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Global Think-Tank

Azerbaijan's country-wide electricity blackout: Problems, Causes, and Results

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Abstract

The problems that occurred in the supply of electricity in Azerbaijan as a result of an accident in the Mingachevir Thermal Power Plant (TPP) in the first week of July caused rightful concern among the public. This accident brought the energy security of Azerbaijan into question, as it revealed serious problems in an important strategic field of the country. Although there are 38 power plants in the country, the accident, which happened in just one of them, caused electricity to go out in 39 regions of the country. In addition, big enterprises owned by Baku Metropolitan, “Azersu”, and State Oil Company of Azerbaijan Republic (SOCAR), including hospitals and other institutions of strategic importance, stopped operating as a result of this accident.

In this paper, the work done on the infrastructure relating to supply of electricity over the last years, the effectiveness of the institutions which implement governmental policies in this field, current problems, and weak spots of the system are discussed.

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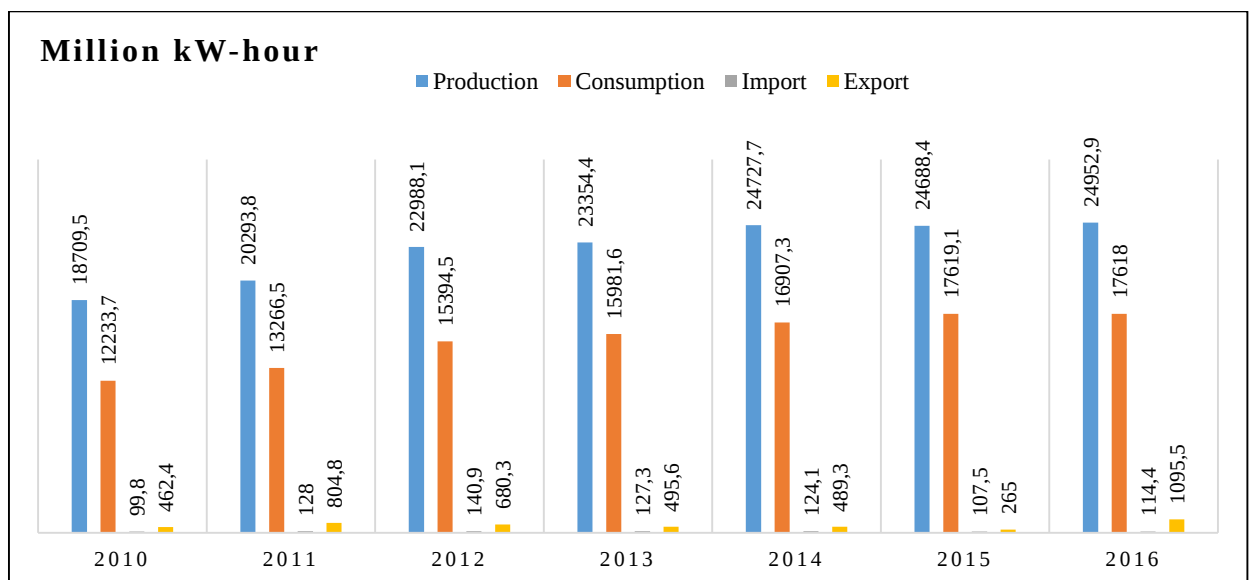
Quantitative Evaluation of the Azerbaijani Electricity

It is useful to consider some technical and economic indicators of this sector before discussing the causes of the problem which occurred in the supply of electricity throughout Azerbaijan.

Production, Consumption, and Existing Potential of Electricity

In the frame of the improvement of Azerbaijan's economy, the country's demand for electricity has continuously increased since 2009. The share of electricity in total energy consumption was around 16% in 2016, equal to 1761 mln kW-hour of electricity¹. The volume of electricity produced over this period, however, was 29.3% more than internal demand; that is, 24952.9 mln kW-hour electricity was produced in Azerbaijan in that year². In total, 91% of electricity produced was for export and for domestic public use, such as the demand of business and government institutions and private households³.

Diagram 1: Selected electricity indicators in 2018



Source: State Statistical Committee of Republic of Azerbaijan, 2018

As seen in the graph, although the total consumption of electricity has increased in recent years, correspondingly, the volume of production has also gone up. Over the 2010-2016 period, total consumption increased by 44%, or 5384.3mln kW- hour, while production rose by 33.7%, or 6243.4 mln kW-hour. In other words, the increase in production exceeded the increase in demand by 16%.

