



Determining an optimal strategy for energy investment in Kazakhstan

James MacGregor^{a,b}

^a Department of Economics, University of Gothenburg, Box 100, SE-405 30 Gothenburg, Sweden

^b Department of Business Administration, Technology and Social Sciences, Luleå University of Technology, 971 87 Luleå, Sweden



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ABSTRACT

The economy of Kazakhstan is locked into reliance on fossil fuel energy sources. Its government is seeking to diversify and deliver sustainable development. We develop an approach to decision-making to support critical decisions over the necessary \$67 billion in electricity investments to 2050 that can simultaneously contribute to a sustainable economy. We apply structured decision-making and cost-benefit analysis, align politically by incorporating the collective expertise of an interdisciplinary group of stakeholders to identify Policy Options, commercial assumptions and externalities, and fill data gaps using technical, economic and environmental data from global sources. Our approach quantifies net present value of these identified Policy Options, explores sensitivities, and suggests alternative investment pathway. Our results indicate policymakers should switch from coal and focus on harnessing the commercial and economic advantages of gas and hydropower for electricity generation. These options would be cheaper and have considerably lower emissions and water usage than the current production mix.

1. Introduction

The Government of Kazakhstan (GoK) is seeking to change its growth trajectory to realise economic growth, energy security and sustainable development, but the country faces three challenges in delivering these three simultaneously. The first is developing an effective strategy to ensure energy security, as the population and economy grow (ADB, 2013). Second, looming domestic electricity generation shortfall from the early 2020s onwards coupled with ageing infrastructure reaching the end of its lifespan and being decommissioned entailing large government investments. Third, is implementing its strategy in light of demand realities and making better decisions. An example is Kazakhstan's electricity generation is based on its abundant reserves of coal and other fossil fuels, rather than on expanding existing and developing new renewable energy sources.

Politically, Kazakhstan has embraced a vision to become one of the world's most environmentally healthy countries, with sustainable energy at its foundation and broad economic development as a key objective. As stated in the Kazakhstan Strategy 2050, the Government's long-term goals include making the country a middle-income nation by 2030; generating half of Kazakhstan's electricity from non-hydrocarbon sources by 2050; increasing the use of alternative fuels; and entering the ranks of the world's top 30 most developed nations by 2050 (GoK, 2012). Furthermore, Kazakhstan's Intended Nationally Determined

Contribution commits to an economy-wide target of 15–25% reduction in GHG emissions by 2030 compared with 1990 (GoK, 2015a, 2015b). The Paris Agreement signed by Kazakhstan on 3 August 2016 further commits the nation to larger reductions (UN, 2016). Other recent developments include the Government's Green Energy Concept in 2013 which introduced feed-in tariffs for wind and solar energy, with a target of achieving 3% of energy generation by 2020; the Energy Efficiency 2030 programme which aims to reduce the economy's energy intensity by 25% by 2030; and the Wind Power Development programme which defines such development as a priority direction for the country (IEA, 2014).

Although Kazakhstan has a poor record on some environmental indicators, in respect of others – such as the exploitation of its large oil reserves, high national carbon dioxide emissions, and its high per-capita carbon dioxide emissions (GoK, 2016) – there is a discernible political move towards promoting sustainable policy and investments. To date, political action includes developing carbon taxation as part of a policy shift towards a more sustainable economy (Osipanova, 2014; GoK, 2012), and an Emissions Trading Scheme developed under the Kyoto Protocol (GoK, 2013), although the Scheme was temporarily suspended until 2018 (ICAP, 2016). However, whether these policies will be enough to allow Kazakhstan to meet its growing electricity demand simultaneous with sustainable development, and whether they will represent the cheapest and best economic options for doing so, remain to be explored more fully.

E-mail address: jamesmacgregor37@gmail.com.

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Looming electricity supply shortfall coupled with ageing infrastructure makes decisions over investment in electricity generation a priority and presents an opportunity to integrate the sustainable development vision in major public investment, attendant policy, incentive mechanisms and public consultation. For public investment purposes, Kazakhstan has solid government finances. Indeed, the political focus on domestic economic indicators, and at this time, the importance of foreign debt sustainability and foreign exchange earnings are secondary to domestic political concerns. Some evidence of this robust fiscus is provided by the country's relatively swift return to economic prosperity compared to other Former Soviet Union countries (NBK, 2016; SWFI, 2016). Lower global prices for Kazakhstan's main exports since 2014 – particularly crude oil, industrial metals and wheat – temporarily imperilled the domestic economy and reduced its international trade with the Eurasian Economic Union by 21% and all countries by 19.9% (NBK, 2016; NBK, 2017; MNE, 2016; MNE, 2017b). However, since late 2016, there are positive indications of prosperity returning, including industrial growth at 3% and inflation stabilised at 6–8%, alongside public sector measures during 2015 including a 5.6% growth in state budget spending to KZT 8.2 trillion and transition to a free-floating exchange rate regime (NBK, 2016; MNE, 2017a).

Tellingly the political will around the Kazakh Government's energy security and sustainable development goals has persisted despite the commodity price crash in 2014 (EBRD, 2016), and even sharpened its focus on the domestic beneficiation of its natural resources and on small- and medium-scale enterprises (Euronews, 2016; Reuters, 2016).

