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Abstract

The world-wide electricity sector reforms of the early 1990s have revealed the considerable complexities of making market driven reforms in network and infrastructure industries. This paper reflects on the experiences to date with the process and outcomes of market-based electricity reforms across less-developed, transition and developed economies. The reforms outcomes suggest similar problems facing the electricity sector of these countries though their contexts vary significantly. Many developing and developed economies continue to have investment inadequacy concerns and the need to balance economy efficiency, sustainability and social equity after more than two decades of experience with reforms. We also use a case study of selected countries that in many respects represent the current state of the reform though they are rarely examined. Nepal, Belarus and Ireland are chosen as country-specific case studies for this purpose. We conclude that the changing dynamics of the electricity supply industry (ESI) and policy objectives imply that analysing the success and failure of reforms will indeed remain a complex process.

Keywords: liberalisation, politics, market, reforms

JEL Classification: L52, L94, P00

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1. Introduction

A combination of political, economic and technological factors enabled a remarkable world-wide experiment of introducing market-based reforms and restructuring of the electricity sector starting the early 1980s (Pollitt, 2012). The importance of the electricity industry in social welfare and economic development implies that reforms in the sector are crucial. The power sector is the 'growth engine' of modern industrial and developing economies while the centralized characteristics of the power systems conceptually make them a 'public utility' (Heller and Victor, 2004). Hence, the lessons of experience from reforms in the power sector matter and can serve as important economic and political tests for governments undertaking the reforms.

Ample amounts of financial resources and effort have already been spent in reforming the electricity sector across less-developed, transition and developed economies since initiating reforms as agreed among energy policymakers, academics and development practitioners. However, the reform process has appeared to be slow and difficult with no clear theoretical and empirical consensus regarding the economic gains of reforms apart from improvements in technical efficiency in the sector across many of the reforming countries (Jamash et al., 2005a, 2005b).

The application and success of market-driven reform model in the power sectors of less-developed countries seems to have been unsuccessful after more than two decades of reforms (Besant-Jones, 2006; Kessides, 2012). In transition economies, the reforms have been erratic, heterogeneous and marked by political reluctance resulting in slow implementation of reforms (Williams and Ghanadan, 2006)¹. Similarly, there is a wide variation in the progress with the implementation of the model even in the EU while compliance with the directives does not necessarily imply a thorough-going electricity reform (Newbery, 2002; Pollitt, 2009a)². In the US, energy reforms affecting the

¹ The transition countries studied in our sample can be divided into three distinct groups Central Eastern Europe and Baltic States (CEB), South Eastern Europe (SEE), and Commonwealth of Independent States (CIS) based on European Bank of Reconstruction and Development (EBRD) areas of operation.

² For example, Germany began the electricity market liberalisation process in 1998 without having an independent regulator in place. The regulator Bundesnetzagentur (BNETZA) was only created in 2005.

electricity sector have been the most disappointing even though major progress has been made in removing the costly price and entry regulation affecting almost every energy sector directly or indirectly over the last nearly four decades (Joskow, 2009).

Most notably, the UK, one of the pioneers of market-based reforms has proposed an electricity market reform signalling the desire for significant government intervention in order to meet the climate change objectives (DECC, 2011). As such, the UK reforms experience has revealed the considerable complexities and difficulties in making market driven reforms work when the global trend towards electricity reforms is driven vastly by orthodox political ideologies and theoretical arguments in favour of market-oriented reforms since nearly two decades. The resulting market failures in terms of investment inadequacy has been vividly exposed in the liberalisation process in developed economies such as the UK even though the incentive regulation of the monopoly electricity networks has resulted in significant efficiency improvements (Helm, 2009)³. Likewise, the regulation of the electricity sector in developing and transition countries continue to remain a major challenge in the transition to accelerating competition in the electricity sector as regulation suffers from weak institutional environment (Laffont, 2005).

It is, therefore, necessary to revisit the experience of the process and impacts of market-driven reform trend and draw lessons learnt in the aftermath of this remarkable experiment. In general, electricity reforms, if successful, should enhance the efficiency of the sector, improve electricity access and reliability, improve service quality, reduce the price-cost gap through cost-reflective pricing and increase investments considering more than twenty years' of reform period in reforming economies (Sen and Jamasb, 2012). This paper reflects on the process and outcomes of liberal electricity reforms and examine whether evidence supports and verifies the motives of market-driven power sector reforms in less developed, transition and developed countries based on country specific case-studies.

The remainder of the paper is structured as follows. Section two provides a brief review on the historical context of reforms in the electricity sectors of less-developed, transition

³ The implementation of incentive regulation occurs in the form of 'price cap' or 'revenue cap' in many European countries. Professor Stephen Littlechild first proposed this concept in 1983 (Littlechild, 1983).

and advanced economies. Section three provides a regional analysis of reform process and outcomes in less-developed, transition and developed economies using brief country-specific case studies. Section four of the paper discusses the outcomes of reforms and provides relevant policy recommendations. Section five concludes the paper.

2. The reform experience: An overview

The early 1980s gave rise to the ‘standard textbook model’ for organizing and restructuring the electricity sectors across many countries around the world. The model was based on market-oriented liberal policies and typically constituted of three fundamental components (Joskow, 2008). The first element involved the vertical separation or unbundling of the potentially competitive segments (wholesale generation and retail supply) from the natural monopoly segments (transmission and distribution networks). The model assumed that not all activities of the electricity supply industry are inherently monopolistic and electricity could also be generated and supplied by competitive firms in organised markets and not by the state. It was believed that vertical separation of these distinct activities would guard against cross-subsidization between competitive businesses and regulated businesses and discriminatory practices such as denial of access to networks (Joskow, 2006).