¹ ARDSK, "Enerji istehlakı", baxış tarixi: 05.07.2018
https://www.stat.gov.az/source/balance_fuel/az/002_47-49.xls

² ARDSK, "Enerji istehsalı", baxış tarixi: 05.07.2018
https://www.stat.gov.az/source/balance_fuel/az/002_11-13.xls

³ ARDSK, "Elektrik enerjisi üzrə əmtəə balansı", 05.07.2018
https://www.stat.gov.az/source/balance_fuel/az/003_1.20.xls

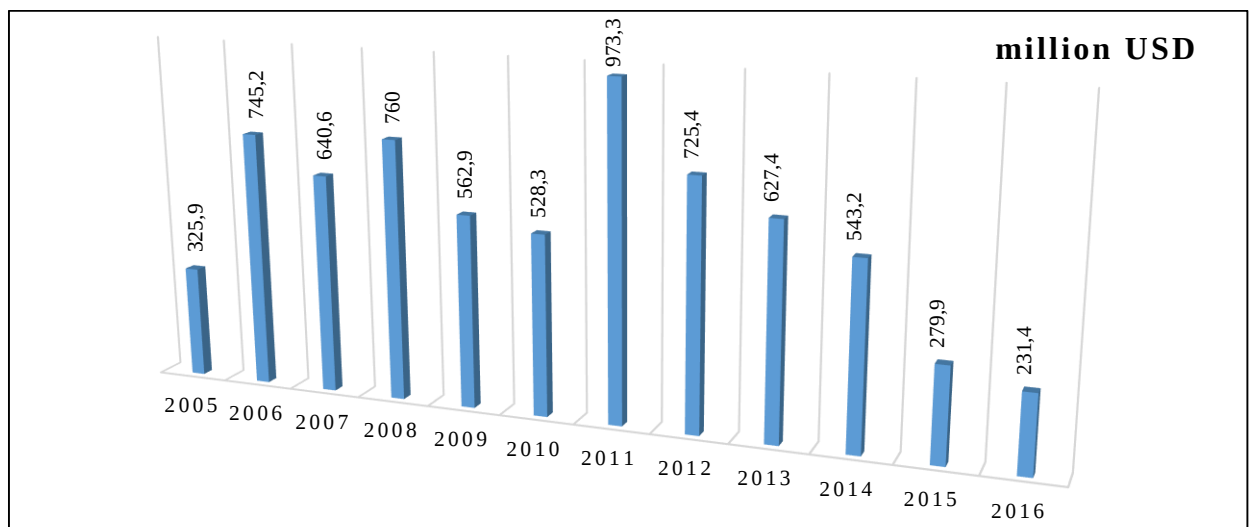
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Demand for electricity by Azerbaijani households in 2016 was equal to 8071.5 mln kW-hour, which was 45.8% of total final consumption⁴.

In 2016, the power of all Azerbaijani electricity stations was 7869 MW; 86% of this belongs to Thermal Power Plants (TPP) and 14% to Hydro Power Plants (HPP). It should be mentioned that in 1990, the total power generation of all power plants was 5051 MW and in 2010 it was 6396 MW. Over the period of independence, the countrywide power generation of power plants increased by 55.8%⁵.

In 2016, there were 239 enterprises institutionalized related to the production, supply, and diversification of electricity. 220 of them, or 96%, belonged to the government.

Figure 2: Capital investments in electricity-related enterprises



Source: State Statistical Committee of Republic of Azerbaijan, 2018

Over the 2005-2016 period, capital investments over all parts of the electricity sector's value chain totaled 6 billion 943.5 million USD (5 billion 872 million manat)⁶, which was 4.7% of total capital investments in all sectors over that same period.

Management of the electricity sector in Azerbaijan and implementation of relevant government policies is the responsibility of "Azerenerji" Open Joint Stock Company (OJSC).

