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**REGIONAL ELECTRICITY  
COOPERATION IN THE  
SOUTH CAUCASUS:  
CROSS-BORDER TRADE  
OPPORTUNITIES AND  
REGIONAL REGULATORY  
UNCERTAINTIES**

IRINA KUSTOVA

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ENERGY CHARTER SECRETARIAT  
KNOWLEDGE CENTRE  
2016

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## ABSTRACT

This occasional paper addresses major developments in cross-border electricity cooperation in the South Caucasus. The position of the South Caucasus, at a crossroads between the emerging Eurasian and European electricity markets, offers lucrative opportunities for cross-border trade and provides incentives for restoring the single transmission network that used to serve the countries of the region before the collapse of the Soviet Union. This study examines regulatory, economic, and political factors that affect the prospects of a regional electricity market. Accordingly, the paper is organised into three parts, addressing institutional, economic and political developments in the region, and relevant barriers to more in-depth regional cooperation.

The first part examines developments in domestic institutional and regulatory frameworks and discusses to what extent the countries of the region have followed the recent trend towards greater liberalisation and privatisation of the industry. It is argued that despite all of the countries having attempted various forms of market opening, restrictive practices in electricity sectors persist. The study argues that cross-border electricity trade should be supported with the approximation of domestic regulatory frameworks and shows that the Energy Charter Treaty (ECT) might offer a common, level playing field for market participants without imposing any particular market model on national governments. Encouraging pro-competitive rules and non-discrimination, the Energy Charter Process points to beneficial effects of market liberalisation on electricity trade, but it does not prescribe the ways and forms in which this liberalisation should occur.

The second part casts light on regional integration initiatives and persisting political and security legacies. The creation of single electricity markets is attempted within the EU Energy Community and the Eurasian Economic Union. While both projects seek greater market integration and liberalisation of electricity sectors, competing regionalism behind the projects might potentially increase their regional rivalry in the future. These regional projects inevitably relativize political and historical legacies in the South Caucasus, and might lead to further regional fragmentation.

The third part addresses economic and technical aspects of cross-border electricity trade. It analyses electricity trade flows across the region and assesses available cross-border capacities. It examines possibilities for intensification of cross-border trade on the basis of several indicators – electricity demand and generation capacity, electricity losses, cross-border flows and capacities, and technicalities of transmission systems. It points out that price differentials are not likely to play an important role in boosting cross-border electricity trade at this stage, and complementarity of generating capacities serves better as a purpose of regional cooperation.

The paper concludes that due to the small sizes of national electricity markets, regional cooperation is crucial for attracting investments in the sector. The politically neutral market-based principles and extensive investment protection provided by the ECT might be a silver bullet for the post-conflict region with competing regional projects.

**Key words:** *electricity markets, power trade, regional electricity cooperation, Energy Charter Treaty, South Caucasus*

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## Introduction

Cross-border electricity cooperation brings numerous economic benefits for neighbouring countries – it enhances the economic efficiency of the use of cross-border transmission capacity on seasonal and daily bases and provides monetary gains from power trade.<sup>1</sup> Combining different load curves also decreases blackouts and ensures optimisation of investment plans in power generation. A number of ongoing and accomplished regional initiatives have demonstrated the virtues of regionalisation of electricity markets and the benefits electricity trade might bring. These projects, aimed at reallocating and redirecting power surpluses among neighbouring countries, include, inter alia, the EU internal electricity market,<sup>2</sup> The Eight Country Interconnection Project (EIJLLPST),<sup>3</sup> the CASA-1000 project in Central and South Asia,<sup>4</sup> and the planned Gobitec project in Northeast Asia.<sup>5</sup>

Cross-border cooperation incentivises more efficient capacity utilisation, but also requires large-scale, long-term investments in electricity network infrastructure. The feasibility of interconnector projects depends on both projects' commercial attractiveness for investors and on the existence of a common level playing field in the region. Perpetuating regulatory uncertainties and vague investment protection – the factors that often reflect weak domestic institutional frameworks – might become a crucial obstacle for any cross-border project and a key challenge in attracting foreign investors, particularly in transition countries.

Two major trends – regionalisation and liberalisation – have been leading to alterations in electricity sectors across the world since the 1990s. Commercialisation and privatisation of electricity sectors have been increasingly viewed as a way to ensure that sector's effectiveness across regions and countries,<sup>6</sup> and have been

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<sup>1</sup> Sunderasan Srinivasan (2013) Electricity as a Traded Good, *Energy Policy* 62, pp. 1048–1052; Hamed G. Shakouri, Mehرداد Eghlimi and Davood Manzoor (2009) Economically Optimized Electricity Trade Modeling: Iran–Turkey case, *Energy Policy* 37, pp. 472–483.

<sup>2</sup> ACER Market Monitoring Report 2015, [http://www.acer.europa.eu/Official\\_documents/Acts\\_of\\_the\\_Agency/Publication/ACER\\_Market\\_Monitoring\\_Report\\_2015.pdf](http://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/ACER_Market_Monitoring_Report_2015.pdf)

<sup>3</sup> This project involves interconnecting the electrical grids of Egypt, Iraq, Jordan, Libya, Lebanon, Palestine, Syria, and Turkey. See: Arab Fund for Economic and Social Development, <http://www.arabfund.org/default.aspx?pageId=454>

<sup>4</sup> Casa 1000, <http://www.casa-1000.org/>

<sup>5</sup> Gobitec and the Asian Supergrid for Renewable Energy Sources in Northeast Asia (Energy Charter Secretariat, 2014), <http://www.encharter.org/index.php?id=643&L=0>

<sup>6</sup> Xu Yi-chong (2006) The Myth of the Single Solution: Electricity Reforms and the World Bank, *Energy Policy* 31, pp. 802–814; Paul L. Joskow (2008) Lessons Learned from Electricity Market Liberalization, *The Energy Journal Special Issue* 2, pp. 9–42; Paul L. Joskow and Richard Schmalensee (1983) *Markets for Power: An Analysis of Electric Utility Deregulation*. Cambridge, MIT Press; David M. Newbery (2002)

promoted by various international financial institutions.<sup>7</sup> Throughout the 1990s, these reforms comprised various degrees of privatisation, unbundling, and deregulation, with allocation of authority to independent regulatory agencies.<sup>8</sup> Consequently, these reforms have challenged states' traditional planning strategies and incentivised states to coordinate their initiatives in order to ensure that regional power exchanges provide an optimal combination of their resources.<sup>9</sup> However, formal institutional reforms have often not overthrown existing informal practices that continued to perpetuate throughout the sector, especially in developing and transition economies.<sup>10</sup>

The South Caucasus – Armenia, Azerbaijan and Georgia, being a crossroads for regional grid connections among Iran, Russia, and Turkey – might benefit from various seasonal, price and geographical combinations in electricity trade.<sup>11</sup> In a more ambitious perspective, connecting the region with the EU internal electricity market and the prospective regional electricity markets of the EU Energy Community Treaty and the Eurasian Economic Union will allow the countries to meet their energy needs more effectively. Since the Turkish grid operator TEIAS joined the European Network of Transmission System Operators for Electricity (ENTSO-E) as an observer

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Issues and Options for Restructuring Electricity Supply Industries, Cambridge Working Papers in Economics 0210; Ioannis N. Kessides (2004) *Reforming Infrastructure – Privatization, Regulation, and Competition*. Oxford University Press, World Bank: Washington, DC.

<sup>7</sup> Bhavna Bhatia and Mohinder Gulati (2004) *Reforming the Power Sector: Controlling Electricity Theft and Improving Revenue*. The World Bank, Washington, D.C.; Daniel Müller-Jentsch (2001) *The Development of Electricity Markets in the Euro-Mediterranean Area. Trends and Prospect for Liberalization and Regional Integration*. The World Bank, WTP 491, April.

<sup>8</sup> Ronald Fischer, Rodrigo Gutierrez and Pablo Serra (2003) *The Effects of Privatization on Firms and on Social Welfare: The Chilean Case*. Research Network Paper R-456, Inter-American Development Bank, Washington, D.C.; Jacint Jordana and David Levi-Faur (eds.) (2004) *The Politics of Regulation. Institutions and Regulatory Reforms for the Age of Governance*. Edward Elgar: Cheltenham, UK, Northampton, MA, USA.

<sup>9</sup> Hamed G. Shakouri, Mehrdad Eghlimi and Davood Manzoor (2009) *Economically Optimized Electricity Trade Modeling*.

<sup>10</sup> Paul L. Joskow (2008) *Lessons Learned from Electricity Market Liberalization*; Yin-Fang Zhang, David Parker and Colin Kirkpatrick (2008) *Electricity Sector Reform in Developing Countries: An Econometric Assessment of the Effects of Privatization, Competition and Regulation*, *Journal of Regulatory Economics* 33, pp. 159–178; Michael Pollitt (2008) *Electricity Reform in Argentina: Lessons for Developing Countries*, *Energy Economics* 30(4), pp. 1536-1567; Rafaella L. Mota (2003) *The Restructuring and Privatisation of Electricity Distribution and Supply Businesses in Brazil: A Social Cost-Benefit Analysis*. Cambridge Working Papers in Economics 0309; Tooraj Jamasb (2002) *Reform and Regulation of the Electricity Sector in Developing Countries*. Cambridge Working Papers in Economics 0226.

<sup>11</sup> Nino Ghvinadze and Laura Linderman (2013) *Cross-border Electricity Exchanges: Bolstering Economic Growth in the South Caucasus and Turkey*. Issue Brief, The Atlantic Council, October.

in January 2016, the Turkish electricity network is integrated with the European grid, and this integration offers the South Caucasus a well-needed connection to Europe.

Current electricity sector reforms across the countries of the region have not yet resulted in significant enhancement of cross-border trade. A wide range of economic, technical, and regulatory factors have played an important role in the success of these reforms. Political legacies in the region also affect prospects for a regional electricity market. First, bilateralism persists in the region due to complex political and historical legacies of the post-conflict societies and strategic choices of the states involved.<sup>12</sup> Second, the transformative dynamics of regional integrationist projects affects cooperative developments in electricity. Different institutional frameworks of the Eurasian Economic Union and the EU Energy Community create overlapping authorities in the region and may externalise politicised practices to the electricity sector, thus downgrading regional cooperative efforts in electricity. Armenia and Russia are creating a common electricity market within the Eurasian Economic Union, and Georgia is negotiating to join the EU Energy Community. As a politically neutral, legally-binding instrument, the Energy Charter Treaty (ECT) is well-positioned to provide a platform for discussions and best practice exchange, as well as ensure necessary investment protection and stability of the framework for cross-border projects. However, the extent to which the countries are ready to be proactive in using the available ECT tools lies somewhere at the intersection of political and institutional factors.