The second component of the model underscored the need and role of private ownership of the ESI on the notion that private entities could better allocate the scarce capital and ensure efficient management of the system. It was perceived that privatisation of state-owned monopolies creates hard budget constraints and high-powered incentives for efficiency improvements and make it difficult for the state to use these industries to meet costly political agendas (Joskow, 2008). However, private ownership of the sector in countries such as Japan, Germany and the US had occurred before 1980s and has been pervasive throughout the post-World War II period (Pollitt, 2012). However, the success of the electricity reform in Norway exhibits that privatisation is not an indispensable aspect of successful electricity reform.

The third component of the standard model stressed the need to create powerful and effective new institutions in the form of independent regulatory agencies. An independent regulator would act as the custodian of public interests (Armstrong et al.,

1994). It was expected that an independent regulatory authority with good information about the costs, service quality and performance of the industry would ensure a proper conduct in the industry by effectively regulating the monopoly segments in terms of the entry, network charges and network access. As such, the US already had independent state and federal energy sector regulators and private ownership since the early 20th century and some wholesale electricity markets prior to 1980s (Pollitt, 2011).

Chile was the first developing country to apply the 'standard textbook model' in 1982. The Chilean reform sequence involved the following steps: i) establishment of the electricity market regulator at the start, ii) corporatization of state-owned enterprise, iii) law for electricity sector liberalization, iv) unbundling (or vertical separation) of the main segments, v) incentive regulation of electricity networks, vii) establishment of a wholesale electricity market, viii) introduction of privatization and ix) introduction of private independent power producers (IPPs). The Chilean reform model was soon followed by the UK (1990) and Norway (1991). The success of the model in these countries under stable political and economic conditions demonstrated the potential of introducing market-based reforms and incentive regulation to other countries around the world signalling the advent of modern electricity reforms. Figure 1 below shows the market-oriented electricity reform steps in Argentina inspired by the popular reform model of Chile. The notable difference between the sequencing of reforms in Argentina and Chile is the introduction of IPPs before privatization in the Argentine electricity market.

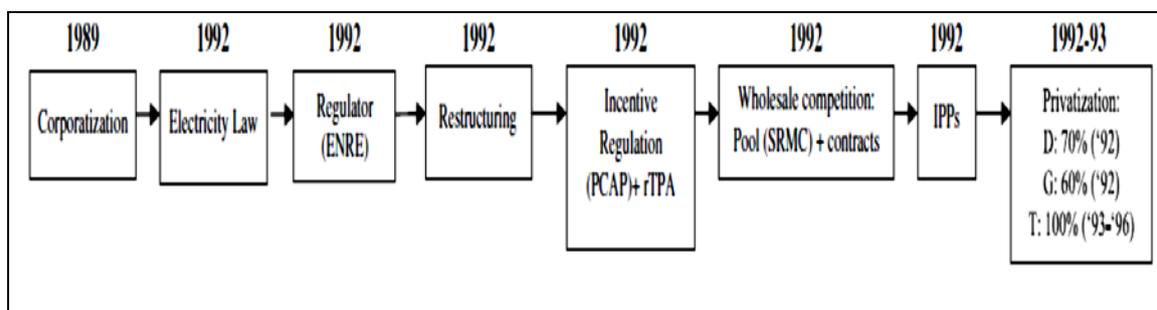


Figure 1: Electricity reform steps in Argentina

Source: Adapted from Jamasb (2006)

The remarkable pace and extent of the reforms imply that many advanced economies and around 70 developing and transition countries had adopted some market driven

reform steps in their electricity sector by the end of 1990s (Steiner, 2001). The general tendency of reform in these countries involved the progression of the reform model from a vertically integrated state-owned monopoly towards an unbundled competitive market. However, the demonstration effect from early success stories was only one of the major drivers of electricity reforms around the world. The electricity sectors in the developed countries were characterised by excess capacity coupled with the use of expensive generation technologies and being productively inefficient and cross subsidies from residential customers to industrial users (Jamassb et al, 2005a). In developing countries, reforms were driven by energy deficit, the operational and economic inefficiency of the state-led vertically integrated utilities, the inability of the state sector to raise adequate capital, the lack of electricity access across the population, the need to reform state subsidies for better allocation of resources and the desire to raise revenue for the state through the sale of state assets (Bacon and Besant-Jones, 2001). Figure 2 shows that market-based electricity reforms involved progressively introducing competition at the single buyer, wholesale and retail level respectively (DTTEM, 2004).