"Azerenerji" OJSC

100% of the shares of "Azerenerji" OJSC – founded in 1996 – belong to the state⁷. In 2017, the revenue of this company was 589.1 million USD (1 billion 14 million manat), which was 25.1% higher than the previous year. The reason behind increased revenues was twofold: both the

⁴ ARDSK, "Ev təsərrüfatlarında enerji məhsullarının istehlakı", baxış tarixi: 05.07.2018
https://www.stat.gov.az/source/balance_fuel/az/004_1.6.xls

⁵ ARDSK, "Elektrik stansiyalarının gücü", baxış tarixi: 05.07.2018
https://www.stat.gov.az/source/balance_fuel/az/005_3.xls

⁶ ARDSK, baxış tarixi: 05.07.2018
<https://www.stat.gov.az/source/industry/az/022.xls>

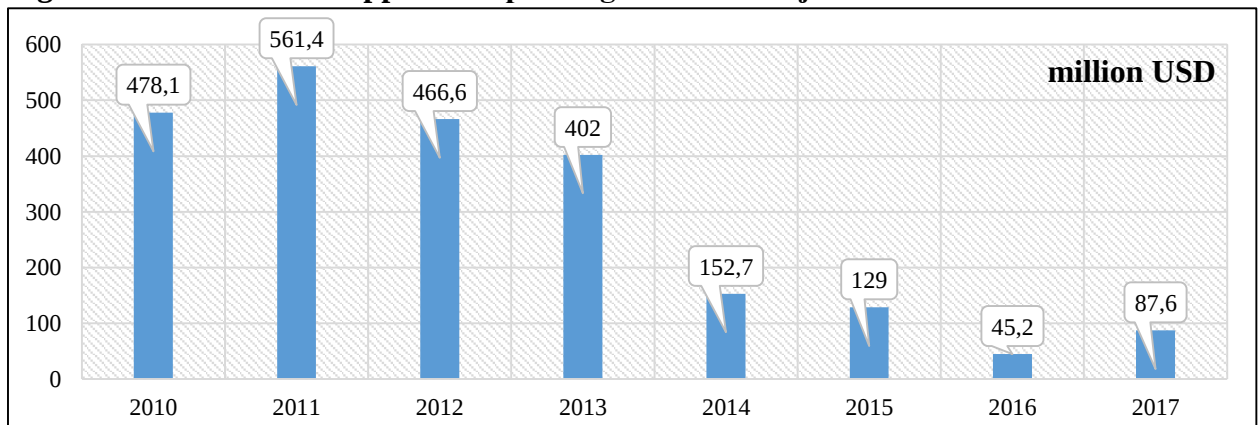
⁷ "Azərenerji" ASC, baxış tarixi: 05.07.2018
<http://www.azerenerji.gov.az/index/page/12>

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increase of domestic tariffs and increase in exports. In 2017, electricity export increased 79.8%, or 22.6 million USD⁸. Although there was a serious increase in revenues in 2017, there was an overall loss of 350.2 million USD (602.8 million manat) for the company. The financial report of this institution shows that the main reason of the loss was the increased amount of spending, which was 160.8 million USD (276.7 million manat), or 74.5%, higher than in 2016. At the end of 2017, the overall capital of “Azerenerji” was 592.7 million USD (1 billion 20.2 million manat) and the total loss was 1 billion 123 million USD (2 billion 123 million manat)⁹. Thus, “Azerenerji” is not a profitable institution.

According “Azerenerji” financial reports, during the 2010-2017 period, the company spent 2 billion 322.6 million USD (1 billion 983 million manat) on the purchase of real estate, building and equipment (infrastructure appointed spending)¹⁰.

Figure 3: Infrastructure appointed spending of “Azerenerji”



Source: “Azerenerji” OJSC, consolidated financial reports

As seen in Figure 3, during the times of high oil prices – and correspondingly high fiscal revenues – the infrastructure appointed spending of “Azerenerji” has been amply high. Over the last few years, however, the central government budget has been the main source of income for this institution. Ironically enough, the last transfer from the government budget to the institution occurred on the eve of the power outage. That is to say, by the 29th of June, the government budget amendments¹¹ directed to pay back the 47.8 million USD (81.4 million manat) debt obligation of “Azerenerji” OJSC to the Finnish corporation “Wartsila”, was confirmed. Besides, there is a 176.5

⁸ Interfax-Azərbaycan, “Azərbaycan 2017-ci ildə 51 mln. dollarlıq elektrik enerjisi ixrac edib”, 23.02.2018

