0) 191 3345463.

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1. Introduction and Purpose

What role does economic regulation play in the success of electricity sector liberalization? Why does the success of liberalization depend on the effectiveness of the existing regulatory framework and regulatory institutions? This paper attempts to address these questions in the context of liberalization of the Australian electricity industry. Our assessment considers growing concerns with rising electricity prices and spiraling network costs in Australia, which are largely attributed to economic inefficiencies and underlying flaws in the regulatory environment (Productivity Commission, 2013).

Australia's liberalization of the electricity sector started with the reform of the Victorian State Electricity Commission which languished under public dissatisfaction as a result of mounting electricity prices, with privatization offering an attractive opportunity for Victoria to reduce significant levels of state debt (Quiggin, 2001; Sharma, 2003; Moran and Sood, 2013). The Victorian power exchange started operating the first Australian power market in Victoria in 1994, while transmission was unbundled and a market was launched in New South Wales (NSW) in 1996. Queensland (QLD) mimicked the reforms that took place in NSW in 1998, while in South Australia (SA) accounting unbundling took place in 1997 following the early corporatization efforts of the state-owned, vertically integrated utility in 1995. Thus, the restructuring of the vertically integrated and state owned Australian electricity supply industry (ESI) of the early 1990s involved the separation of competitive (generation and retail) and monopoly segments (transmission and distribution networks, supply) with increased participation of privately owned firms in the competitive segments. The establishment of the National Electricity Market (NEM) in 1998, which is an energy-only market for wholesale electricity trade, indicated stricter adherence to the 'textbook' reform model aimed at widening and deepening competition in the wholesale market.

Electricity sector liberalization in Australia occurred within the wider context of the efforts for improving the competitiveness of the Australian economy, starting with financial deregulation over the 1970s and 1980s. In particular, the floating of the exchange rate subjected Australian exports, comprised mainly of agricultural and mining goods, to global competitive forces, whilst high tariff walls protected manufactured goods from competition. The inward focus of domestic industry led to declining standards of living, unemployment, inflation, and balance of payments deficits. This led the Hawke-Keating Labor government to set up an independent Committee of Inquiry into National Competition Policy for Australia in 1992, also known as the Hilmer Report (Hilmer, 1993). The recommendations from the Hilmer Report, delivered in 1993, were to focus on efficiency and productivity throughout the economy, by improving economic management and removing impediments to competition. Included in the rationalization of economic management was the

recommendation on the restructuring of the public sector monopoly businesses and granting third party access in network industries.

After more than two decades of electricity sector reforms, the current state of electricity reform progress in Australia is marked by individual heterogeneity across different states¹. The natural monopoly segments remain economically regulated where the independent regulator sets network charges. However, network charges have experienced sharp increases, resulting in network costs constituting around 40-50 percent of an average household's electricity bill. This has largely been driven by increasing network and retail allowances, which have more than doubled since 2007. For example, the regulated network companies in New South Wales and Queensland with significant public ownership have experienced increasing transmission and distribution network revenue allowances leading to increasing network costs that are not necessarily efficient (AER, 2013). Hence, average electricity prices rose by around 70 percent in real terms from June 2007 to December 2012 in Australia, largely blamed on increasing network costs in most states and the flaws in the existing network regulatory environment (Productivity Commission, 2013). NSW households experienced an 80 percent increase in electricity prices from 2007 to 2012. End-user electricity prices have also increased in Victoria, where private ownership is persistent (Reeves, 2013). These price increases contradict the proclaimed perception of the benefits of electricity sector liberalization: that it would lead to lower consumer prices (Chester and Morris, 2011).

This paper, therefore, reviews the role and structure of the current regulatory framework and the institutions surrounding the economic regulation of electricity networks in the NEM. By 'economic regulation' we refer to both direct legislation and administrative regulation of prices and entry in line with Joskow and Rose (1989). We also study the role, structures and procedures of electricity regulation in Norway. Cross-country case studies are well-suited for in-depth investigation and qualitative analysis (Jamassb et al. 2004). Norway is an interesting case study as it is a forerunner of ESI liberalization that has been able to nurture both wholesale and retail competition and incentive-regulation in the market without privatization (Moen and Hamrin, 1996; Magnus, 1997; Askim and Claes, 2011). The liberalized Norwegian electricity market has performed well in terms of economic efficiency and market functionality (Midttun and Thomas, 1998; Bye and Hope, 2005).

This paper also seeks to contribute to the existing, though limited, literature that analyses the regulatory issues and options in the NEM. We believe that there are relevant conclusions to be drawn and suggestions that can be made for improving the structure of the independent regulatory environment in Australia. This is necessary because the success of liberalization in network and infrastructure industries is only realized by effectively managing the interface between the competitive and regulated

¹ See Moran and Sood (2013) on the evolution of Australia's National Electricity Market.

segments where economic regulation – in terms of the regulatory regime, regulatory arrangements and its varying supporting institutions – plays a pivotal role (Newbery, 2002).

The remainder of the paper is structured as follows. Section 2 provides an overview of economic reasoning on the importance of establishing a suitable regulatory framework and regulatory institutions while undertaking regulatory reform in order to liberalize electricity markets. Section 3 presents the regulatory institutional organization in Australia and Norway. We also compare the role, structures and procedures of electricity regulation between Australia and Norway. Section 4 identifies regulatory shortcomings in the NEM and recommends improving key regulatory issues. Section 5 concludes the paper.

2. Background and Scope: Institutions and Economic Regulation

Electricity networks are capital intensive and generally viewed as exhibiting natural monopoly characteristics such as large economies of scale, scope and densities (Kahn, 1971). These characteristics imply that in practice, entry to network businesses is restricted and price regulation is required to minimize inefficiencies associated with monopoly pricing. Regulated prices are typically set by an independent regulator in such a way that the regulated firm is allowed to recover the efficient costs of providing the service. The price setting process is concerned with two different types of incentives (Joskow, 2013).

The first is the incentive for regulated firms to make regulatory submissions that more accurately reflect their actual expectation of cost required for providing the regulated services over the next control period. The economic literature refers to the case where the firm has an incentive to overstate its cost forecasts as *adverse selection* (or hidden information). The second is the incentive for firms to reduce costs during the regulatory period below those initially approved by the regulator. The economic literature refers to the case where firms have no incentives to reduce costs as *moral hazard* (or hidden action).

The emergence of adverse selection and moral hazard is related to a fundamental asymmetry of information between the regulator and the regulated firm. Adverse selection may result as the regulator cannot perfectly determine whether the regulated firm's cost forecasts reflect best practice. For example, some cost drivers may only be observed by the regulated firm, and not by external consultants that are often hired by the regulator to scrutinize the firm's cost proposals. In a similar vein, the regulator may not be able to observe the opportunities that the firm has for cost reduction, which can lead to moral hazard. For example, the regulator may not be able to observe managerial effort.

Overcoming asymmetric information and setting prices that allow regulated business to recover efficient costs requires the establishment of a regulatory framework, including regulatory institutions (Chester, 2007). Indeed, the experience with economic regulation that followed the privatization and deregulation process of the 1990s around the world highlighted the role of institutions in determining the effectiveness of electricity regulation (Bergera et al. 1998).

The important role that institutions play in economics is well understood. North (1991) and Acemoglu (2006) point out that institutions are humanly devised constraints that structure interaction at the political, economic and social levels; provide incentive structure for an economy; create order and reduce uncertainty in economic exchange. From an institutional economics perspective, regulatory institutions consist of the institutional environment and the institutional arrangement as the two essential components (Williamson, 1996). The institutional environment consists of the 'rules of the game', which can be formal or informal while the institutional arrangement focuses on the governance mechanism. Regulatory reform, in institutional terms, involves changing the rules of the game (i.e. the institutional environment) and modifying the governance mechanism or institutional arrangement in accordance with the new rules. The effect of new rules on economic performance runs through its long-lasting impact on institutions (Easterly and Levine, 2003).