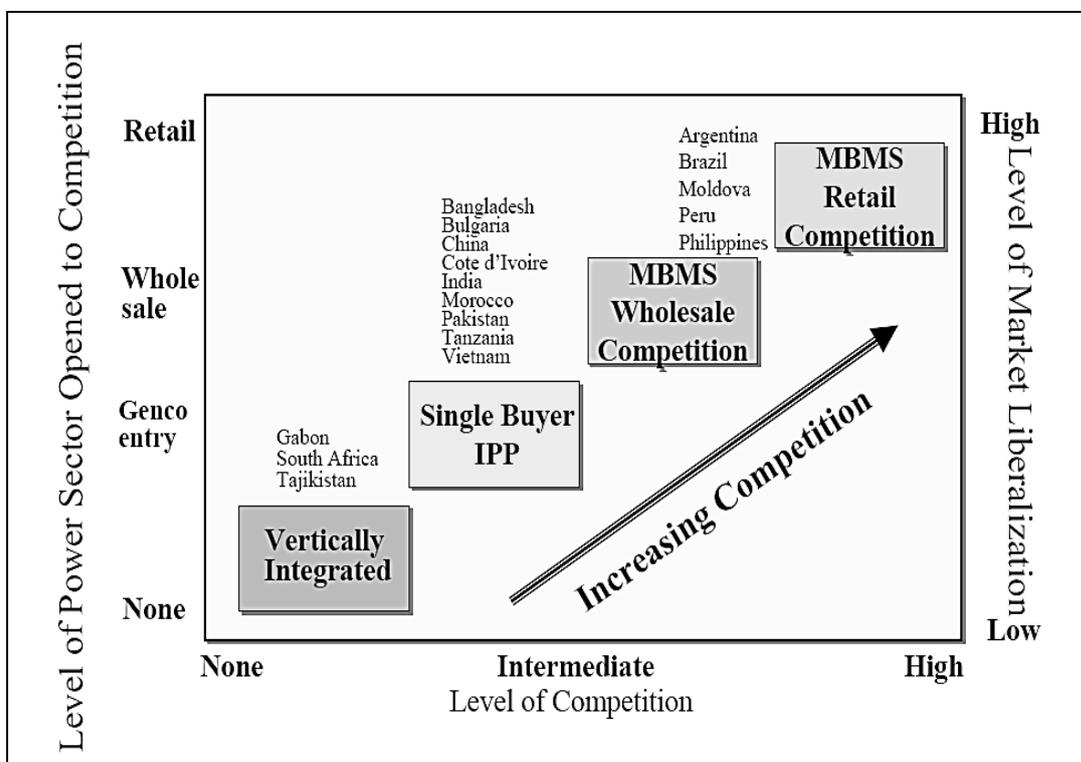


Figure 2: Electricity market models transitioning

Source: Adapted from DTTEM (2004)

The allure of utility privatisation was particularly strong among the transition countries. These economies experienced massive market-oriented systemic changes in all sectors of their economy since the early 1990s. The structural change included macro stabilization, price liberalization, eliminating institutions of the communist systems and openness to international trade. These reforms were also termed as Type I reforms while Type II reforms included the design and enforcement of laws, regulation and proper institutions to support and nurture the functioning of the market driven reforms (Svejnar, 2002). Large-scale economic privatisation combined with the establishment of legal institutions in establishing well-defined property rights and contracts and anti-corruption agencies were the major hallmarks of the Type II reforms.

The emergence of transition economies coincided with the world-wide trend in power sector reforms. Hence, market-oriented reforms began soon after the collapse of Soviet Union and within the context of overall macroeconomic reforms in transition countries. In particular, large-scale privatization of the electricity sector was experienced in the context of broader economic changes among the transition countries indicating that reforms should also be understood and explained in the wider macroeconomic context in these countries (Sen and Jamasb, 2012; Pollitt, 2009a). While the transition countries associated with the European Union made some progress in line with the EU electricity reform model, the incentives to implement reforms have been mix for other transition countries⁴. Nonetheless, the transition countries are of special interest in the context of analysing the electricity sector reform process and outcomes because they include a diverse mix of countries belonging to different stages of economic development i.e. from developed to developing. On the other hand, the developing countries among the transition economies are richer in terms of economic and intuitional endowments than many developing countries elsewhere in Asia and Africa.

Similarly, in advanced economics particularly the EU, the motives for reform came as an initiative from the European Commission through two electricity directives in 1996 and 2003 (Newbery, 2002). The EU directive 96/92/EC laid down the foundations concerning common rules towards the creating of an internal market for electricity. The

⁴ Fifteen of the 'transition countries' are currently associated with the EU as members, candidates and potential candidates.

2003 directive (2003/54/EC) established several key objectives to be achieved by 1 July, 2007 such as the creation of an independent regulator, 100% market opening to all customers including households, legal unbundling of the network segments from generation and supply and free entry in generation via a non-discriminatory network access to third-parties. In addition, the EU Directive 2009/72/EC underscored the need to mitigate the barriers to cross-border trade and expand interconnections towards creating an integrated single market for electricity in Europe.

However, the European reform model excludes some aspects of the standard model that are present in some of the leading reform countries. In near, the directives have avoided requiring ownership change which is regarded as a sovereign matter and thus politically sensitive. It is also not mandatory to privatise the state-owned assets as experienced under successful electricity liberalisation in Norway, Sweden and France although there is a major emphasis to increase private sector participation in the standard reform model. Likewise, the ownership unbundling of transmission system operation or transmission assets is not required in the EU directives though independent system operation exists in many of pioneer reform countries (Jamass and Pollitt, 2005). Table 1 summarises the major drivers of electricity reforms across developing and transition countries in terms of 'pull' and 'push' factors. While the 'push' factors primarily include the unfavourable macroeconomic conditions; the 'pull' factors captures the incentives associated with adopting electricity reforms.