This occasional paper analyses the dynamics of cross-border electricity cooperation in the region. First, the study looks at domestic institutional frameworks in each country (Armenia, Azerbaijan and Georgia) to reveal whether regulatory provisions for their electricity sectors provide enough room for regional-level cooperation. Discussing to what extent cooperation is feasible under fragmented institutional and political preferences, the paper addresses the role the ECT can play in providing a common level playing field for regional cooperation.

Second, the paper assesses market conditions in the region in order to reveal existing opportunities for cooperation. Numerous ad hoc cooperative endeavours have taken place between Turkey and the EU, and also between the South Caucasus, Turkey, and Iran. This section analyses opportunities for regional electricity trade and infrastructure development plans. It is argued that a more inclusive cooperation at the technical level among national regulators is welcomed by many stakeholders in the region. Launching a regional dialogue on establishing a hub for electricity trade in the future might provide a necessary ground for creating a stable environment for cross-border projects.

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<sup>12</sup> Mustafa Aydın (ed.) (2011) *Non-traditional Security Threats and Regional Cooperation in the Southern Caucasus*. IOS Press BV, Amsterdam.

The conclusion addresses the future of regional electricity cooperation in the South Caucasus. Taking into account high sensitivities towards any attempts for cooperation seen as politically motivated, it is advised to use a market-based, bottom-up approach to identify practical needs and technical cooperatives strategies in the sector. An inclusive dialogue on domestic developments programmes will enrich understanding of needed capacities and interconnectors by national governments and various stakeholders.

### **Electricity market reforms and domestic institutions in the South Caucasus**

It has been widely acknowledged that effective cross-border power exchange requires more advanced competitive trading mechanisms and greater market openness – in other words, “functioning cross-border power markets require complementary domestic reforms”.<sup>13</sup> These domestic reforms, mostly in the form of liberalisation and decentralisation of the electricity sector, have been conducted largely in line with the concept of the regulatory state, which is majorly characterised with “an extensive use of regulation ... and of a massive diffusion of the autonomous regulatory agency as a new institutional model for public management”.<sup>14</sup> Electricity sector restructuring and electric utility privatisation have been conventionally argued to increase efficiency of the sector and ensure fiscal imperatives, as well as to attract foreign investments in the sector.<sup>15</sup> Three steps have been acknowledged as essential in order to tackle inefficiency and indebtedness of the electricity sector:<sup>16</sup>

- introduction of cost-reflective prices;
- removal of direct and indirect subsidies;
- imposition of financial and budget constraints on the basis of Performance Based Regulation (PBR).

The transition economies of the South Caucasus have attempted to pursue regulatory reforms in line with World Bank provisions since the 1990s. These transition economies were, to a large extent, tasked to increase the rate of investment and mitigate chronic imbalances in the performance of state-owned

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<sup>13</sup> Regional Electricity Markets in the ECT Area. Report (Energy Charter Secretariat, Brussels, 2003). Here, p. 17.

<sup>14</sup> Jacint Jordana and David Sancho (2004) Regulatory Designs, Institutional Constellations and the Study of Regulatory State. In: Jacint Jordana and David Levi-Faur (eds.) (2004) The Politics of Regulation. Institutions and Regulatory Reforms for the Age of Governance. Edward Elgar: Cheltenham, UK, Northampton, MA, USA, pp. 296–319. Here, p. 296.

<sup>15</sup> Paul L. Joskow (2008) Lessons Learned from Electricity Market Liberalization. Here, p. 11.

<sup>16</sup> Robert P. Anex (2002) Restructuring and Privatizing Electricity Industries in the Commonwealth of Independent States, Energy Policy 30, pp. 397–408.

utilities.<sup>17</sup> All countries attempted some degree of privatisation and deregulation, whilst Georgia, Russia and Turkey have pursued these reforms somewhat further. For example, Georgia's reforms are in line with the EU internal electricity market model and aim to integrate the country's grids with Turkey and, further, with European grids. Turkey has been gradually opening the market, including the recent changes to electricity market licence regulation introduced by The Regulation Amending the Electricity Market Licence Regulation on 23 December 2015.

Electricity reforms have aimed at reducing budget pressures in the form of needed financial injections from state-owned enterprises with low performance (artificially low tariffs left little room for utilities to self-finance), introducing higher fiscal responsibility, and expanding capacity that is often ageing and low efficiency. To a large extent, these reforms have been driven by attempts to remove burdening arrangements, such as subsidies and low collection rates, from national balances.<sup>18</sup>

In a nutshell, electricity reforms need to address a number of legal and regulatory issues in various combinations depending on domestic needs.<sup>19</sup> This study relies on a list of elements of electricity reforms elaborated by Jamasb et al. (2005),<sup>20</sup> this is not a must-to-do list, but incorporates some of the most important issues that are likely to be addressed during electricity reforms. The elements are, inter alia, the following: corporatisation of state-owned utilities; enactment of an electricity reform law; unbundling of vertically-integrated utilities; provision of third party access to networks; establishment of an independent regulator; establishment of a competitive wholesale generation market; liberalisation of the retail supply market; privatisation of electricity assets; and definition of rules concerning consumer protection. Table 1 summarises the major outcomes of various reforms in the South Caucasus.

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<sup>17</sup> Tooraj Jamasb, Raffaella L. Mota, David Newbery and Michael Pollitt (2005) Electricity Sector Reform in Developing Countries: A Survey of Empirical Evidence on Determinants and Performance. Policy Research Working Papers, World Bank Group, March, <http://elibrary.worldbank.org/doi/abs/10.1596/1813-9450-3549>

<sup>18</sup> Tooraj Jamasb, Raffaella L. Mota, David Newbery and Michael Pollitt (2005) Electricity Sector Reform in Developing Countries. Here, pp.7–8.

<sup>19</sup> See, for example, Robert Bacon (1999) A Scorecard for Energy Reforms in Developing Countries. Viewpoint, Note 175, April, World Bank Survey, [https://openknowledge.worldbank.org/bitstream/handle/10986/11487/multi\\_page.pdf?sequence=1&isAllowed=y](https://openknowledge.worldbank.org/bitstream/handle/10986/11487/multi_page.pdf?sequence=1&isAllowed=y)

<sup>20</sup> Tooraj Jamasb, Raffaella L. Mota, David Newbery and Michael Pollitt (2005) Electricity Sector Reform in Developing Countries. Here, pp.7–8.

**Table 1. Electricity reforms in the South Caucasus**

Elements of electricity reforms	Armenia <sup>21</sup>	Azerbaijan <sup>22</sup>	Georgia <sup>23</sup>
<b>Corporatisation of state owned utilities</b>	<p>Measures to improve utilities' financial performance and bill collection; tariff reforms begin in 1994, entities are transformed into closed joint-stock state-owned companies (1997).</p> <p>1998: a financial rehabilitation plan (tariff increases, the improvement of payment discipline, and debt restructuring).</p> <p>2003: the Integrated Financial Rehabilitation Plan for Utilities.</p>	<p>Measures to improve Azerenerji's financial performance, including optimisation of transmission losses and operational costs, metering, and bill collection.</p> <p>Adopted a medium-term tariff policy that incorporates a transition to full cost recovery for utility service providers. 2007: the tariff reform (the electricity tariff was increased three-fold).</p>	<p>Measures to improve utilities' financial performance and bill collection.</p> <p>Generation and distribution are largely privately owned.</p> <p>Transmission company Georgian State Electrosystem (GSE) and Energy System Commercial Operator (ESCO) are commercial state-owned entities.</p>
<b>Enactment of an electricity reform law</b>	<p>The Law on Energy (1997, with further amendments): separation of generation, transmission, and distribution.</p> <p>The Law on Electricity Distribution Company (EDC, 2000): privatisation of distribution; dropping the requirement that the prospective owners commit to a fixed level of</p>	<p>The Law on Energy (1998, with further amendments);</p> <p>The Law on the Use of Energy Resources (1998, with further amendments);</p> <p>The Law on Electricity (1998);</p> <p>The Law on Power Plants and Heat Generation Plants (1999, with further amendments).</p> <p>The State Programme for the Development of the Fuel</p>	<p>The Law on Electricity and Natural Gas (1997, with further amendments), and the Electricity (Capacity) Market Rules (2006).</p>

<sup>21</sup> For an overview of reforms in Armenia, see: From Crisis to Stability in the Armenian Power Sector, World Bank Working Paper 74, 2006; In-depth review of the investment climate and market structure in the energy sector of the Republic of Armenia. Report (Energy Charter Secretariat, Brussels, 2015).

<sup>22</sup> For an overview of the electricity sector of Azerbaijan, see: Azerbaijan Country Profile, EBRD, <http://www.ebrd.com/downloads/legal/irc/countries/azerbaijan.pdf>; In-depth review of the investment climate and market structure in the energy sector of Azerbaijan. Report (Energy Charter Secretariat, Brussels, 2013); Sector Assessment (Summary): Energy, (Asian Development Bank), <http://www.adb.org/sites/default/files/linked-documents/cps-aze-2014-2018-ssa-02.pdf>

<sup>23</sup> For an overview of reforms in Georgia, see: Assessment of Power Sector Reforms in Georgia. A country report (Asian Development Bank, 2015), <http://www.adb.org/sites/default/files/institutional-document/161067/georgia-psr-report.pdf>

