CAREC

Central Asia
Regional Economic
Cooperation

# Strategy for Regional Cooperation in the Energy Sector of CAREC Countries

Good Neighbors • Good Partners • Good Prospects

ABBREVIATIONS

| | |
|---|---|
| ADB | Asian Development Bank |
| AKFED | Agha Khan Foundation for Economic Development |
| AREO | Alternate and Renewable Energy Options |
| bbl | Barrel |
| BCM | Billion Cubic meters |
| BTC | Baku-Tbilisi-Ceyhan Oil Pipeline |
| BTE | Baku-Tbilisi-Erzerum Gas Pipeline |
| CAPS | Central Asian Power System |
| CAREC | Central Asia Regional Economic Cooperation |
| CDM | Clean Development Mechanism |
| CPC | Caspian Pipeline Consortium |
| CASAREM | Central Asia-South Asia Regional Electricity Market |
| CASA-1000 | Central Asia-South Asia 1000 MW Export Project |
| CNPC | Chinese National Petroleum Corporation |
| DSM | Demand Side Management |
| FSU | Former Soviet Union |
| GWh | Million kWh |
| GNI | Gross National Income |
| GDP | Gross Domestic Product |
| HPP | Hydro Power Project / Hydro Power Plant |
| HVDC | High Voltage Direct Current |
| IFIs | International Financing Institutions |
| KgOE | Kilogram Oil Equivalent |
| IFRS | International Financial Reporting Standards |
| kV | Kilo volt |
| km | kilometer |
| OECD | Organization of Economic Cooperation and Development |
| OTL | Overhead Transmission Line |
| PPP | Purchasing Power Parity /Public Private Partnership |
| RAO UES | United Energy System of Russia |
| SS | Substation |
| TCF | Trillion Cubic feet |
| TAPI | Turkmenistan-Afghanistan-Pakistan-India gas pipeline |
| T and D | Transmission and Distribution |
| TWh | Billion kWh |
| TPP | Thermal Power Project/Thermal Power Plant |
| XUAR | Xinjiang Uyghur Autonomous Region of China |

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REGIONAL COOPERATION STRATEGY
IN THE ENERGY SECTOR OF CAREC COUNTRIES

## A. INTRODUCTION

1. The member countries participating in the Central Asia Regional Economic Cooperation Program embrace the Program's mission of development through cooperation and join efforts to bring to fruition the shared vision of "Good Neighbors, Good Partners and Good Prospects".

2. The regional economic cooperation is an important vehicle for enhancing national development strategies of the participating countries and realizing the countries' immense development potential in the context of increasingly integrating Eurasia. Infrastructure is a key pillar supporting the participating countries' drive for development through cooperation, where energy infrastructure is vital in ensuring overall economic growth and prosperity.

3. This energy strategy has been developed in accordance with the Comprehensive Action Plan endorsed at the 5th Ministerial Conference on CAREC. The strategy seeks to enable the development of best solutions to meet future energy demand and promote development of new energy resources for the region and for exports by exploiting the potential for mutually beneficial gains among the participating countries

## B. LONG TERM VISION FOR THE SECTOR

4. The long term vision of the region's energy sector is to ensure: (a) energy security through the balanced development of the region's energy infrastructure and institutions, stronger integration of the region's energy markets to make available adequate volumes of commercial energy (and energy services of acceptable quality) to all physical and juridical persons in a reliable, affordable, financially sustainable and environmentally sound manner; and (b) economic growth through energy trade.

## C. STRATEGIC APPROACH

### Drivers for regional cooperation

5. The regional energy cooperation is driven by the need to (i) overcome, through increasing integration of the energy markets, the impact of uneven distribution of energy resources among the CAREC countries; (ii) optimize existing energy interrelationships (see Appendix 1) and achieve least-cost solutions to energy constraints. The energy cooperation process is further stimulated by external factors such as the availability of new attractive energy markets in eastern and southern China, Pakistan, India and Iran, along with new strategic transit opportunities for oil and gas through Turkey, Georgia, and Russia, coupled with strong interest in the region from Chinese, Russian and other investors. Also, rising global energy prices enhance the attractiveness of the large hydropower project options in Kyrgyzstan and Tajikistan, especially in the context of regional energy market development taking into account the interests of all the countries situated along transboundary watercourses and the availability of export markets beyond Central Asia.

### Principles of regional cooperation

6. Regional energy cooperation will be promoted in good faith and in observance of the following principles:

- sustained political will for reforms and cooperation;
- bilateralism and multilateralism;
- mutual benefits for all;
- gradualism, voluntarism, and consensus;
- prudent, marginal and diversified dependence on outside energy resources to maintain adequate energy security;
- mutually compatible regulatory arrangements based on evolving experience, including specific legal and regulatory framework for each cooperation venture based on international cooperation practices;
- pursuit of sector reforms, governance and operations conducive to regional cooperation on a commercial basis;
- adherence to adequate level of transparency and disclosure standards:
- respect for environment through collective action with regards to clean energy, transboundary watercourses; climate change and littoral space;
- fair and rational use of natural resources, including transboundary watercourses, and minerals, and
- consideration of the concerns of the neighboring countries.

**Forms of regional cooperation**

7. Regional energy cooperation will be advanced through the development of market relations, transit arrangements, investments, relationships under agreements on the joint use and protection of trans-border rivers and sea-bed resources as well as knowledge sharing.

**Benefits from regional coooperation**

8. Through regional cooperation the participating countries will pursue benefits from developing new energy market opportunities, receiving transit revenues and achieving least-cost development solutions through a rational sharing of resources.

9. In this context the participating countries look forward to evolving medium-to long-term inter-relationships resulting in:

(i) states with sufficient energy resources for exports (Azerbaijan, Kazakhstan, Uzbekistan) securing access to export markets and earning export revenues to support their energy[1] export - led growth;

(ii) states rich in hydropower resources, but lacking fossil fuels (Kyrgyz Republic and Tajikistan), gaining access to export markets for hydroelectricity and earning export revenues to secure import of fossil fuels to meet their winter energy deficits

(iii) transit countries (such as Afghanistan and Mongolia) earning valuable transit and transmission fees, and Mongolia becoming an alternative energy transit route between Russia and China and exporting coal and possibly electricity in the future to China;

(iv) China importing oil and natural gas from Kazakhstan, and natural gas from Uzbekistan and Turkmenistan,

(v) Azerbaijan trading larger volumes of power with Russia, Georgia, and Iran; and

(vi) Central Asian countries exporting power and natural gas to South Asia (see Appendix 2).

