



**Central Asia
Regional Economic
Cooperation**

Energy Action Plan Framework

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EXECUTIVE SUMMARY

In November 2008, the 7th Ministerial Conference on CAREC approved the *Strategy for Regional Cooperation in the Energy Sector of CAREC Countries* (“*Energy Strategy*”). The *Energy Strategy* emphasizes energy security through cooperation and integration. It also recognizes joint use and protection of trans-border rivers. In May 2009, CAREC Senior Officials requested multi-lateral institutions to work with CAREC countries to prioritize actions under the *Energy Strategy*, in the form of an Action Plan. The Plan will be submitted to the 8th Ministerial Conference to be held in Mongolia in October 2009. The Action Plan was the focus of meeting of the Energy Sector Coordinating Committee (ESCC) on September 2-3, 2009 in Almaty, Kazakhstan.

The Action Plan explores opportunities for regional integration through power development, with only indirect assessments for bulk management of oil, gas, and coal resources. The Action Plan for 2010-2013 calls for prioritization of investments in Central Asia for regional and export opportunities. The strategy recognizes various energy corridors: spread along Central Asia, China/Mongolia and Caucasus. In the first phase, the Central Asia corridor is considered the main priority. Other corridors will be considered later.

The Plan is guided by the following principles:

- **Regional:** Build on concept of phased investments to increase energy security, energy efficiency and trade
- **Selectivity:** Focus on investments with high cooperation content
- **Holistic:** Sector development with linkages to other subsectors
- **Reliance:** Focus on regional and national institutions to develop and implement the Action Plan, with the multi-lateral institutions serving as facilitators and financiers

Through regular meetings, the ESCC will provide coordination and oversight on implementation of the Plan.

The Action Plan is structured around three strategic issues:

- **Energy Demand/Supply Balance and Infrastructure.** Promote energy security and regional trade by optimizing integrated transmission and generation (infrastructure) expansion.
- **Regional Dispatch and Regulatory Development.** Maximize the benefits of the unified Central Asian Power System.
- **Energy-Water Linkages.** Strengthen cooperation by integrating energy and water analysis.

The outputs of the Action Plan cover (i) investments, (ii) knowledge and capacity building, and (iii) policy development. The initial activities include additional diagnostic or foundational studies, and immediate investments. The Action Plan is dynamic and will evolve over the three-year period.

The following table summarizes the strategic themes, objectives, and deliverables.

Core Issue		Energy Supply-Demand Balances	Regional Dispatch and Regulatory Development	Energy-Water Linkages
Objective		To promote regional trade by optimizing integrated transmission and generation expansion.	To maximize the benefits of unified operation of the Central Asia Power System.	To strengthen cooperation by integrating energy and water analysis.
Deliverables	Policy Environment	Develop: national generation and transmission plan, integrated regional plan, and assess benefits of regional integration.	Develop an institutional platform and framework for regional power trade based on economic principles. This platform could be within Central Dispatcher Centre (CDC) Energy.	Strengthen Central Asian institutions to lead the dialogue and analysis on rational use of energy-water resources.
	Capacity Building	Involve national and regional organizations in developing the model and execution of the plan.	Strengthening CDC and national load dispatch centers and facilitating preparation of regulations.	Enhance integrated energy-water models, analytical tools, and shared databases that enable assessment of options and impacts across both sectors.
	Investments	Promote/accelerate early-win grid strengthening and generation programs.	Phased investments to implement adequate SCADA, metering, and communication systems in accordance with national needs and circumstances.	Identify consensus projects to improve energy-water rational and effective use (e.g. irrigation and hydro-power rehabilitation and efficiency improvements).

Energy Action Plan Framework

I. BACKGROUND

1. In November 2008, the 7th Ministerial Conference on CAREC approved the *Strategy for Regional Cooperation in the Energy Sector of CAREC Countries* (“Energy Strategy”). The *Energy Strategy* emphasizes energy security, energy efficiency, and energy trade. The strategic approach recognizes the need to overcome the impact of uneven distribution of energy resources and the benefits of hydropower development in the context of regional energy market development and interests of downstream riparian countries. The strategy notes the goal of least cost solutions and cooperation in the area of trade, market relations, joint use and protection of trans-border rivers, and knowledge sharing.

