

DRAFT SECTOR NOTE ON ENERGY

CENTRAL ASIA

Designing a Program for Effective Management of Energy and Water Resources

For Discussion: Energy Sector Session

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DESIGNING A PROGRAM FOR EFFECTIVE MANAGEMENT OF ENERGY AND WATER RESOURCES



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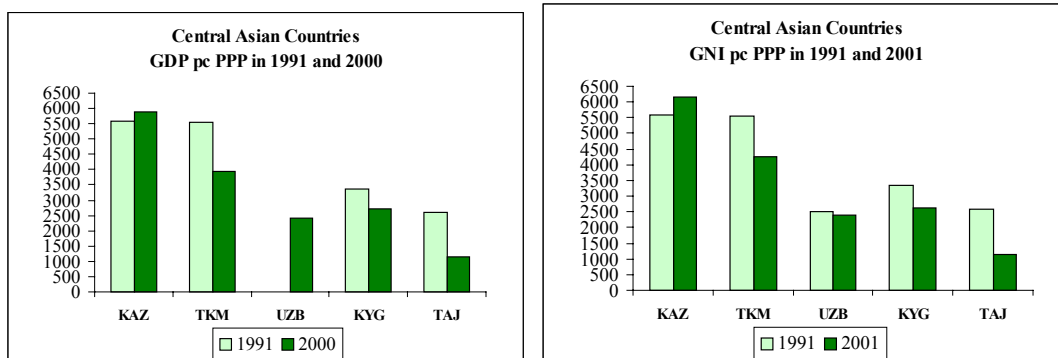
A. The Transition Process

The five Central Asian Countries that were part of the Soviet Union are now more than ten years into a transition process that commenced with the break up of the Soviet Union. While there are clear differences in the transition experience among these countries, the process throughout the region, as elsewhere in the former Soviet Union, can be characterized as reflecting three transitions rolled into one:

- i. A **political transition** – from a highly controlled centralized political system to a more decentralized and democratic form of government;
- ii. An **industrial transition** – from the institutional framework of central planning towards the institutions of a market economy; and
- iii. An **economic transition** – involving the disintegration of the highly integrated economic space of the FSU, with the resultant disruptions in trade, financial and labor market connections.

For each of these areas there have been broadly two stages of transition in the FSU countries:

- i. A first stage of economic decline, involving the disintegration and destruction of existing political, institutional and economic relations;
- ii. Followed by a second stage of recovery, involving rebuilding, reform and integration with the world economy.



As shown in Figure 1, the Central Asian region experienced seven years of dramatic economic decline starting in 1990, losing 33% of the region's measured GDP. It then stagnated for another three years through 1999. Fortunately, in 2000, the Central Asian region started to benefit from the vigorous economic recovery that began for the FSU as a whole in 1999 and is set to continue in 2003 and beyond. However, GDP for the region in 2002 was still about 13% below its 1990 level. The combined GDP of the region is only \$39 billion. Income per capita is depressed in richly endowed countries like Uzbekistan (\$314), and Turkmenistan (\$685). It is only beginning to recover in Kazakhstan (\$1650) and, at a much slower pace and from much lower levels, in Kyrgyzstan (\$326) and Tajikistan (\$181)¹.

The energy and water sectors have a critical role to play in the continuing transition process in each of the Central Asian countries.

The energy sector plays a significant role in the overall economy of these countries, as in other transition countries, and International Financial Institution (IFI) experience suggests that without energy sector reform and financial viability the transition process is much more difficult and delayed. Achieving sustained financial viability for the energy sector is, therefore, a critical objective.¹ This is not to suggest that achieving sustained financial viability will, of itself, enable a country to complete the transition process successfully, but it does suggest that without addressing this component in the overall reform agenda, a country will have difficulty completing its economic transition.

The water sector has a similarly critical role in the Central Asian countries. Agriculture plays a major part in the economies of all the countries and effective management of water resources is, therefore, a critical requirement. The region, however, has suffered from a long history of mismanagement of water resources perhaps best exemplified by the deterioration in the Aral Sea. Effective water sector reforms are, therefore, also essential to the completion of the transition process. (see separate paper “Improved Water Manage in the Aral Sea Basin – Summary of Strategic Directions” for further detailed discussion of issues on water resource management in the region).