[1] Energy exports include exports of electricity, oil, gas and coal.

## D. STRATEGY ELEMENTS

10. The achievement of the long-term vision for the energy sector in the region will be pursued through economically and financially sound *investment measures* for regional cooperation taking into account the interests of all states in the region. To enable identification and implementation of such projects *capacity building and knowledge sharing measures* will be pursued. To ensure sustainability of investments, sound and appropriate *policy environment* will be maintained.

### Investment Measures for Regional Cooperation

11. The improved performance of the national energy sectors of the participating countries is of critical importance for the achievement of greater benefits from regional energy cooperation. Therefore both domestic and cross-border investments will be pursued.

12. The domestic investments will focus on energy efficiency and clean energy. Energy efficiency investments will encompass efficiency improvements in energy production, transportation, distribution and energy use and will cover such areas as: (i) loss reduction; (ii) rehabilitation of existing assets; (iii) least-cost system expansion and operation; (iv) appropriate heating options; (v) commercialization of energy operations; and (vi) upgrading end-use equipment, facilities and buildings (including other demand side management measures). Clean energy investments will include such aspects as: (i) retrofits for mitigation of pollution; (ii) reduction of fuel resources used per unit of goods produced; (iii) elimination of gas flaring; and (iv) developing alternative and renewable energy sources,

13. The cross-border investments will focus on production of ecologically clean energy and energy trade and will be pursued with mutual agreement among all relevant parties in the following key areas: (i) cross border energy transmission, (ii) facilitation of access/transit to third country energy markets; (iii) production for export, (iv) development of energy resources on a joint/cooperative basis respecting the laws of relevant states for protecting nature; (v) integration of energy markets, (vi) capacity building for energy trade, (vii) projects under Clean Development Mechanism and carbon finance, and (viii) investments abroad to access energy resources there. (Key prospective "bold stroke" projects of regional importance are shown in Appendices 4 and 5)

### Capacity building and knowledge sharing

14. The new responsibilities and functions of the participating countries in the regional cooperation context will be supported by enhancing their institutional capacity through exchange of knowledge and experience among participating countries and with recognized international sources of best practices. The capacity building will focus on the following knowledge areas:

- Commercial operation of the sector: focus on negotiations, contracting (power purchase, power wheeling and transmission services), regional dispatch and system control, metering, billing and collections, and utility accounting and audit, modern corporate governance techniques, tariff adjustments, operational efficiency, and consumer relations.
- Sector regulation: focus on ensuring transparency, stability and predictability and consistent fairness.
- Public Private Partnership arrangements: focus on forms and regulation.
- Demand Side Management, energy efficiency and energy conservation: focus on integrated resource planning, energy service companies and financing mechanisms.

- Alternative and renewable energy: focus on resource surveys, devising promotional and incentive arrangements.
- Riparian issues: focus on international experience in transboundary river management and protection.

**Policy measures**

15. The policy measures will focus on enhancing (i) energy trade and security; (ii) financial viability of energy supply entities and the sustainability of energy services; (iii) social protection in the energy sector; (iv) sector restructuring and commercialization; (v) sector regulation; (vi) promotion of private sector participation; (vii) cooperation in international river basins; (viii) littoral agreements; [2] (ix) alternative and renewable energy options; and (x) energy efficiency and initiatives under Clean Development Mechanism (CDM) and other (successor) carbon financing mechanisms.

16. The choice and sequencing of these policy measures will be in accordance with the circumstances of each country and planned forms of cooperation. The pursuit of such chosen policies will be to the extent they are politically and administratively feasible.

Energy trade and security

17. Energy trade will be pursued to increase the available forms and sources of energy to complement in an effective and reliable way the domestic energy resources of the CAREC countries thus enhancing energy security and or to develop the energy exports potential as a driver of economic growth.

Financial viability of energy supply entities and sustainability of energy services;

18. Regional energy trade will be sustainable only when it takes place among financially viable and solvent entities. The financial viability of the energy entities will be ensured through (i) adjusting tariffs to cover costs, including cost of capital, (ii) reducing losses to minimize costs and improve efficiency of supply; (iii) improving system and consumer metering, billing and collection practices to industry standards, and (iv) adopting least cost planning, construction and operation.

Social protection in the energy sector

19. Efforts to develop adequate social protection systems for energy consumption will continue by improving the targeting of the compensation mechanisms to the needy and eliminating non-payments and discounts to a wide range of privileged consumers. Realistically designed and efficiently implemented lifeline tariff will be the second best option.

Sector restructuring and commercialization

20. Wherever feasible sector restructuring and commercialization will be pursued to enhance energy trade through (i) independent and solvent transmission business, separated from generation and distribution businesses, (ii) transmission service charge to all system users on the basis of a reasonable return on transmission investments, and (iii) regulated or open third party access to transmission (subject to technical availability and capacity).

[2] For example, agreements on protection and use of sea-bed resources by littoral states

21. There are large opportunities for further improvement in commercializing the energy entities and trade transactions. The trading entities such as generating companies, distributing entities or trading companies will pursue a clear commercial orientation through (i) applying enforceable and standard energy purchase or sales contracts, (ii) ensuring transparency of transactions and operations including also internationally acceptable accounting, audit and disclosure standards (such as IFRS) to the extent feasible.

Sector regulation

22. Sector regulation will improve to enable meaningful energy cooperation. Fair, transparent and stable regulation will be pursued through (i) separation of the regulatory functions from ownership, policy making, operations and maintenance in the energy sector.

23. Regulatory principles will be embodied in regulatory laws and regulatory practices will follow published rules and regulations by the regulatory body under the law. The regulatory body will have reasonable functional and financial autonomy. Its accountability will be ensured by provisions for appeals against its rulings to the high courts and accountability to parliament through detailed annual reports.

Private sector participation

24. Private sector involvement in the energy sector will be facilitated through promoting public-private partnerships and enhancing the enabling framework, including membership in the Energy Charter Treaty, which provides safeguards for private investment against nationalization and other restrictive measures. Most CAREC participating countries have already become members of the said Treaty.

