

World Bank Team's response to the concerns of Uzbek Experts communicated through the Ministry of Economy

The note below provides response to two specific areas of concerns expressed by the Uzbek team of experts in their note dated February 28, 2014. Additionally, a summary of the Bank economic appraisal is provided as presented in the Project Appraisal Document for the CASA-1000 project.

As a preamble, three elements should be noted:

- 1- Given the time passed since the updated Feasibility Study was developed, the economic analysis of the project has been further updated taking into account a number of developments including the actual energy balance, generation and demand growths in the years after the feasibility study date; as well as fuel costs and other variables of the project.
- 2- As was mentioned during the video-conference in January 2014, the Bank team does not have access to the Kambarata-1 feasibility study that the Uzbek team had referred to. Therefore, the Bank team is unable to comment on the assumptions used in the Kambarata-1 FS report and/or compare it with the CASA-1000 FS assumptions.
- 3- As noted earlier, the power generation infrastructure needed for CASA-1000 is already in place. It is reconfirmed that the feasibility of the CASA-1000 project is not based on any new generation including Kambarata HPP-1.

1. Concern #1: Surplus electricity is not sufficient due to overestimate of generation and underestimate of demand.

Our (the Bank team's) estimate of the combined electricity surplus in the Kyrgyz Republic and Tajikistan during summer over the period 2016-2021 (and thereafter) is larger compared to the estimate presented by Uzbekistan for the reasons described below.

(a) Generation

- i. There are no details provided on how the Uzbek experts arrived at the estimate of the combined generation of 17,000 GWh and whether the thermal generation is included or not.
- ii. We assume that the estimate of combined generation of 17,000 GWh for the vegetation period refers to the summer generation. The combined generation as per the FS estimates during the summer period is at an average of 18,559 GWh (for 2016-2021).
- iii. The above estimate of available summer surplus does not assume any thermal generation during summer months.
- iv. In computing the estimate of the potential for summer generation it is also assumed that both the Kyrgyz Republic and Tajikistan will rehabilitate most of their existing hydropower plants. In fact, several such rehabilitation projects are already underway in Tajikistan. Similarly, in the Kyrgyz Republic the ADB has approved a rehabilitation program for Toktogul and a loan from China is already lined-up for

Team response to the concerns of Uzbek Experts

the rehabilitation of Bishkek CHP which will reduce the need to generate from the reservoirs in the winter.

(b) Electricity consumption and demand forecast

- i. There are no details provided to the Bank on how the Uzbek experts arrived at the estimated demand growth of 3% per year.
- ii. The demand forecast during the Bank appraisal was updated to: (a) reflect the actual data available for 2011-2012; (b) required increases in tariffs in both Kyrgyz Republic and Tajikistan to reach short-term cost-recovery levels. The revised average annual growth rates of forecast demand in the Kyrgyz Republic and Tajikistan are estimated at 2% and 1.3% per year respectively. The updated demand forecast for Kyrgyz Republic is also consistent with CAREC Power Sector Regional Master Plan,¹ prepared by consultant funded by ADB, and Tajikistan's Winter Energy Crisis Report prepared by the World Bank.² The combined estimated demand growth from 2016-2021 is significantly lower than the estimate provided by Uzbekistan of 14,266 GWh in 2016 and reaching 16,538 GWh by 2021.
- iii. We would like to note that electricity consumption in both Tajikistan and the Kyrgyz Republic has historically grown at a slower rate than GDP. In case of Tajikistan, the average growth rate of total electricity consumption is significantly lower than the GDP growth rate. The average annual growth rate of GDP in 2008-2012 was 6.6%, whereas during the same time period electricity consumption³ reduced by an average annual rate of 1.5%. More importantly, summer electricity consumption decreased at an average annual rate of 2.7%. It should be noted that economic growth in Tajikistan does not have a strong correlation with increased electricity consumption.
- iv. In the Kyrgyz Republic, similar trends related to electricity consumption have been observed for the period 2008 to 2012. While GDP increased at an average annual growth rate of 3% the electricity consumption increased at a lower annual average rate of 2.5% over the same period. The growth in electricity demand would have been lower, if the electricity tariffs had not fallen in real term. The average tariffs in nominal price terms barely increased, but the local inflation averaged 11.7%⁴ per year over the same period. The average summer consumption, however, increased by 1.2% over the same period, which is much slower than the GDP growth. Most of the increase in electricity demand took place during the winter.

¹ Central Asia Regional Economic Cooperation (CAREC): Power Sector Regional Master Plan," Sep. 2012.

² Tajikistan's Winter Energy Crisis: Electricity Supply and Demand Alternatives," 2013, World Bank.