B. Regional Inter-relationships in the Energy and Water Sectors

Designing reform programs in the energy and water sectors in the Central Asian countries, however, is complicated by the degree of regional inter-dependence that exists among the countries.

Table 1: Primary Energy Resources in Central Asia

Fossil Fuel Reserves	Unit	Kazakhstan	Kyrgyztan	Tajikstan	Turkmenistan	Uzbekistan	Total
Crude Oil	MTOE	1,100	5.5	1.7	75	82	1,264.2
Gas	MTOE	1,500	5	5	2,252	1,476	5,238
Coal	MTOE	24,300	580	500	Insignificant	2,851	28,231
Total	MTOE	26,900	591	507	2,327	4,409	34,734
% of Total		77.4	1.7	1.5	6.7	12.7	100
Hydro Potential	GWh/year	27,000	163,000.0	317,000	2,000	15,000	524,000
	MTOE/ year	2.3	14	27.3	0.2	1.3	45.1
% of Total	%	5.2	31.1	60.5	0.4	2.9	100.1

¹ Calculated based on market exchange rates for Kazakhstan, Kyrgyzstan and Tajikistan and indicative exchange rates for Uzbekistan and Turkmenistan. The indicative exchange rate for Uzbekistan is defined as a weighted average of the official (60%), commercial bank/consumer goods/cash (10%) and parallel market (30%) exchange rates. For Turkmenistan, the indicative rate is a weighted average of the official (70%) and parallel market (30%) exchange rates.

As Table 1 indicates, there is considerable disparity in the endowment of energy and water resources. While Kazakhstan, Uzbekistan and Turkmenistan enjoy world-class endowments of fossil fuel resources, the Kyrgyz Republic and Tajikistan enjoy very limited access to such resources but do have very significant endowments of water resources.

The energy and water infrastructure assets that these countries inherited reflect the regional approach employed by the central planners of the Soviet Union. This infrastructure implicitly contemplated energy and water transfers across administrative boundaries that have since become national borders and the design reflected perceived needs within the region.

The water management system was designed primarily as an irrigation system, with power generation being incorporated as a by-product. Energy systems were then designed to take account of the location of various energy sources and resulted in the following key elements:

- The Central Asian Transmission System (CATS) was designed as a regional power grid, utilizing hydropower exports from Kyrgyz and Tajikistan as well as allowing interchange of power among all the countries. The dispatch center for this system was and is located in Uzbekistan.
- The gas pipeline network was designed to allow delivery of gas to the southern portion of Kazakhstan, to Kyrgyz and to Tajikistan from Turkmenistan and Uzbekistan.
- Oil refineries were located in the more significant oil producers – Kazakhstan, Uzbekistan and Turkmenistan with refined products being transported into Kyrgyz and Tajikistan.
- Coal consumption was largely tied to the local availability of coal and to the ability to use the rail network for coal transportation.

Following the break-up of the Soviet Union, however, each of the countries has been faced with the need to establish formal relations with the other countries in the region covering energy trade and water resource transfers. In addition, they have had to take over responsibility for the operation and maintenance of the infrastructure facilities within their own countries and are faced with having to identify the optimum means of financing and constructing the new infrastructure facilities that will be required to sustain the energy and water sectors in the region over the longer term (i.e. beyond 2020).

The resultant arrangements that have been put in place to manage the energy and water resources of the region are sub-optimal and, without a focused effort to reform these arrangements, they will represent a significant impediment to effective transition progress in each of the countries. Measures are required to address issues over an extended time frame, but there is a logical sequence associated with the implementation of key measures. In brief the sequencing of required actions is as follows:

- i. To revise the arrangements for the trade in energy and the transfer of water resources to ensure that all incentives are correctly aligned and reflect the true economic values of these commodities;
- ii. To implement measures to improve the management of the use of energy and water resources in each of the countries and address the critical associated regional infrastructure requirements; and
- iii. To develop an agreed longer term vision covering future investments required to sustain effective energy and water resource management within the region. This longer-range vision needs to address both the requirements of individual countries and requirements that have a broader regional connotation.