Cooperation in using transboundary watercourses

25. Modern approaches to benefits-sharing will be pursued to enable an ecologically sound exploitation and protection of transboundary water courses in a manner that safeguards not only the regular irrigation, power and drinking water interests but also the economic, environmental, cultural and social interests of all riparian states along important river basins such as Amu Darya and Syr Darya. Carrying bilateral and multilateral negotiations and possibly concluding relevant riparian agreements will enable, inter alia, the design, construction and operation of large storage hydro power plants in many CAREC countries such as Afghanistan, Kyrgyz Republic and Republic of Tajikistan. These power plants will focus on generation for export to outside destinations, apart from helping to meet winter power shortages in the domestic markets of those or other Central Asian states by adhering to mutual responsibilities of riparian states in using transboundary watercourses and without inflicting significant harm to the use of water resources by riparian states[3]. The CAREC countries may also draw on relevant experience of other inter-governmental bodies in managing transbounadry river basins in Central Asia and elsewhere in the world. Further, improvement of the treatment of riparians'rights and obligations will be considered through relevant international rules as well as conventions, which have been already joined by some of the CAREC participating countries. These conventions have been summarized in Appendix 8. However, it is recognized that not all CAREC states are signatories of all these conventions, and not all conventions have entered into force and that seeking accession to these and similar conventions is a sovereign right and choice of the states. When a state is not a

[3] Uzbekistan and Kazakhstan are concerned of harm to the use of water resources and this must be considered in line with principles of cooperation outlined in Paragraph 6.

signatory to the relevant convention bilateral negotiations and adoption of the procedures under the safeguard policies of the IFIs may help.

Littoral agreements

26. Further expansion of the scope of the littoral agreements will be pursued among the Caspian Sea countries to enhance opportunities for exploration and protection of seabed resources and laying gas and oil pipelines under the sea.

Alternative and renewable energy options (AREO)

27. Opportunities for alternative and renewable energy investment options will be pursued, complemented by international incentives offered through the Clean Development Mechanism and similar carbon finance facilities. In order to ensure level playing field between AREO and conventional commercial energy the possibility of minimizing the subsidies on the conventional energy will have to be explored.

Energy Efficiency

28. Energy efficiency improvements allow for rational and economic use and trade of energy resources, introduction of advanced technology and infrastructure and improve the financial viability of energy utilities. Operations under Clean Development Mechanism or similar carbon finance mechanisms contribute to environmental improvements in the participating countries. Policies for promoting energy efficiency and energy conservation and carbon finance mechanisms need to be adopted.

## E. STRATEGY IMPLEMENTATION

### Implementation Dimensions

29. In view of the current opportunities and dynamics in the region, the participating countries will focus on implementation of the regional cooperation strategy along the following main dimensions (energy corridors):

(i) Central Asia-China: this dimension focuses on energy trade and investments between China and the Central Asian Republics.

(ii) Central Asia-South Asia: emerging and potential electricity trade between Central Asian Republics and South Asia.

(iii) Cooperation opportunities within Central Asia.

(iv) Central Asia-Russia: most of the oil and gas exports till now have been oriented to Russia or through Russia to western destinations. Russia has been investing in exploration and production in the Central Asian countries as well as in rehabilitation, expansion and operation of pipeline systems (also in large and complex hydro power projects) and is therefore involved in the energy export efforts of the Central Asia countries.

(v) Central Asia-EU: the EU dimension focuses on facilitating exports of Central Asian and Azeri exports of energy to Europe. Azeri oil and gas are already flowing towards the west On account of its geographical location and its own abundant hydrocarbon resources, Azerbaijan has the potential to emerge as an energy corridor between Central Asia and EU in the near future not only in relation to oil and gas but also in relation to electricity transit.

30. The implementation of the regional energy strategy will be pursued through the above dimensions in consideration of geo-political realities, need to diversify export markets, and the inherent economics and risk profiles of the dimensions. (See Appendix 3)

**Costs and Financing**

**(i) Investment Measures**

31. Available information on the capital costs of the investment schemes and their possible sources of financing have been compiled and indicated in Appendix 7. The overall costs and possible financing are summarized in Table 1. The list in Appendix 7 is neither exhaustive nor authoritative. It is at best indicative or illustrative. The inclusion of any project in this list does not necessarily imply commitment or approval on the part of any government.

32. Capital costs of investment proposals are tentative due to scarce cost information on projects pursued by the private sector under production sharing or concession contracts for exploration and production of hydrocarbons and coal. Similarly, information is not readily available for many of the dedicated oil and gas pipelines built, or to be built by consortiums of governments and the private sector.

33. Nevertheless, the cost estimates indicated provide private investors and IFIs with a broad idea of the lower bound of the financing needs.

34. Excluding 10 items for which cost data is not readily available, the capital cost of the remaining items are estimated at about $20.6 billion. Possible financing could be self financing ($5.1 billion), IFIs ($ 3.8 billion) and others ($11.7 billion).

35. Self financing level of about 20-30% is needed to ensure financial viability, leverage debt and secure other forms of project finance.[4] Other sources of financing include: (i) private and commercial sources, (ii) bilateral sources, (mostly Chinese and Russian), (iii) international hydrocarbon investors, and (iv) IFIs.

**(ii) Capacity Building Measures**

36. Capacity building measures will be pursued in various forms such as (a) on-site training of local experts by international consultants (b) pilot projects, (c) exchange of experience among CAREC utilities and with outside utilities (d) regional training courses and conferences, seminars or workshops. The scope of the activities within the CAREC regulatory forum will expand.

37. One regional workshop is to be organized in the short to medium term for each of the six topics indicated in Section D above, followed up by technical assistance in each country with pilot projects demonstrations. The participating countries will seek donors and IFI's support to finance the estimated relevant costs as follows:

[4] In the case of existing operating entities, 30% of the new project cost is assumed to be raised through internal cash generation. In the case of new entities established to execute own and operate new projects, 30% of the project cost is assumed to be raised as equity from sponsors as well as the public and private equity markets. In either case 70% of the project cost is assumed to be secured as long term debt from public (including IFIs) and private sources of debt.