2. In May 2009, CAREC Senior Officials requested multi-lateral institutions to work together with Central Asian countries on the preparation of an Action Plan. The Plan is to be discussed at the 8th Ministerial Conference to be held in Mongolia in October, 2009. The Action Plan was the focus of the meeting of the Energy Sector Coordinating Committee (ESCC) on September 2-3, 2009 in Almaty, Kazakhstan.

II. NEED FOR A FRAMEWORK

3. Coordinated and effective development of the regional energy sector will require agreement on strategic issues, as well as comprehensive diagnostics. With these solid foundations, activities to implement the priorities can be staged and milestones developed to track progress and ensure sustained efforts.

A. Principles

4. The Action Plan will be guided by the following principles:

- Regional: Build on concept of phased investments to increase energy security, energy efficiency and trade
- Selectivity: Focus on investments (physical and non-physical) with high cooperation content
- Holistic: Sector development with linkages to other subsectors
- Reliance: Focus on national and regional institutions to develop and implement the Action Plan, with the multi-lateral institutions serving as facilitators and financiers

B. Scope, Focus and Deliverables

5. The Energy Strategy identifies five main energy corridors. Among these, at this initial stage, the Action Plan focuses in Central Asia. This sub-region has diversified and complementary resources, a high potential for trade and strong nexus between energy and water resources management. The Action Plan will later consider further CAREC corridors.

6. The Action Plan will focus primarily on electricity and take into account the role of gas, oil, coal, and water in generating power. This focus is consistent with the needs and priorities of encouraging regional cooperation in Central Asia.

7. The Action Plan will cover the period 2010-2013. The focus will be on immediate gains while building the foundation for cooperative and efficient development of the sector, identifying investments beyond 2013.

8. The Action plan will deliver (i) investments, (ii) knowledge and capacity building, and (iii) policy advice.

C. Strategic Themes

9. The Action Plan is structured around three strategic themes:

- **Energy Demand/Supply Balance and Infrastructure Constraints:** This issue directly addresses the most efficient use of energy resources across the region to meet the needs of its people in a reliable, affordable, financially sustainable, and environmentally sound manner. This approach includes factors such as use of renewable energy resources, energy efficiency and demand side management, intra-regional and extra-regional trade opportunities, and least cost planning. The strategy takes into consideration seasonal supply/demand balances and transmission constraints. This theme focuses on infrastructure investments.
- **Regional Dispatch and Regulatory Development:** This issue directly addresses sector restructuring, regulation, and contractual arrangements. It covers the policy and institutional needs to facilitate energy security, trade and the efficient transit across the region.
- **Energy-Water Linkages:** Hydropower brings a valuable dimension to the region's energy assets. As also recognized in the *Energy Strategy*, the particular distribution of hydropower resources in Central Asia raises complexities of transboundary water management. This theme calls for a strong analytical base to support coordinated management of energy and water resources.

Example Benefits of Mixed Energy Systems

- Reducing **the energy security risks** of individual, national systems that depend on a single or limited types of energy sources.
- Lowering the overall requirement of **reserve margin** relative to individual country needs with accompanying potential for savings in CAPEX for countries.
- Optimized operation of thermal plants operation resulting in **lower costs in operation as well as in annual maintenance.**

10. Each of these strategic themes is discussed below in more detail.

1. Energy Demand/Supply Balance and Infrastructure constraints

a. Background

11. Central Asia enjoys abundant energy resources. However, the resources are not of the same nature nor are they evenly distributed. For instance, Kazakhstan has large oil and coal reserves, Uzbekistan and Turkmenistan have sizeable gas reserves, and Kyrgyz Republic and Tajikistan have significant hydro power resources. This uneven distribution of resources justifies and qualifies regional cooperation. Each country can import and export the most appropriate energy form at the appropriate time to mutual advantage, and differences in energy services can be optimally combined to reduce costs and mitigate supply risks.

12. During the Soviet era the Central Asian Republics (CAR) energy system was designed to take advantage of regional variations. The CARs were interconnected to some extent by gas and to a lesser extent by oil pipelines. This interconnection was done mainly by electrical interconnection, through the 500kV Central Asian Power System (CAPS). Regional cooperation then mixed the thermal based power systems of Kazakhstan, Turkmenistan, and Uzbekistan systems with the hydro based systems of Tajikistan and Kyrgyz Republic. At the same time, Tajikistan and Kyrgyz Republic exported energy during summer when their hydro based power was at a maximum and imported energy during winter when they were in energy deficit. The Tajikistan and Kyrgyz Republic water releases were coordinated to meet irrigation needs in the downstream countries.