Push Factors	Pull Factors
<i>Macroeconomic events:</i> 1970 oil crisis, Post-Soviet economy-wide market-based transition (1989), Asian Financial crisis (1997-1998), economy-wide liberalization and reform programs as initiated by the fiscal crisis.	<i>Capital raising options:</i> privatization of state assets, greenfield private investment.
<i>Limited national fiscal ability:</i> high public debt, utility borrowing as a major proportion of national debt.	<i>Lending for institutional reform:</i> macroeconomic stabilization lending conditional upon power sector restructuring, asset privatization (IMF), liberalisation and reform for new power sector loans (World Bank in 1993).
<i>OECD Deregulation:</i> new energy multinationals created as a result of	<i>Spill-over effects from international experiences:</i> learning from pioneering reforms

OECD energy sector deregulation, provided investment opportunities for Europe and USA.	of power sectors in Chile, England and Wales and Norway in the 1980s and early 1990s.
<i>Investments constraints of the power sector: no ability to self-finance, system upgrading and modernization required high projected electricity demand.</i>	<i>EU accession: opportunities to benefit from regional integration by reforming the power sector in accordance with the EU Directives.</i>

Table 1: Drivers of power sector reforms

Source: Adapted from Nepal and Jamasb (2012a)

3. Reform process and outcomes: A regional analysis

Analysing the effectiveness of electricity reforms is complex as the dynamic nature of the reform process includes a number of interrelated steps that occur in different forms or models (Pollitt, 2009a). However, the approaches to analyse electricity sector reform can be classified into three major categories: econometric studies, efficiency and productivity analysis and individual and comparative case studies (Jamasb et al., 2005b). Econometric studies can suitably analyse well-defined issues and hypothesis tests through statistical analysis of reform determinants and performance given data availability while efficiency and productivity analyses are desirable for assessing the effectiveness with which inputs are transformed into outputs, relative to best practice. In contrast, single or multi-country case studies are desirable when in-depth investigation or qualitative analysis is needed. We use single country case-studies to assess the effectiveness of reforms in the electricity sector of the reforming countries in less-developed, transition and advanced economies.

Many developing countries have always faced the continued challenge of meeting electricity demand driven by economic growth and increasing population in the face of long-run capacity shortage. This has resulted in rolling and frequent power outages under tight electricity demand and supply conditions (Kessides, 2012). Although some elements of market-based reforms are introduced in these countries, the electricity prices are often not cost-reflective and cross-subsidies from industrial to residential users are common place as high prices are not politically desirable. Electricity pricing reforms has always been difficult in developing countries. This is because while politically determined low electricity prices are economically inefficient to a large

extent, it can be essential in developing countries to maintain social equity and increase affordability among the dominant poor population.

On the other hand, the small size of the electricity sector in these countries can limit the application of reform models and benefits from pursuing market-based electricity reforms. For example, it is not appropriate to unbundle a power system with less than 1000 megawatts (MW) of capacity into many separate generation and distribution companies with the assumption that effective competition can be promoted (Bacon and Besant Jones, 2006). In addition, less-developed and developing countries in Asia and Africa tend to experience prolonged political instability which can complicate the process and outcome of reforms (Nepal and Jamasb, 2012b).

In transition countries, reforms in the electricity sector became a mixed priority along with the need to focus reforms in other sectors of the economy in most ways. This could be a major reason on the observed heterogeneity of reforms implemented across the transition countries with mixed success stories. The countries that are joining the EU have already pursued (and are likely to pursue) far-fetched reforms like retail market opening and the creation of a spot market in their wholesale market while those in Asia such as Turkmenistan, Uzbekistan and Belarus are still struggling with early stages of reform. Most importantly, it is not clear among the transition countries that the advanced reformers have significantly benefited from market-driven electricity sector reforms than the slow reformers or non-reformers. This is likely because power sector reforms in transition countries were not well-targeted as they missed the third major element of the standard model which focussed on creating independent and effective regulatory institutions (Nepal and Jamasb, 2012a). Furthermore, political ideology has proved to be a stumbling block on power sector reforms in transition countries when it is evident the success of electricity sector reform also depends on the willingness to change, learn and adapt to new information and problems as observed from the Latin American reform experiences.

In advanced economies like the EU, the reform process focussed on deepening competition and started with somewhat unique feature of allowing competition in the retail market. The market opening process was gradual and at the start involved large industrial users and eventually included the residential sector as well. The creation of a single integrated market for electricity remains the major objective as driven by the

Lisbon Agenda of 2010 and reinforced by the three European Directives of 1996, 2003 and 2009. However, achieving full market integration across the EU requires a complete harmonisation of the economic and institutional aspects governing the regionally integrated but yet separate cross-border markets as the regulatory and institutional structures vary widely across the EU markets (Niesten, 2006). For example, the day-ahead wholesale electricity price differences are still large among countries like Ireland and UK as compared to the prices in countries like Norway and Sweden (Meeus and Belmans, 2008). Also, incompatible differences exist in the form of market design and structure among the different transmission system operators (TSOs) and the spot market operators across EU.