- $1.5 million for the six international workshops, in addition to a contribution from the participating countries at 10% of total cost
- $10.5 million for follow up TA activities

38. Additional costs, if needed, (especially those in local currencies) will be met by contributions in kind by the relevant CAREC government. (see table 1 on Costs and Financing further in the text)

**(iii) Studies to be carried out**

39. Analytical and research work needs to be undertaken for identification of specific investments and in support of key strategic and policy decisions in the energy sector. In addition to contributions from the participating countries support of the donors and IFIs support is needed for carrying out such studies, estimated at $ 10,85 million (See Table 1 on Costs and Financing and Appendix 6)

40. In respect of studies and capacity building programs about 10% of the costs are assumed to be met by the countries, while the remaining costs are for possible IFI and bilateral assistance.

Table 1: Indicative Costs and Financing of Regional Cooperation Program ($ million)

| Item | Total Cost | Self Financing | IFI Financing | Other Sources | Short Term 2008-2009 | Medium Term 2010-2014 | Long term 2015-2027 |
|---|---|---|---|---|---|---|---|
| **Investment projects** | 20,625.5 | 5,077.3 | 3,871.8 | 11,676.4 | 5,972.0 | 9,903.5 | 4,750.0 |
| **Capacity Building** | 12.0 | 1.2 | 5.4 | 5.4 | 4.0 | 8.0 | 0.0 |
| **Studies** | 10.85 | 1.0 | 5.2 | 4.65 | 9.2 | 1.65 | 0.0 |
| **Total** | 20,648.35 | 5,079.5 | 3.882.4 | 11,686.45 | 5,985.2 | 9,913.15 | 4,750.0 |

**Progress Indicators and Monitoring Framework**

41. Progress Indicators (PI) have been provided for each of the investment proposals in Appendix 7. Wherever possible it also indicates the base line value. In addition, use of some broader indicators may be useful to monitor progress in respect of the overall Regional Energy Cooperation program.

42. The indicators will be compiled in the format given in Table 2 below for each country on the basis of official information to be given by each country and information from other sources and a regional table prepared on the basis of the country tables. It is recognized that reporting data for the indicators will be voluntary on the basis of the best national efforts.

43. Indicators, 5, 6, 7 and 8 relating to energy imports and exports should cover only transactions among CAREC countries and those of CAREC countries with Russia, Iran, Georgia, Turkey, and South Asia (Pakistan and India). It is assumed that exports to and from Europe will take place through Turkey or Russia and would be included within the data reported for Turkey and Russia. The data for China will include exports to and imports from all CAREC countries, but not from any other country. Further the term “energy” consists of oil, natural gas, coal and electricity (in the context of this table) and *each country* needs to have separate rows for *each item* relevant to its economy. These numbers could help monitor the growth in energy trade and the energy flow

in the respective energy corridors such as CA-SA, CA –China, Intra-Central Asia, CA-Turkey (EU), and CA-Russia

**Table 2: Progress Indicators for the Regional Energy Cooperation Program**

| No. | Performance Indicator | 2006 Base line data | Targets for: | | |
|---|---|---|---|---|---|
| | | | 2010 | 2015 | 2020 |
| 1 | Agreements reached (Riparian[5]) | | | | |
| 2 | Agreements reached (Energy trade) | | | | |
| 3 | Agreements reached (Energy transit) | | | | |
| 4 | Agreements reached (Littoral[6]) | | | | |
| 5 | Volume of energy exports and imports for gas | | | | |
| 6 | Volume of energy exports and imports for oil | | | | |
| 7 | Volume of energy exports and imports for electricity | | | | |
| 8 | Volume of energy exports and imports for coal | | | | |

**Risks and mitigation measures:**

44. Risks to the strategy can be related to project sites, investments, trade, security, country performance and geo-politics.

45. Project site - related risks such as those relating to geology, hydrology and seismic factors and security will be avoided to a large extent by careful site investigations and by choosing flexible project parameters.

46. Investment related risks will be minimized by (i) adopting sound macroeconomic and commercialization policies, (ii) securing IFI's financing and guarantees programs. (iii) Energy Charter Treaty membership (as applicable) and (iv) bilateral investment agreements (as applicable) (See Appendix.8 outlining key International Agreements and Programs and the respective membership status of the CAREC countries).

47. Trade - related risks such as supply risk, market risk and payment risk will be handled through appropriately written trade contracts providing for "take or pay", "supply or pay" clauses and providing for appropriate guarantees for payment obligations and suitable commercial international arbitration clauses.

48. Resolution of internal conflicts and avoidance of regional conflicts can help to mitigate a range of country - related risks and security risks for the regional cooperation.

49. Geo-political risk related to diverging positions of major players in the region can be handled through appropriate diplomatic channels.

50. In addition to observance of the basic rules of International Law, adherence to relevant UN international conventions would provide venue for dispute resolution between CAREC countries

[5] Water sharing agreements (following international standards) among riparian states in respect of international rivers are needed to raise funds from IFIs and commercial sources for major hydropower projects

[6] This applies only to states adjoining Caspian Sea.

and countries outside CAREC. (See Appendix 8 outlining key International Agreements and Programs and the respective membership status of the CAREC countries). It is recognized that bilateral and multi-nation dialogues are respectively preferred by CAREC countries to solve disputes.

51. Application of IFIs safeguard policies provides a sound basis for avoiding the occurrence of disputes and grievances.

52. Next Steps

After the approval of the proposed strategy, future meetings of the Energy Sector Coordinating Committee (ESCC) will pursue the development of an action plan and related measures to promote further implementation of the Strategy based on contributions from the CAREC countries.

