CASA-100 Project Risk Assessment

Thorough professional analysis of the CASA-100 Project has revealed the following major miscalculations and flaws in the said project:

I. Electric energy deficit for export supply

The design made by SNC-Lavalin consulting company and calculated for the available 6 billion kWt/h of surplus power in Tajikistan and Kyrgyzstan, has the following major errors in methodology that resulted in incorrect parameters and conclusions:

1. As base, the calculation uses a limited period of 23 years, characterized by relatively high flow in Naryn and Vakhsh Rivers. Altenative estimate based on the entire observation period (1910-2009 for Naryn, and 1932-2009 for Vakhsh) gives different results.
2. Projected output till year 2035 fails to account for reduced power generation in Tajikistan of up to 1.2 billion kWt/h on average annually, due to silting (choking) of the Nurek HPP water reservoir.
3. Technical condition of plant and equipment at the Nurek and Toktogul HPPs is underestimated. For example, dam stability for the Nurek HPP, with certain load combination, is designed at 1.05, while the requirement is 1.125. This will require a reduction of the max water table to a value that would ensure dam stability; this will result in reduced useful reservoir capacity, and, consequently, reduced electric power surplus by 559.1 million kWt/h per annum.
4. Projections till year 2035 show dramatic underestimation of average annual domestic power consumption (Tajikistan by 1.4%; Kyrgyzstan by 2.6%). Actually, domestic power consumption should grow in line with economic growth, at 3-5% per annum.
5. Projections show dramatic overestimation of energy loss reduction rates: from 23% to 13% in Kyrgyzstan, which would require billions of dollars in capital investment to reconstruct the entire system of power generation, transmission and consumption. This resulted in the overestimated energy surplus by 1.4 billion kWt/h on average annually.

Eliminating these methodological miscalculations alone gives the following results:

- Analysis based on the actual monthly data for the entire observation period (1910-2009 for Naryn, and 1932-2009 for Vakhsh) shows that Tajikistan and Kyrgyzstan together have the **average annual deficit of 3.08 billion kWt/h**, including 0.802 billion kWt/h in Kyrgyzstan, and 2.278 billion kWt/h Tajikistan (see Table attached).
- Electric energy surpluses occurred only during vegetation season (April through September) and constituted 2,696 billion kWt/h, with a deficit in the non-vegetation season of 5,778 billion kWt/h. In the meantime, seasonal energy flows in Tajikistan (purchase in winter and sales in summer) and Kyrgyzstan was 3.5 billion kWt/h, which took up the seasonal surplus of summer electric energy in Tajikistan. Actually, surplus power could only be created in June-August, or during three months in a year.
- If one took the draught period (1974-1986) into account, which is very important for the estimation of project risks and sustainability, then the total energy deficit in both systems would be 5.512 billion kWt/h, and the vegetation season surplus only 1.810 billion kWt/h.
- estimates of power generation and consumption (assuming the 3% annual growth rate), the projected summer power surplus in Kyrgyzstan and Tajikistan in 2016 of 2.696 billion kWt/h will be completely exhausted by the beginning of year 2022. The dynamics of reduction in total electric energy surplus during vegetation season is shown in the Table below.

In million kWt/h

Balance Item	***2016***	***2017***	***2018***	***2019***	***2020***	***2021***
Generation	16962	16962	16962	16962	16962	16962
Consumption	14266	14694	15135	15589	16057	16538
Balance	2696	2268	1827	1373	905	423

Thus, the SNC-Lavalin estimates, according to which exportable capacity during vegetation season will be 1300 MWt for 30 years show an overestimation of almost 9 times, as the realistic estimate of the total energy supply shows that 9.5 billion kWt/h can only be supplied for 6 years: from 2016 to 2021.

II. Underestimation of technical risks of implementing the project

1.1. The project envisages construction of power transmission lines (High-voltage line (HVL) of 500 kV) 1,222 km long, running through Kyrgyzstan, Tajikistan, Afghanistan and Pakistan (PS Datka (Kyrgyzstan) – PS Khujant (Tajikistan) – Rogun HPP (Tajikistan) – Kabul – Peshawar), including: 500 kV DC line 750 km long through Tajikistan (117 km) – Afghanistan (562 km) – Pakistan (71 km); 500 kV AC line through Kyrgyzstan (substation Datka, 452 km) – Tajikistan (PS Khujant, 20 km) with total length of 472 km; and converter substations (1300 MWt in Sangtud, 300 MWt in Kabul, and 1000 MWt in Peshawar).

However, the world's only similar DC line with three back-to-back terminals of 500 kV presently exists only between the Canadian Quebec and the US northern states, operating in the environment completely different from that of the project in question.

First of all, the designers ignore the extremely difficult conditions for construction at the Salang Pass, where it is impossible to build more than one power transmission line of any voltage. Currently, that section already has one 220V line, which is practically impossible to relocate, as proposed by SNC-Lavalin, the project consultant. The alternative option of going around the Salang Pass from the West is also difficult to implement due to the presence of highly mobile soil foundations in this area, making it inaccessible to power lines of any structural design.