C. The Energy-Water Nexus

At present, arrangements governing the trade in energy are very much bound up with issues related to the transfer of water resources. While the water management systems in Kyrgyz and Tajikistan were originally designed primarily to meet irrigation needs, their role in providing hydropower, particularly to the economies of those two countries, has taken on increasing importance following the break-up of the Soviet Union. Thus, while the downstream countries continue to regard the system as an irrigation system (and argue that they are entitled to receive the water required to meet their irrigation needs), the upstream countries (Kyrgyz and Tajikistan) now regard these as hydropower systems.

These two views are potentially in conflict. The downstream countries require water in the summer. Kyrgyz and Tajikistan, on the other hand face their maximum energy demands in the winter. Releasing water in the summer is accompanied by the potential to generate power that is not required at the local level. It also reduces water levels and thereby reduces the hydro-generation potential in the winter. Conversely, meeting all domestic winter power requirements in Kyrgyz and Tajikistan could result in excessive water releases and associated downstream flooding and could cause a shortfall in water supplies for the next irrigation season. The alternative is for Kyrgyz and Tajikistan to import gas and coal, but at a potentially higher cost.

The countries have addressed these inherent conflicts through a 1998 framework agreement that, in itself, represents a considerable achievement in terms of post-Soviet Union regional cooperation. This agreement results in annually negotiated arrangements for the trade in energy that is effectively linked to the energy production and energy requirements associated with the water releases for irrigation purposes. These arrangements, however, suffer a number of serious shortcomings:

- The negotiated arrangements result in inconsistency in pricing and, in some cases overpricing, of the energy commodities. This results in incorrect incentives being applied to energy trading and acts as a barrier to optimization of energy trading.
- The arrangements are settled by means of barter transactions. This, in and of itself is not an over-arching problem provided the barter volumes are very clearly linked to a transparent price. However, the arrangements suffer from a lack of full transparency that acts both as a trade inhibitor and an invitation to corruption.

- The arrangements are not adequately enforceable, either implicitly or explicitly which allows the parties to abrogate key provisions of the arrangements.
- Energy and water release requirements are, to some extent, at the mercy of the weather and this can result in significant changes year over year. Over a more extended period these changes tend to even out. Annually negotiated agreements, however, do not address this longer term smoothing.

The ideal solution is to revise the entire arrangement, separating the issue of compensation for the provision of water services (which is implicitly recognized in the 1998 framework agreement and in the annually negotiated arrangements) from negotiations on the sale and purchase of energy commodities. The arrangement for the provision of water services should be based on an agreed formula² and should extend over a number of years – ideally on a continuous basis (i.e. the agreement continues indefinitely unless curtailed as a result of actions clearly specified in the agreement). Enforceability provisions will also be required and the IFIs may have a role in assisting with the creation and implementation of such provisions.

Arrangements for the sale and purchase of energy commodities should be negotiated independent of the arrangements for the provision of water services. Several ongoing operational agreements, however, need to be created or updated to support such arrangements. These include:

- An updated dispatch protocol for CATS;
- Terms and conditions associated with wheeling electricity (i.e. cross border trade of electricity);
- Other conditions that will assure non discriminatory access to regional transportation facilities;
- Updated agreement on technical standards;
- A dispute resolution mechanism.

An appropriate set of revisions to the arrangements covering the current energy-water nexus will result in the application of the appropriate economic incentives to govern energy trade and the provision of water services and will represent a major step toward the introduction of a market based approach to the management of these regional interactions.

D. Reforming the Domestic Energy and Water Sectors

Along with the other countries of the FSU, the Central Asian countries face challenges in reforming their domestic energy and water sectors. It is important to measure and monitor performance related to reforms being introduced. In looking at a country's economy as a whole there are a number of well-established measures to assess performance. At the sectoral level, however, such measures are not always as clearly

² The World Bank is in the final stages of preparing a paper outlining a methodology for calculating such a formula.

defined. In the energy and water sectors for example, it is difficult to measure precisely how well a country is meeting the key challenges of reform such as:

- i. Creating an effective legislative and regulatory framework;
- ii. Attracting investment;
- iii. Creating a competitive market;
- iv. Introducing good governance; and
- v. Assuring financial viability.