## Appendix 1: Current Energy Inter-relationships among CAREC Countries

| | Azerbaijan | Kazakhstan | Kyrgyz Republic | Tajikistan | Uzbekistan | Afghanistan | China | Mongolia |
|---|---|---|---|---|---|---|---|---|
| **Azerbaijan** | xx | Kazakh Oil and gas exports through BTC and BTE under discussion Littoral agreements in place | | | | | | |
| **Kazakhstan** | Kazakh oil and gas exports through BTC and BTE under discussion. Littoral agreements in place. | xx | Imports Kyrgyz hydro power. Transit for power exports north by swap arrangements. Water sharing agreements | Import of Tajik hydro power. Water sharing agreements | Import of Uzbek gas/power. Water sharing agreement | | Export of Kazakh oil to China | |
| **Kyrgyz Republic** | | Import of Kazakh oil, coal and gas. Export of power to Kazakhstan | xx | Export of power. Electricity transit north – south in relation to Tajikistan | Import of Uzbek coal and gas. Export of electricity to Uzbekistan | | Power exports to China | |
| **Tajikistan** | | Export of power to Kazakhstan | Transit for Power exports north | xx | Power transit, Power exchanges & Import of Uzbek and gas | Export of Tajik Power To AFG | | |
| **Uzbekistan** | | Gas exports/power transit/ water agreements | Export of Uzbek gas | Export of Uzbek gas/power transit/water agreements | xx | Export of Uzbek power | Oil and gas exploration concessions to China | |
| **Afghanistan** | | | | Import of Tajik power | Import of Uzbek power | xx | | |
| **China** | | Energy Investments in Kazakhstan. Import of Kazakh oil | Import of about 1 GWh of power/year during 2003-2007 | Chinese financing of North-South power line and hydro power project | Investments in UZB. Oil and gas exploration | | xx | |
| **Mongolia** | | | | | | | Export of coal to China | xx |

## Appendix 2: Evolving Energy Inter-relationships among CAREC Countries

| | Azerbaijan | Kazakhstan | Kyrgyzstan | Tajikistan | Uzbekistan | Afgha-nistan | China | Mongolia | Other Countries |
|---|---|---|---|---|---|---|---|---|---|
| Azerbaijan | xx | Flow of Kazakh oil and gas through BTC and BTE pipelines | | | | | | | Flow of Turkmen oil and gas through BTC and BTE pipelines. Electricity trade with Russia, Georgia and Iran |
| Kazakhstan | | xx | Import of Kyrgyz hydropower. Investment in Kambarata Hydropower. Export of coal and gas to KYR | | Import of Uzbek gas for Southern Kazakh provinces | | Export of Kazakh oil, gas and possibly thermal power to China | | Kazakh oil, gas and power exports to Russia. Power exports through CASAREM Join TAPI project |
| Kyrgyzstan | | Transit for power flow between Kazakh and Tajik systems | xx | Power exports to CASAREM through Tajik system | Import of Uzbek gas | Power export to CASAREM via Tajikistan | Possible export of power to China | | Power exports through CASAREM. Frequency support to CAPS |
| Tajikistan | | Transit for Kazakh power for CASAREM | Transit for Kyrgyz Power for CASAREM | xx | Import of Uzbek gas | Increased Export of Power to AFG Import of gas from AFG | Possible export of hydropower | | Export to CASAREM. |
| Uzbekistan | | Export Gas to South Kazakhstan | Export gas to Kyrgyzstan | Export of gas to Tajikistan. Power transit. | xx | Increased Export of power to AFG | Gas transit to China | | Join TAPI project. Russian imports of Uzbek gas |
| Afghanistan | | Potential for power imports through CASAREM | Potential for power imports through CASAREM | Direct power imports and imports via CASAREM. Possible gas exports to Tajikistan | Power imports from Uzbekistan | xx | | | Transit for TAPI pipeline and CASAREM power line |
| China | Energy investments | Energy exploration, production and pipeline investments and oil and gas imports | Potential power investments and imports | Investments in coal, hydropower and North-South power transmission. Possible power imports. | Gas transit to China | | xx | Potential power imports from Mongolia | Oil (partly transiting through Mongolia), gas and power imports from Russia. |
| Mongolia | | Possible import of oil, petroleum products and LPG | | | | | Coal and potential power exports to China | xx | Become a transit country for energy flows between Russia and China |
| Other Countries | Power exchange with Georgia, Iran and Russia. Oil and gas exports to Turkey and further to the West Europe | Energy exports to and via Russia. Possible access to a Persian Gulf port and a Mediterranean port | Power imports via CASAREM | Power imports via CASAREM | Gas imports by TAPI project. Russian imports of Uzbek gas | | Russian export of gas and power to China | | xx |

**Appendix 3**

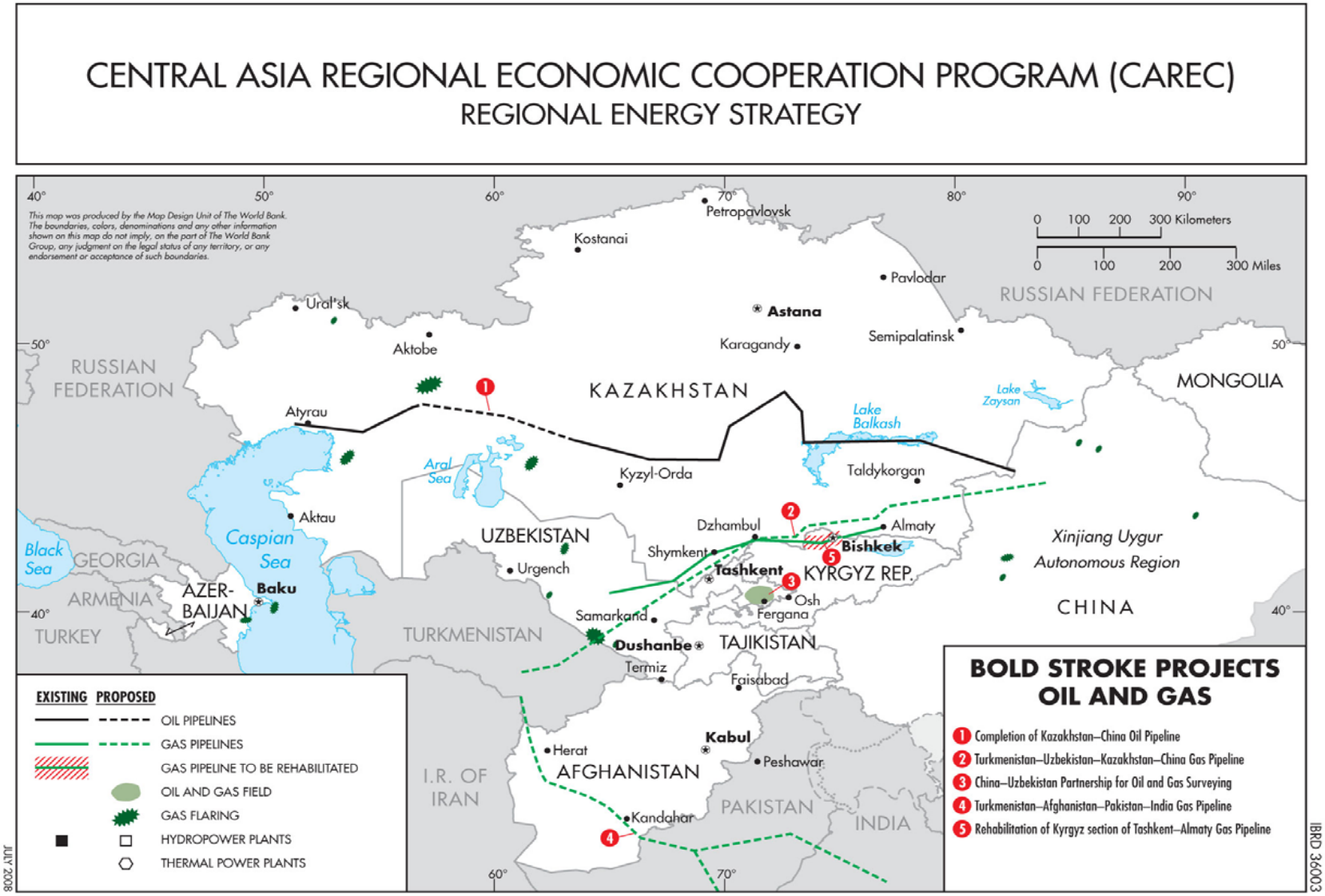
## Suggested Dimensional View for Regional Cooperation