<http://interfax.az/print/726672/az>

⁹ “Azərenerji” ASC, “AZƏRENERJİ” AÇIQ SƏHMDAR CƏMİYYƏTİ 31 dekabr 2017-ci il tarixinə bitən il üzrə Konsolidə edilmiş Maliyyə Hesabatları, baxış tarixi: 06.07.2018, səh: 4

http://www.azerenerji.gov.az/files/2018_04_26_12_56_08_cecd.pdf

¹⁰ “Azərenerji” ASC, “Hesabatlar”, baxış tarixi: 05.07.2018

<http://www.azerenerji.gov.az/index/page/11/>

¹¹ Maliyyə Nazirliyi, “Milli Məclis 2018-ci ilin dövlət büdcəsinə dəyişiklikləri təsdiqləyib”, 29.06.2018

<http://maliyye.gov.az/node/2197>

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million USD (300 million manat) subsidy fund for the purpose of covering the loss which is created by SOCAR selling gas to "Azerenerji" OJSC below market value¹².

Despite all of these external funds, the money did not succeed in enabling gross changes in the energy supply system, which is the main link of the country's energy security.

"Mingachevir Thermal Power Plant": Main causes of the accident

An accident occurred at the "Mingachevir TPP" on July 3, 2018, which caused an outage of electricity supply to 39 regions throughout Azerbaijan¹³. "Azerenerji" OJSC and the Ministry of Energy of Azerbaijan, the two responsible agencies, have attempted to explain the accident by blaming it on the sharp temperature increases and 40% increase in demand for electricity¹⁴. However, the public has not been satisfied with such an explanation considering the public programs (and corresponding funds) implemented to strengthen the country's energy security over the last years.

"Mingachevir TPP" became operational in 1955, 63 years ago. Due to the age of the plant, much of the infrastructure became out-dated. In light of this fact, major renovations were carried out at the station over the course of 2 long periods, the first being 1997-2001¹⁵. The most recent large-scale renovation began in 2010 and was completed in 2017. On February 27, 2018, after a ceremony commemorating the end of reconstruction efforts – with the President of the Republic of Azerbaijan in attendance – the station became fully functioning. According to official data, as a result of the reconstruction work, the power generation of the station was increased by 49.3%, to 424 MW¹⁶. This amounts to 5.4% of Azerbaijan's current electricity production potential.

On the day following the accident, on July 4, 2018, a meeting held by the President of the Republic of Azerbaijan revealed that the causes of the accident were different than related previously by "Azerenerji" and the Ministry of Energy¹⁷. Thus, the causes of the accident can be grouped as follows:

1. ***"Mingachevir TPP" continues to use a significant portion of out-dated infrastructure*** – as the station was put into operation 63 years ago, there have been two major reconstructions of the station (1997-2001 and 2010-2017); however, some of the equipment has not been upgraded and does not meet modern technical requirements. There is a significant difference between the infrastructure and the workload of the station. The outdated equipment cannot keep up with the existing production demand.

According to the Ministry of Emergency Situations, the station was physically outdated. A preliminary review of the incident by the Prosecutor General's Office indicates that despite the fact that the usage period of transformers had expired, they continued to be in use. The incident has also revealed the lack of

¹² Hesablama Palatası, "“Azərbaycan Respublikasının 2018-ci il dövlət büdcəsi haqqında” Azərbaycan Respublikası Qanununda dəyişikliklər edilməsi barədə” Azərbaycan Respublikasının Qanun layihəsinə Azərbaycan Respublikası Hesablama Palatasının Rəyi”, baxış tarixi: 06.05.2018, səh: 31

<http://sai.gov.az/upload/files/2018-DURUSTLESME-REY-FINAL.pdf>

¹³ Prezident.az, "Azərbaycan İstilik Elektrik Stansiyası" MMC-nin yarımstansiyalarından birində baş vermiş qəza ilə əlaqədar Dövlət Komissiyasının yaradılması haqqında Azərbaycan Respublikası Prezidentinin Sərəncamı", 03.07.2018, <https://www.president.az/articles/29256>

¹⁴ "Azənerji" ASC, "Energetika Nazirliyi və "Azənerji" ASC-nin birgə operativ məlumatı", 03.07.2018 <http://www.azerenerji.gov.az/index/page/1470/1/>

¹⁵ "Azənerji" ASC, baxış tarixi: 06.07.2018 <http://www.azerenerji.gov.az/index/page/13#mingechevirses>

