



Reference Document  
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## **Diagnostic Study on Pillar 1 of the CAREC Energy Strategy: Energy Supply-Demand Balance and Infrastructure Constraints**

# **Executive Summary**

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# **DIAGNOSTIC STUDY ON PILLAR 1 OF THE CAREC ENERGY STRATEGY: ENERGY SUPPLY-DEMAND BALANCE AND INFRASTRUCTURE CONSTRAINTS**

## **EXECUTIVE SUMMARY**

### **I. INTRODUCTION**

1. The Central Asian Regional Economic Program was initiated by ADB in 1997 with its members comprising of Afghanistan, Azerbaijan, Kazakhstan, Kyrgyzstan, Mongolia, Tajikistan, People's Republic of China, and Uzbekistan, and supported by an alliance of major multilateral development institutions. The Energy Sector Coordinating Committee (ESCC) – whose priority is to promote efficient and rational use of energy within the region - has agreed on the components of an Energy Action Plan.

2. This study (Pillar 1) of the Action Plan involves carrying out a diagnostics evaluation on the energy supply/demand balance and infrastructure constraints, and to identify the status regarding completed, ongoing and planned energy sector projects which will have an impact on the intra-regional power trade capability. Regional dispatch and regulatory development aspects will be covered under Pillar 2; and Pillar 3 will cover issues relating to Energy-Water linkages. This study is to serve as an initial basis for a Regional Power Sector Master Plan for Central Asian Countries and Afghanistan - Regional Technical Assistance (RETA), endorsed by ESCC - to identify the investment needs in generation and transmission in the region.

3. Four countries are the focus of this diagnostic study - Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan. Each of these countries is served by different portfolios of generation mixes. Because of the different mixes, their availability characteristics, time-value signatures and varying non-coinciding peak demand requirements, there exists significant complementary inter-trade potential between the countries concerned. Increased inter-trade activity would reduce incidences of un-met demand (mainly during winter); conserve and optimize renewable and fossil fuel resources; reduce environmental impacts from emissions, and from water management requirements; and provide each country with increased economic benefits from the above measures. Further economic benefits will accrue due to increased system generation redundancy, a lowering of the need to run costly combined cycle gas turbines (CCGT), open cycle gas turbines (OCGT) and mid-merit or peaking plant generators, and a general improvement in the availability of system ancillary services.

4. This report compiles information and content drawn from primary sources including documents from Government Agencies of Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan as well as from Asian Development Bank (ADB), The World Bank, U.S. Agency for International Development, and observations made during our visits to the countries during the period from June to August 2010. A number of credible Internet related and miscellaneous sources were also consulted.

5. We would like to thank the Government officials, as well as staff of Kazakhstan Electrical Grid Operating Company (KEGOC), National Electrical Grid of Kyrgyzstan (NEGK), Electric Power Plants Company (EPP), Barki Tojik, Uzbekenergo, Coordinating Dispatch Center (CDC), USAID, AES Company, the ADB and World Bank regional offices and other organizations who shared their valuable insights, understanding and vision for the region with us.

## II. KEY FINDINGS

### A. Inter-trade Decline

6. The fact that power trade between the countries has been in decline since the succession from the Soviet Union lies in general in a combination of the following factors:

(i) Technical Barriers: Lack of reliable infrastructure; robust transmission lines and interconnectors; substations; and metering, monitoring and protection systems. Uncertainty over adequacy of fault isolation capability leading to cascade outages inter-regionally. ***(Requires feasibility studies, Technical Assistance and Project Finance).***

(ii) Commercial Barriers: Differing Power Purchase Agreements between neighboring countries, resulting from differing commercial and strategic leverages; tariff disparities and sub cost-recovery levels; uncertainty over accurate wholesale metering capabilities; uncertainties over invoice / debt settlement; lack of clarity surrounding barter, offset and contra-settlement balancing of imports and exports. ***(Requires negotiation, transparency, fairness and understanding of bi-lateral and regional benefits).***