Hence, a common integrated market for Europe is still a far-fetched reality although the market integration is progressing with the creation of several regional integrated wholesale markets within EU. As such, the cross-border electricity trade as a percentage of total consumption is increasing in the UCTE synchronised region as well as total region (both UCTE and non-UCTE) since 1998 (Pollitt, 2009b). The increase in cross-border electricity exchanges with the creation of power exchanges indicates a general progress towards EU market integration. Moreover, the integration of small regions and island economies in the wider EU market currently remains a testing political and economic challenge for Europe towards an integrated European electricity market (Nepal and Jamasb, 2012c).

The following sub-sections provides brief country-specific case studies on the progress and outcomes of market-driven electricity reforms across the less-developed, transition and advanced economies since the early 1990s. The outcomes and process of reforms in the economies discussed below (namely Nepal, Belarus and Ireland) is of general relevance to the specific country groups to which they belong but this should not be over-generalized as this is often a major pitfall in analysing and comparing on the outcomes of electricity sector reforms. Nepal is a less-developed economy with a small electricity sector reeling under political instability while Belarus is one of the transition economies that is not associated with the EU. Ireland is an island economy and geographically isolated from rest of the Europe but aiming for integration in the EU electricity markets.

3.1 Nepal

Nepal (officially the Federal Democratic Republic of Nepal) is a less-developed landlocked economy in South-Asia sandwiched by two of the world's fastest growing and energy hungry economies India and China with a geographical area of 147,181 square kilometres. The country has a population of about 27 million while the per capita income is about 1,200 US dollars in purchasing power parity (PPP) terms implying a low-income nation. The country has a low Human Development Index of 0.46 while the Transparency International perceives Nepal as one of the most corrupt countries in the world ranking 154 out of 182 countries in 2011.

Electricity sector reform process started in Nepal since 1985 with the establishment of Nepal Electricity Authority (NEA) (Thakur, 2002). NEA is a vertically-integrated (although functional unbundling exists) monolithic state-owned and controlled entity responsible for the generation, transmission and distribution of electricity across the economy. The establishment of NEA eventually paved the way towards creating a legal framework and corporatization of the sector through the formulation of the hydropower development policy of 1992 and was enforced by the Water Resources Act and the Electricity Act with amendments made to the NEA Act of 1984 (ADB,1999).

The Act led to the opening of the generation segment to the private domestic and foreign IPP's through non-recourse financing while also theoretically allowing NEA to function autonomously. The entry of the private sector in power generation imply that NEAs status was replaced from that of a sole monopoly player to that of a licensee with the responsibility of buying the privately generated power in accordance to a single-buyer model (SBM). In addition, the Community Electricity Distribution Bye Laws was introduced in 2003 with the objectives of promoting public participation in reducing non-technical power losses (such as theft) and institutionalising distribution, encourage community management in the extension of distribution lines and promote rural electrification.

However, the outcomes of these reforms seem to have contradicted the objectives after more than two decades of the reform process. The vertically-integrated system has developed only around 0.72 GW out of potential 40 GW of generation capacity

including the IPPs' generation indicating lack of investments in generation while the peak demand is also projected to increase to 2206 MW by 2020 and 3679 MW by 2030 (NEA, 2010). The electricity prices remain too low to cover costs and support system expansion and suffer from persistent cross-subsidization among domestic and industrial customers. The price-cost gap has exacerbated the financial health of NEA with an overwhelming loss of NRs. 4681 million in 2009 (NEA, 2009).

Likewise, the technical and non-technical electricity losses remain high in Nepal primarily due to old grid infrastructures and growing power theft due to increasing national demand for electricity (Smith, 2004). In terms of electricity access, NEA currently serves 15% of the total population with electricity indicating low level of electrification under conditions of large disparity among urban and rural customers. Electrification rate in urban area is 90% whereas that in rural area is 5% only. Thus, the Nepalese electricity sector resembles a monopolistic public utility suffering from chronic underinvestment and insufficient capitalization, politically-regulated low and distorted tariffs coupled with low access rate, frequent supply interruptions, and widespread financial and operation inefficiency.

The on-going decade long political instability led to discontinued policies, uncertainty, and often weak and stalled implementation of reforms in the electricity sector and thereby explaining the poor state of the sector. Persistent political instability has also placed constraints on timeframe for undertaking reforms as any reform that extends beyond the lifespan of the government becomes politically infeasible and thereby slowing down or stalling the reform progress as a whole (Bhattacharya, 2007). As such, tariffs reforms and improvement in governance mechanisms through the establishment of an effective independent regulatory body seem more urgent than unbundling of NEA in the present context (Nepal and Jamasb, 2012b). This is because the existence of effective regulatory body can facilitate private participation in the sector and act as a mechanism to protect the sector from political instability and also expand generation to meet demand by investing foreign and domestic private capital under conditions by setting fair terms for entry and access. However, it is necessary for less-developed economies like Nepal to have cautious and planned restructuring of the sector at a first place as effective regulation is a complex and difficult task facing any energy regulators even in developed economies.

As the sector grows larger in the long run, complete vertical separation of the networks and privatisation of them is an option while accounting separation of the competitive and monopoly segments is desirable in the short term to promote transparency, accountability and prevent corruption in the sector.

3.2. Belarus

Belarus (officially the Federal Republic of Belarus) is a landlocked transition economy in Eastern Europe bordered by Russia, Ukraine, Poland, Lithuania and Latvia with a total area of 207, 595 square kilometres. The country has an overall population of about 9.7 million while the per capita income is about 15,000 US dollars in PPP terms implying an upper-middle-income economy. The nation has a high HDI score of 0.76 while the Transparency International perceives Belarus as a corrupt country with a rank of 143 out of 182 countries in 2011.