The institutional endowment of a country largely determines the institutional environment, and the electricity sector regulatory effectiveness of countries tends to reflect many of the characteristics of institutions at a macro-level (Haney and Pollitt, 2011). The institutional endowment of a country includes the five elements of legislative and executive system, judicial system, administrative system, informal rules and country-specific social and ideological characteristics (Levy and Spiller, 1994). This implies that institutional endowment influences the economic performance of regulated network industries through its impact on institutional development, in line with the arguments by Sokoloff and Engerman (2000).

A number of empirical studies demonstrate that the extent to which a regulatory system becomes effective mostly depends on the country's institutional environment. Henisz (2002), using discrete time logit models based on a two-century long historical analysis, showed that the level of stability of the institutional environment is an important determinant of infrastructure investment in network industries. The sample size consisted of 160 countries, with heterogeneous characteristics captured in the model such as colonization, regional belonging and a vector of time dummies. Haney and Pollitt (2011), using Ordinary Least Squares (OLS) models, showed that the existence and experience of an independent regulator is the most important institutional determinant in best practice electricity regulation. The authors constructed an empirical model to investigate the impacts of industry size, political and economic institutions on the degree of best practice regulation, drawing from the incentive regulation and institutional economics literature. The best practice index

was constructed from the survey responses of regulators in 40 countries. Similarly, Erdogdu (2013) showed the importance of better institutions in explaining why some countries can implement more extensive electricity and regulatory reforms, using an econometric model based on Poisson regression with cross-section data. The data covered 51 states in the US, 13 provinces in Canada and 51 other countries. The results showed that the backgrounds of the chairperson and the minister/governor, the level of democracy and the level of country level corruption are significantly correlated with the extent of reform progress. In addition, Green and Rodriguez Pardina (1999) identified a set of standards involving the certainty, clarity and transparency of regulatory processes for effective electricity regulation based on an independent regulator model. Case studies and examples from countries around the globe were used to construct a regulatory manual, with a view to providing the information required for effective regulation early in the process.

The theoretical literature on regulatory institutions, however, by and large has focused on the governance of regulatory contracts between the regulated firm and consumers (Goldberg, 1976; Williamson, 1996), and between the regulated firms and the government (Levy and Spiller, 1994). The characterization of the regulatory institutional organization, which is the decision-making mechanism for formulating and enforcing the rules, remains neglected by the literature (Brousseau and Fares, 2000; Niesten, 2006). This paper adds to the understanding of how institutions interact with regulatory outcomes by studying the regulatory institutional organization in the electricity markets of Australia and comparing it to that of Norway.

3. Methodology: A Cross-Country Institutional Approach

The regulatory institutional organization includes the specification of authorities involved in the regulation of electricity industries (i.e. the different layers of institutions); the allocation of regulatory responsibilities among these authorities (i.e. their different roles) and the coordination mechanisms that underpin the mutual relations between these authorities. Studies by Glachant and Finon (2000), Ogus (2002) and Niesten (2006) have recognized the importance of specifying the rule makers, and the allocation of different regulatory tasks and powers among different regulatory authorities, in the European electricity liberalization context.

3.1. The Australian ESI

Responsibility for electricity regulation in Australia was originally divided amongst state, territory and national regulators during the introduction of deregulation. As part of the deregulation process a National Electricity Market (NEM) was developed. This market comprises Queensland, New South Wales, the Australian Capital Territory, Victoria and South Australia. Tasmania joined the NEM when the Basslink

Interconnector was commissioned in April 2006. Jurisdictions in the NEM were required to regulate the electricity industry according to an industry access code.

The regulatory framework was changed in the early 2000s with a move to create national, rather than state based regulators. In the new regime, there are three main authorities involved in the economic regulation of electricity networks in Australia, namely the Standing Council of Energy and Resources (SCER), the Australian Energy Market Commission (AEMC) and the Australian Energy Regulator (AER). The responsibility of the wholesale market (NEM) operation lies with the Australian Energy Market Operator (AEMO). The AEMO was established in 2009 when a number of state planning bodies and gas market operators were combined with the National Electricity Market Management Company (NEMMCO). AEMO is also responsible for transmission system planning in Victoria, as planning functions have been separated from network ownership and operation, which are left to the privately owned parties. These bodies constitute the regulatory and market framework governing the operation of the NEM. The roles and structures of the regulatory institutions are briefly described below:

3.1.1. Standing Council of Energy and Resources (SCER)

The SCER was established in 2011 by amalgamating the Ministerial Council on Mineral and Petroleum Resources and the Ministerial Council on Energy (MCE). The Council of Australian Governments (COAG) as the national policy and governing body of NEM established the MCE in 2001. The objective of the MCE was to deliver the economic and environmental benefits resulting from implementation of the COAG energy policy framework by providing national oversight, leadership and coordination of policies facing the Australian energy sector.

SCER is responsible for pursuing a strategic national agenda across the Australian energy and resource sectors. One of SCER's priority issues is to assess the market mechanisms and regulatory frameworks including governance of network regulation to facilitate adequate, efficient, and timely investment in networks and ensure efficient network operation. The ministers responsible for energy and resource matters in the Commonwealth, States, Territories and New Zealand gain membership of SCER and are chaired by the Commonwealth Minister for Energy, Resources and Tourism. The decision making process within SCER is based on consensus wherever possible unless specific voting rules are included. In the case of voting, the principle of one vote per jurisdiction applies (SCER, 2011).

3.1.2. Australian Energy Market Commission (AEMC)

The AEMC was established in 2005 under the *Australian Energy Market Commission Establishment Act 2004* of South Australia, when NEM jurisdictions agreed to change the NEM institutional arrangements. AEMC replaced the dissolved National

Electricity Code Administrator (NECA), which was one of the governing bodies of the NEM and responsible for administering changes, and enforcing the National Electricity Code. AEMC was given the power to make changes to the Rules without the approval of the Australian Competition and Consumer Commission (ACCC) and is responsible for conducting broader reviews as requested by the MCE (Moran and Sood, 2013).

AEMC is also responsible for maintaining and developing the National Electricity Rules (NER) and providing advice to Ministers on how best to develop energy markets over time (AEMC, 2013). It is the rule maker and developer of the national electricity and gas markets. The AEMC operates with three strategic policy areas, with the retail, distribution and network regulation group being one of them. The group is responsible for reviews and rule change proposals relating to the retail markets and the regulation of revenues or the pricing of network companies (both distribution and transmission). AEMC consists of three commissioners, where two of these are appointed on the recommendation of the participating State and Territory jurisdictions, while one is appointed on the recommendation of the Commonwealth Government. One of the commissioners acts as the chairman of AEMC.

3.1.3. Australian Energy Regulator (AER)

The AER was established in 2005 as an independent statutory authority and administratively part of the Australian Competition and Consumer Commission (ACCC) under Part IIIAA of the *Trade Practices Act 1974* (TPA). AER was set up as a division within the ACCC to monitor as well as to perform the ACCC's transmission revenue regulatory functions. AER was created in an attempt to mitigate the confusing and overlapping style of decision-making process practiced by NECA and the ACCC, which led to the institutional reform of 2005 (Moran and Sood, 2013). The AER operates under the *Competition and Consumer Act 2010* (formerly the TPA).