¹⁶ Azertac, "Mingəçevir Su Elektrik Stansiyası yenidənqurmadan sonra istismara verilib", 27.02.2018 [https://azertag.az/xeber/Mingechevir_Su_Elektrik_Stansiyasi_yenidenqurmadan_sonra_istismara_verilib VIDEO-1140521](https://azertag.az/xeber/Mingechevir_Su_Elektrik_Stansiyasi_yenidenqurmadan_sonra_istismara_verilib_VIDEO-1140521)

¹⁷ Prezident.az, "İlham Əliyevin yanında ölkənin enerji sistemində vəziyyətlə əlaqədar müşavirə keçirilib", 04.07.2018, <https://www.president.az/articles/29261>

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routine check-ups on technical equipment and the failure to carry out appropriate repairs and restorations. For example, the current transformer has been damaged without replacement for the last 6 years.¹⁸

2. **Failure to comply with technical norms** - the investigation of the causes of the accident has revealed that most of the equipment in the plant has not been replaced with new machinery, risk assessments of existing infrastructure have not been carried out in an organized fashion, and security measures have been followed only at the most minimal levels.

During the investigation by the Prosecutor General's Office, it was revealed that the water temperature of the cooling system of the generator was 28.5 degrees, whereas international norms dictate it should be 12 degrees to adequately cool the hydrogen found in the body of the generator. Additionally, there have not been adequate checks of the flammability, acidity, moisture, tension and tangents of the body of the system's electricity transformer. During the investigation of the plant, it was revealed that the electricity transformer was damaged due a lack of adequate fireproof isolation. Additionally, 6 diesel tanks were completely missing water cooling systems and the security of the country-wide fuse system was not implemented properly. The Ministry of Emergency Situations found the canals covering 63 keys were not adequately strengthened and all of the cooling systems did not function properly¹⁹.

3. **The electric power system is not built in such a way that it considers energy security** - the accident in one of the plant's power blocs resulted in the failure to provide energy to most parts of the country and even cut off the power supply system from Russia and Georgia's energy systems, suggesting that the energy supply system is not based on the principle of security.

The former technical director Vafa Aghayev of "Barmek Azerbaijan"— a defunct private energy provider – claimed to the local press that there are too few lines between "Mingachevir TPP" and Baku, overloading the existing ones. Additionally, he lamented that there are no stations that work without fossil fuels (wind and solar stations) that are close to consumer centers. Vafa Aghayev observed that if an accident were to occur and the loading automation, asynchronous shift, and the automation that slows down the frequency all functioned properly, energy supply would continue to be maintained in the country. According to him, to prevent another similar accident in the "Mingachevir TPP", the counter-accident automation and fuse security system should be upgraded, transformers must be replaced with fire and explosion-proof equipment, strategic power lines should be upgraded, and a more reliable and enhanced interconnector (circular system) must be built²⁰.

4. **Serious shortcomings of "Azerenerji" OJSC have been revealed** - the events once again show that the organization did not fulfil its strategic commitment to ensure the energy security of the country, it was managed by personally-based decisions rather than the targeted strategic development plan, large amounts of funds were not spent efficiently, and it has failed to comply with liability requirements, only to name a few.

The Prosecutor General's Office states that in 1994, a project designed to lay a canal under the Mingachevir reservoir was developed but never executed. Additionally, over the past three years, 6 demands by the Ministry of Emergency Situations direct to the management of "Azerenerji" and its chief engineer were not followed. For example, there has been no system implemented to provide automatic information about fire hazards. It was also mentioned in their investigation that although the issue has been

¹⁸ Prezident.az, "İlham Əliyevin yanında ölkənin enerji sistemində vəziyyətlə əlaqədar müşavirə keçirilib", 04.07.2018, <https://www.president.az/articles/29261>

¹⁹ Prezident.az, "İlham Əliyevin yanında ölkənin enerji sistemində vəziyyətlə əlaqədar müşavirə keçirilib", 4.07.2018, <https://www.president.az/articles/29261>

²⁰ Axar.az, "Mingəçevir İES-də baş verən qəzanın detalları – Ekspert", 08.07.2018 <http://axar.az/news/gundem/289848.html>

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repeatedly raised, the cooling systems in 6 oil tankers and the relay protection service of "Azerenerji" have not been fully implemented in the country.