Electricity reform process has been slow in Belarus since it declared independence on 25 August, 1991 and only includes some initial aspects of market-based reforms. The electricity sector is dominated by the state-owned and controlled holding company Belenergo created in 2006 comprising six regional power system enterprises responsible for the generation, transmission and distribution of electricity in Belarus. Belenergo serves as the single buyer of power including imported electricity while there are no independent power plants and producers. The reliance on imported energy (crude oil and natural gas from Russia) coupled with upward surging electricity demand imply that energy efficiency remains the core aspect of electricity reform in Belarus (Rakova and Pavel, 2005).

The 'Law on Energy Saving', enacted in 1998 and amended in 2006 sets out the need to promote energy efficiency as a matter of national priority while setting various targets in reducing energy intensity from 2005 levels. Likewise, the 'Law on Renewable Energy Sources' was adopted in 2010 that sets out the directions of state regulations concerning the use of non-traditional and renewable energy sources as the country aims to be energy independent and address its unbalanced fuel portfolio situations (REEEP, 2012). However, there is no clear and explicit 'electricity laws' in Belarus.

In addition, Belarus is planning to create a wholesale electricity market of its own to be operative by 2015 motivated by the reform experience around the world. The details of

creating a wholesale market is being laid down in new electricity bill as declared by the Deputy Energy Minister of Belarus on 23 May, 2012 (BELTA, 2012). The creation of a wholesale market is expected to attract foreign direct investments, make spending transparent and reduce generation costs.

However, the Belarusian electricity market faces several principal concerns at present since various early attempts of reforms. Capacity shortage and security of supply concerns continue to evolve the electricity market as the electricity system mostly rely on imported gas as fuel covering 90% of the domestic demand while the remaining 10% being imported from Russia, Ukraine and Lithuania. The load forecast for 2020 is expected to reach 13,000 MW given the existing installed capacity of 8,247 MW when around 60% of the power plants have reached their worn out points of tightening capacity (Zachmann et al., 2008). The electricity prices are politically regulated and well below the long run marginal cost of electricity supply (LRMC) and too low when compared to other transition countries (EBRD, 2004). This is particularly interesting for Belarus when electrification is generally not considered an issue among the transition countries with increasing emphasis towards economic and operational efficiency of the sector (Stern, 2009)⁵.

Electricity losses in the transmission and distribution networks reached 11.3% of power production in Belarus which was almost twice the OECD average of 6.8% (IEA, 2008). The electricity market lacks overall transparency due to vertical and horizontal integration of the industry coupled with the absence of any clear separation of government policy from commercial management and economic regulation of the electricity supply industry in Belarus.

The slow and politically reluctant electricity reform process in Belarus indicates that the transition to market-based economic reforms was not a political choice but rather a consequence of past economic and political system to some extent. Nonetheless, Belarus needs to restructure and possibly privatize the sector in the path towards creation of a wholesale market and increase transparency. Further, privatization should be pursued only after creating an effective institution to govern the privatisation process in the form of independent regulators. An independent regulation shall ensure the

⁵ This is also reflected in the famous quote by Lenin in 1920 that 'Communism is Soviet power plus electrification of the whole country'.

opening of the Belenergo network to third parties on a clear non-discriminatory basis along with utilizing incentives for cost reduction without affecting service quality. The gradual increase in residential prices up to the LRMC level with no direct subsidies and cross-subsidies is essential to make the market sustainable.

Transition economies like Belarus experiencing overall-market based reforms in the economy need to harmonise the inter-sector reforms in the economy to make the reforms work (Nepal and Jamasb, 2012a). For example, adjacent reforms should be carried out to solve the structural problems in biggest electricity consuming sectors such as housing, utilities and industries to make the electricity reforms successful while deregulation of electricity prices should be supported by deregulation in gas prices under a consistent competition policy framework of the country.

3.3. Ireland

Ireland (officially known as the Republic of Ireland) is an island economy in Europe sharing its only border with Northern Ireland and encompasses an area of 70,273 square kilometres. The country has a population of about 4.5 million while the per capita income is about 39,000 US Dollars in PPP terms implying a high-income economy. The nation has a very high HDI score of 0.96 while the Transparency International perceives Ireland as a relatively corruption free country with a rank of 19 out of 182 countries in 2011.

Electricity reform process in Ireland is based on the EU Directives driven to integrate separate and national electricity markets into one since 2000. Ireland responded to the EU Directives by opening the market fully in 2005 from a 30% market opening in 2000 (Valeri Malaguzzi, 2009). Ireland achieved the institutional notion of market integration with the creation of an all-island Single Electricity Market (SEM) regulated by the Northern Irish Authority for Utility Regulation (UREGNI) and Commission for Energy Regulation (CER) consisting of 2.5 million customers. SEM is a gross mandatory pool for any generator with an export capacity of 10 MW. The generators bid in their short-run marginal cost and receive the energy-only system marginal price.