13. Since 1990 the Central Asian republics have largely followed an energy self-sufficiency model. Regional electric trade collapsed from 25GWh in 1990 to 3.7GWh in 2008. This has resulted in occasional summer spillage in Tajikistan due to water storage limitations and winter energy deficits in Tajikistan and Kyrgyz Republic. In recent years due to low hydrologic conditions winter energy deficits have been more pronounced, with the winter of 2007/8 being particularly severe. Hydro power requirements (mainly in winter) and irrigation needs (mainly in summer) pose problems for reservoir operation, replacement of winter hydro power by supplies of fossil power and fuel, and exchange conditions between water and energy. Some countries are generating electricity using high value fossil fuels rather than importing from neighboring countries with surplus electricity generated from renewable resources.

14. The CAPS remains an interconnected network with system operation and planning being managed by the Central Dispatching Centre (CDC) in Tashkent. Turkmenistan withdrew from CAPS in 2003 but continues to export to CAR countries from islanded power plants. Afghanistan is in the process of joining CAPS and wishes to meet a part of its demand with imports from CAR countries. Trade is conducted on a bilateral basis; but these arrangements are constrained by limited physical infrastructure. A summary of recent energy trade is presented in following table:

Table 1: CAPS Electricity Trade 9-year Average (2000–2008)

GWh		IMPORT					TOTAL Export	Net Exporter (+) / Net Importer (-)
		KAZ ¹	KGZ	TAJ	UZB	TKM		
EXPORT	KAZ	X	0.0	2.3	0.0	0.0	2.3	-1,718.3
	KGZ	1,642.2	X	223.0	515.9	0.0	2,381.2	2,230.1
	TAJ	69.6	62.6	X	560.5	0.0	692.7	-657.8
	UZB ²	0.0	88.4	705.2	X	5.2	798.9	-284.0
	TKM	8.8	0.0	419.9	6.5	X	435.2	430.0
TOTAL Imports		1,720.6	151.1	1,350.5	1,082.9	5.2	4,310.4	0.0

Notes:

¹ - KAZ imports also includes electricity for further re-export for RAO UES

² - UZB export to TAJ includes intergovernmental agreements and exports to TALCO

b. Objective and Actions

15. The Action Plan will increase energy security, energy efficiency and trade by optimizing integrated transmission and generation (infrastructure) expansion. Key actions are proposed as follows:

- **Diagnostics:** Review of existing studies, confirmation of key issues, and identification of complementary analytical work (if required) as the foundation for integrated development of the regional power system .
- **Policy and Investment:** Carry out a study on integrated development of the regional power system, and identify long-term solutions to balancing demand and supply, taking into account current assets, demand projections, and trade opportunities. The study will address policy measures to promote security and efficiency and will consider:
 - demand and growth projections at country level,
 - condition of existing assets, and rehabilitation needs at country level,
 - planned projects needs and new asset requirements at and identification of alternatives including renewable energy options and the efficient use of power including load management and other demand side management measures
 - alternative scenarios for generation, including hydropower
 - optimization with and without consideration of local and global environmental externalities.

The study will develop national generation and transmission plans as well as an integrated regional plan. Policy notes will be prepared on actions needed for regional trade, energy efficiency, and promotion of renewable energy.

- **Capacity Building:** Actions at the national and regional level to improve institutional efficiency, and improvement of energy models. Any model developed will be transferred to the relevant regional and national institution(s), accompanied by appropriate training to support ongoing use.
- **Investments:** Consistent with the *Energy Strategy*, execute phased investments with regional content covering generation, transmission, distribution and energy efficiency. The latter will include loss reduction and/or, demand side/load management investments, including those eligible for carbon credits.

2. Regional Dispatch and Regulatory Development

a. Background

16. The Central Asian countries were bestowed with strong power transmission networks in the region- constituting about 1,600 km of 500 kV and 1,400 km of 220 kV lines. This network is operated by the Coordinating Dispatcher Center for energy (CDC) in Tashkent, which controls and monitors the demand-supply balance, power voltage, and frequency. CDC is a nongovernment, noncommercial organization working under the apex power council, constituting heads of power utilities/ transmission companies of Kazakhstan, Kyrgyz Republic, Tajikistan and Uzbekistan.