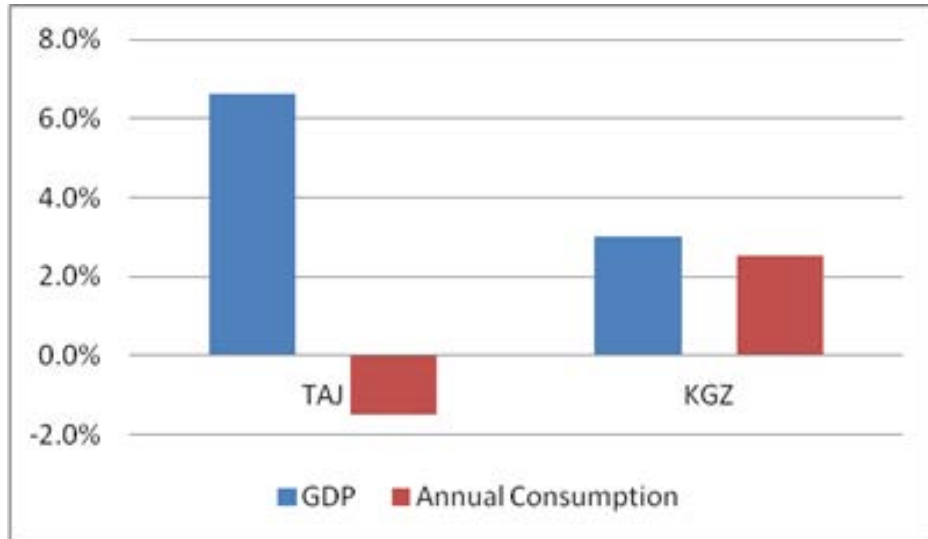
³ Inclusive of losses and imports.

⁴ World Economic Outlook, IMF, October 2013

Team response to the concerns of Uzbek Experts

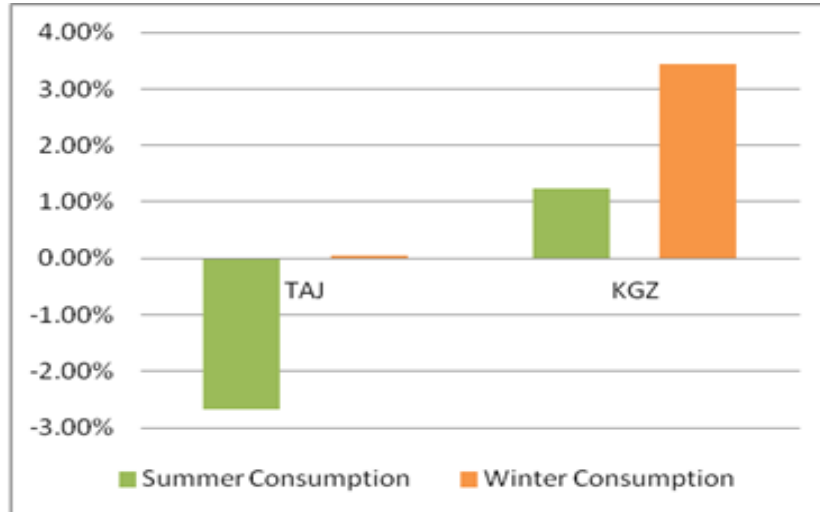
- v. Figure 2 below illustrates that for both countries' annual electricity consumption has increased at a slower rate than the GDP growth for the same period, i.e. 2008-2012.

Figure 2: Average Annual Growth Rates of GDP and Annual Electricity Consumption in Tajikistan and the Kyrgyz Republic, 2008-2012



- vi. With the significant reduction of electricity tariffs in real terms the annual per capita households electricity consumption in the Kyrgyz Republic has substantially increased, which has exceeded the level of certain OECD countries such as Germany, UK, and Turkey as confirmed by the Energy Efficiency Indicators of the World Energy Council. In a country with almost universal access, such an increase leaves little room for further increase in per capita consumption. The expected tariff increases and improvement in the system losses management programs under implementation with donors, is expected to contribute to curb demand growth in the coming years.
- vii. As shown in the Figure 3 below, the actual summer electricity demand in Tajikistan in 2008-2012 reduced by an average annual rate of 2.7%, which cannot be attributed to electricity deficit given that it has large electricity surplus during summer period. In the Kyrgyz Republic also, summer consumption has increased at a lower average annual growth rate of 1.2% compared to annual electricity consumption (2.5% per annum). Since, the CASA-1000 project assumes that only surplus power available in summer months will be exported, this is an important aspect in surplus estimation for CASA-1000 project.

Figure 3: Average Annual Growth Rate of Summer and Winter Consumption (2008-2012)



viii. The above analysis suggests that the revised electricity demand forecast for Tajikistan and the Kyrgyz Republic (1.3% and 2% respectively as per updated Bank forecast) is reasonable and there will be sufficient surplus electricity in the summer months to make the project economically viable.

(c) Resulting estimated combined surplus.

Based on the above explanations of the generation and demand forecasts used in the project assessment, Table 1 below presents the resulting estimated combined summer surplus for the period 2016-2021.