	<p>investment (USD 80 million).</p> <p>2004: The Law on Energy Efficiency and Alternative Energy.</p> <p>The Government currently considering adopting a Grid Code.</p> <p>The Energy Sector Development Strategy of Armenia (adopted in 2005, updated in 2007)</p>	<p>and Energy Sector (2005–2015)</p> <p>The State Programme on the Use of Alternative and Renewable Sources (2004)</p>	
<b>Unbundling of vertically-integrated utilities</b>	<p>The unbundling of a vertically integrated <i>Armenergo</i> into generation, transportation and distribution utilities (started in 1995).</p> <p>The sector:</p> <ul style="list-style-type: none"> <li>• generation companies</li> <li>• one state-owned transmission company (CJSC High Voltage Electrical Networks);</li> <li>• one privately owned distribution company (CJSC Electricity Network of Armenia);</li> <li>• a state-owned system operator (CJSC Electric Power System Operator);</li> <li>• a state-owned settlement centre.</li> </ul>	<p>Unbundling is not envisaged:</p> <ul style="list-style-type: none"> <li>• Azerenerji JSC (established in 1996, vertically-integrated state-owned)</li> <li>• Azerishig, state-owned distribution company. Created by the presidential decree on February 9, 2015 on the basis of Baku Electric Grid JSC, state-owned regional distribution company, in order to improve power supply of the regions of the country.</li> <li>• several independent private mini-power plants.</li> </ul>	<p>The unbundling of Sakenergo, the state vertically integrated monopoly, into generation, transmission and distribution:</p> <ul style="list-style-type: none"> <li>• Generation companies</li> <li>• Georgian State Electrosystem JSC (state-owned) and JSC Sakrusenergo (50% by the state and 50% by RAO UES) – transmission companies;</li> </ul> <p>GSE owns and operates 330, 220 and 110 kV lines (along with some 35 kV lines) and high voltage substations, (including the 500 kV substation), and holds the licence for the Dispatch Centre. JSC Sakrusenergo operates a 500 kV line.</p> <ul style="list-style-type: none"> <li>• ESCO is responsible for balancing electricity demand and supply, and for contracting for electricity export and import.</li> <li>• The Dispatch Centre (GSE is a dispatch licensee)</li> </ul>
<b>Provision of third party access to</b>	Non-discriminatory access, but not formally organised	Non-discriminatory access, but not implemented in	Free third party access – separate technical and access

<b>networks</b>	(i.e. access of generators to networks and connection tariffs).  Ongoing assistance to the Ministry of Energy for the adoption of TPA legislation in the electricity transmission networks of Armenia by INOGATE (majorly for the Armenia–Georgia Interconnector).	practice due to the market structure.  No grid code.	rules (the Market Rules and Grid Rules adopted by the GNEWERC in 2014).  Priority access to the transmission network to Turkey (long term contract with the TSO) with new HPPs.
<b>Establishment of an independent regulator</b>	The Armenian Energy Regulatory Commission (AERC), established in 1997; now called the Public Services Regulatory Commission (PSRC) – regulatory implementation (tariffs, service quality and licensing, consumer complaints).  The PSRC issues licenses for generation of thermal energy (including combined electric/thermal generation), transmission and distribution, import and export.	The Tariff Council – tariff regulation;  Ministry of Industry and Energy: policy implementation, licensing, and sanctions against energy companies for non-compliance with energy legislation	The Georgian National Energy and Water Supply Regulatory Commission (GNEWERC): drafting and approving tariff methodology and licensing rules, and granting and revocation of licenses. It establishes tariffs and issues licenses for generation (excluding existing hydro power plants under 13 MW and new power plants in operation since 2008).
<b>Establishment of a competitive wholesale generation market</b>	De facto “single buyer” model market: regulated prices, direct contracts.  Electricity export requires a license from the PSRC.	None. Export and import operations need a special permit.	The “single buyer” model was replaced by ESCO in 2006. Market participants are allowed purchasing electricity both via direct contracts and ESCO. ESCO is responsible for balancing, exports/imports and exports of surplus power not sold through bilateral contracts. TSO functions are split between ESCO and the Dispatch Centre.  New generating plants and existing generating plants under 13 MW are no longer subject to tariff regulation by GNEWERC.  Electricity import/export is deregulated – no licensing

			required.
<b>Liberalisation of the retail supply market</b>	Tariffs are set by a regulator generally regarded as near medium-term cost recovery levels.	A uniform tariff for residential consumers.	Opening of the retail market is planned by 2017.
<b>Privatisation of electricity assets</b>	<p>Privatisation of the power distribution network, and of most generating companies (including small HPPs).</p> <p>Attempts to privatise the distribution company throughout the late 1990s; Midland Resources Holding (MRH) gained control over the distribution systems in 2002 and later sold it to RAO UES.</p> <p>In the early 2000s, assets of generation sector were swapped to Russian companies in state debt forgiveness.</p>	<p>Some consultations during 2011–2015 on the privatisation of electricity assets, but no immediate plans.</p> <p>Several private mini-power plants (HPPs) are privately-owned.</p> <p>Attempted long-term management contracts for the distribution companies throughout the 2000s.</p>	Generation and distribution are majorly privately-owned (except for the Enghuri and Vardnili HPPs).
<b>Definition of rules concerning consumer protection, allocation of subsidies, etc.</b>	<p>The PSRC is responsible for consumer complaints.</p> <p>Gradual transition to cost-based tariffs, improvements of bill collection (in 1999, shifted to post offices instead of bill collectors).</p> <p>Meter relocation program, twelve thousand new tamper-proof meters installed with the Automated Metering and Data Acquisition System (AMDAS, 1999–2001).</p>	<p>Ministry of Industry and Energy handles consumer complaints and ensures service quality control.</p> <p>In 2007, Azerenerji initiated the installation of meters, including prepayment smart meters. This has resulted in much improved collection from an average of 38% in 2006 to nearly 88% in 2013.</p>	<p>Introduction of a modern metering, billing, and collection system (began by AES, an American company that bought 75% of JSC Telasi, the distribution company in Tbilisi, in 1998. The company was sold to RAO UES in 2003).</p> <p>Step tariffs residential</p>
<b>Private investment in greenfield sites*</b>	The Armenia Renewable Energy and Energy Efficiency Fund: 2011 a first version of the Armenian Renewable Energy	<p>The State Programme for Usage of Renewable and Alternative Energy Sources;</p> <p>The Agency for Renewable and Alternative Energy</p>	Strategy to replace thermal generation with renewable energy (hydropower), approximately 67 greenfield projects offered on Build-Own-Operate (B-O-O)

	roadmap: Local renewable energy sources; green energy projects; private sector participation in small hydropower generation.	Sources under the MIE.	principle.
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Sources: ADB,<sup>24</sup> Energy Community<sup>25</sup>, EBRD<sup>26</sup>, ESCO,<sup>27</sup> INOGATE<sup>28</sup>

\* Note: World Bank Survey criterion

The output of similar reforms might, however, vary across the countries. Inevitably, a country's institutions and sector governance might alter the effectiveness of reforms and signal significant risks for foreign investors. Much depends not only on particular reform provisions, but also on the political will of governments to not to allow vested interests and institutional legacies to circumvent the reform path. Peculiarities of decision-making processes that lie behind the formal similarities of many institutional innovations can become the keys to successful reforms. Thus, a set of institutional reforms implemented de jure in most countries under discussion during the post-Soviet transition has been challenged de facto by persisting informal practices, such as ownership, institutional cultures and group interests.<sup>29</sup>

In case of serious budget constraints, reforms become a way to inject much needed financial resources in the sector from international and private donors. However, liberalisation of domestic markets requires certain political choices, which might be rather sensitive and much dependent on the domestic political situation. A combination of various issues that a government faces during regulatory and market reform might decrease its commitment to proceed with far-reaching regulatory and

<sup>24</sup> Assessment of Power Sector Reforms in Georgia. Country report (Asian Development Bank 2015), <http://www.adb.org/sites/default/files/institutional-document/161067/georgia-psr-report.pdf>

<sup>25</sup> Giorgi Tushurashvili (2013) Energy Strategy and Energy Policy Developments for the Promotion of Clean Power Generation in Georgia, Energy Community, <https://www.energy-community.org/pls/portal/docs/1910181.PDF>

<sup>26</sup> Georgia country profile, EBRD, <http://www.ebrd.com/downloads/legal/irc/countries/georgia.pdf>

Armenia country profile, EBRD, <http://www.ebrd.com/downloads/legal/irc/countries/armenia.pdf>

<sup>27</sup> Electricity System Commercial Operator, History, [http://www.esco.ge/index.php?article\\_id=12&clang=1](http://www.esco.ge/index.php?article_id=12&clang=1)

<sup>28</sup> Workshop on the Assistance to the Ministry of Energy for the adoption of TPA legislation in the electricity transmission networks of Armenia, INOGATE, 15 December 2015, <http://www.inogate.org/activities/608?lang=en>

<sup>29</sup> Tooraj Jamasb, Raffaella Mota, David Newbery and Michael Pollitt (2005) Electricity Sector Reform in Developing Countries: A Survey of Empirical Evidence on Determinants and Performance; Robert P. Anex (2002) Restructuring and Privatizing Electricity Industries in the Commonwealth of Independent States.

institutional changes.<sup>30</sup> Among others, the countries of the South Caucasus have faced a need to ensure domestic stability, protect political and strategic interests, address institutional dependencies in the sector, and simultaneously calibrate domestic political aspirations and group interests.

- Domestic politics and social stability. An increase of end-user tariffs to cost-recoverable levels – an inevitable step during market reforms – has remained a crucial issue of the countries' domestic politics due to its social sensitivity. Non-economic prices for energy are a historical legacy of the Soviet period, when the price for electricity as a necessity was nominal. Costs for household electricity were bundled into the rent, and electric power was not paid by consumers.<sup>31</sup> Coupled with the economic downturn and skyrocketing poverty of the population, low electricity prices remained a highly sensitive issue for domestic politics. Moreover, large-scale non-payments represented another obstacle for reforms, and poor metering complicated bill collection further. In turn, industrial and residential prices below economic costs inhibit investment inflows in generation and transmission, since investors fail to recover costs and make reasonable profits. The political sensitivity of tariff policy incentivises governments to maintain control over tariff calculations and intervene when necessary. Setting cost-reflective prices remains a crucial issue in the vicious circle of investors' lack of confidence in regulatory frameworks and any significant reform attempted in the sector. Similar to many other transitional economies, such as those of Central Asia, the South Caucasus has faced the dilemma of attracting foreign investors and ensuring social stability.<sup>32</sup> The lack of investment becomes especially apparent in the countries with budget restrictions, such as Georgia and Armenia, while others, like Azerbaijan, can inject some state financing into the sector.
- Political and strategic considerations. Despite calls for more technical and regulatory cooperation being articulated by various stakeholders in the region, regional politicisation trends have deeply penetrated the sector. A technical and economic rationale to restore a single electricity network conflicts with political preferences of the states, and difficulties in regional cooperation are nested into strategic legacies and unresolved territorial and historical conflicts. A lack of political incentives to engage in open dialogue

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<sup>30</sup> Julian A. Lampietti, Sudeshna Ghosh Banerjee and Amelia Branczik (2007) *People and Power. Electricity Sector Reforms and the Poor in Europe and Central Asia*. The International Bank for Reconstruction and Development / The World Bank, Washington DC.