17. The adequate utilization of an extensive transmission network like CAPS depends on development of facilities to dispatch and coordinate power flows, and a proper regulatory and institutional system to manage and maximize benefits to participants. The facilities at CDC are old and in need of significant investment to bring them to par with modern control and dispatch centers. Kazakhstan has already initiated steps to modernize its national control center and its nine regional control centers. Similar investments may also be needed in the national dispatch centers of all the member countries. To complement these facilities, institutional systems to regulate and manage the system through a central entity (having confidence of all the players) would be required.

18. The operation of CAPS can be improved and the benefits of a mixed energy system expanded by taking actions such as:

- Flattening of the demand curve thereby reducing peak loads and associated infrastructure demands; and
- Mitigating part of the credit risk for independent power producers (IPPs) development projects with relatively small countries

19. Notwithstanding the benefits of regional dispatch, there are a number of projects aimed at developing and optimizing transmission facilities from a single country context rather than at the regional scale. But some small initiatives have already been undertaken which support the development of a strong dispatch and regulatory set up in the regional context. USAID, under the project Regional Electric Market Assistance Program (REMAP), has supported the establishment of CDC. There are plans to provide further assistance through a REMAP-II.

b. Objectives and Actions

20. The Action Plan will maximize the benefits of a unified CAPS operation. This entails moving towards the integrated planning of the transmission system on a regional basis, developing institutional capacity, and enhancing the role of CDC and national dispatch centres. Key actions are as follows:

- **Diagnostic:** Review existing studies and confirm key issues related to regional dispatch. Identify urgent investments in CDC and national dispatch centres. This work will support the preparation of a concept note for either future studies, policy reforms, investments, and/or the establishment of dispatch entity.
- **Policy:** Develop an institutional platform and framework (organization, hierarchy, charters, and codes) for regional power trade based on economic principles. This platform could be within CDC Energy. However, coordination with national dispatch centres is critical. The national centers are equipping themselves to ensure efficient national dispatch. If not coordinated, developments at the national level could create technical and institutional barriers to united regional dispatch. An early task is to define principles that would allow meeting the national needs without jeopardizing moving back to unified regional dispatch.
- **Capacity Building:** Strengthen regional and national dispatch centers and facilitate preparation of relevant regulations. Deliver on-the-job training during the preparation of relevant charters, codes, augmented by developmental assignments in dispatch centers, etc.

- **Investments:** Phased investments to implement adequate Supervisory Control and Data Acquisition (SCADA), metering and communication systems in accordance with national needs and circumstances.

3. Energy Water Linkages

a. Background

21. Hydropower resources concentrated in the upstream republics of Kyrgyz Republic and Tajikistan provide important energy services and complement other energy sources available in the rest of the region. However, given large existing and potential water storage capacity of hydropower projects, the role of the hydro resources extends beyond power generation. Other sectors such as drinking water and irrigation in both upstream and downstream countries are affected. Agriculture, the mainstay of several economies in the region, requires irrigation water during summer season. However, countries with large hydro potential (and extreme cold climates) have the ability to store water in summer in order to generate power to meet domestic needs for heating and lighting deficits in the winter. Decisions in the management of water extend even beyond these direct uses, with both domestic and regional implications for water quality, climate change mitigation and adaptation, ecological protection and even water quantity through evapotranspiration.

22. Water management, especially in the face of climate change, also links back to energy security and system stability through the annual and year-over-year management of reservoirs for ancillary services such as power frequency regulation and reserve capacity.

23. The Action Plan addresses the need to analytically integrate the two resources and the running of model impacts of energy and water projects on a range of users across all countries involved.

b. Objectives and Actions

24. The Action Plan will strengthen cooperation by integrating energy and water analysis. This analysis will improve understanding of water-energy linkages and enable to decision makers to query options and investments applying to both energy and water sectors. This work does not encompass decision-making on water or energy sharing agreements. Institutionally, the energy-water analytical framework creates a focal point for dialogue based on a widely accepted, credible, and understood characterization of each sector, and their co-dependencies.

c. Actions

- **Diagnostic:**
 - Assessment of current analytical approaches, including data, models, and interfaces for dialogue used in both the energy and water sectors.
 - Identification of priority analytical enhancements including the extension of data through satellite imagery, additional modules to address such issues as climate change and water quality, and incorporation of relevant water basins outside Central Asia (e.g., Afghanistan).