The possibility to trade with dual currency (both Sterling Pounds and Euro) makes SEM a unique wholesale electricity market in the world. SEM is currently connected to Great Britain via the Moyle interconnector amounting to almost 4.7% (about 500 MW) of

total SEM generation capacity. The all-island market is set to expand interconnections and improve market integration with GB with the operation of the East-West interconnector (500 MW) connecting Ireland with Wales (De Nooij, 2011). Further, the regulatory authorities of France, UK and Ireland (FUI) have proposed to couple the day ahead wholesale electricity markets in these countries by 2014 in line with the EU policy of increasing electricity market integration (EIRGRID, 2012). Ireland has also adopted an ambitious renewable energy target of as the island plans to generate 40% of its electricity from renewable energy sources by 2020 despite a severe economic downturn in the country (IEA, 2012).

However, the Irish market faces several challenges despite adopting advanced electricity reform measures. It mostly relies on imported gas and oil for electricity generation indicating that Ireland faces one of the highest wholesale electricity prices in Europe besides Denmark and Germany in addition to resulting security of supply concerns (European Commission, 2011). This implies that the economic notion of regional market integration remains a far-fetched reality in Ireland. Wholesale market concentration is also high as the installed capacity share of the three largest generators in the Republic of Ireland amounted to 88% of the installed capacity at the end of 2009 indicating market power concerns and lack of competition in Ireland (European Commission, 2011).

The relatively small size of the market, lack of confidence in the regulatory regime and the dominance of the Irish market by the vertically-integrated and state-owned Electricity Supply Board (ESB) imply that Irish market has failed to attract new entrants after the start of liberalisation process started in 1999 (McCarthy, 2005). In addition, the current level of market integration between SEM and GB markets is only 0.17 (out of 1 where a value of 1 indicates full market integration) despite being physically interconnected indicating the inefficient use of the existing Moyle interconnector (Nepal and Jamasb, 2012c). Moreover, the transition towards a low-carbon economy can increase the reliance on imported gas as gas-fired power plants will be required to provide flexibility in electricity supply when wind power is not available.

Thus, the Irish electricity market is poised towards improving regional market integration in the face of growing amount of wind power in the energy mix. However, improving market integration requires greater investment in interconnectors under

correct regulatory and market incentives for traders to effectively engage in trading via the interconnectors. The increasing role of wind power in the wholesale market may necessitate redesigning the existing market to support such transition. As such, it is desirable that Ireland also adopts the carbon price floor as Northern Ireland which shall also mitigate the discrepancies between these two jurisdictions (Newbery, 2012).

Further, increasing market integration between SEM and other markets will depend upon the harmonisation of several market design and institutional features such as gate closure timings, composition of wholesale prices, form of generation bids and market scheduling and dispatch. Harmonising these market and institutional features across other EU markets will be a major challenge for an all-island small and isolated wholesale market like SEM.

4. Discussions

The above case studies suggest that significant heterogeneity exists in the power sector outcomes while the application of the market-driven reform process has been far from a global success after more than two decades of reforms and restructuring of the electricity sector. The academics, policymakers and practitioners supporting market-based reforms may generalise the success of the reform process in leading reforming countries such as NordPool, UK, Chile and other Latin-American countries (LACs) like Argentina, Colombia and Brazil in concluding that the market-based reforms if implemented properly can be successful. These LACs preferred to pursue privatisation and competition as opposed to the single buyer model with public ownership in most Asian countries.

In contrary, those opposing the reforms can generalize the outcomes of the slow and unstable market-based reforms in Eastern Europe, Asia and Africa without undermining the severe market failures that occurred in the California electricity market crisis during 2001-2002 in concluding that the market-based reforms have been costly, unsuccessful and economically wasteful. Hence, it is necessary to draw out relevant lessons and policy recommendations based on the reform discourse observed from experiences of different countries at different stages of economic development and at varying stages of the market-oriented reform process.

It is mostly necessary in developing and transition countries to impose cost-reflective prices in order to make their electricity systems sustainable. However, this should be carried out in the presence of a cautious re-balancing mechanism between economic efficiency and social equity to offset the undesirable social effects of a hike in tariffs. For example, price adjustments can be done before privatisation rather than after privatisation for socio-economic reasons if privatisation of the electricity companies is considered as an option for reform in less-developed countries. However, as in the case of Norwegian reform, local and regional ownership of the electricity sector may work instead of complete privatization in these countries lacking any comprehensive privatization experience.

The privatisation experience in some LACs also garnered public opposition due to the failure of liberalised reform process to deliver for the poor while being linked to bad governance and corruption (Roland, 2008). It also provides a lesson to have a proper regulatory agency in place when moving ahead with any contractual arrangements via PPAs between the IPPs and the incumbent (Gausch et al. 2006). Similarly, governance improvements are crucial to control corruption and the issues of non-payment. Improvements in governance are necessary to have the independent regulation in place in the case of reforms being adopted. Thus, corruption control together with skilled work force enrichment and carefully determined sustainable electricity prices may be more essential in developing and transition countries rather than the costly reforms as per the standard model. Therefore, the application and sequencing of electricity sector reforms in less-developed and developing countries will be largely country-specific depending upon individual country needs and priorities and should not be based on the *'keeping up with the joneses'* principles (Nepal and Jamasb, 2012b).

The early success stories also demonstrate that market-based reforms require the presence of appropriate institutions and effective governance mechanisms. Chile and Norway had well designed economic institutions in place to buttress market-based reforms in the sector. Hence, it is essential that appropriate governance mechanisms be put in place so that the social and institutional capacities of the country are able to support the reforms being implemented in the power sector of developing and transition countries. In addition, political objectives should not be prioritised at the cost of sound economic principles while the political-economy arrangements in these countries should

facilitate the reform process in the electricity sector. A better understanding of the political economy evolving the energy sector needs to be developed to better inform the reform design process in developing and transition countries.