(iii) Political Willingness: Lack of enthusiasm to participate in mutually-beneficial trading arrangement) sometimes resulting in communication breakdown and a loss of appetite for participation; and internal policies prioritizing self-sufficiency in generation and transmission to the exclusion of adequate consideration of interconnection. ***(Requires negotiation, a buy-in to the concept of bi-lateral and regional benefits, and high-level willingness to participate in regional economic improvement. This is the key catalyst and enabler which must first occur before the barriers at (i) and (ii) above can be effectively addressed).***

### B. Projects Progression

7. There has been significant progress achieved in the four member countries which fall within the brief of this study. Projects that have been implemented, or are underway, or are in the planning stages, generally are physical (infrastructural) in nature and belong to one of the following type-sets:

(i) Generation projects from 10 MW to 4000 MW have been identified, many using renewable energy resources which are prevalent especially within Tajikistan and Kyrgyzstan.

(ii) Transmission infrastructure projects, at 110 kV but particularly 220 kV and 500 kV to facilitate meaningful power inter-trade.

(iii) Substation and switchgear rehabilitation, wholesale metering, protection systems, and reliability improvements.

(iv) SCADA systems, telemetry, and functionality of National Dispatch Centers.

8. Number of projects include components addressing non-physical aspects of power sector, i.e. performance improvement and commercialization of the generation, grid and distribution companies (state or private) within each country. Non-physical aspects include everything from utility operational efficiency benchmarking, transmission and dispatch loss reduction, commercial losses control, effective billing and collections, management process optimization and corporate governance.

9. It is essential that the CAREC members achieve improvements in the above areas, in addition to achieving adequate cost recovery in the form of realistic tariffs, in order to enable appropriately-priced long-term Power Purchase Agreements (PPAs) to be available. This is necessary in order to attract private sector investment in to tap the abundant potential of renewable energy generation potential. This will enable energy and energy derivatives to become the primary export commodity for the CAREC members thereby catalyzing significant economic growth.

### **C. Gaps & Overlaps**

10. A number of over and under-concentrations of effort exist and unless identified and rectified these will lead to lost opportunities (arising from gaps in pipeline projects) and cost inefficiencies (arising from duplication of effort via overlaps). In general these can be summarized as follows:

(i) Several International Financing Institutions are examining – sometimes simultaneously – areas within the Demand Side Management sector, such as electric load displacement; energy efficiencies; and building standards (energy). There should be greater coordination of effort here.

(ii) Many areas require coordinated effort and attention now if they are to avoid becoming critical path issues during future projects and efforts at increased power inter-trade. These include:

- National Dispatch Centre demand loads are being fed to the Regional Dispatch Centre in Tashkent (“Coordination Dispatch Centre”– CDC) from member countries, but many key loads are not being properly measured or the data is not properly transmitted to the CDC.
- The CDC receives data acquisition streams from the Central Asian countries but presently has little or no supervisory or load / generator dispatch functionality.
- There are many potential HPPs in the region in the scale-range of 10 – 30 MW which seem feasible but presently lack financing prospects. These should be examined again and prioritized for finance.
- Several internal 220 and 500 kV transmission backbone and ring-main lines are being constructed in the interests of self-sufficiency with inadequate attention being paid to their integration into a regional power network in time.
- Inappropriate industry structures pose a significant barrier to the development of regional power trade. If the transmission company and some generators are government-owned, it seems unlikely that cheaper power will be imported from abroad while local generators remain idle. Regional energy trade will therefore

require the commercial interests of the transmission companies and their managers to be completely separated from those of the generators.

- Inappropriate tariff setting due to the subsidized gas price in the case of some Central Asian countries results in thermal generation becoming competitive with hydro generation from HPPs. This distorts free market activity and beneficial regional trade.

### **III. NEXT STEPS**

11. This study will lead into the production of two major master plans: (i) Regional Power Sector Master Plan for Central Asian countries, which will tie in with (ii) a simultaneous Power Sector Master Plan for Afghanistan.

12. These master plans will identify the investment needs in generation and transmission assets in the area, and prioritize these according to seasonal supply-demand balances; transmission constraints; intra and extra-regional power trade opportunities, and overall least-cost infrastructure investment planning options.

13. Both these studies are expected to have the consultants appointed and ready to commence by end of 2010 with a view to completion by end of 2011.