| **Central Asia-China Cooperation** | **Central Asia- South Asia Cooperation** | **Intra -Central Asia Cooperation** | **Central Asia-Russia cooperation** | **Central Asia-EU** |
|---|---|---|---|---|
| Completion of Kenkiak-Kumkol section of the Kazakh-China oil pipeline | Project(s) to create CASAREM | Gas flaring reduction in Kazakhstan, Uzbekistan and Azerbaijan | Blending Russian oil with Kazakh oil exports oil to China. | Construction of the Baku-Tbilisi-Ceyhan oil pipeline to the Mediterranean port in Turkey |
| Turkmenistan-Kazakhstan-Uzbekistan-China gas pipeline project | Kazakhstan and Uzbekistan joining CASAREM as exporters of thermal power | Second Phase of the 500 kV North South transmission line in Kazakhstan | Capacity expansion of the CPC oil pipeline to Novorossiysk and the Atyrau-Samara oil pipeline | Baku-Tbilisi-Erzerum gas pipeline to connect to the Turkish gas system |
| China-Uzbek partnership in exploration and drilling for oil and gas | Kazakhstan joining Uzbekistan and Turkmenistan in the Turkmenistan-Afghanistan-Pakistan-India gas pipeline project | Rehabilitation of western part of the Tashkent-Bishkek-Almaty gas pipeline in the Kyrgyz section. | Russia planning to export gas and electricity directly to the Eastern parts of China. | Expansion of the capacities of the above lines and enabling trans-Caspian transport of oil by tankers, and gas possibly by CNG tankers to help Kazakhstan and Turkmenistan to export their oil and gas to the west |
| | | 500 kV North-South power transmission line in Tajikistan and its continuation till Datka 500 kV substation in Kyrgyz Republic./Kambarata HPP site/Kemin 500 kV Substation | Construction of Caspian Littoral Gas pipeline and modernizing Central Asia Center III gas pipeline. | A possible pipeline from Kazakhstan through Turkmenistan and Iran to a Persian Gulf port. |

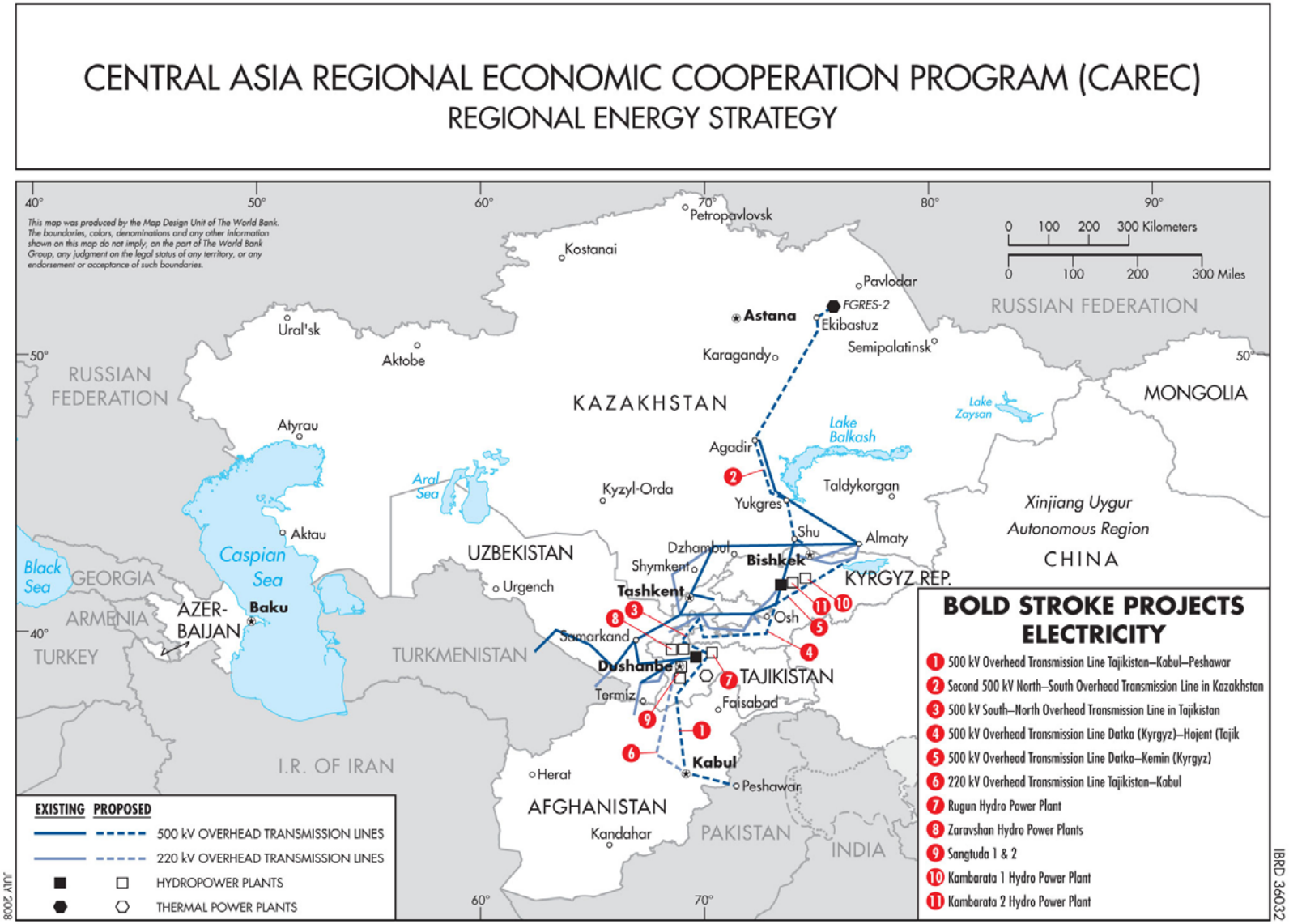
(List of some Prominent Projects)