<sup>31</sup> Susanne A. Wengle (2015) *Post-Soviet Power. State-led Development and Russia's Marketization*. Cambridge University Press.

<sup>32</sup> Anatole Boute (2015) *Towards Secure and Sustainable Energy Supply in Central Asia: Electricity Market Reform and Investment Protection* (Brussels: Energy Charter Secretariat, 2015).

and increasing competition for regional leadership complicate pan-regional approaches to electricity.

- Institutional legacies in the electricity sector. Fragmentation of the Soviet system into several stand-alone grids facilitated under and overcapacities across the region. These problems have been aggravated with an economic slowdown in the sector and shifts in domestic demand/supply patterns. Industrial consumption fell as a result of the economic downturn of the 1990s, while residential demand grew, thus increasing peak-load demand. This further aggravated the gap between generation and capacities across the region, which emerged from the breakup of the Soviet single power network. Persisting organisational structures in the electricity sector of the South Caucasus initially made it rather unattractive for privatisation, and lowered governments' incentives to engage with reforms. Most companies were majorly state-owned and financed by governments with no direct relationship to electricity sales revenues. Subsidies for electricity utilities, both direct, such as payments from the government to a company in the form of a compensation, and indirect, such as low interest loans and various arrangements due to informal practices, are still present in most countries. For example, the independence of GNEWRC from Georgian government bodies has been questioned in the country report by the Asian Development Bank.<sup>33</sup> Moreover, the same study argues that cross-ownership of generation, supply and distribution, and transmission activities in Georgia impedes the sector's competitive practices. Another example refers to the recent protests in Armenia against an electricity price increase of 17–22% during summer 2015.<sup>34</sup> While political sensitivity to the tariff policy was one of the major triggers of these protests, they were also driven by allegedly persisting inefficient and non-transparent regulatory practices in the sector.
- Group interests. The logic of reform has often confronted with resistance from domestic actors who are accustomed to obtaining economic and political benefits from non-privatisation. Cross-sectoral ownership by various oligarch and interest groups in the countries prevents effective unbundling of the industry and implementation of competitive provisions. For example, the initial attempt of the Armenian Electricity Distribution Company (EDC) during the 1990s to improve bill collection by means of hiring a large number of inspectors resulted in poor collection, in part due to the collusion of inspectors and the population during cash bill collection. Privatisation also

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<sup>33</sup> Assessment of Power Sector Reforms in Georgia. Country report. Asian Development Bank 2015. Here, p. 4.

<sup>34</sup> Armenian protests: Thousands rally against energy price hike. BBC, 24 June 2015, <http://www.bbc.com/news/world-middle-east-33238070>

often met resistance from various groups and policy-makers. Thus, in order to prevent vested interests from prevailing over reforms, the Government of Armenia shifted relevant responsibilities from the Ministry of Energy to the Ministry of Justice during the early 2000s.<sup>35</sup>

Removing trade and investment barriers (such as monopolies, lack of open access to grids, and limited access to final consumers) remain essential issues in the region. Investment attractiveness depends both on a country's investment climate and guaranteed investment protection and on regional infrastructure, especially given the fact that the national electricity markets of Armenia, Azerbaijan and Georgia are rather small. However, until regulatory reforms result in greater market opening, trade will remain limited to sporadic (bilateral) exchange. Insufficient cooperation and coordination among transmission system operators and the lack of harmonisation of national markets have been continuously reported as the principle factors causing the lack of progress in regional power trade. Numerous discussions with stakeholders and donors have revealed a general acknowledgement of the need to enhance the role of national regulatory agencies and transmission system operators in harmonising practices.

### **Regional integration initiatives and a South Caucasian regional electricity market**

Security considerations and historical legacies play an essential role in the region, and while this paper focuses on economic and regulatory aspects of regional economic integration, it acknowledges the pivotal importance of political problems that have penetrated the region. Truly mutually beneficial cooperation cannot be achieved without political issues being resolved – and this would require long-term political commitments from the countries of the region.<sup>36</sup>

This political complexity is aggravated by emerging regional integration dynamics. Overlapping authorities of regional frameworks – the Eurasian Economic Union and the EU Energy Community – might affect regional electricity cooperation. From one side, these regional initiatives create market-oriented legal frameworks that aim for the further regionalisation and liberalisation of domestic electricity markets. From the other side, they also create fragmented political authorities and may provide differentiated market designs.<sup>37</sup> Aggravated with persisting political and historical

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<sup>35</sup> From Crisis to Stability in the Armenian Power Sector. Here pp. 4–6.

<sup>36</sup> Thomas de Waal (2013) *Black Garden: Armenia and Azerbaijan Through Peace and War*, 10th Year Anniversary Edition, Revised and Updated, NYU Press.

<sup>37</sup> David Lane and Vsevolod Samokhvalov (eds.) (2015) *The Eurasian Project and Europe. Regional Discontinuities and Geopolitics*. Basingstoke & New York, NY: Palgrave Macmillan; Piotr Dutkiewicz

legacies, the emergence of a common harmonised framework for a regional electricity market seems to be challengeable. This section discusses these two regional projects – the Eurasian Economic Union and the EU Energy Community – and outlines other regional and multilateral frameworks that address the issues of the electricity sector in the South Caucasus.

### The Eurasian Economic Union

Reintegration of electricity networks in the post-Soviet space was attempted immediately after the dissolution of the USSR – in 1992, the Council of CIS signed the Agreement on Coordination of Interstate Relations in the Electric Power Industry, which was followed by the Agreement on Parallel Work of Electric Power Systems in 1998. The CIS Electric Power Council, at the moment the only body to address mitigation of negative externalities due to the dissolution of the single Soviet electricity system, aimed at coordination of new national electricity markets, united by technicalities and infrastructure, but divided by regulatory approaches. It adopted several strategies of cooperation in electricity, and the Concept of a common electricity market in 2005. The Concept prescribes a gradual opening of electricity markets, a decrease of barriers for market access, and a steady integration of national energy markets.<sup>38</sup> The Agreement on formation of a common electricity market was signed in 2007 by Armenia, Belarus, Kazakhstan, Kyrgyzstan, Russia, and Tajikistan as part of the Eurasian Economic Community (EurAsEC) arrangements. In the 2000s, the EurAsEC started creating a common power market (CPM).

The Eurasian Economic Union, an integrationist project for the post-Soviet states launched in the late 2000s, has proposed major initiatives in hydrocarbon and electricity markets. As announced, Armenia, Belarus, Kazakhstan, Kyrgyzstan, and Russia<sup>39</sup> intend to create a common electricity market by 2019, and a single hydrocarbon market by 2025. The priority attributed to a common electricity market refers to historical legacies and institutional path dependence on the Soviet electricity system, which provides numerous organisational and technical advantages – these countries operate with similar technical and regulatory standards. Regarding a common electricity market, the Concept of the Common Electricity Market was approved by the Eurasian Economic Commission in May 2015, and, in 2016, the Programme for a single electricity market is expected to outline the merge of member states' energy systems into a single network. The implementation of provisions should be performed by member states over 2016–2018, and the

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and Richard Sakwa (eds.) (2014) *Eurasian Integration – The View from Within*. Abingdon & New York: Routledge.

<sup>38</sup> Evgeny Vinokurov (2008) *The CIS Common Electric Power Market. Sector Report* (Eurasian Development Bank), [http://eabr.org/general/upload/docs/CEPM\\_eng.pdf](http://eabr.org/general/upload/docs/CEPM_eng.pdf)

<sup>39</sup> Armenia and Kyrgyzstan joined the Eurasian Economic Union in 2015.

intergovernmental treaty on a common electricity market should come into force in 2019.

Several options were considered during consultations on the model of a common electricity market – first, a single market based on the model of the wholesale electricity market of Russia; second, the creation, in Russia, of regional electricity markets approximately equal to the markets of Belarus and Kazakhstan; and, third, the formation of a common electricity market with preservation of national electricity markets of member states. The last option was chosen as the most pragmatic and best suited for a successful integration output. Overall, the integration process is expected to take place in three major steps. First, harmonisation of national legislation, market opening reforms (unbundling), and development of a common legal base for supranational governance of the electricity markets. Second, national electricity markets are opened to other members. Third, national markets are expected to be integrated into a common market.

This intensive working plan needs, however, to bypass political bargaining among member states of the Eurasian Economic Union.<sup>40</sup> Thus, Belarus insists on the priority of the creation of a single gas market before the electricity one mostly due to their interest in equal pricing and accessing oil and gas infrastructure, and the question remains open to debate.<sup>41</sup> Despite silence from the media, the question of whether the integration process in gas and electricity should be separated or treated as a single process may create unexpected delays. Creation of a common electricity market shall be accompanied with relevant domestic reforms of the sector, but a different degree of member states' preparation might create obstacles.

In any case, the creation of a common electricity market will have serious implications for Armenia, a member state of the Eurasian Economic Union.<sup>42</sup> Having functioning connections with Iran and Georgia, the country might need to mitigate emerging differences between two regional integrationist projects, the Eurasian Economic Union and the EU Energy Community. A member of the latter, Georgia, is increasingly moving its existing regulatory framework up to the standards of the EU internal electricity market.

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<sup>40</sup> However, earlier in 2016, the Concept for development of the common gas market of the Eurasian Economic Union was approved.

<sup>41</sup> Союзники снова споткнутся о газ, Belrynok, 19 August 2015, <http://www.belrynok.by/ru/page/industry/833/>

<sup>42</sup> Armenia and the Customs Union: Impact of Economic Integration. Report 20 (Eurasian Development Bank, 2013), [http://www.eabr.org/general/upload/CII%20-%20izdania/2014/%D0%90%D1%80%D0%BC%D0%B5%D0%BD%D0%B8%D1%8F-%D0%A2%D0%A1/doklad\\_20\\_en\\_preview.pdf](http://www.eabr.org/general/upload/CII%20-%20izdania/2014/%D0%90%D1%80%D0%BC%D0%B5%D0%BD%D0%B8%D1%8F-%D0%A2%D0%A1/doklad_20_en_preview.pdf)

## The EU Energy Community

The EU Energy Community was created in 2005 as part of the EU's external policies towards its neighbourhood and was primarily aimed at "the import of the EU energy policy into non-EU countries."<sup>43</sup> It has invoked the significant structural and institutional reorganisation of electricity markets in member states and neighbouring countries through the implementation of EU energy acquis by its contracting parties, but without granting them possibility to participate fully in creation or amendment of the rules.