To deliver on its vision and satisfy indicators of a sustainable economy, the GoK will need to make informed decisions that explicitly trade-off economic and the environment. Yet, in Kazakhstan, decision-making over energy policy and investment would improve if there was better information, data and evidence, coupled with an appropriately structured decision framework (ADB, 2013). Furthermore, major investment decisions – such as over electricity generation infrastructure and technologies – are becoming more complicated in light of these fresh political commitments to economic growth, energy security and sustainable development. Clearly there is a need to corral data, evidence and stakeholder views in advance of making the considerable financial investments that are required. It is the fundamental premise of this paper that in order to meet these sustainable development goals and ensure energy security, the investment decisions of the Government of Kazakhstan will require cost-benefit analyses that are both structured and identify, consider and integrate all relevant components.

This paper contributes to the identification and analysis of Kazakhstan's electricity options. This paper adds to the small literature that deals with Kazakhstan's energy security (Miglio et al., 2014), domestic demand management (Sarbasov et al., 2013) and complements the literature on electricity and energy security among Central Asian countries in general (Miglio et al., 2014).

2. Kazakhstan's electricity sector

Kazakhstan gained its independence from the Soviet Union in 1991, at the same time as its Central Asian neighbours – Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. Independence transformed the former Soviet Union (FSU) power monopoly system, and handed responsibility for electricity generation and the national power balance to new national monopolies. Independence triggered recession and a 50% drop in electricity production, which in turn resulted in a lack of funds for operations and maintenance across the power management system, and a critical under-investment in new assets – which persists. Since Independence, the Central Asian economies have focused on isolating and growing their energy systems in a bid to enhance their domestic energy security (IEA, 2014; Acemoglu and Robinson, 2013; Acemoglu and Yared, 2010) with a sharp eye on potentially profitable

exports to its neighbours which harbour equally low electricity tariffs (Inogate, 2015). Yet, trade in electricity does occur with its neighbours both owing to seasonal variations and as part of several high-level political cooperation, trade promotion and long-term contracts (Kadrzhanova, 2013). For instance, the Supreme Interstate Council of Kazakhstan and Kyrgyzstan facilitates the trade of 86% of Kyrgyzstan's total annual electricity exports to Kazakhstan alongside most of its dairy and agri-food exports (GoK, 2015a, 2015b). Undoubted efficiency gains could be made from a more integrated and market-based regional electricity network if there were greater coordination between electricity-producing units in the various Central Asian countries (via markets or through joint ownership of multiple units), and if overall production shifted to those parts of the region with the greatest comparative advantages in electricity production. However, such an integrated regional electricity market is unlikely for the near future since it entails the loss of national political control over electricity pricing and electricity availability.

Electricity tariff increases in Kazakhstan have been proposed but shelved after being met with protests from small- and medium-scale enterprises as well as the general population (RFE/RL, 2016a, 2016b). Electricity pricing across Asia is a political hot potato. Several countries have experienced widespread protests over their governments' attempts to increase electricity prices (The Guardian, 2015; RFE/RL, 2016a, 2016b; Paul, 2017). Thus, for the near future, a key political goal for the electricity sectors across Central Asia would be to avoid policies that risk leading to higher electricity prices or to increased uncertainty in supply. Since Independence, residential consumers in Kazakhstan have paid almost double the rates of their industrial counterparts (ANMR, 2010). Yet even for these residential customers, Kazakhstan has some of the lowest electricity prices in the world, owing to subsidies of approximately 60%, and tariffs set and regulated by the ANMR (EBRD, 2010; Nugumanova, 2013). Low prices for electricity explain the concomitantly subdued level of reinvestment by electricity generation companies, the reliance of many manufacturing firms on own electricity production, and the restrained level of access to electricity in remote and rural areas owing to the expense of extending supply networks.

Today, Kazakhstan's electricity sector is split between those elements regarded as a natural monopoly and a liberalised competitive wholesale sector, albeit with retail tariffs still regulated by the Government. Governance is provided by the Agency of Natural Monopolies Regulation (ANMR) which holds authority to determine tariffs and their calculation methodology, but is not empowered to authorise new capacity (GoK, 2005). The other type of entity in Kazakhstan's electricity sector is the Unified Power System, which consists of a deregulated and competitive wholesale market and retail markets.

The main electricity market participants are the national power grid company (the Kazakhstan Electricity Grid Operating Company (KEGOC), which is a joint stock company or JSC), which is responsible for the 24,644-km transmission network; electricity producers with a range of ownership structures, which operate 66 power plants; electricity distribution companies, which operate 29 distribution networking centres; the JSC Kazakhstan Operator of Electric Power and Capacity Market (KOREM), which operates the centralised trading of electrical energy; and the consumers of electricity themselves (EBRD, 2010; KEGOC, 2016a; KOREM, 2016).

Kazakhstan's domestic electricity generation infrastructure has a capacity of 19,200 MW, with an available capacity of 15,765 MW. Over 90 billion kWh of electricity was generated annually since 2013, rising by an average of 4.5% since 2001. Over this period, the significance of exports has shrunk from 8% of total annual electricity generation to less than 5% and imports halved to 3% (Table 1).

Kazakhstan has 3.6% of global coal deposits and one of the largest proven natural gas reserves, at 1900 bcm (Parkhomchik, 2016; IEA, 2011; Rowland, 2016). Coal dominates as an electricity power source accounting for 81.6% of domestic electricity generation (Table 2) and

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