- Review of water savings potential and priority policy, management and/or infrastructure investments. Identification of appropriate regional institution(s) for integrated analysis, and evaluation of capacity building priorities.
- Identification of necessary linkages across relevant organizations to ensure robust cross-sectoral dialogue, with accompanying policy note to guide institutional strengthening and coordination.
- **Policy:** Assist Central Asian institutions to lead the dialogue and analysis on rational use of energy-water resources. Based on input from the International Fund for Saving the Aral Sea and Scientific Information Centre of the Interstate Commission for Water Coordination, establish regional working groups and international panel of experts. Initiate a regional training program on energy-water linkages and associated analytical tools and resources.
- **Capacity Building:** Upgrade integrated energy-water models, analytical tools, and shared databases that enable assessment of options and impacts across both sectors. Based on the diagnostic, undertake a water-energy linkage study, develop additional modules, etc. Ensure analytical tools and products fully meet the needs of users, in particular groups mandated to advise on energy-water management issues to Heads of States through a consultative approach to model development.
- **Investments:** Identify consensus projects to improve energy-water rational and effective use. Implement fast track projects; initiate the preparation of longer-term investment efforts.

D. Implementation of Action Plan

1. ESCC

25. The ESCC will guide and oversee implementation of the actions identified in the Action Plan. It will facilitate agreement on the terms of references as well as conclusions and recommendations of diagnostic work and studies. The ESCC will encourage strong involvement of regional and national experts in the assessments. It will monitor and report on progress on a regular basis, share outputs, and discuss key conclusions/initiatives. Regular (bi-annual) meetings will be held, with an agenda that covers reports on action items, progress on the three core themes, and updates on regional energy projects.

2. Schedule of Outputs

Preliminary Schedule of Outputs			
Date	Energy Supply-Demand	Regional Dispatch	Energy-Water Linkages
Dec 2009	Diagnostic note	Diagnostic note	Diagnostic note
July 2010	Identification of early investments/programs for loss reduction and demand side management investment options	Institutional note on harmonizing dispatch centres Terms of reference to strengthen regional dispatch centre	Draft Terms of Reference for a policy note on institutional strengthening and coordination
March 2011	Generation and transmission plan and prioritization of infrastructure investments	Phased outputs from REMAP study	Based on emerging analysis, assess consensus water/energy efficiency projects
Dec 2011	Policy notes on regional trade as well as opportunities for renewable energy and efficiency. Initiation of preferred, long term generation and infrastructure investments identified in the plan		Updated analytical foundation for energy-water linkages, including decision tools
June 2012		Preliminary design of platform for regional dispatch	Initiation of energy-water efficiency projects
Ongoing	Prioritized investments in transmission, distribution, and generation	Prioritized investments in dispatch systems	Phased activities to strengthen institutions based on diagnostic and policy note. Phased investments to improve analytical tools

3. External Assistance

26. The Action Plan will require finance for studies, capacity building and investments. ADB, World Bank, Islamic Development Bank, EBRD, USAID and others will provide support as appropriate. ESCC will explore avenues for coordinating IFI contributions.

4. Key Performance Indicators

27. The *Energy Strategy* identifies eight performance indicators to monitor implementation of the *Energy Strategy*. This Action Plan, focusing as it does on the Central Asia energy corridor, would emphasize indicators 1,2,3,and 7, that is:

- (1) Agreements reached (riparian)
- (2) Agreements reached (energy trade)

- (3) Agreements reached (energy transit)
- (7) Volume of exports and imports for electricity.¹

28. Three years is a relatively short time frame for some of these indicators. It is expected that numerical measures will be possible for volume of exports (as new transmission lines become operational). However, riparian agreements and finalized agreement for energy transit may not be finalized in the three year period. The indicators provide a framework for monitoring progress, with specific linkage back to the *Energy Strategy*, and specific performance indicators would be developed for individual actions within the Plan.

¹ Less emphasis will be placed on littoral agreements reached, and volume of trade in oil and coal.