Along the lines of the reforms conducted within the EU, the EU Energy Community requires several electricity market reforms in order to meet the criteria of EU energy acquis. Thus, contracting parties need to make compatible with EU legal frameworks the organisation of the electricity sector (unbundling), provide third party access to networks, and design national electricity markets according to the EU model.<sup>44</sup> As a part of negotiations within the Energy Community, Georgia aims to design its domestic electricity market in line with EU acquis.<sup>45</sup>

## Regional initiatives

In addition, several regional initiatives, most of which are under the auspices of the EU framework, offer technical and regulatory approximation of the domestic electricity sectors of the countries. Thus, fostering electricity cooperation is one of the objectives of the EU Eastern Partnership. In the framework of the Eastern Partnership, the Council of European Energy Regulators (CEER) and the European Commission organise regular multi-lateral meetings and specialised workshops with the energy regulatory bodies of the six partner countries (Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine).<sup>46</sup> Until now, four workshops have been organised. At the one that took place in 2014, regulatory aspects of market integration in building regional electricity markets were discussed.

The INOGATE programme is tasked to provide technical and project support to partner countries, which include the countries of the South Caucasus. In particular, a project aimed at the harmonisation of electricity standards in the South Caucasian

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<sup>43</sup> Energy Community website, [https://www.energy-community.org/portal/page/portal/ENC\\_HOME/ENERGY\\_COMMUNITY](https://www.energy-community.org/portal/page/portal/ENC_HOME/ENERGY_COMMUNITY)

<sup>44</sup> Jean-Michel Glachant and François Lévêque (eds.) (2009) *Electricity Reform in Europe: Towards a Single Energy Market*. Cheltenham: Edward Elgar.

<sup>45</sup> Tamar Tsursumia (2015) *Electricity Cooperation Opportunities in the South Caucasus: The Role of Georgia*, Occasional Paper (Energy Charter Secretariat, Brussels, 2015).

<sup>46</sup> CEER–Eastern Partnership, CEER, [http://www.ceer.eu/portal/page/portal/EER\\_HOME/EER\\_INTERNATIONAL/CEER\\_Eastern\\_Partnership](http://www.ceer.eu/portal/page/portal/EER_HOME/EER_INTERNATIONAL/CEER_Eastern_Partnership)

and Central Asian countries, Moldova, and Ukraine, was administered in 2009–2011.<sup>47</sup> Some specific projects administered by INOGATE under EU financial support include the participation of Tbilisi in the Covenant of Mayors, a European movement involving local and regional authorities, aimed to deliberate on increasing renewable energy and energy efficiency.<sup>48</sup> INOGATE also recently assisted the Ministry of Energy of Armenia in the adoption of TPA legislation in electricity transmission networks, particularly regarding the regulatory status of the Armenia–Georgia Interconnector.<sup>49</sup>

The EU-backed Black Sea Synergy initiative, among others, aims at greater stability and approximation of energy policies in the region.<sup>50</sup> The Organisation of the Black Sea Economic Cooperation, a regional platform created in 1992, also addresses energy issues, electricity networks in particular, as part of its activities.

These initiatives offer platforms for discussions, best practice exchange, and technical and expert assistance. However, they largely depend upon the political component of integrationist projects and the geopolitical considerations of the countries involved.

### **Cross-border regional trade opportunities and infrastructure projects in the South Caucasus**

Technical and economic factors play a significant role in boosting regional cooperation and ensuring further market integration. Technical barriers, lack of compatibility between systems, inefficiencies in the use of cross-border interconnectors for balancing countries' electricity needs, lack of domestic and cross-border interconnectors, high technical and commercial losses, and lack of adequate investment in electricity network infrastructure are a few factors that can seriously complicate greater integration of electricity networks and inhibit regional trade opportunities.

This section analyses the prospects for regional trade according to the following indicators:

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<sup>47</sup> Harmonisation of electricity standards, INOGATE, <http://www.inogate.org/projects/harmonisation-of-electricity-standards?lang=en>

<sup>48</sup> Infrastructure and Environment, Delegation of the European Union to Georgia, [http://eeas.europa.eu/delegations/georgia/projects/overview/infrastructure\\_environment\\_rural\\_dev/index\\_en.htm](http://eeas.europa.eu/delegations/georgia/projects/overview/infrastructure_environment_rural_dev/index_en.htm)

<sup>49</sup> Workshop on the Assistance to the Ministry of Energy for the adoption of TPA legislation in the electricity transmission networks of Armenia, INOGATE, 15 December 2015, <http://www.inogate.org/activities/608?lang=en>

<sup>50</sup> Joint Staff Working Document, Black Sea Synergy: review of a regional cooperation initiative, European Commission, SWD(2015) 6 final, 20 January 2015, [http://eeas.europa.eu/blacksea/doc/swd\\_2015\\_6\\_f1\\_joint\\_staff\\_working\\_paper\\_en.pdf](http://eeas.europa.eu/blacksea/doc/swd_2015_6_f1_joint_staff_working_paper_en.pdf)

- Electricity demand in the countries of the South Caucasus – production and consumption;
- Generation capacities – capacity utilisation and investment programmes in their renovation and restoration;
- Electricity losses – technical and commercial;
- Technical specifications – connections of countries' power systems;
- Cross-border trade flows in the region;
- Cross-border capacities – existing and planned interconnectors.

Cross-border trade in the region is present in the form of bilateral exchanges. Further enhancement of regional trade lacks adequate domestic and cross-border infrastructure, as well as synchronicity among the countries' power systems. The small sizes of the countries' domestic electricity markets provide incentives for combining efforts in meeting various needs in national power systems and attracting foreign investments. Table 2 outlines major production and consumption data of the South Caucasian countries and their neighbours.

**Table 2. Electricity Production and Consumption, GWh, 2013**

	<b>Armenia</b>	<b>Azerbaijan</b>	<b>Georgia</b>	<b>Iran</b>	<b>Russia (South UES)*</b>	<b>Turkey</b>
<b><i>Production:</i></b>	<b><i>7710</i></b>	<b><i>23354</i></b>	<b><i>10059</i></b>	<b><i>270371</i></b>	<b><i>82842</i></b>	<b><i>240154</i></b>
<b>Hydro</b>	2173	1489	8271	15244	22049	59420
<b>Nuclear</b>	2360	0	0	5414	17136	0
<b>Thermal</b>	3173	21729	1788	185930	42617	170641
<b>Other</b>	4***	136^	0	231**	1040	8729^^
<b><i>Final Consumption</i></b>	<b><i>5404</i></b>	<b><i>15982</i></b>	<b><i>9074</i></b>	<b><i>212274</i></b>	<b><i>85585</i></b>	<b><i>196168</i></b>
<b>Industry</b>	1209	2996	2327	76797	n/a	91384
<b>Transport</b>	124	531	282	394	n/a	826
<b>Residential</b>	2028	6716	3624	65234	n/a	44972
<b>Commercial and public services</b>	950	4829	1202	32334	n/a	54072

<b>Agriculture and fishing</b>	151	910	34	33650	n/a	4914
<b>Other</b>	942	0	1605	3865	n/a	0

Sources: IEA, InterRAO UES, author's calculations

Notes: Hydro includes production from pumped storage plants (IEA);

\*: data for United Electricity System of South;

\*\*.: biofuels and wind;

\*\*\*.: wind;

^.: waste, wind, and solar PV;

^^.: wind, biofuels, geothermal, waste, and others.

There is room for greater demand in the future. For instance, Turkey's electricity demand is estimated to grow 7.4% by 2018, reaching 357,202 GWh.<sup>51</sup> Additionally, seasonal variations in the countries' electricity demand can become a solid ground for further regional cooperation. Several preliminary considerations might be particularly important:

- Seasonal variations in hydropower generation in Georgia allow the export of electricity to neighbouring countries during spring and summer floods. The recently completed interconnectors with Azerbaijan and Turkey, and ongoing construction of the interconnector with Armenia, will offer opportunities to use Georgia's hydropower generation potential more effectively.
- Turkey can offer the highest electricity prices in the region and high demand in summer. However, capacities in the East–West transmission corridor limit Turkey's electricity imports.<sup>52</sup> From April to June, Turkey limits imports from Georgia (up to 350 MW), which is also due to an increase in generation at local HPPs. Planned construction of HPPs in the eastern part of Turkey is aimed to satisfy growing demand and mitigate environmental concerns, and it might be advised to plan this construction within a broader regional framework.
- The recently expanded Azerbaijan–Georgia interconnector (500 kV) offers an opportunity to export excessive electricity from Azerbaijan to Turkey via Georgia. Exports from Georgia to Azerbaijan might balance Georgia's seasonal surpluses, but flexibility of domestic gas pricing for electricity production in

<sup>51</sup> Turkish Electrical Energy 10-year Generation Capacity Projection (2009–2018), <http://www.teias.gov.tr/eng/ApkProjection/CAPACITY%20PROJECTION%202009-2018.pdf>, Here, p.12.

<sup>52</sup> The analysis of the East–West transmission corridor and the blackout on 31 March 2015: Report on Blackout in Turkey on 31st March 2015, ENTSO-E, 21 September 2015, [https://www.entsoe.eu/Documents/SOC%20documents/Regional\\_Groups\\_Continental\\_Europe/20150921\\_Black\\_Out\\_Report\\_v10\\_w.pdf](https://www.entsoe.eu/Documents/SOC%20documents/Regional_Groups_Continental_Europe/20150921_Black_Out_Report_v10_w.pdf)

Azerbaijan should be taken into account while assessing the feasibility of these export flows.

- Enhancement of cooperation between Armenia and Iran (swaps of Iranian natural gas for Armenian electricity) and announced construction of a new 400 kV power line (estimated to be operational by 2018) will provide enough room for Armenian electricity output being exported to Iran, especially in case the Armenian NPP is renovated. A new interconnector between Armenia and Iran also opens room for cooperation among Georgia, Armenia and Iran, as well as Russia.<sup>53</sup>

### Complementarity of generating capacities in the region

Existing large surplus generation capacities and daily and seasonal variations in capacity utilisation are one of the most important indicators of a potential increase in physical trade in electricity.<sup>54</sup> Any assessment of regional trade opportunities needs to take account of installed and operational capacities, their utilisation, and various renovation and restoration programmes.