Perhaps the most significant measure to consider – the acid test – is the level of subsidies (both explicit and implicit) provided by these sectors to the economy as a whole. This is, in effect, a simple measure of the financial viability of the sectors. But it also broadly measures whether the sector will be able to sustain and expand its services over time, whether it allocates scarce resources efficiently, and whether it relies on quasi-fiscal flows that could endanger the macroeconomic stability of the country (i.e. financial flows that should have been part of the Government budget process, but have effectively bypassed the process).

While some assumptions have to be made concerning the true economic value of the energy being supplied, it is possible to calculate these subsidies on a sufficiently consistent basis both to chart progress in a specific country and to compare progress among countries.

At the beginning of the transition period, energy supplies throughout the FSU were heavily subsidized and the three components that essentially make up the subsidies reflect the legacy of widespread expectations that energy and water services should be provided at little or no cost. The three components are:

- i. Non-payments for energy consumed;
- ii. Tariff structures that do not recover the full cost of the energy supplied; and
- iii. Excessive losses that reflect both operating inefficiencies and theft.

D.1 Non-Payment Issues: In seeking to reduce implicit energy and water sector subsidies, strengthening payments discipline is a critical first step. This means both securing a high level of payment compliance and replacing barter transactions with cash transactions. Achieving this involves an extensive effort focused at all categories of customer. Measures to address non-payments among industrial, commercial and residential customers have to be coupled with the introduction of hard budget constraints. Without having in place effective measures to deal with non-payments, efforts to increase tariffs to full cost recovery levels can be seriously undermined.

D.2 Tariff Issues: In order for the energy and water sectors in any particular country to be efficient and remain financially viable, tariff levels need to be high enough to recover costs. In the short run this means that tariffs have to cover input, operating and maintenance costs. Over the longer term, the tariffs also have to contribute the funds required for the capital investment needed to sustain the sector. Depending upon the

circumstances in a particular country this translates into either long run average cost or long run marginal cost (taking into account the discount factors applicable to future investments).

Increasing tariffs to full cost recovery levels does have consequences. Tariff increases can be difficult politically and timing may become critical in determining a government's willingness to take necessary action. There is also an issue of affordability and social impact, which makes it important that governments develop and implement social safety net, measures to accompany any significant increase in tariff levels.

D.3 Excessive Loss Issues: One way to avoid having to raise tariffs is to lower costs. Cost control, therefore, is another important avenue for lowering the need for subsidies on energy and water services. One important source of undue costs is excessive losses. These can result from a variety of factors. One of the most common sources of the problem is the use of "norms" of consumption for consumers who are not metered. Operating losses can also be excessive because of poor network maintenance. Thirdly, energy theft can be a major problem, in the form of meter tampering, bypassing meters and colluding with utility employees. Dealing with excessive losses requires a clear commitment on the part of utility companies and governments to introduce metering, properly maintain networks, and enforce laws addressing theft.

Table 2: Power Sector Implicit Subsidies for 2002 (US\$ million)

Implicit Subsidies	Kyrgyz	Tajikistan	Uzbekistan
From technical losses	65.7	74	217.1
From collection failure	11.1	7.8	80.5
From tariff below cost	88.3	246.8	1011.9
Total implicit subsidy	165	328.6	1309.5
Total as % of GDP	10.1%	27.6%	13.5%

Source: Estimates by The World Bank

As Table 2 indicates the level of implicit subsidies in the power sector of a number of Central Asian countries are high, implying an urgent need to develop plans to address the issue of financial viability.

The first step in dealing with the issue is to acknowledge the problem. The second step is to develop a workout plan with appropriate sequencing. Experience has suggested that particular attention needs to be directed initially at the point at which energy is transferred to the end consumer. This means dealing with the payment issues. It also means that the distribution end of the business needs to be made financially viable if the rest of the sector is to become financially viable.

As part of the workout plan, careful consideration needs to be given to the development and introduction of a social safety net to mitigate the consequences for the poor of a transition to full cost recovery levels.