As you can see, the causes of the accident at "Mingachevir TPP" are human-related, they encompass problems of corruption, transparency, accountability, and so forth, rather than a lack of adequate energy supply to the system. At the same time it should also be noted that despite specific warnings, "Azerenerji" did not ameliorate deficiencies in the operation of the station and, especially, effective control mechanisms were not instituted. Relevant agencies charged with monitoring the company's and institution's performance have not fulfilled their obligations. Thus, the large-scale accident at "Mingachevir TPP" revealed the following problems:

- Technical shortcomings pose serious risks for the country's energy security
- The country's electricity supply system is poorly diversified,
- The country's economy and state-owned enterprises, including strategic infrastructures, are not prepared for energy risks,
- The activities of energy security agencies of the country, including "Azerenerji" OJSC, are not systematically organized and wholly inadequate,
- Electricity production and supply systems have been properly integrated
- The state funds allocated for the development and strengthening of the electricity supply system have been spent inefficiently,
- The monitoring activities of public spending and public procurement agencies is not properly executed,
- There are serious elements of corruption in "Azerenerji" OJSC,
- Alternative energy policies and energy security policies have been correlated.

When considering the root of the problems listed above, it is clear that the main reason is the dominance of state ownership in the electricity sector. This again brings forward the issue of privatization of electricity generation and its supply system. It should be noted that the "Strategic Road Map on Development of Communal Services (Electricity and Heat Energy, Water and Gas) in the Republic of Azerbaijan", approved on December 6, 2016, includes the privatization of thermal and hydro power plants that operate with natural gas, as well as increasing the share of private investment in the construction of new stations. In accordance with the instructions of the Cabinet of Ministers of the Republic of Azerbaijan in the first half of 2017, the German company "VPC GmbH" conducted a diagnostic assignment aimed at increasing the efficiency of power stations owned by "Azerenerji" OJSC²¹. In addition, with the financial support of the Asian Development Bank, the second phase of the "Technical Assistance Program for the Development of a Suitable Environment for Private Sector in Energy Sector" is being implemented²². However, despite all this, no process of privatization of any power plant has been started thus far.

Conclusion

Recent events at "Mingachevir TPP" showed that there are serious deficiencies in the energy security system in Azerbaijan, creating significant risks for the country's economy. State policy-makers have not effectively organized their activities in this field. Additionally, investment programs in this field

²¹ Azərbaycan Respublikasında kommunal xidmətlərin (elektrik və istilik enerjisi, su və qaz) inkişafına dair Strateji Yol Xəritəsi, baxış taxiri: 06.07.2018, səh: 21-22
https://mida.gov.az/documents/Kommunal_xidm%C9%99tl%C9%99rin_inki%C5%9Faf%C4%B1na_dair_Strateji_Yol_X%C9%99rit%C9%99si_.pdf

²² Azərbaycan Respublikasında kommunal xidmətlərin (elektrik və istilik enerjisi, su və qaz) inkişafına dair Strateji Yol Xəritəsinin icra vəziyyəti, baxış tarixi: 06.07.2018, səh: 20
https://azertag.az/store/files/Strateji_yol_xeritesi/strateji%20yol-02102017/Kommunal_hesabat_20170929.pdf

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have not been maintained alongside transparency principles leading many of the funds raised by the sector's numerous financial sources, including the state budget, to become subject to corruption. Moreover, it has become clear that there is a lack of coordination among government agencies and problems with the implementation of mutual requests.

Failure to ensure adequate management of the country's electricity grid in emergency situations and the inadequate integration of production and supply systems have further deepened the consequences of the accident.

Analysis show that the programs directed toward the maintenance of electricity supply have been aimed at changes in quantity. Results in quality have not been obtained.

It was also found out that the monopoly of "Azerenerji" OJSC in the energy sector limited the possibility of using alternative sources in emergency situations. At the same time, this fact acts as the main obstacle to potential quality improvements. Despite the commitment to expand private sector participation in the sector, no concrete results have been achieved.

Recommendations

Taking into account the above results, it is expedient to carry out the following reforms in the electricity supply system in order to strengthen the energy security of the country:

1. *Increasing private sector participation* – gradual privatization of enterprises operating in the electricity supply system and ensuring the fulfilment of the commitments set out in the road map for this purpose;
2. *Preparation of action programs* – re-assessment of all stages of the electricity supply system and the development of follow-up concrete action plans aimed at the elimination of existing problems;
3. *Increasing transparency and accountability* – reorganization of the financial audit of "Azerenerji" OJSC, audit of performance of revenues and spending, determination of responsibility of observed deficiencies, and, in parallel, the increase in accountability of strategic enterprises and the organization of public control over their actions;
4. *Assurance of optimal integration* – creation of a flexible integration infrastructure among production and supply systems operating in the sector, elimination of risk elements from the interconnection system;
5. *Increasing access to alternative energy sources* – review of alternative energy policies from the energy security context, diversification of access to electricity supply for the strategically important state enterprises, and general country-wide diversification of electricity supply, including renewable energy sources.