AER is responsible for monitoring, investigating and enforcing compliance in the wholesale electricity and gas markets; regulating electricity networks and natural gas pipelines by setting the maximum amount of prices that the network companies can charge; and the regulation of the retail electricity and gas markets where jurisdictions have commenced the National Energy Retail Law. However, maximum retail tariffs for small customers remain in the hands of the jurisdictional regulator in other states except Victoria and South Australia. The Commonwealth funds the AER, while the staff, resources and facilities are provided through the ACCC. The AER Board is an independent entity and consists of 3 members appointed by the Governor-General for terms of up to five years, and one of them chairs the AER. The three-member board consists of one Commonwealth member and two state/territory members. The AER may make decisions in relation to its functions under the National Electricity Law,

National Gas Law and National Retail Law. However, decisions of the AER are subject to judicial review by the Federal Court of Australia.

AER regulates the maximum amount of revenue that the network companies are allowed to earn, as the network companies submit their proposal to the AER on the prices or revenue that they want the AER to set. The AER reviews the proposals submitted by the network companies and makes decisions considering several factors, such as increasing electricity demand, assets profile, operating costs and network reliability where the regulatory control period generally applies for five years. All expenditures on electricity networks are included in the regulatory asset base (RAB) when determining the capital expenditure allowances, operating expenditure allowances and the cost of capital. The network companies can earn a high-regulated rate of return of 10.2%, which can encourage gold-plating behaviour among network companies.

The AER applies the weighted average price caps and maximum revenue caps – such as the ‘CPI-X’ pricing regime (or price cap regulation) – to set the price/revenue path of the regulated network companies which incorporates inflation adjustment and a required productivity increase. CPI is the Consumer Price Index and is a measure of inflation while the ‘X’ factor is some measure of expected improvements in efficiency. In theory, the delinking of prices/revenues with the underlying costs of the firm implies that the ‘CPI-X’ regime is an incentive based regime that provides strong incentives for cost or efficiency savings, after the price path has been set in relation to the forecasted costs for a given regulatory control period (Littlechild, 1983; Joskow, 2013). However, a less desirable feature of the traditional ‘CPI-X’ regulation is that the incentive for efficiency savings diminishes as the regulatory period proceeds. The AER uses a building block model that accounts for a network’s operating and maintenance (O&M) expenditure, capital expenditure, asset depreciation costs and taxation liabilities, and for a return on capital (AER, 2013). However, an efficiency carryover mechanism in the building block approach to incentive regulation prevents the incentives to defer cost savings in the ‘CPI-X’ regulatory framework. The price control mechanisms in the distribution network regulation by the AER can involve the weighted average price caps or average/maximum revenue caps.

3.2. The Norwegian ESI

Norway was one of the first countries to deregulate and liberalize its ESI following the enactment of the new *Energy Act* in 1990, which provided the legal foundation for Norway’s electricity market reform. The creation of a spot market for wholesale electricity trade; the legal vertical separation of the dominant, state-owned, and vertically integrated company Statkraft into Statkraft SF (a generating company) and Statnett SF (a transmission company); and the network regulation of the monopoly

segments of the ESI were significant elements of the reform process (Bye and Hope, 2005). Norway implemented the market liberalization process without changes in the ownership (i.e. privatization) unlike the UK, where privatization was considered a prerequisite for successful electricity market reform from an economic efficiency perspective (Midttun and Thomas, 1998)

Norway participates in the competitive Nord Pool Spot for wholesale electricity trade, which is the largest joint wholesale market for electricity trade in the world in terms of volumes (TWh) traded. The Nord Pool Spot is licensed by the Norwegian Water Resources and Energy Directorate (NVE), which is responsible for organizing and operating a market place for power trading, and by the Norwegian Ministry of Petroleum and Energy (MPE) to facilitate the international integration of power markets. The main regulatory institutions responsible for the regulation of Norwegian ESI include the MPE, the Norwegian Competition Authority (NCA) and the NVE.

3.2.1. Ministry of Petroleum and Energy (MPE)

The Norwegian MPE was established in 1997 and is under the lead of the Minister of Petroleum and Energy. The Minister has personal staff, with one state secretary and one political advisor. The ministry has around 140 employees. The principal responsibility of the MPE is to achieve a coordinated and integrated energy policy. The Ministry has four departments including the Energy and Water resources department. This department aims to ensure good management of water and hydropower resources, other domestic energy sources and energy use in both economic and environmental terms. The department has a section for the electricity market whose role includes overseeing issues related to the regulation of grid activities and setting electricity grid tariffs. The department is also responsible for monitoring the state-owned enterprises Statnett SF and Enova SF.

3.2.2. Norwegian Competition Authority (NCA)

Competition regulation in Norway started in 1917, after the outbreak of World War I. However, the present name came in 1994 when a new *Competition Act* was passed and the authority was restructured. The Ministry of Government Administration, Reform and Church Affairs provide the framework for the NCA's activities and acts as the appellate body of the NCA's decisions. The Department of Competition Policy within the Ministry of Government Administration, Reform and Church Affairs is responsible for drafting the *Competition Act* and for managing the NCA. The NCA employs in excess of 100 employees.

The main role of the NCA as a government agency is to enforce the competition law in accordance to the *Norwegian Competition Act 2004*. The NCA investigates mergers and acquisitions. In the electricity sector, the Norwegian competition policy has mainly been concerned with improving market transparency through the retail-price information system, and elimination of any market power abuse by dominant

firms that have resulted from mergers and acquisitions. A price information system for retail prices from power suppliers was introduced by the NCA in 1998 to improve market transparency. The time allowed for consumer switching was also reduced to a week. The price information system has largely improved market transparency in the retail segment. The introduction of the retail price information system along with other regulatory measures such as the abolishment of switching fees have stimulated retail market competition in Norway (Bye and Hope, 2005). The NCA is also responsible for assessing the implications of transmission capacity constraints on competition in the electricity markets.

3.2.3. Norwegian Water Resources and Energy Directorate (NVE)

The NVE is a Norwegian Government Agency established in 1921. The NVE was assigned the role of electricity regulator with the enactment of the *Norwegian Energy Act* in 1991. The regulatory tasks are ensured by the NVE, while a regulatory body was set up as one of the departments within NVE in 1990. The regulatory staff comprises approximately 100 employees, with competences in economics, engineering and other academic professions and covers the responsibilities of energy modeling and analysis, economic regulation of network companies, regulation of system responsibility, network operation and planning, network pricing, wholesale and retail market regulation and monitoring, energy efficiency, energy resources, energy security and emergency preparedness (NVE, 2011a).

NVE acts as the national independent regulatory authority for the electricity market in Norway while the Director General performs the functions of the regulator. The regulator has no ownership interests in the electricity industry, is an independent legal entity with its own budget adopted by Parliament, and has the power to act in the scope of its competences (NVE, 2011a). The budget covering the regulatory functions is mainly provided through the yearly government budget and by fees paid by the regulated companies.

NVE is delegated powers through the *Energy Act* and has the power to issue regulations on economic and technical reporting, network income, market access and network tariffs, non-discriminatory behavior, customer information, metering, settlement and billing, and the organized physical power exchange (Nord Pool Spot) (NVE, 2011a). NVE has the discretion to make necessary decisions to fulfill the delegated powers according to the *Energy Act*, as well as issuing regulations on system responsibility and quality of supply. The NVE's energy and regulation department regulates and monitors the Norwegian power networks.