Second: the long transit from substation Datka to Peshawar can result in frequent power cuts in bad weather. Every blackout will create capacity deficit of up to 1000 MWt, as well as technical problems for the power system of Pakistan to ensure sustainable operation.

Third: given that the project envisages power supply in summer time only, it will be difficult to keep the transmission line intact in the Afghanistan territory during the idle time (that is, in September – May, or 9 months in a year) in view of the unstable security and political situation in the country.

1.2. Most of the HPPs in Tajikistan and Kyrgyzstan built 30-40 years ago require thorough assessment of the technical soundness of their installations and equipment, as well as substantial repair and rehabilitation effort.

Underestimation of the technical soundness of the HPPs can result in higher accident probability, and thus in greater uncertainty in estimating potential energy exports.

III. Underestimated capital expenditure cost for the project

The estimates show the average cost of construction of 1 km transmission line at US$ 288,000, when the actual average cost of construction of 1 km transmission line in the region is at least US$ 350-400 thousand. Similarly, underestimated are the costs of the DC terminals and expenditure associated with their construction in difficult terrain, such as that of the Salang Pass.

In view of the above, the CapEx cost of the project rises from $M953 to $B1.5, and the total cost will amount to more than $B1.8.

Even if the project benefits taken by the SNC-Lavalin at $B1.7 are accounted for, the project is making a loss, with its net present value (NPV) in the negative.

Parameters	***Company Report***	***Expert Estimates***
Benefits (B)	1,724 million USD	1,724 million USD*
Costs (C)	1,281 million USD	1,828 million USD**
Ratio (B/C)	1.34	0.94
NPV	443 million USD	-104 million USD

* In the Table, Benefit is conditionally taken based on the SNC-Lavalin data;
** Capital investment amount based on real calculations, and other costs based on the SNC-Lavalin data.

IV. Overestimated project profitability and economic viability

The Consultant's project misses detailed estimates of financial and economic parameters that would take into account all costs and proceeds from the implemented project, by each recipient of the credit resources.

Yet it is clear that the project benefit figure of 1,724 million USD quoted by the Consultant is also substantially overestimated, due to both the distorted prices for the supplied power, and overestimated volume of power supply.

For instance, in its estimates the Consultant uses the cost of 1 kWt/h of electric energy from Tajikistan at 1.5 cents, and accounting for the cost of supplying it to Pakistan – at 4.97 cents. However, the cost of energy currently sold by Tajikistan to Afghanistan is already 3.37 cents; from Kyrgyzstan to Kazakhstan 4.4 cents, and from Uzbekistan to Afghanistan 7.0 cents. Given the changes in transmission cost from 4.0 cents (in the early years of project implementation) to 7.0 cents (increase in exports results in quadratic blowup in losses), the final cost of electric energy will be at least 7.37 cents already in the early years of project implementation.

Given that in the estimate the cost of resources to Pakistan was calculated on the basis of the average cost of contracts for non-guaranteed power supply, which is currently about 9.2 cents, the actual benefit will constitute not 4.23 cents (= 9.2 - 4.97), but 1.8 cents (= 9.2 – 7.37), or more than 2 times smaller.

In this situation, the borrowers' ability to pay becomes questionable. One should also take into account the Consultant's projection that in the environment of rising domestic tariffs – in Tajikistan from 0.68 to 2.50 US cents per kWt/h (or 4 times) and in Kyrgyzstan from 2.31 to 3.21 cents (or 35%) – the collection rate will reach 98% by year 2015 (with the current collection rate of 58-70%), which appears to be an overestimation and raises a question about timely repayment of loan funds during non-vegetation season.

It thus becomes evident, that as a result of serious miscalculations in the project prepared by the Consultant, company SNC-Lavalin, the project's financial costs will not be recovered, because:

(a) it is not possible to supply to Afghanistan and Pakistan the envisaged volume of electric energy under the current project design (overestimation of almost 9 times); that is, capacity recalculated on the basis of real supply possibilities will actually constitute 146 MWt, not 1300 MWt, in 24 hours over the 30-year period;

(b) of the incapacity of Pakistan and Afghanistan to generate the envisaged revenue from the domestic sales of electric power due to its higher import cost (overestimation of almost 2 times).

The Government of the Republic of Uzbekistan believes that the authors of the project exercised superficial approach to its assessment, which may mislead stakeholders.

The above makes it apparent that the implementation of the CASA-1000 Project is integral with the plans of the Tajik and Kyrgyz participants to construct gigantic hydro-engineering facilities – the Rogun HPP and the Kambarata HPP-1, which will catastrophically aggravate the already tense water management situation in the region. (It is noteworthy that in the Consultant's project document one of the transmission line participants is named "PS Khujant (Tajikistan) – Rogun HPP (Tajikistan)".) This once again confirms that the key idea behind the CASA-1000 Project as devised by its authors is to cover the missing electric power capacity, especially after year 2022, by the construction and operation of the Rogun HPP.

Risks and catastrophic consequences of the construction of these two hydropower facilities were presented by the Government of Uzbekistan earlier.

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