Complementarity of generation capacity among the countries offers opportunities for better investment allocation in generating capacity, improving load factors across power systems.<sup>55</sup> Maintaining reserve margins (usually up to 20% of installed capacity) is typically obligatory for security reasons,<sup>56</sup> but regional cooperative efforts can reduce the relevant costs due to power exchange through regional interconnectors. Regional complementarity of generating capacities can also contribute to developments in renewable energy and improve the overall countries' environmental dispatch.<sup>57</sup> Table 3 outlines the countries' generating capacities and maps out major power plants.

<sup>53</sup> On 23 December 2015, Armenia, Georgia, and Iran, and the chief executive of the Rosseti signed a memorandum on cooperation in the energy sphere. Armen Grigoryan (2016) Armenia, Georgia, Iran and Russia Plan to Expand Energy Cooperation, Eurasia Daily Monitor 13(1), [http://www.jamestown.org/single/?tx\\_ttnews\[tt\\_news\]=44939&no\\_cache=1#.VtIrx7-Q\\_Wg](http://www.jamestown.org/single/?tx_ttnews[tt_news]=44939&no_cache=1#.VtIrx7-Q_Wg)

<sup>54</sup> Regional Electricity Markets in the ECT Area. Report (Energy Charter Secretariat, Brussels, 2003). Here, p. 45.

<sup>55</sup> Multi Dimensional Issues in International Electric Power Grid Interconnections. (Department of Economic and Social Affairs, Division for Sustainable Development, United Nations, 2006), <https://sustainabledevelopment.un.org/content/documents/interconnections.pdf> Here, pp. 15-17.

<sup>56</sup> Regional Electricity Markets in the ECT Area. Here, p. 36.

<sup>57</sup> Re-Powering Markets. Market Design and Regulation during the Transition to Low-carbon Power Systems. Report (International Energy Agency, 2015).

**Table 3. Generating capacity, MW**

Country	Installed generating capacity	Major power plants (PPs)	Comments
Armenia	4,021	<ul style="list-style-type: none"> <li>▪ The Metzamor NPP (376 MW);</li> <li>▪ Hrazdan (1110 MW) and Yerevan (550 MW) thermal (gas-fired) PPs;</li> <li>▪ Sevan-Hrazdan (556 MW) and Vorotan (400 MW) Cascades;</li> <li>▪ Wind power plant Lori-1 (2.64 MW) and small hydropower plants with less than 30 MW;</li> <li>▪ The Yerevan Thermoelectric Plant (50 MW) for the Nairit Chemical Plant;</li> <li>▪ The Vanadzor Thermoelectric Plant (50 MW) – not operating</li> </ul>	<p>Armenia imports natural gas from Russia and Iran (for TPPs) and uranium from Russia.</p> <p>The Metsamor NPP (planned to retire in 2026) and two HPPs provide base-load capacity.</p> <p>The TPPs are used to meet winter peak demand and provide baseload capacity during NPP maintenance.</p> <p>There is underuse of renewable sources of energy, small hydropower, and solar hot-water heaters.</p>
Azerbaijan	6,231.6	<ul style="list-style-type: none"> <li>▪ <i>13 TPPs (around 80%):</i> Azerbaijan TPP (2,400 MW); Janub South TPP (780 MW); Sumgait TPP (525 MW); Shimal (400 MW); Sangachal (300 MW); Baku TPC (107 MW); Baku PP (104 MW); Shahdagh (104 MW); Astara (87 MW); Shaki (87 MW); Khachmaz (87 MW); Nakhchivan PP (87 MW); Nakhchivan GTES (64 MW)</li> <li>▪ <i>15 HPPs:</i> Mingechevir HPP (402 MW); Shamkir HPP (380 MW); Yenikend HPP (150 MW); Fizuli (25 MW); Takhtakerpu (25 MW); Shamkirchay (25 MW); Varvara (16 MW); Ismayilli-1 (1.6 MW); Gusar-1 (1 MW); Araz (22 MW); Bilav (22 MW); Arpaçay-1 (20.5 MW); Arpaçay-2 (1.4 MW); Vaykhir (5 MW); Goychay (3.1 MW).</li> </ul>	<p>New capacities reached 867 MW in 2013. Heavy oil PPs are mostly no longer used since 2013.</p> <p>Janub TPP replaced Ali Bayramli TPP (the second largest PP in Azerbaijan) in 2013.</p> <p>Private sector investments in the generation facilities accounts for about 1% of the total installed capacity (mini-PPs). Construction of mini-HPPs (such as Takhtakerpu (25 MW), Goychay (3.1 MW), Ismayilli-1 (1.6 MW)) is completed in 2014.</p> <p>The Nakhichevan exclave is inter alia dependent on power imports from Iran and Turkey. Arpaçay-1 and Arpaçay-2 in the Nakhichevan were commissioned in 2013–2014.</p>

		<ul style="list-style-type: none"> <li>▪ <i>Wind PPs</i> – completed in 2013–2015: Gobustan (2.7 MW); Pirakushkul (80 MW); Khizi (5.3 MW); Khizi (Shurabad) (48 MW); Yeni Yashma (50 MW); Mushviq (8 MW)</li> </ul>	
Georgia	3,700	<ul style="list-style-type: none"> <li>▪ <i>HPPs (2657.1 MW):</i> Enguri HPP (1,300 MW); Vartsikhehesi (184 MW); Vardnilihesi (220 MW); Lajanurhesi (112.5 MW); Zhinvalhesi (130 MW); Gumathesi (68.8 MW); Rionhesi (48 MW); Khrami II (114.4 MW); Khrami I (112.8 MW); Zahesi (36.8 MW); Khadorihesi (24 MW); Dzevrulhesi (80 MW); Shaorihesi (38.4 MW); Chitakhvhesi (21 MW); Ortachalahesi (18 MW); Atshesi (16 MW); Satskhenishesi (14 MW); Small HPPs (below 13 MW) (118.4 MW)</li> <li>▪ <i>TPP (913 MW):</i> Mtkvari TPP (300 MW); Tbilisresi (272 MW); G-Power (110 MW) Gardabani (231.2 MW)</li> </ul>	<p>Gradual replacement of thermal generation with hydropower.</p> <p>Limited reservoir capacity. Large reservoir HPPs – Khudoni (702 MW) and Namakhavani (450 MW) – are planned by 2020.</p> <p>Hydro generation is highly seasonal: in summer, the country needs to export excess power, and in winter, to import .</p> <p>Khadorihesi and G-Power were launched in 2005–2006.</p> <p>Gardabani TPP was commissioned in 2015.</p> <p>According to Ministry of Energy, 22 HPPs (1,550 MW) are either under construction or at licensing stage and are planned to be operational by 2020.<sup>58</sup></p>

Source: EIA; ADB, Azerenerji;<sup>59</sup> EU Energy Community, CEER;<sup>60</sup> Ministry of Energy of Georgia

<sup>58</sup> Georgia Energy Policy Talks, Tbilisi, INOGATE, 25 February 2016, [http://www.inogate.org/documents/Final\\_ThemePaper\\_1stEnergyTalk\\_Feb25\\_20160219.pdf](http://www.inogate.org/documents/Final_ThemePaper_1stEnergyTalk_Feb25_20160219.pdf)

<sup>59</sup> Energy production, Azerenerji, [http://www.azerenerji.gov.az/index.php?option=com\\_content&view=article&id=91&Itemid=112&lang=en](http://www.azerenerji.gov.az/index.php?option=com_content&view=article&id=91&Itemid=112&lang=en)

<sup>60</sup> Energy System of Azerbaijan, Presentation at Workshop 'Building regional electricity markets', 27 May 2014, CEER, [http://www.ceer.eu/portal/page/portal/EER\\_HOME/EER\\_INTERNATIONAL/CEER\\_Eastern\\_Partnership/3rd/WO/02\\_02\\_Azerbaijan.pdf](http://www.ceer.eu/portal/page/portal/EER_HOME/EER_INTERNATIONAL/CEER_Eastern_Partnership/3rd/WO/02_02_Azerbaijan.pdf)

Armenia needs to calibrate the NPP baseload, which is economically appropriate but environmentally challenging given the seismic instability. Additionally, their NPP is scheduled to be retired in 2026, and is planned to be replaced with a new reactor (with a capacity of 1,060 MW). Funding for this project is expected to be derived from a joint venture with Russia, but is yet to be confirmed. If completed, a new NPP will offer enough opportunities for electricity export, both to Georgia and Iran. However, since Georgia has decreased import significantly, Armenia's export opportunities to Georgia need closer analysis.

The Hrazdan TPP is of low efficiency (35%) and is used to cover peak loads and substitute the NPP during regular maintenance. A new Hrazdan 5 TPP (440 MW) meets operational standards. The Yerevan TPP has 550 MW installed capacity, but only one generating unit is operational with around 50 MW. It is largely outdated and needs renovation. A new 240 MW combined cycle gas turbine at the Yerevan TPP came online in 2010. Additional construction of small HPPs (87 MW by 2015, additional 61 MW by 2020) and wind PPs (40 MW by 2015 and 120 MW by 2020) are being envisaged.<sup>61</sup> However, the construction of Shnogh HPP (75 MW) and Loriberd HPP (66 MW) is considered feasible in case of greater regional integration.<sup>62</sup>

Azerbaijan has rich domestic oil and natural gas sources, and TPPs are likely to remain the major source of electricity production (up to 90%). With the completion of new combined cycle gas turbine generation units by around 2016, old and less efficient generation units will be decommissioned, and the overall generation availability will rise to 75%. Since 2013, heavy oil TPPs are largely out of use – to compare, in 2003 they generated around 40% of electricity.<sup>63</sup> Existing surplus of electricity production can be exported to Georgia and Turkey after the interconnector has been completed (the Azerbaijan–Georgia–Turkey Power Bridge).

Georgia prioritises the efficient use of hydro potential and enhancement of other green sources. Internal generation capacity has been increased with updates in hydropower generation areas in the North (Svaneti and Racha-Lechkhumi) and in South-West and South (Samtkhe-Javakheti, Guria and Achara). Georgia's hydropower electricity production is characterised with high seasonality, and geographical peculiarities of the rivers. One of options to balance seasonal fluctuations and ensure stability of generation is the increase of reservoir capacity by construction of a new

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<sup>61</sup> Priorities of the development of the Armenia's electricity market, Presentation at Workshop 'Building regional electricity markets', 27 May 2014, CEER, [http://www.ceer.eu/portal/page/portal/EER\\_HOME/EER\\_INTERNATIONAL/CEER\\_Eastern\\_Partnership/3rd/WO/02\\_01\\_Armenia.pdf](http://www.ceer.eu/portal/page/portal/EER_HOME/EER_INTERNATIONAL/CEER_Eastern_Partnership/3rd/WO/02_01_Armenia.pdf)

<sup>62</sup> Ibid.