Social legitimacy and public acceptance of reforms are crucial factors in tackling the traditional problems of power theft and non-payment in most of the transition and developing countries. Social legitimacy and public acceptance of reforms can increase if the adopted reform programs adequately reflect the local or country-specific economic, political and social conditions evolving the power sector rather than completely holding to a reform ideology that proved successful elsewhere.

The reforms have worked relatively better in economies like NordPool and the LACs despite some differences among their models, because they pursued home-grown reforms reflecting local conditions rather than being complete followers. Thus, it is not clear if the market-centred EU electricity reform model which is in a trial phase across the EU-25 is a suitable reform model for transition countries. As such, the development policymakers should not rely on formulaic economic or systems models for power sector reform.

In advanced economies such as the EU, increased investments in transmission networks and transmission infrastructures connecting the cross-border markets coupled with the efficient allocation and usage of transmission capacity are essential to improve the market integration process. This remains particularly true for small regions and island states in the EU (Nepal and Jamasb, 2012c). The transition towards a less carbon intensive energy-economy, increasing digitization of the grid (so called smart grids), larger adoption of renewable energy and the growing integration of electric vehicles imply undertaking capital-intensive tasks of maintaining and re-designing the existing grid to accommodate these technological transitions in the networks. However, the lack of adequate investments in both transmission and distribution networks is a major market failure of the modern day liberalised market structures in the EU built on the standard reform model. It is estimated that the transition towards a sustainable and smart energy economy will require an investment of about 200 billion euros in electricity and gas transmission networks (Vinois, 2012). Thus, the on-going quest towards the creation of a single electricity market will significantly depend on the

ability of the EU electricity markets to innovate the required level of investments in the networks and cross-border infrastructures.

However, increased investments and a significant rise in grid related capital costs will necessitate a rise in the consumer electricity bills. Rising end-user electricity bills can be a major concern even for countries like the UK where around 4.75 million households experiencing fuel poverty in 2010 (DECC, 2012). Hence, developed economies also face a major challenge and need of balancing mechanisms between economic efficiency and social equity as in less developed and developing countries. As final electricity bills rises, more emphasis should be placed towards energy efficiency and innovation, the use of energy efficient technologies and demand-side management in advanced economies like the EU. The effective role of the regulatory body to generate the required level of investments and mitigate the adverse impacts of electricity price rises would be equally important.

The lack of adequate network investments is a critical issue for less-developed and developing countries even though the current principal concerns with reforms is mostly associated on the generation adequacy and easing capacity shortage. It is inevitable that the existing grid in these countries cannot accommodate all electricity generated as generation continue to expand to meet the growing demand. Further, the gradual switch towards renewable energy sources will exert additional pressure on the existing grid in terms of integrating generation into the transmission and distribution networks unless re-designed and updated. For example, the Indian power crisis in July, 2012 affected around 700 million people and halted the functioning of several other critical infrastructures after a two-day blackout. The blackout experience teaches a valuable lesson for developing countries to also invest in power infrastructures and effectively manage demand in meeting the growing electricity demand spurred by economic growth.

5. Conclusions

This paper has assessed the process and outcomes of market-driven reforms evolving the electricity sector of the less-developed, transition and developed countries based on country-specific case studies. The case studies indicate that reforming the electricity

sector remains a major economic, political and social challenge across all countries in the world.

Successful electricity reforms require coordinated progress on all aspects of the development process. Hence, it is necessary to harmonize infrastructural reforms with related political, macro-economic and financial sector reforms for electricity reforms to be successful. The interplay and intricacies between the economic, social and political factors complicates the reform process as a whole. This implies that any qualitative and quantitative evaluation on the success or failure of the reform process is difficult irrespective of the evaluation of reforms being a matter of empirical testing or a theoretical debate. It may be argued that the long-term consequences of market based reforms in the electricity sector will be much clearer by qualitatively and quantitatively studying a longer reform discourse in the future. However, this is not a guarantee as how long exactly 'long-term' is unclear. Further, new economic, political and technological challenges will continue to evolve the electricity sector as market based reforms continue to progress across all countries, though at varying speed.

The reform process, therefore, is stalled in many countries while it remains work in progress in many others. While a majority of the less-developed and developing countries are still at some stages of the standard reform menu; developed countries have already established a well-functioning wholesale spot market of electricity but are experiencing the challenge to sustain competition in the wholesale (and retail) markets coupled with the lack of adequate investments in the networks. Climate change and security of supply of supply issues in the face of regulatory uncertainty have raised new concerns in advanced economies such as the EU who are already at advanced stages of reforms. For example, the recently proposed electricity market reforms in the UK are being driven by capacity shortage concerns as is also present among the less-developed and developing countries.

While cost-reflective pricing and privatisation in the presence of sound regulation can mitigate the capacity concerns in developing countries; developed countries such as UK will need new market model and industry structure to increase the production and accommodation of renewable energy sources and discourage fossil-based generation in the transition towards a low-carbon economy and to meet the EU energy policy goals and environmental targets. Thus, all these factors lead us to conclude that electricity

sector reform is and will indeed remain a complex and continuously evolving process across all types of economies.

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