During the implementation phase, governments would certainly benefit from seeking private sector involvement. Unfortunately the interest of strategic investors in purchasing and investing in privatized utility companies, particularly in the poorer countries of the FSU has diminished substantially in recent years. There remain, however, opportunities for private sector participation through concessions and management contracts. In addition, there is the possibility of public/private partnership arrangements³.

E. The Regional Dimension to Domestic Sector Reform

Given the inter-dependence of the Central Asian countries with regard to energy and water supplies, concerns about the financial viability of the energy or water sector in any individual country may translate into broader regional concerns. As an example, the gas delivered to the Almaty region in Kazakhstan passes through Kyrgyz. Were the gas sector infrastructure within Kyrgyz to collapse because of the unsustainable financial state of the sector, this could have a serious effect on Kazakhstan. A strong case can, therefore, be made that a focused, regionally coordinated effort to develop and implement a plan to protect critical regional infrastructure be initiated as soon as possible.

F. Investments for the Longer Term Sustainability of the Sectors

The need for a regionally coordinated effort to address the needs of existing infrastructure facilities of regional importance also extends to the need to evaluate longer-term investment requirements. This would include an evaluation of already identified project opportunities such as Kambarata and Rogun, but should also assess other potential requirements and opportunities such as upgraded and/or expanded inter-connections (e.g. to the People's Republic of China, Afghanistan etc.) Much of this potential activity is not on the immediate horizon, but, given the long lead times that will be required for such projects, it would be appropriate to initiate the work required for feasibility assessments and to build this into a longer-term coordinated vision for the management of energy and water resources in the region.

G. Next Steps

It is clear that a focused effort will be required both at the regional level and at the individual country level to address the challenges facing the energy and water sectors if they are not to remain a potential impediment to both the pace and, ultimately, the completion of the transition process. Changes will have to be phased in and a sequenced approach to achieving implementation of these changes is recommended. With this in mind, the following is a suggested list of implementation objectives for the countries in the region and a list of potential/on-going projects and studies that can/are supported by IFIs (full description of activities are in Annex 1):

³ The Parmir power project in Tajikistan that involves the Agha Khan Foundation and is receiving financial support from the World Bank and from IFC is an excellent example of how a public/private partnership arrangement can generate financing for an energy sector project in a very poor country with a difficult investment climate.

G.1 For Near Term Completion

- Reach agreement on de-linking the energy-water nexus and establishing a revised evergreen arrangement based on a transparent objective methodology to provide compensation by the downstream countries for the provision by the upstream countries of the water services that support the downstream countries' irrigation needs.
- Put in place arrangements to allow for negotiation of energy trading on an equitable market related basis.
- Put in place the supporting updated operating agreements.

Specific Projects and Studies supported by IFIs are in Annex 1

G.2 For Medium Term Completion

- Each country would benefit from the development of a comprehensive assessment of its energy and water sectors identifying a road map for implementation of needed reforms.
- Harmonization of legislation and regulations within the region will facilitate the growth in trading activity to the benefit of the region as a whole. This should be coordinated with efforts to address the critical needs associated with key regional infrastructure assets.
- The defined reforms should be implemented in a systematic and sequenced fashion.

Specific Projects and Studies supported by IFIs are in Annex 2

G.3 For Longer Term Completion

- Identify and evaluate options to assure the long-term sustainability of the energy and water sectors in the region.
- Incorporate these into a coordinated regional vision for the energy and water sectors.

Specific Projects and Studies supported by IFIs are in Annex 3

ANNEX 1

**For Near Term Completion
Potential Projects and Studies Supported by IFIs**

Studies	Agency	Amount	Timing	Description
Regional: Central Asia Water Energy Nexus – Regional Cooperation in the Syr Darya Basin	IBRD	Own Funds	2003	Provides analysis of the existing water sharing agreement on the Syr Darya and recommends modifications and a new methodology to make the arrangement transparent, objective and functional
Regional: Assistance in Revising the 1998 Agreement on the Use of Water and Energy of Syr Darya River	ADB/ USAID	0.1	2004	Advisory service to revise the 1998 Agreement (in cooperation with USAID)