<sup>63</sup> Energy System of Azerbaijan, Presentation at Workshop 'Building regional electricity markets', 27 May 2014, CEER.

large reservoir HPPs, Khudoni (702 MW) and Namakhavani (450 MW), planned by 2020. Yet, HPPs with regulating water reservoir are challenging to build.

### Renewable energy in the region

Growing environmental concerns provide room for a greater role for renewable energy sources and new technologies for thermal plants across the region.<sup>64</sup> Inter alia, an increase of the share of renewable energy in electricity generation is put forth as a priority by the countries of the region: for example, Turkey's 2009 Electricity Market and Security of Supply Strategy aims for an increase up to 30% by 2023 by utilising hydropower potential in the country; and Georgia's National Renewable Energy Action Plan (NREAP) and National Energy Efficiency Action Plan (NEEAP) welcome greater developments of renewable energy, especially hydropower, according to the EU legal framework and best practices. Azerbaijan also made efforts for developing cleaner energy during the last decade – in 2003, 40% of electricity production was generated from heavy oil PPs, which recently were nearly faded out. The country also invests in the construction of mini-HPPs, wind PPs (104 MW), and a TPP (34 MW) that runs on waste.

### Electricity losses in the region

For the countries of the South Caucasus, reducing technical and commercial (non-technical) losses became one of the priorities during the 1990s. While excessive technical losses result mostly from the inefficiency of substation, transformer and line transmissions and their outdated controls, commercial losses are comprised of thefts, meter tampering and bypassing, and non-payment. The countries confronted a need to mitigate inefficiency, regain control over bill collection and implement relevant automated systems for control over flows.

Throughout the 2000s, the countries managed to decrease technical losses significantly, in part by implementing a wide range of new technologies to improve control over transmission and distribution. Traditionally, monitoring and control have been conducted semi-manually, relying on telephone communications with plant operators and field personnel. Increasingly, automated control has been introduced, inter alia, supervisory control and data acquisition (SCADA) systems with automatic generator control (AGC).<sup>65</sup>

In 2007, Azerbaijan carried out a SCADA project and substantially increased residential tariffs, installed meters and improved bill collection. As the in-depth review of the investment climate and market structure in the energy sector of

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<sup>64</sup> For a detailed discussion, see Maximilian Kühne, Philipp Ahlhaus and Thomas Hamacher (2015) Perspectives for electricity generation from renewable energy Sources in the South Caucasus region, Caucasus Analytical Digest 69, pp. 11-15, <http://www.css.ethz.ch/publications/pdfs/CAD-69-11-15.pdf>

<sup>65</sup> Multi Dimensional Issues in International Electric Power Grid Interconnections.

Azerbaijan points out, “as of 2010, losses in the transmission system are 3.8%, whereas losses in the distribution system are 16.6%, where both loss ratios are calculated as the loss over total generation.”<sup>66</sup> In May 2015, the Asian Development Bank and Azerbaijan signed a Memorandum of Understanding for a \$1 billion investment programme to upgrade the country’s power distribution network. Technical losses in Azerbaijan’s electricity distribution networks are expected to be reduced from 16.5% to 6.5%, and losses from energy transmission lines to 2.8% by 2020. The newly created Azerishig JSC is envisaged to implement reforms.<sup>67</sup>

During the 1990s, in Armenia, nearly 25% of supplies disappeared as commercial losses.<sup>68</sup> The initiatives of the government to relocate meters to public areas has improved the situation significantly. This approach proved to be more cost-effective than replacement of old meters, which was envisaged in most post-soviet countries during the 1990s.

The programme for power system rehabilitation implemented in Georgia has improved the situation regarding losses. Electricity transmission and distribution losses were 29.15% in 1996, and 11.2% in 2011. According to GNERC, in 2014 actual losses decreased approximately by 32% compared with 2009, and losses in distribution networks were 5.2%, which is 42% less than in 2009. Electricity losses in the transmission network were steady, with a slight (2.1%) increase in 2009.<sup>69</sup> One of the prerequisites for transfer to the retail market by 2017 is the introduction of so-called “smart” meters on the wholesale level.

### Compatibility of electric power systems

The integration of national power systems – grid connections – requires synchronisation of networks. All power systems in the region operate at a 50 Hz frequency. Azerbaijan, Georgia and Russia are synchronised and constitute part of the IPS/UPS. Georgia is synchronised with Russia and part of northern Armenia. The remaining part of Armenia’s electricity network operates synchronously with Iran. The power systems of Russia and Iran cannot be synchronised due to extensive operational coordination needed.

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<sup>66</sup> In-depth review of the investment climate and market structure in the energy sector of Azerbaijan. Report (Energy Charter Secretariat, Brussels, 2013). Here, p. 35.

<sup>67</sup> Azerbaijan To Upgrade Its Power Distribution Network, Engerati, 5 May 2015, <http://www.engerati.com/article/azerbaijan-upgrade-its-power-distribution-network>

Yet, there are unclear signals about the reform. As the latest news reports, ADB continuously postpones the approval of the loan.

<sup>68</sup> Armenia from crisis to stability. Here, p. xi.

<sup>69</sup> Georgia Energy Policy Talks, Tbilisy, 25 February 2016, [http://www.inogate.org/documents/Final\\_ThemePaper\\_1stEnergyTalk\\_Feb25\\_20160219.pdf](http://www.inogate.org/documents/Final_ThemePaper_1stEnergyTalk_Feb25_20160219.pdf)

Since technical constraints prevent the synchronisation of the Armenian, Georgian, Iranian and Russian grids, new transmission lines between Armenia and Georgia with asynchronous “back-to-back” connections will allow the single synchronisation of all four countries’ electric grids.

While synchronous alternating current (AC) power grids require a high level of technical compatibility and operational coordination, High Voltage Direct Current (HVDC) allows the asynchronous interconnection of networks that operate at different frequencies, or are otherwise incompatible. AC operation provides “the greatest benefits of interconnection”, but they also “entail greater reliability risks”, such as vulnerability to disturbances in neighbouring systems.<sup>70</sup> They are also a viable alternative when synchronous AC connections are difficult or impossible due to the use of different frequencies in the systems to be interconnected, or other important system differences. DC ties between different AC systems deliver some of the benefits of interconnection while avoiding many of the technical problems of synchronous operation.

The basic design features of an interconnection include the following elements:<sup>71</sup>

- whether an interconnection is AC or DC;
- if DC, whether it is single-pole or double-pole (+/-);
- transmission capacity (in MVA);
- transmission voltage (in kV);
- system components and overall design;
- the operating agreement.

HVDC connections are feasible for longer (more than 600 km) distances, and are more costly than AC for shorter distances. There are two general types of asynchronous interconnection: a) HVDC transmission over some distance between two converter stations, which are connected at either end to an AC system; and b) HVDC “back-to-back” interconnection to AC systems on either side, without any intervening transmission. Back-to-back connections have sometimes served as a stepping stone to a later full synchronous interconnection.

#### Cross-border electricity flows in the South Caucasus

Until now, price differentials did not drive trade significantly, and bilateral technicalities aggravated by political reasoning (such as the closed Armenia–Turkey and Armenia–Azerbaijan lines) guided cooperative dynamics. In order for price differentials to play an important role in cross-border trade, a greater degree of

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<sup>70</sup> Multidimensional issues in international electric power grid interconnections, UN, Department of Economic and Social Affairs, 2006, p. 18.

<sup>71</sup> Ibid., pp. 22-23.

market liberalisation is needed, so that generation costs can affect incentives of market participants.<sup>72</sup> Table 4 shows cross-border electricity flows among the countries of the South Caucasus and their neighbours.

Since 1997, Armenia has been exchanging electric power with Iran, supplying power in summer and receiving power during the winter peak demand load. These countries also envisaged an electricity-to-gas exchange (3 MWh of Armenian electricity – 1000 cm of Iranian natural gas). Taking into account increased gas prices for natural gas imported from Russia, enhancement of electricity generation with Iranian natural gas at the Yerevan and Hrazdan TPPs seems commercially attractive for Armenia. After ongoing interconnector projects are completed, electricity exchange capacity between Armenia and Iran will reach 1200 MW. Enhancement of this trade can improve the efficient use of resources – providing optimal loading of nuclear plants and decreasing dependence on imported natural gas.

With Georgia, Armenia has an asynchronous system connection. Some electricity sales have been made to Georgia, however, the terms and conditions of these sales are not available. In 2012, the countries signed an Agreement on Power Supplies during Emergency Situations.<sup>73</sup> The ongoing expansion of exchange capacity between Armenia and Georgia to 350 MW, with a further planned increase to 700 MW by 2021, is likely to estimate potential increase in cross-border trade. Additional imports from Georgia might be feasible – if prices are attractive for private investors in Georgian HPPs.

Trade between Georgia and Russia is falling due to Georgia's internal load, and export to Russia during summer is less efficient for Georgia than to other countries (mainly Turkey). At some point in the past, construction of a 500 kV line (Dariali–Vladikavkaz) was discussed, but, inter alia, this was largely acknowledged as a commercially challenging project.

This is also explained by Georgia's increasing role as a transit country and exporter of electricity to Turkey, particularly after the completion of the Azerbaijan–Georgia–Turkey Power Bridge in 2015. Supplies from Azerbaijan to Turkey via Georgia started in February 2016. Currently, they are made under a debt repayment scheme: Azerbaijan repays its debt to Turkey for the electricity which is delivered to the Nakhichevan Autonomous Republic. Given large-scale energy efficiency programmes in Azerbaijan (including new combined-cycle TPPs), it is possible to expect an increase of exports to Turkey in the future.

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<sup>72</sup> Regional Electricity Markets in the ECT Area. Here, p. 46.