Some of the prominent project proposals (referred to as Bold Strokes) and currently being pursued or considered are listed in first three columns in this Table. Two maps indicating the location of most of the prominent projects listed above are given in Appendix 4 and 5.

**Appendix 4** **CAREC Regional Energy Cooperation**



**Appendix 5** **CAREC Regional Energy Cooperation**



**Appendix 6**

## Illustrative List of Studies to be carried out

| No. | Study | Cost ($) | Outcome | Time frame |
|---|---|---|---|---|
| 1 | A study in each CAREC country on its potential for energy efficiency improvements and energy conservation. | 6,000,000 | Identification of the opportunities for energy efficiency and energy conservation, policies, institutions, market framework and projects needed to promote them | To be completed in the short term |
| 2 | Study Mongolia's potential as an energy transit country. | 300,000 | Promotion of energy trade between Russia and China and also possibly Korean peninsula | Study to be completed in the short term |
| 3 | Study of options to Mongolia to access Kazakh or other Central Asian gas (via China or Via Russia) | 300,000 | Promotion of energy trade between Kazakhstan and Mongolia | Study completion in the short term |
| 4 | Study of possible Mongolian imports of oil products and LPG from Kazakhstan | 300,000 | Promotion of energy trade between Kazakhstan and Mongolia | Study completion in the short term |
| 5 | A study on potential cooperation and involvement of international expertise in developing Mongolia's capacity for oil, gas and coal refining: | 500,000 | Development of Mongolia's capacity for oil, gas and coal refining | Study completion in the mid-term |
| 6 | Study of the potential of the Xinjiang province to emerge as a major energy transit province. | 250,000 | A detailed knowledge (of the energy potential, status and outlook (demand and supply) and its links to the east) of this province will promote further trade between Central Asia and China | Study to be completed in the short term |
| 7 | A study of China's role as a major investor in the energy resource development of Central Asia and as the market for Central Asian energy exports. | 350,000 | The Study will enable Central Asia to make effective use of the potential of China in this regard. | Study completion by 2008 |
| 8 | Study of the options for the export of Kazakh hydrocarbons to the west, east and the south. | 500,000 | Diversification of export markets | Short term |
| 9 | A study of options for the movement of primary energy commodities in the CAREC region | 500,000 | Diversification of export markets | Short term |
| 10 | A study for the possible import of gas from Afghanistan into | 500,000 | Gas trade between Tajikistan and Afghanistan | Short term |

| | | | | |
|---|---|---|---|---|
| | Tajikistan including a feasibility for a gas pipeline | | | |
| 11 | A study of power imports from Iran to the Farah province of Afghanistan (220 kV line). | 200,000 | Increase the volume of power trade between AFG and Tajikistan | Short term |
| 12 | A pre-feasibility study for the possible establishment of large-scale solar power plants in Mongolia. | 250,000 | Promotion of alternative energy | Short term |
| 13 | A pre-feasibility study for utilization of solar collector for the nomadic community in Mongolia. | 100,000 | Promotion of alternative energy | Short term |
| 14 | Economic feasibility of the transportation of Liquid Petroleum Gas (LPG) and Compressed Natural gas (CNG) from Kazakhstan and other Central Asian countries to Azerbaijan for further transportation to countries in the west. | 500,000 | Promotion of trade in LPG and CNG | Short to medium term |
| 15 | A study of the interconnection of Central Asian power system and Azerbaijani power system across the Caspian Sea through submarine cables. | 300,000 | Promotion of electricity exports and integration of the Central Asian Power system with that of Europe via the Caucasus energy corridor | Short term |
| | Total | 10,850,000 | | |

## Appendix 7

| Regional Energy Cooperation among CAREC Countries | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| List of Investment Projects (Amounts in US$ million) | | | | | | | | | | | |
| **No.** | **Investment Proposal** | **Capital Cost** | **Source of Financing** | | | **Phasing of Investments** | | | **Outcome** | **Progress Indicator** | **Remarks** |
| | | | Self Financing | IFI Financing | Other Sources | Investments 2008-2009 (Short Term) | Investments 2010-2014 (Medium Term) | Investments 2015-2027 (Long Term) | | | |
| | **Afghanistan** | | | | | | | | | | |
| | Electricity | | | | | | | | | | |
| 1 | Transmission and distribution rehabilitation in Afghanistan to enable the country to absorb the imported power from Iran, Turkmenistan, Uzbekistan and Tajikistan and distribute it to load centers. Cost: $ 700 m for the North East Power Transmission System only. Funded entirely by donors. Distribution segment will cost equal amount or more. One estimate places it at about $1.0 billion | 1,700.0 | 340.0 | 680.0 | 680.0 | 200.0 | 800.0 | 700.0 | Reducing domestic electricity shortages. In 2004 supply was 215 MW or 59% of the demand (which may have been underestimated). | Increase in the volume of electricity imported and absorbed. In 2006 imports were 414 GWh (or 35.1% of total supply) | Other Sources would be mostly bilateral donors. NEPS and some distribution rehab partly funded already |
| | Gas | | | | | | | | | | |
| 2 | Provide safe transit facilities for the Turkmenistan-Afghanistan-Pakistan gas pipeline and for the CASAREM power transmission line | | | | | | | | Income from transit fees and transmission charges | The amount of such fees and charges earned. Present Transit Income: zero | |
| | **Total for Afghanistan** | 1,700.0 | 340.0 | 680.0 | 680.0 | 200.0 | 800.0 | 700.0 | | | |