The economic regulation of electricity networks in Norway involves a combination of 'direct' and 'economic' instruments. The direct instruments, as reflected in the *Norwegian Energy Act*, oblige the companies to connect to new consumers and generation sources, and provide a high level of power quality. The network

companies may charge an investment contribution to cover the costs of new network connections. Network companies also receive a reasonable return, a minimum of 2%, on their investments given effective management and utilization of the networks, while any companies falling short of the minimum return will receive compensation at the end of regulatory period.

Rate-of-return regulation was used to set the monopoly prices in the Norwegian ESI before 1997 and later changed to incentive regulation (Forsund and Kittelsen, 1998). However, the current economic instruments involve the use of 'revenue caps' as an incentive-based regime to determine annual revenue caps for each individual licensee. The allowed revenue is intended to cover the costs of operation and depreciation of the grid with a reasonable rate of return on invested capital over the regulatory period. The incentive regulation models have been modified over-time.

Currently, the revenue cap formula to determine the income of the 155 distribution and regional transmission companies in Norway is based on the formula ' $RC_t = 0.4C_t + 0.6C_t^*$ ' where RC_t is the revenue cap in year t and C_t is the cost base for each network company based on costs from year t-2. C_t^* is the cost norm for the company derived from a total cost benchmarking analysis of the companies and also based on data from year t-2. Data Envelopment Analysis (DEA) is used to benchmark the costs of network companies and OLS regression models are used to correct the DEA results for environmental factors. NVE also defines a WACC (weighted average cost of capital) to calculate the capital cost of each company (NVE, 2011b). Thus, the Norwegian incentive regulation regime has both the elements of cost efficiency incentives and yardstick regulation.

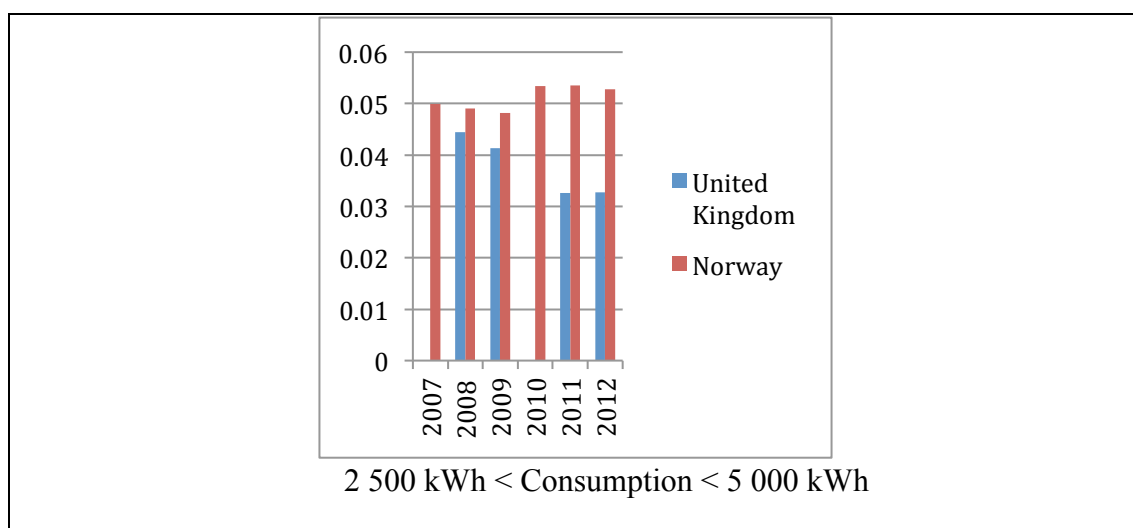
Table 1 summarises the regulatory framework and organisational structure of the regulatory institutions in Australia and Norway. The table highlights the institutional approach to ESI regulation in these two countries along with the individual characteristics of the independent regulatory agency (IRA). However, it should be noted that any direct comparison between the regulatory institutional organisation in Norway and Australia should account for the differences in the geography, regulatory environment and industry structure between these two countries.

Properties\Countries	Australia	Norway
General approach (main institutions)	Ministry and IRA	Ministry and IRA
Observations	both at federal and at individual states	national level
Scope of IRA	electricity and gas	electricity and district heating
Board Members of IRA	3	no board but a director general
Length of appointment of IRA	up to 5 years	n/a
Possibility of renewal of IRA	Yes	n/a
Staff of IRA	126 monitoring over	100 monitoring over

	around 20 million population	around 5 million population
Budget of IRA	6200000 AUD ²	920 million NOK ³
Main source of financing of IRA	government and financed through ACCC	parliament and fees from regulated companies
Pricing regime	revenue cap	revenue cap
Regulated rate-of return	10.2%	2% (minimum)
Use of benchmarking	no explicit use	yes

Table 1: Regulatory institutional comparisons

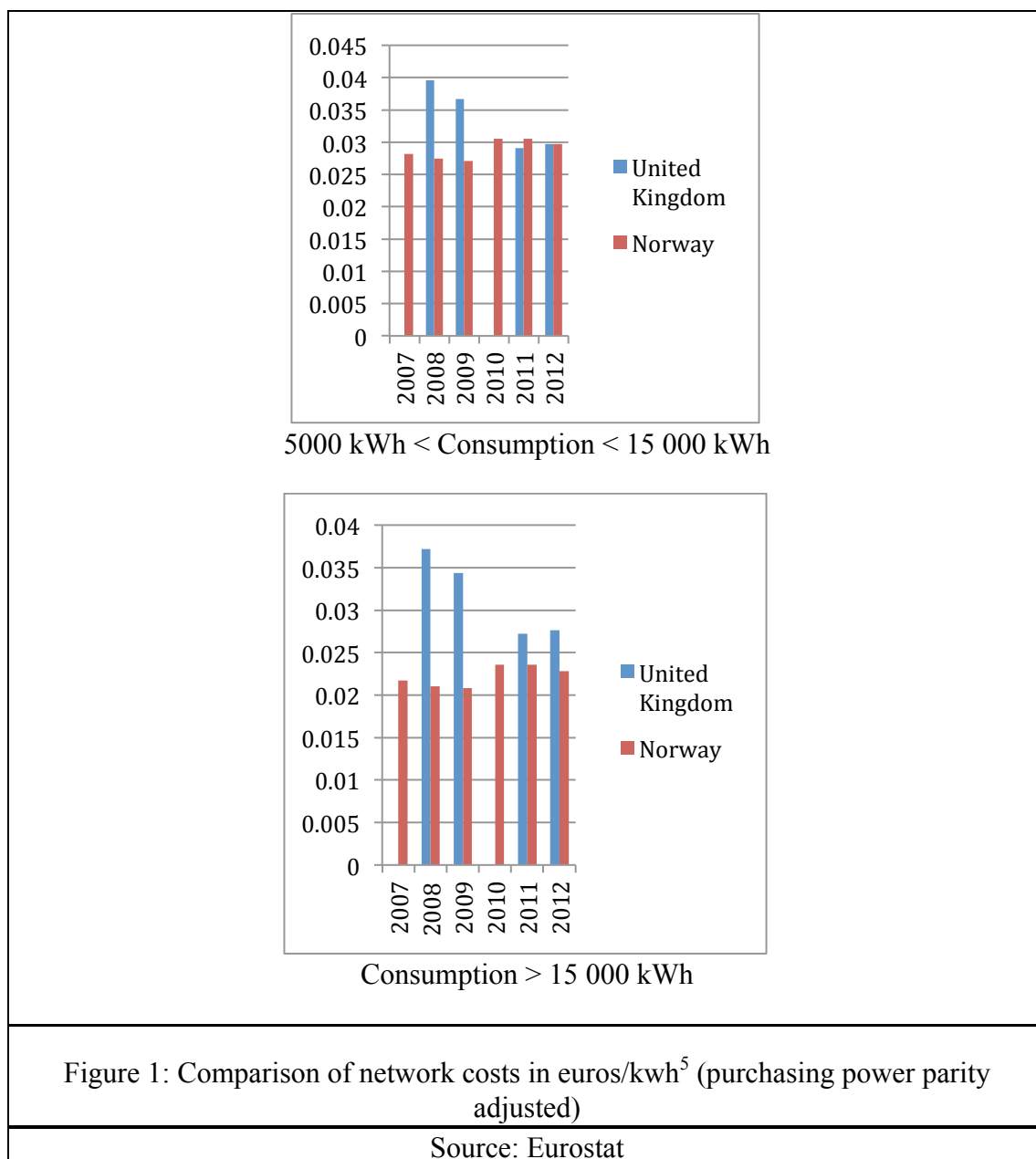
Figure 1 below shows the end user network costs for domestic consumers under varying consumption ranges among the European countries such as the UK and Norway. Both UK and Norway are considered to be leaders in global electricity sector liberalization (Pollitt, 2007). It can be seen that network costs in both the UK and Norway have been relatively stable across each consumption range⁴. The network costs in Norway are much lower than in the UK for high consumption domestic users.