<sup>73</sup> On 27 July 2014, Georgia referred to Armenia with the request to provide emergency power supplies due to the major blackout in most of Georgia, including Tbilisi (Success Story. Armenia supplies electricity to Georgia during major blackout. USAID Armenia, 2014, [http://www.leds.am/ss/USAID%20SUCCESS%20STORY\\_Georgia%20blackout\\_2014.pdf](http://www.leds.am/ss/USAID%20SUCCESS%20STORY_Georgia%20blackout_2014.pdf))

**Table 4. Cross-Border Electricity Flows in the South Caucasus, GWh**

	<b>Armenia</b>					
<b>Armenia</b>	(2013)* (E): 1313 (I):148	<b>Azerbaijan</b>				
<b>Azerbaijan</b>		(2013):* (E): 495 (I): 127	<b>Georgia</b>			
<b>Georgia</b>	<i>AM&gt;GE</i> (2013): 0.001 (2014): 2.10 <i>GE&gt;AM</i> (2013): 73.16 (2014): 140.46	<i>AZ&gt;GE</i> (2013): 23.56 (2014):184.23 <i>GE&gt;AZ</i> (2013): 6.61 (2014): 8.03	(2013):* (E): 450 (I): 484	<b>Iran</b>		
<b>Iran</b>	Electricity exchange for natural gas (3 MWh for 1000 cm); electricity for electricity exchange	<i>IR&gt;AZ</i> to the Nakhichevan (electricity swaps)		(2013):* (E): 11727 (I): 4144	<b>Russia**</b>	
<b>Russia</b>		<i>RU&gt;AZ</i> (2014): 53 <i>AZ&gt;RU</i> (2014): 134	<i>RU&gt;GE</i> (2014): 607.07 (2013): 460.55 <i>GE&gt;RU</i> (2014): 160 (2013): 370.61	(2014):* (E): 680 (I): 294	<b>Turkey</b>	
<b>Turkey</b>		<i>AZ&gt;TU via GE</i> since February 2016 <i>TU&gt;AZ</i> to the Nakhichevan	<i>TU&gt;GE</i> (2013–2015):0 <i>GE&gt;TU</i> (2013): 0.005 (2014): 236.49	<i>IR&gt;TU</i> (2014): 850		(2013):* (E): 1227 (I): 7429

Source: IEA, InterRAO UES, ESCO

Note: \* total Export/Import; \*\* – Southern part of Russia

Cross-border interconnector capacities

Due to small sizes of the domestic markets of the South Caucasian countries, regional cooperation is essential for administering the construction of interconnectors. Regional frameworks have secured recent completion of several interconnector projects to connect Turkey and Georgia, enhance connections between Azerbaijan and Georgia, and between Armenia and Iran. The accomplished results have already proved the enhancement of physical opportunities for electricity exchanges. Several ongoing projects are likely to complete the power bridges across the region.

Most of the ongoing and completed projects have been supported by external funding from international donors (the most active are the US Agency for International Development (USAID), EU's Neighbourhood Investment Facility (NIF), European Bank for Reconstruction and Development (EBRD), the German Development Bank (KfW), and the International Financial Corporation (IFC)). Existing cross-border capacities are presented in Table 5.

**Table 5. Cross-border interconnector capacity in the South Caucasus**

<b>Interconnector</b>	<b>Countries</b>	<b>Capacities/ Operation Mode</b>
<b>Centralnaya–Inguri (“Kavkasioni”)</b>	(Russia–Georgia)	500/850 MW (500 kV) – parallel synchronous
<b>Psou–Bzybi (“Salkhino”)</b>	(Russia–Georgia)	200/100 MW (220 kV) – island (isolated)
<b>“Dariali”</b>	(Russia–Georgia)	30 MW (110 kV), to be put in operation – island (isolated)
<b>Derbent–Khachmaz</b>	(Russia–Azerbaijan)	300 MW (330 kV)
<b>Belidzhi–Yalama</b>	(Russia–Azerbaijan)	50 MW (110 kV)
<b>Hopa–Batum</b>	(Turkey–Georgia)	15 MW/120 MW (220 kV) – island (isolated)
<b>Borçka–Akhalsikhe (“Meskheti”)</b>	(Turkey–Georgia)	700 MW (400 kV) – parallel asynchronous. HVDC B2B at Georgia’s side. Completed in 2013
<b>Kars–Gumri</b>	(Turkey–Armenia)	200 MW (220 kV) 154 kV. Not in operation
<b>Iğdır–Babek</b>	(Turkey–Azerbaijan)	40 MW (154 kV) – island (isolated)

	Nakhichevan)	
<b>Doğubeyazıt–Bazargan</b>	(Turkey–Iran)	40 MW (154 kV) – island (isolated)
<b>Başkale–Khoy</b>	(Turkey–Iran)	250–450 MW (154kV/400 kV) island (isolated)
<b>Agarak–Ahar</b>	(Armenia–Iran)	400 MW (220 kV) 2 lines
<b>Alaverdi–Gardabani (“Alaverdi”)</b>	(Armenia–Georgia)	Appr. 200 MW (220 kV) in case of export maximisation in peak hours requires expansion or a new 400 kV line.  island (isolated) mostly
<b>Larvari and Ninotsminda</b>	(Armenia–Georgia)	Two lines with 20 MW/30 MW (110 kV), commercial operations of two old lines. Island
<b>Akstafa</b>	(Armenia–Azerbaijan)	400 MW (330 kV) out of use
<b>Astara–Parsabad</b>	(Azerbaijan–Iran)	700 MW (220–330 kV), upgraded in 2009
<b>Samuh–Gardabani (“Gardabani”)</b>	(Azerbaijan–Georgia)	250 MW(330 kV) – parallel synchronous. Newly built
<b>Mukhranis Veli</b>	(Azerbaijan–Georgia)	850 MW (500 kV) – parallel synchronous. Reconstructed

*Source: Ministry of Energy of Georgia, GSE, Azerenergi*

As Table 5 shows, recently completed projects between Turkey and Georgia and between Georgia and Azerbaijan offer significant improvements in physical cross-border exchange. Thus, the project Power Bridge (Azerbaijan–Georgia–Turkey) is a sub-regional project under the Black Sea Regional Transmission System planning project (BSTP) with, inter alia, EBRD and USAID financial support. The interconnector between Georgia and Turkey was completed in 2013, the AGT Power Bridge in June 2015, and they increased the capacities of electricity transit to Turkey up to 700 MW.

The BSTP has been administered since 2004 with major participants including USAID, the US Energy Association and TSOs of the region (Armenia, Bulgaria, Georgia, Moldova, Romania, Ukraine and Turkey). This Project aims to enhance regional cooperation and includes projects, training, and facilitation of investments in the region. Its Working Group is currently adapting the ENTSO-E methodology of cost-benefit analysis to the technical, legal and regulatory environment of the Black Sea region.

Ongoing and planned projects are designed to complete the connections among the countries of the region. Enhancement of cooperation between Georgia and Armenia, and between Armenia and Iran, are among the priorities for the future. Table 6 shows these major projects.

**Table 6. Infrastructure projects in the South Caucasus**

<b>Interconnectors (planned and under construction)</b>	<b>Capacities/operation mode</b>
<b>Turkey–Iran</b>	600 MW (400 kV DC), HVDC B-to-B Station in investment plan, commissioning in 2018
<b>Turkey–Iran (Van–Khoy)</b>	400 kV AC, OHL for HVDC B-to-B Station in investment plan, commissioning in 2018
<b>Turkey–Iran (HVDC B-to-B Station)</b>	100 MW (154 kV DC) Under discussion
<b>Turkey–Georgia (Tortum–Akhaltsikhe)</b>	Planned commissioning date – 2019; 400 kV AC in investment plan, planned commissioning in 2019
<b>Turkey–Georgia (Muratlı–Batum)</b>	154 kV AC Under construction (planned commissioning date – 2018)
<b>Armenia–Iran</b>	800 MW (400 kV by 2018), planned to increase the overall capacity up to 1200 MW
<b>Armenia–Georgia</b>	400–500 kV, asynchronous

*Sources: Ministry of Energy of Armenia, TEIAS*

The presence of physical cross-border infrastructure and compatibility of systems' technical characteristics are prerequisites for any regional trade. However, these should be complemented with compatible power trade mechanisms in order to boost cross-border exchange. It is also advised to discuss domestic plans for sector development, given various complementary opportunities for generating capacities. Harmonisation of regulatory frameworks has also been continuously reported by market players as one of the most welcomed issues.

## **Conclusion: The role for the Energy Charter Treaty in regional electricity cooperation in the South Caucasus**

Regional cooperation opens room for lucrative power exchange among the countries of the South Caucasus. First, it allows complementarity of domestic generating capacities, which might contribute to balancing seasonal inconsistencies in the countries' power balances. Moreover, redistribution of excessive power generation across the countries might be complemented with more cost-effective investment arrangements for new capacities in these countries. Second, foreign investment inflows into these small national power markets are more feasible if a regional cooperation platform provides a certain degree of regulatory compatibility, investment guarantees beyond political commitments, and more lucrative market conditions. The attractiveness of such a regional platform increases once it can potentially tie the two major power markets of the European Union (and its Energy Community) and the emerging Eurasian region.

However, any substantial cooperative outcome faces three crucial obstacles. First, post-conflict historical legacies in the region require significant political compromise in order to boost apolitical, functional cooperation. The emerging, divergent solutions regarding the roadmap towards regional electricity cooperation are increasingly tricky to mitigate.

Second, despite the fact that the two regional projects, the Energy Community Treaty and the Eurasian Economic Union, share basic market-oriented provisions regarding the electricity sector, they represent two competing regional integration projects. Inevitably, membership in these projects is a choice the countries of the region shall need to make. It is unclear how these competing projects might affect the commercial dynamics of electricity projects in the region, but surely the hesitancy of the South Caucasian states to strengthen regional ties is sending mixed signals to foreign investors and may impede investment inflows.

Third, domestic institutional structures affect states' political preferences regarding regional frameworks and particular projects. Achieving regional cooperation requires not only political entrepreneurship but also harmonisation of activities across different domestic electricity sectors. Thus, developments of interconnection capacities need to be complemented with the adjustment of the relevant domestic regulatory frameworks. Coupled with the significant interest of market participants in strengthening regional economic cooperation, these measures might bring improvements in electricity cooperation in South Caucasus.

Regional electricity cooperation requires a platform for political dialogue and a systematic channel for knowledge and information sharing. For this, the Energy

Charter Process – and its major instrument, the Energy Charter Treaty – might become the appropriate tool for all countries of the region and their neighbours. Since these states are all either signatories or observers of the Process, the use of the Process as a platform for (informal) regional cooperation both significantly lowers any transaction costs borne by the participants and ensures a politically neutral framework for cooperation. The last might become a silver bullet for a politically sensitive and fragmented region. Moreover, the ECT offers a unique legal framework for energy trade, transit, investment protection and energy efficiency, providing legal guarantees for investors and hedging against domestic political and regulatory alterations.

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