Table 1: Average Combined Surplus in Tajikistan and the Kyrgyz Republic (2016-2021)

<i>In GWH</i>	Summer
Estimated Combined Generation	18559*
Forecast combined Demand	12720
Estimated combined average surplus (2016-2021)	5839

*This estimate does not include any thermal generation

2. Concern #2: Hydrology related issues.

- (a) **1987-2009 vs. 1932-2009 hydrology data:** Following the Uzbek observation that the CASA Feasibility Study (FS) had assumed a shorter time series of hydrology data compared to the 76 years of available data, the Bank team carried out a comparison of statistics for the hydrological flows during the 23 years (1987-2009) period and during the 76 years period (1932 to 2009) for the Vakhsh flow series. Our analysis of annual flow (total of monthly flows for 12 month, in MCM) provides the following results.

Table 2: Comparison of Vaksh River Flows

	1932-2009	1987-2009
Mean	20010.0	20618.9
Standard Deviation	2491.8	2513.9
Max	27199.8	25686.1
Minimum	14094.0	14094.0

Source: The World Bank team analysis of the Vakhsh River Flows Series

The comparison of the hydrology data suggests that the average annual flows of the Vakhsh river in 1932-2009 were only 3% lower than the average annual flows in 1987-2009 used in the economic appraisal of the Project. During the early years of the project the cumulative surplus from both countries is much larger than the line capacity; therefore a decrease of 3% in available surplus does not affect the project until the later years of the project. Further, the fuel oil prices have significantly increased (more than 30%) since the FS was conducted. This increase in actual and forecasted fuel oil prices strengthened the project viability compared to FS estimates. The details of the Bank’s economic analysis are presented below.

- (b) **Coordination.** The FS has considered various options including potential coordination of the supply between the Kyrgyz Republic and Tajikistan. However, in terms of economic benefits, it resulted in increase of economic rate of return by about 1 percent only. Given small economic benefits anticipated from coordination, the participating countries decided not to include coordination in the assessment of the project. The ongoing negotiations on the Power Purchase Agreements (PPA) indicate energy quantities without coordination.
- (c) **Climate impact is uncertain.** It is not clear from the note of the Uzbek experts which studies are being referred to. From the Bank team’s perspective, several reports consulted, including Potential impacts of Climate Change on the hydrological regime of Tajikistan and the Kyrgyz Republic at the horizons 2050 and 2080 by Ouranos, dated May 2008, indicate that gradual changes in the shape of the annual hydrograph will take place in the upcoming years up to 2050 due to the effects of temperature increase and glacier melting. Increased spring and summer runoff due to glacier melt is expected in the region. (Feasibility study page 2-11). However, we agree that the impact of the climate change cannot be accounted

Team response to the concerns of Uzbek Experts

precisely and, therefore, these benefits are not taken into account in the project assessment.

3. Update of Economic Analysis of CASA-1000 Project: As part of the CASA-1000 (hereinafter referred to as the Project) preparation, the World Bank conducted its own due diligence to update and assess the economic viability of the project as required by the World Bank's Operational Policy rules. The key findings of the updated economic analyses are provided here. Such update was needed given that FS was prepared in 2010 and some inputs and assumptions required revision. The Bank team economic analyses of the project indicate that project would yield a positive NPV of US\$1,208 million and an EIRR of 26 percent.

Presented below are the key assumptions and input variables that were used as part of the Bank team analysis. Overall, the economic analysis of the Project was done following very conservative approach to valuation of benefits:

- Project costs. The project costs were revised to include additional costs of: (a) community support program of about 6% of project cost while the economic benefits of these programs were not included in the analysis; and (b) increased contingency provisions given the complexity of the Project at 15% for Kyrgyz Republic, Tajikistan and Pakistan and 25% for Afghanistan.
- Demand forecast. The demand forecast for both countries was updated assuming that: (a) annual unit forecast growth rate of GDP during the evaluation period increases demand on average by 0.5-0.7; (f) Kyrgyz Republic was assumed to have 8% average annual increase of tariff until 2020 and Tajikistan was assumed to have 10% average annual increase in tariff by 2025. Even in case of 20% higher-than-forecast GDP growth or 20% lower-than-forecast tariff increase, the project remains economically viable.
- Conservative assumptions on the marginal source of generation displaced in Afghanistan and Pakistan. It was assumed that both Afghanistan and Pakistan would fully implement their ambitious Power Sector Expansion Plans and build significant new generation capacity to meet the forecast demand, therefore. This assumption effectively reduces the estimated economic benefits from imported electricity under the Project.
- Forecast fuel costs. The up-to-date forecast of natural gas, diesel and fuel oil prices was used to evaluate the economic costs savings in Afghanistan and Pakistan from imported electricity under the Project. It is important to highlight that international price of diesel and fuel oil increased by more than 30% in 2010-2013, driving up domestic prices in Pakistan and Afghanistan even faster.

Team response to the concerns of Uzbek Experts

The Bank team carried out a series of sensitivity analysis on the key variables of project variability. The project EIRR showed strong robustness to the tests as illustrated below in Figure 4.

Figure 4: Project EIRR Sensitivities