² Based on the expenditures assessment of AER on major items such as payments to external consultants, lawyers, travel, employee costs and website management as documented in the AER inaugural report (see AER, 2012).

³ The budget reported for 2013 in Norwegian Kroner (NOK). Einar Hope provided the information.

⁴ A detailed discussion on the evolution of distribution network costs in the UK is contained in Mountain and Littlechild (2010).



Likewise, Table 2 shows that rising network costs have been the largest contributor to price increases since 2010 in the NEM. Network costs, on average, accounted for around 50% of price increases in states like Queensland, New South Wales and Tasmania during 2011/12 where the state owns the transmission and distribution assets. In Victoria and South Australia, network share of total residential electricity costs consisted of 34% and 46% respectively.

⁵ Please note that the consistent data on the UK network costs is missing in Eurostat and hence is not reported in the figures for 2007 and 2012.

	Network costs (in cents/kwh)			Network share of total residential electricity costs		Contribution to price increases from 2011-12 to 2014-15 (in %)	
	2011-12	2014-15	Increase	2011-12	2014-15	Distribution	Transmission
Queensland	11.0	14.6	32.7%	49.8%	52.3%	58.6	3.4
New South Wales	14.1	16.0	13.5%	55.5%	51.6%	0	33.9
Victoria	9.8	13.2	34.7%	34%	37.5%	51.6	1.6
South Australia	13.8	18.2	31.9%	46.2%	54.7%	108.8	20.6
Tasmania	14.2	17.5	23.2%	54.2%	56.3%	40.8	26.5

Table 2: Projected network costs 2011/12 to 2014/15
Source: AEMC (2013)

4. Results and Discussions: Policy Issues and Recommendations

This section draws upon the analysis of the regulatory framework and regulatory institutional organisation in Norway and Australia. Such comparison allows us to focus on the strengths and weaknesses of the regulatory arrangements between these countries. However, there are difficulties in making direct comparisons between the regulatory framework and the way in which particular regulatory bodies implement that framework (Mountain and Littlechild, 2010). We identified five key differences, in particular, which are discussed below.

4.1. Independence of the AER

There are several criteria to gauge the independence of a regulator. It is claimed that independent regulatory agencies are better able to hire more experienced and capable personnel because they are not restricted to civil servant salaries (Cushman, 1941). Independent agencies also have a long-term focus (Landis, 1938). Stern (1997) and Stern and Holder (1999) define regulatory independence in terms of the distance between the government and the regulatory bodies measured against factors such as the appointment and dismissal of the regulatory bodies, financing of the regulatory bodies, and the relationship between the regulatory body and the government (such as a separate office independent of any ministries, a body independent of government, etc.). The appointment and dismissal procedures (or the security of the tenure members), source of finance and the relationship of the regulatory body with the government are crucial in governing regulatory framework aspects such as the level of discretion and the burden of proof of the regulator (see also Mountain and Littlechild, 2010).

The AER is financed by the ACCC and does not have its own budget and staffing arrangements. Hence, it may be influenced by the ACCC given the close links between these bodies. It is also only responsible for implementing the rules recommended by the AEMC and approved by SCER. The SCER represents the council of government ministers, and therefore has financial interests in limiting the power of the AER because of ownership interests in the network companies in Queensland, Tasmania and New South Wales. The AER has no power to control or manage retail prices, that power being in the hands of the state bodies, the Queensland Competition Authority (QCA), New South Wales' Independent Pricing and Regulatory Tribunal (IPART) and the Office of the Tasmanian Economic Regulator (OTTER).

By comparison, the NVE in Norway is jointly funded by the parliament and the fees paid by the regulated companies. It is empowered with designing and implementing rules such as regulation on economic and technical reporting, network income, market access and network tariffs. The NVE has the power to develop enhanced efficiency incentives through price control. By contrast, the AER has limited power to develop efficiency incentives by using retail tariff as a mechanism. In that sense, the NVE has more scope for defining incentives than the AER.

Similarly, in Norway, the assumptions about future parameters such as the level of demand, operating expenditures, capital expenditures, and cost of capital are entirely a matter for the regulator as in the UK (OFGEM, 2009). NVE exercises a greater degree of control over the information that network companies provide. Hence, the burden of proof is on the regulated network companies to convince the regulator to adopt the conditions in their own proposal. However, in Australia, the AER is required to accept cost proposals by a distribution company if the proposed costs are efficient and reasonable. Hence, the burden of proof is on the AER if it chooses different parameters to those proposed by the network company, as this will need justification as required by the NEL. This burden of proof can be minimized if AER is granted more authority, which will involve changing the rules in NEL.

In the short term, the processes and effectiveness of the AER as an independent agency can be improved by eliminating resourcing constraints in terms of providing adequate budget and staffing, and providing the AER with greater responsibility with respect to determining appropriate levels of demand, investment and tariff setting. This has the effect of making one body more accountable for the economic and technical performance of the ESI.

In the long run, the AER could be separated from the ACCC and established as a separate entity with its own budget and staffing. This would improve the transparency of the AER and it is consistent with the changing operating environment of the Australian ESI. For example, regulatory tasks are likely to increase in the transition

towards a low-carbon economy, and the electricity grids are transforming to be able to respond to new technologies and demand conditions.

4.2. Coordination between AER and different federal and state regulatory institutions

Coordination mechanisms between the different regulatory institutions are desirable to avoid any overlap of regulatory responsibilities between the authorities involved. Coordination is also required to resolve inconsistencies in the interpretation of terms among the regulatory institutions (Niesten, 2006). A common mechanism to coordinate the relationship between various regulatory organizations is complying with a memorandum of understanding, agreement or association. The AER has a memorandum of understanding (MoU) with the AEMC and the ACCC with a view to streamline and co-ordinate the governance arrangements for Australian energy markets. The MoU recognizes the importance of communication, cooperation and reciprocity between the regulatory institutions. However, state and territory governments and their regulators still play too large a role in regulating retail arrangements and also mandate other license conditions for network companies (Productivity Commission, 2013).