References

1. ARDSK, "Enerji istehlakı", baxış tarixi: 05.07.2018
https://www.stat.gov.az/source/balance_fuel/az/002_47-49.xls
2. ARDSK, "Enerji istehsalı", baxış tarixi: 05.07.2018
https://www.stat.gov.az/source/balance_fuel/az/002_11-13.xls
3. ARDSK, "Elektrik enerjisi üzrə əmtəə balansı", 05.07.2018
https://www.stat.gov.az/source/balance_fuel/az/003_1.20.xls
4. ARDSK, "Ev təsərrüfatlarında enerji məhsullarının istehlakı", baxış tarixi: 05.07.2018
https://www.stat.gov.az/source/balance_fuel/az/004_1.6.xls
5. ARDSK, "Elektrik stansiyalarının gücü", baxış tarixi: 05.07.2018
https://www.stat.gov.az/source/balance_fuel/az/005_3.xls
6. ARDSK, baxış tarixi: 05.07.2018
<https://www.stat.gov.az/source/industry/az/022.xls>
7. "Azərenerji" ASC, baxış tarixi: 05.07.2018
<http://www.azerenerji.gov.az/index/page/12>
8. İnterfax-Azərbaycan, "Azərbaycan 2017-ci ildə 51 mln. dollarlıq elektrik enerjisi ixrac edib", 23.02.2018
<http://interfax.az/print/726672/az>
9. "Azərenerji" ASC, "Azərenerji" Açıq Səhmdar Cəmiyyəti 31 dekabr 2017-ci il tarixinə bitən il üzrə Konsolidə edilmiş Maliyyə Hesabatları, baxış tarixi: 06.07.2018, səh: 4
http://www.azerenerji.gov.az/files/2018_04_26_12_56_08_cecd.pdf
10. "Azərenerji" ASC, "Hesabatlar", baxış tarixi: 05.07.2018
<http://www.azerenerji.gov.az/index/page/11/>
11. Maliyyə Nazirliyi, "Milli Məclis 2018-ci ilin dövlət büdcəsinə dəyişiklikləri təsdiqləyib", 29.06.2018
<http://maliyye.gov.az/node/2197>
12. Hesablama Palatası, "Azərbaycan Respublikasının 2018-ci il dövlət büdcəsi haqqında" Azərbaycan Respublikası Qanununda dəyişikliklər edilməsi barədə" Azərbaycan Respublikasının Qanun layihəsinə Azərbaycan Respublikası Hesablama Palatasının Rəyi", baxış tarixi: 06.05.2018, səh: 31
<http://sai.gov.az/upload/files/2018-DURUSTLESME-REY-FINAL.pdf>
13. "Azərenerji" ASC, baxış tarixi: 06.07.2018
<http://www.azerenerji.gov.az/index/page/13#mingechevirses>
14. Prezident.az, "İlham Əliyevin yanında ölkənin enerji sistemində vəziyyətlə əlaqədar müşavirə keçirilib", 04.07.2018
<https://www.president.az/articles/29261>
15. Azərbaycan Respublikasında kommunal xidmətlərin (elektrik və istilik enerjisi, su və qaz) inkişafına dair Strateji Yol Xəritəsi, baxış tarixi: 06.07.2018, səh: 21-22
https://mida.gov.az/documents/Kommunal_xidm%C9%99tl%C9%99rin_inki%C5%9Faf%C4%B1na_dair_Strateji_Yol_X%C9%99rit%C9%99si_.pdf
16. Azərbaycan Respublikasında kommunal xidmətlərin (elektrik və istilik enerjisi, su və qaz) inkişafına dair Strateji Yol Xəritəsinin icra vəziyyəti, baxış tarixi: 06.07.2018, səh: 20

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https://azertag.az/store/files/Strateji_yol_xeritesi/strateji%20yol-02102017/Kommunal_hesabat_20170929.pdf