ANNEX 2

**For Medium Term Completion
Potential Projects and Studies Supported by IFIs**

Studies	Agency	Amount (US\$M)	Timing	Description
TAJ Utility Reform Study	IBRD	Own Funds	2003	Formulation of medium term reforms required in the domestic utility services – electricity, gas and water
KAZ Gas Transmission and Distribution Study	IBRD	Own/GOK Funds	2003/4	Review of gas transmission and distribution network rehab requirements, impact of such investments on delivery costs, and review of institutional structure of newly created KAZMUNAIGAZ
KAZ Energy Sector TA	IBRD	Own Funds	2003/4	Assist Agency for Regulation of Natural Monopolies on energy regulatory framework, focus on transmission pricing and distribution tariff methodology. Assist Ministry of Energy in organizing short-term electricity market and improved Electricity Grid Code.
UZB Energy Sector Study	IBRD	Own Funds	2004	Design of medium term reforms required in the domestic utility services – electricity, gas and water
** Regional: Improved Management of Critical Natural Resources	USAID	2.78	2004	Regional study to provide technological and structural solutions to the system changes needed to meet the water and energy needs of the region
** Regional Power Transmission Modernization in CARs (Phase II)	ADB	0.8	2004	Second phase study on enhancing power trade among the CARs, and establishing an integrated Central Asia regional wholesale power market
** Regional Gas Transmission Improvement Project in CARs (Phase II)	ADB	0.8	2005	Provide necessary technical and institutional support to continue the enhancement of regional gas trade
** these studies also include longer term elements				
Projects	Agency	Amount (US\$M)	Timing	Description
KYR Consolidated Structural Adjustment Credit	IDA cofinanced with Swiss, Netherlands	35	On-going	Supports the Government's effort to strengthen its fiscal position and improve the business environment through utility, tax and de-regulation reforms. For the energy sector, it supports the unbundling of the giant power company into four power distribution companies, and separation of generation and transmission companies and increase in tariffs closer to cost recovery levels

KYR Consolidated TA	IDA	5	On-going	Supports CSAC in the regulatory reform of the gas and power sector, as well as restructuring and privatization.
KYR Power and District Heating Project	IDA cofinanced with ADB, Denmark Swiss, NDF	20	On-going	Retrofitting and reconstruction of heat and power distribution network, and efficiency improvement of supply and end-use of heat and power.
KAZ Electricity Transmission Rehabilitation	IBRD cofinanced with EBRD	140	On-going	Restructuring of KEGOC into financially viable grid company; refurbishment of transmission substations and modernize dispatch control systems and development competition through power pool and access to transmission network
TAJ Pamir Project	IDA/IFC		On-going	Improve supply of electricity in the Borno Badakshan Oblast through private sector involvement and investments
Regional Transmission Modernization Project (UZB/TAJ)	EBRD	50	2004	Proposed joint ADB-EBRD project to enhance regional energy systems to promote cross border electricity trade and cooperation between UZB and TAJ.
KAZ KEGOC North South Power Transmission Project	EBRD	60	2004	Proposed project will finance the construction of 270 km new North-South 500kv electricity transmission line to address energy and peak supply deficit in southern Kazakhstan
Regional Gas Transmission Improvement Project in the CARs	ADB	100	2004	Proposed project to rehabilitate sections of regional gas transmission lines and institutional reform
Regional Power Transmission Modernization in CARs, Phase II	ADB	70	2006	Proposed project to improve operation and efficiency of the regional power transmission system and create basis for future wholesale regional power market
Regional Gas Transmission Improvement Project in CARs, Phase II	ADB	80	2006	Proposed project continues the work started in the Phase I (2004) project
KYR Energy Sector Reform Project	IDA	15	2006	Support implementation of Private Sector Participation in the whole energy distribution sector. Likely cofinancing by other IFIs.

ANNEX 3

For Longer Term Completion Potential Projects and Studies Supported by IFIs

Studies	Agency	Amount	Timing	Description
Regional: Export Potential of Electricity from CARs	IBRD	Own funds	2003/4	