In Norway, there is a cooperation agreement between NVE, the Competition Authority (such as for mergers issues) and the Financial Supervisory Authority of Norway (financial markets). Most importantly, the coordination among different regulatory institutions is achieved by decision-making procedures based on the principles of subsidiarity (Jamash and Pollitt, 2005). Subsidiarity is an organizing principle of decentralization based on the idea that a matter ought to be handled by the smallest, lowest, or least centralized authority capable of addressing that matter effectively (Kersbergen and Verbeek, 2004). Hence, central authority should only have a subsidiary function and perform only those tasks which cannot be performed effectively at a more intermediate or local level. This implies that the subsidiarity principle also delegates power to different regulatory institutions along with streamlining the coordination among different regulatory institutions. The AER can also benefit from enhanced coordination exercising the subsidiarity principles, guided by economic logic more in practice than in theory. Delegation of responsibilities and accountability under the subsidiarity principles can avoid any potential conflict of objectives between the AER and the state regulators.

4.3. Application of robust benchmarking techniques

Benchmarking can be broadly defined as comparison of some measure of actual performance against a reference or benchmark performance (Jamash and Pollitt, 2000). The primary role of benchmarking under incentive regulation is to decouple the allowed revenues of a network company from its own underlying costs by determining the regulated revenue cap based on the cost structures of other regulated similar network companies. Benchmarking conceptually mimics the incentives

offered by a competitive market in a monopoly environment. This resembles a yardstick competition in its extreme form where the outcomes of perfect competition are replicated in a monopoly market (Shleifer, 1985).

Norway was one of the first European countries to introduce an incentive regulation regime based on efficiency benchmarking. Norway switched to an incentive regulation based on the DEA technique in 1997 (Forsund and Kittlesen, 1998). The cost norm C_t^* of each network operator is obtained from the DEA analysis under the current regulatory framework. Norway is also the only country where the regulator has systematically examined the effects of environmental factors on the quality of service and reflected these in the efficiency benchmarking models (Bjørndal et al. 2009; WIK, 2011). The existing efficiency benchmarking utilizes measures of snow, forest, and coastal climate as output variables in the DEA model. Hence, the model assumes that these affect the network companies' production function rather than their efficiency. Also, the benchmarking process is enhanced through learning-by-doing. However, undertaking regulatory benchmarking and learning-by-doing to enhance the process requires significant financial and human resources, which the AER seems to lack. For example, the UK regulator, Ofgem, retained an academic advisor to assist in the development of benchmarking analysis with strong interaction between the industry and consumers in the development of incentives (OFGEM, 2009). The benchmarking technique has also changed from relatively simple comparisons to use of corrected OLS.

However, in Australia, the regulatory interest in benchmarking is limited even though a London Economics benchmarking study for IPART concluded that the NSW distribution companies were inefficient compared to the 200 other companies in the dataset (IPART, 1999; Haney and Pollitt, 2009). The application of benchmarking in the past also received criticism from the regulated network companies. The absence of systematic benchmarking implies that the AER relies on 'bottom-up' reviews of distribution companies' expenditure proposals where price controls are generally undertaken sequentially for network companies in different States (Mountain and Littlechild, 2010). However, the AEMC established new directives regarding the use of benchmarking in 2013. The use of benchmarking analysis by the AER as a powerful incentive mechanism tool may improve the cost efficiency of the distribution network companies and avoid gold plating (Averch and Johnson, 1962) in electricity distribution, while also eliminating the existing practice of distribution companies formulating their proposals with minimal guidance.

However, benchmarking analysis involves identifying the relevant costs approach such as top-down or bottom-up, the cost drivers, the data sample and the appropriate benchmarking technique. International benchmarking is an option to increase the sample size, as the AER currently regulates 13 electricity distribution companies in Australia with differing network characteristics and assets profiles. However, cross-country differences among companies need to be accounted for and benchmarking

becomes complicated. As such, the costs of not doing robust benchmarking are high and the AER may currently adopt benchmarking for informative results rather than obtaining deterministic results. As the AER gets wiser, and more capable and resourceful in the long run, benchmarking using robust benchmarking techniques can be explicitly applied to set the incentives for network companies in the incentive regulation regime, which is a work in progress at the moment.

4.4. Demand-side involvement

An independent regulator is the guardian of the public interest (Armstrong, Cowan and Vickers, 1994). An effective regulatory framework adequately involves consumer priorities and interests in the economic regulation of networks. This is important because future electricity networks need to move from a passive to an active operation, and network and tariff design needs to provide opportunity for end-users to participate as actors in the market by actively responding to real-time price signals (Joskow, 2012). The advent of smart grids and mobile electricity consumers (electromobility) has also signalled the demise of the long held assumption on the technological maturity of the electricity networks (Schiavo et al., 2013). Likewise, distributed generation is blurring the traditional delineation between consumers and producers and thereby increasing the number of prosumers as new market participants in the ESI. Thus, it is important that electricity markets serve constantly evolving consumer needs through appropriate regulatory arrangements.

To date, the AER has neither engaged well with consumer groups nor created the environment for network companies to engage with consumers (Productivity Commission, 2013). One of the ways in which consumers can participate in energy markets is by being able to switch suppliers. However, the retail market lacks adequate transparency - leaving consumers with opaque price information. This implies that the efforts to educate consumers about their choices can be improved. For example, the AER commissioned the Energy Made Easy website which seeks to provide comparative retail offers from 36 authorised retailers. However, the 'standing offers' detailed on the website are outside the bilateral negotiation which happens between the customer and the retailer before deciding on the final contractual terms. This means that 'standing offers' could overstate price, offering discounts to those that are able to negotiate beneficial terms, rather than provide equitable pricing structures. Also, in Queensland, consumers are still supplied by their retailer at the regulated prices determined by the Queensland Competition Authority (QCA, 2013), so the website does not provide comparative 'standing offers' for all customers, rendering the information patchy at best. In addition, consumer involvement in the regulated network segments can be empowered through new ownership models. For example, in Norway, the council and local municipalities also own the regulated distribution network companies.

The establishment of new institutions such as the National Energy Consumer Advocacy Body and the Consumer Challenge Panel on 1 July 2013 are desirable moves to formalise the involvement of consumers in the regulatory process. However, the effectiveness of these bodies can only be guaranteed if these bodies are independent from the AER, are accorded some power or authority in the network regulated revenue determination process, and receive adequate funding and staffing resources. Demand-side involvement is also likely to intensify with the large-scale adoption of smart meters and smart grids where consumers have the opportunity to respond to real-time price signals. These technical changes further necessitate that future network regulation should involve adequate communication with the stakeholders while being flexible and effective.

4.5. Privatization as an option

Economic theory suggests that privatization may improve resource allocation (Vickers and Yarrow, 1998). Practical examples of electricity privatization success includes the UK where consumers benefited from high service reliability and lower power prices since privatization in 1990 as real prices fell by about 25 per cent (Thomas, 2002). Network costs in the UK have also remained stable and have not increased in real terms (OFGEM, 2009). In Australia, electricity prices have decreased for the first 10 years of the reform but have increased over the last few years (Chester and Morris, 2011).

The transmission and distribution networks in Tasmania, New South Wales, Queensland and part of the Australian Capital Territory (ACT) remain state-owned. State-owned network companies can have conflicting and differing objectives that can undermine the effectiveness of incentive regulation as well as reduce economic efficiency. The Productivity Commission (2013) has identified significant gaps in the performance of state-owned corporations and privately owned network companies in the Australian ESI (Productivity Commission, 2013). Privatization, as a public policy instrument, remains an option to improve the efficiency of network companies by reducing distortions and improving incentives. This is importantly so as private companies can be expected to be more aggressive in dealing with the regulators although the evidence is minimal in Australia (Breunig and Menezes, 2012). However, the success of privatization is not guaranteed and should not be considered at its face value. Newbery (2004) argues that successful privatization of network companies requires incentive-based regulation that allows investment to be adequately rewarded from unsubsidised revenues while maintaining quality, but contains restrictions that permit effective competition for the network services.

Norway pursued the market liberalization reforms without changes in ownership as privatization of the power sector was politically unacceptable (Bye and Hope, 2005). However, consumers have been able to actively participate in the market and seem to get a fair price deal as competition among 97 state-owned and independent retailers is

strong and prices are close to costs (Von der Fehr and Hansen, 2010). This can largely be attributed to incentive-based regulation that provides strong incentives for cost efficiency and discourages gold plating, alongside the surrounding regulatory institutions and arrangements. Hence, the success of privatization is strongly linked to the regulatory regime and institutions while state ownership does not preclude the need to have adequate regulatory arrangements and sound regulatory practice in liberalizing electricity industries.

5. Conclusions

This paper studies the regulatory institutional organisation of electricity networks regulation in the Australian NEM and identifies some inadequacies in the existing regulatory arrangements and framework. We find that the national regulatory regime and arrangements can provide potential for gold plated network costs and rising end-user electricity prices in Australia, in the absence of incentives for undertaking efficient investment. We also study the regulatory institutional organisation and arrangements in Norway as a successful liberalized electricity market model with effective competition and regulation without privatization of the ESI. This allowed us to diagnose the weaknesses in the regulation of the Australian ESI even though it was not the aim of the paper to make a direct comparison between these two markets given inherent country-specific differences.

This paper identifies several short-run and long run regulatory and institutional reform measures that could be adopted to strengthen the position of the AER and streamline the network regulatory process. In the short-term, the AER should be provided with adequate resources (financial and staff experts) and discretion while making it accountable for resource use and decision-making. The Norwegian regulatory model provides a good example of creating balance between the advantages of an independent regulator against the disadvantages of complete regulatory independence. Unnecessary bureaucratic time delays at the SCER and AEMC level should be minimised so that the reform processes are timely and quick (Productivity Commission, 2013). SCER seems to exercise undue power over the regulation of its own profit-making entities. The abolishment of SCER would imply that SER and AEMC should directly report to the Federal minister responsible for energy and reduce the unnecessary decision making delays. The regulatory arrangements and pricing regime should focus more on customer engagement and delivering customer needs.

In the long run, the AER should be separated from the ACCC, while robust benchmarking techniques should be adopted in the incentive regulation framework to provide powerful incentives for cost efficiency. This will also necessitate incorporating other output-based variables such as quality in the incentive regulation framework so that the cost-efficiency incentives do not conflict with service quality objectives. Privatization of the state-owned assets also remains an option. However,

privatization should not occur until sound regulatory arrangements are in place. Do sound regulatory arrangements involve eliminating all existing state based electricity regulators, and instead operating only with a national regulator? This remains an important question for the future. Further research could also focus on the appropriate pricing regime for future network regulation that should facilitate the transition to a low-carbon economy, which involves electricity networks undergoing profound technical changes.

References

Acemoglu, D. (2006). A Simple Model of Inefficient Institutions, *Scandinavian Journal of Economics*, Vol. 108(4), pp. 515-546.

AEMC (2013). Electricity Price Trends Final Report, Possible future retail electricity price movements: 1 July 2012 to 30 June 2015, Australian Electricity Market Commission, March.

AER (2012). Annual Report 2012-2013, Inaugural Report, Australian Energy Regulator.

AER (2013). State of Energy Market Report 2013, Australian Energy Regulator.

Armstrong, C.M., Cowan, S., and Vickers, J. (1994). Regulatory Reform, Economic Analysis and British Experience, Cambridge, MA: MIT Press.

Askim, J. and Claes, D.H. (2011). Part Hare, Part Tortoise – Explaining Patterns in Norwegian Public Utilities Reforms 1990-2010, *Utilities Policy*, Vol. 19 (2), pp. 87-94.

Averch, H. and Johnson, L.L. (1962). Behaviour of the Firm Under Regulatory Constraint, *American Economic Review*, Vol. 52 (5), pp. 1052-1069.

Bergera, M.E., Henisz, W.J. and Spiller, P. (1998). Political Institutions and Electric Utility Investment: A Cross-Nation Analysis, *California Management Review*, Vol. 40 (2), pp. 18-35.

Bjørndal, E., M. Bjørndal and A.S. Camanho (2009), Weight Restrictions in the DEA Benchmarking Model for Norwegian Electricity Distribution Companies – Size and Structural Variables, Technical Report 22/09, Institute for Research in Economics and Business Administration, Bergen.

Breunig, R. and Menezes, F.M. (2012). Testing Regulatory Consistency, *Contemporary Economic Policy*, Vol. 30 (1), pp. 60-74.

Brousseau, E. and Fares, M. (2000). Incomplete Contracts and Governance Structures: are Incomplete Contract Theory and New Institutional economics Substitutes or Complements? In: Menard, C. (Ed.), *Institutions, Contracts and Organizations*, Edward Elgar.

Bye, T. and Hope, E. (2005). Deregulation of Electricity Markets: The Norwegian Experience, *Economic and Political Weekly*, Vol. 40, No. 50, pp. 5269-5278.

Chester, L. (2007). Who Benefits from the Restructuring of the Australian Electricity Sector?, *Journal of Economic Issues*, Vol. 41 (4), pp. 981-1001.

Chester, L. and Morris, A. (2011). A New Form of Energy Poverty is the Hallmark of Liberalized Electricity Sectors, *Australian Journal of Social Issues*, Vol. 46 (4), pp. 435-459.

Cushman, R. (1941). *The Independent Regulatory Commissions*, New York, Oxford University Press.

Easterly, W. and Levine, R. (2003). Tropics, Germs, and Crops: How Endowment Influence Economic development, *Journal of Monetary Economics*, Vol. 50 (1), pp. 3-39.

Erdogdu, E. (2013). A Cross-Country Analysis of Electricity Market reforms: Potentials Contribution of New Institutional Economics, *Energy Economics*, Vol. 39, pp. 239-251.

Eurostat (2013). Energy Statistics – Prices, Available at: http://epp.eurostat.ec.europa.eu/portal/page/portal/energy/data/main_tables.

Forsund, F.A. and Kittelsen, S.A.C. (1998). Productivity Development of Norwegian Electricity Distribution Utilities, *Resource and Energy Economics*, No. 20, pp. 207-224.

Glachant, J.M. and Finon, D. (2000). Why do European Union's Electricity industries continue to Differ? A New Institutional Analysis. In: Menard, C. (Ed.), *Institutions, Contracts and Organizations*, Edward Elgar.

Goldberg, V. (1976). Regulation and Administered Contracts, *The Bell Journal of Economics*, pp. 426-448.

Green, R. and Rodriguez Pardina, M. (1999). Resetting Price Controls for Privatized Utilities: A Manual for Regulators, The World Bank, Washington D.C.

Haney, A.B. and Pollitt, M. (2009). Efficiency Analysis of Energy Networks: An International Survey of Regulators, *Energy Policy*, Vol. 37(2), pp. 5814-5830.

Haney, A.B. and Pollitt, M. (2011). Exploring the determinants of ‘Best-Practice’ Benchmarking in Electricity Network Regulation, *Energy Policy*, Vol. 39, pp. 7739-7746.

Henisz, W.J. (2002). The Institutional Environment for Infrastructure Investment, *Industrial and Corporate Change*, Vol. 11(2), pp. 355-389.

Hilmer, F. (1993). National Competition Policy, Report for the Independent Committee of Inquiry, AGPS, Canberra.

IPART (1999). Pricing for Electricity Networks and Retail Supply, Report, Vol. 1, Independent Regulatory and Pricing Tribunal, June.

Jamasb, T. and Pollitt, M. (2000). Benchmarking and Regulation: International Electricity Experience, *Utilities Policy*, Vol. 9(3), pp. 107-130.

Jamasb, T., Newbery, D. and Pollitt, M. (2004). Core Indicators for Determinants and Performance of the Electricity Sector in Developing Countries, Cambridge Working Papers in Economics 0438, Faculty of Economics, University of Cambridge.

Jamasb, T. and Pollitt, M. (2005). Electricity Market Reform in the European Union: Review of Progress Toward Liberalization and Integration, *The Energy Journal*, Vol. 26 (special issue), pp. 11-42.

Joskow, P.L. and Rose, N. (1989). The Effects of Economic Regulation (chapter 25). In: Schmalensee, R. and Willig, R (Ed.), *Handbook of Industrial Organization*. Elsevier.

Joskow, P.L. (2008). Lessons Learned from the Electricity Market Liberalization, *The Energy Journal*, Vol. 29 (special issue), pp. 9-42.

Joskow, P.L. (2012). Creating a Smarter U.S. Electricity Grid, *Journal of Economic Perspectives*, Vol. 26(1), pp. 29-48.

Joskow, P.L. (2013). Incentive Regulation in Theory and Practice: Electricity Distribution and Transmission Networks (NBER Chapters). In: National bureau of Economic Research, *Economic Regulation and its Reform: What Have We Learned?* Inc.

- Kahn, A.E. (1971). *The Economics of Regulation: Institutional Issues*, Vol. 2. New York: Wiley.
- Kersbergen, K.V. and Verbeek, B. (2004). Subsidiarity as a Principle of Governance in the European Union, *Comparative European Politics*, Vo. 2 (2), pp. 142-162.
- Landis, J. (1938). *The Administrative Process*, New Haven: Yale University Press.
- Levy, B. and Spiller, P.T. (1994). The Institutional Foundations of Regulatory Commitment: A Comparative analysis of telecommunications Regulation, *Journal of Law, Economics and Organization*, Vol. 10 (2), pp. 201-246.
- Littlechild, S.C. (1983). *Regulation of British Telecommunications Profitability*, London: Department of Industry.
- Magnus, E. (1997). Competition without Privatisation – Norway’s Reforms in the Power Sector, *Energy for Sustainable Development*, Vol. 3(6), pp. 55-61.
- Midttun, A. and Thomas, S. (1998). Theoretical Ambiguity and the Weight of Historical Heritage: A Comparative Study of the British and Norwegian Electricity Liberalization, *Energy Policy*, Vol. 26 (3), pp. 179-197.
- Moran, A. and Sood, R. (2013). Evolution of Australia’s National Electricity Market (chapter 9). In: Sioshansi, F.P. (Ed.), *Evolution of Global Electricity Markets: New paradigms, New Challenges, New Approaches*. Elsevier.
- Moen, J. and Hamrin, J. (1996). Regulation and Competition without Privatisation: Norway’s Experience, *The Electricity Journal*, Vol. 9 (2), pp. 37-45.
- Mountain, B. and Littlechild, S. (2010). Comparing Electricity Distribution Network Revenues and Costs in New South Wales, Great Britain and Victoria, *Energy Policy*, Vol. 38 (10), pp. 5770-5782.
- Newbery, D. (2002). *Privatization, Restructuring and Regulation of Network Utilities*, MIT Press Books, The MIT Press, Edition 1, Vol.1, December.
- Newbery, D. (2004). *Privatizing Network Industries*, CESifo Working Paper No. 1132, Munich.
- Nielsen, E. (2006). Regulatory Institutions and Governance Transformations in Liberalizing Electricity Industries, *Annals of Public and Cooperative Economics*, Vol. 77 (3), pp. 291-307.

- North, D.C. (1991). Institutions, *Journal of Economic Perspectives*, Vol. 5 (1), pp. 97-112.
- North, D.C. (1994). Economic Performance through Time, *American Economic Review*, Vol. 84 (3), pp. 359-368.
- NVE (2011a). Report on Regulation and the Electricity Market, Norwegian Water Resources and Energy Directorate, July.
- NVE (2011b). Annual Report 2011, The Norwegian Energy Regulator, Norwegian Water Resources and Energy Directorate, June.
- OFGEM (2009). Regulating Energy Networks for the Future: RPI-X@20, Office of gas and Electricity Markets, February.
- Ogus, A. (2002). Regulatory Institutions and Structures, *Annals of Public and Cooperative Economics*, Vol. 73, pp. 627-648.
- Pollitt, M. (2007). Liberalization and regulation in Electricity Systems: How can we get the Balance Right?, Cambridge Working Papers in Economics 0753, Faculty of economics, University of Cambridge.
- Productivity Commission (2013). Electricity Network Regulatory Frameworks, Productivity Commission Inquiry Report, Vol. 1, No. 62, Productivity Commission, Australian Government, April.
- QCA (2013). Regulated Retail Electricity Prices 2013-14, Queensland Competition Authority, May.
- Quiggin, J. (2001). Market-Oriented Reform in the Australian Electricity Industry, *Economic and Labour Relations Review*, Vol. 12 (1), pp. 126-150.
- Reeves, A. (2013). Modest Increase in Victorian Network Tariffs for 2014, Australian Energy Regulator, News Release, NR 033/13, December.
- SCER (2011). Terms of Reference, Standing Council on Energy and Resources, Canberra, Australia.
- Schiavo, L., Delfanti, M., Fumagalli, E. and Olivieri, V. (2013). Changing the Regulation for Regulating the Change, Innovation–Driven Regulatory Developments in Italy: Smart grids, Smart Metering and E-Mobility, *Energy Policy*, Vol. 57, June, pp. 506-517.

Sharma, D. (2003). The Multidimensionality of Electricity Reform- an Australian Perspective, *Energy Policy*, Vol. 31(11), pp. 1093-1102.

Shleifer, A. (1985). A Theory of Yardstick Competition, *Rand Journal of Economics*, Vol. 16, No. 3, pp. 319-327.

Sokoloff, K.L. and Engerman, S.L. (2000). Institutions, factor Endowments, and Paths of Development in the New World, *Journal of Economic Perspectives*, Vol. 14 (3), pp. 217-232.

Stern, J. (1997). What Makes an Independent Regulator Independent? *Business Strategy Review*, Summer, pp. 67-75.

Stern, J. and Holder, S. (1999). Regulatory Governance: Criteria for Assessing the Performance of regulatory Systems: an application to Infrastructure Industries in the developing Countries of Asia, *Utilities Policy*, Vol. 8 (1), pp. 33-50.

Thomas, S. (2002). The Impact of Privatisation on Electricity Prices in Britain, Presentation to the IDEC National Seminar on Public Utilities, Sao Paulo, August 6-8.

Vickers, J. and Yarrow, G. (1998). Privatization: An Economic Analysis, Cambridge: MIT Press.

Von der Fehr, N.H. and Hansen, P.V. (2010). Electricity Retailing in Norway, *The Energy Journal*, Vol. 31, No. 1, pp.25-46.

WIK (2011). Cost Benchmarking in Energy Regulation in European Countries, Final Report, Study for the Australian Energy Regulator, December.

Williamson, O.E. (1996). The Mechanisms of Governance, New York, Oxford University Press.

Wright, A. (2012). Electricity Prices Continue to Soar in Victoria, Essential Services Commission Report Reveals, Herald Sun, News, September 20.