**Note:** The information in this list has been gathered from many sources. The list is indicative or illustrative and is not exhaustive or authoritative. The inclusion of any project in this list does not necessarily imply that the relevant governments have approved them or committed to them in any way.

| | **Azerbaijan** | **Capital** | **Self** | **IFI** | Other | 2008-09 | 2010-14 | 2015-27 | Outcome | Progress | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Gas | **cost** | **financing** | **financing** | sources | Short-term | Medium-term | Long-term | | Indicator | |
| 3 | Rehab of the T&D system in the gas sector (Capital cost $669 m) as well as gas flaring reduction (Capital cost $60 m) | 729.0 | 219.0 | 255.0 | 255.0 | 100.0 | 629.0 | 0.0 | Restoration of the design capacity of the T&D system and reduction of air pollution | Volume of gas saved. Present flaring is 0.3 BCM of gas. Gas losses are of the order of 20% compared to a norm of 1% to 2% | Other sources would include commercial sources. |
| | Oil | | | | | | | | | | |
| 4 | Study for improving the economics of BTC oil pipeline and BTE (gas pipeline by allowing the export of Kazakh and Turkmenistan oil and gas through these lines. Cost: $300,000 | 0.3 | 0.3 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | Facilitating the market diversification for Kazakh and Turkmen energy exports | Maintenance of the optimal level of flow of oil and gas over the lifetime of the pipelines. | Study may be funded by the Consortium owning BTC and BTE |
| | Electricity | | | | | | | | | | |
| 5 | Construction of a set of 500 kV. 330 kV, 220 kV and 110 kV transmission lines and substations to improve the transmission capacity of the interconnection of the Azeri power system with those of Russia, Georgia, and Iran to enable larger power flows among these systems. Capital cost of transmission investments including the above is $231.7 million | 232.0 | 70.0 | 81.0 | 81.0 | 100.0 | 132.0 | 0.0 | Evolution of a power market cluster around Azerbaijan and to enable power flows from Azerbaijan to Turkey via Georgia | Volume of electricity exchanged within the cluster. Present volume of exchange: 2004: Imports 2.4 TWh Exports 1.0 TWh. 2006: Imports: 1.76 TWh. Exports 1.0 TWh | Other sources would include commercial sources. |
| | **Total for Azerbaijan** | 961.3 | 289.3 | 336.0 | 336.0 | 200.3 | 761.0 | 0.0 | | | |

| | **Kazakhstan** | **Capital** | **Self** | **IFI** | Other | 2008-09 | 2010-14 | 2015-27 | Outcome | Progress | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | oil | **cost** | **financing** | **financing** | sources | Short-term | Medium-term | Long-term | | Indicator | |
| 6 | Completion of the 778 km long 813 mm diameter oil pipeline section from Kenkiyak to Kumkol, to enable the full intended level (20 million tons/year) of exports of Kazakh oil to China. Capital cost: 112 billion Tenge or $983million | 983.0 | 490.0 | 0.0 | 493.0 | 490.o | 493.0 | 0.0 | Increase Kazakh oil exports to China | Volume of oil exported every year. Export in 2006 was about 2.2 million tons. In the medium term export of oil will rise to 10-15 million tons/year) | 10 year loan from commercial sources with a grace period of 3.5 years. Guarantee of the loan by China is envisaged for 4.5 years. |
| 7 | (a) Capacity expansion of CPC oil pipeline to Novorossiysk from 28 to 67 million tons/year including Kazakh oil of 50 million tons/year. Capital cost $2.6 billion; and (b) Capacity expansion of Atyrau-Samara oil pipeline to 15 million tons/year. Capital cost $ 187.3 million. | 2,787.0 | 1,500.0 | 0.0 | 1,287.0 | 1,500.0 | 1,287.0 | 0.0 | Increase Kazakh oil exports through this line. | Volume of incremental flow through this pipeline every year. Present flow 24.4 million tons/year. (In the medium term the additional flow is expected to reach 40-60 million tons/year) | Other sources would include commercial sources. |
| 8. | Kazakhstan Caspian Transportation System (KCTS) to export oil from Tengiz, Kashagan, and Karachaganak fields westwards. Involves 729 km long oil pipeline from Eskene to Kuryk (23 million tons per year) Oil terminal at Kuryk and further transport of oil by oil-tankers to the BTC pipeline in Azerbaijan. Pipeline cost ($ 1.3 billion. Oil terminal cost $500 to $600 million. Unspecified number of oil tankers at $ 70 m to $80m each | 2,200.0 | 1,100.0 | 0.0 | 1,100.0 | 1,100.0 | 1,100.0 | 0.0 | Increase in Kazakh oil exports westwards | Volume oil thus exported per year | Expected to be operational by 2012 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Gas | | | | | | | | | | |

| | **Kazakhstan (continued)** | **Capital** | **Self** | **IFI** | Other | 2008-09 | 2010-14 | 2015-27 | Outcome | Progress | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **cost** | **financing** | **financing** | sources | Short-term | Medium-term | Long-term | | Indicator | |
| 9 | A feasibility study for a gas pipeline from Kazakhstan to China to transport 30 BCM /year of gas to be carried out jointly by KazMunayGaz and CNPC | | | | | | | | Diversification of gas export markets | Completion of the study and start of construction | First phase to transport 10 BCM will be ready by 2009/2010 |
| 10 | Kazakh/China gas pipeline from West Kazakhstan to the South and then to China. This will also carry Turkmen gas. Capital cost: | | | | | | | | Supply of gas to South Kazakhstan and export to China. Also transit for Turkmen gas | About 30 BCM/year of gas is expected to flow | |
| 11 | Rehabilitation and upgrade of the gas transmission system in Kazakhstan by KazRosGaz to improve gas transmission and to increase exports north (to Russia). | | | | | | | | Increase in the transmission capacity | Volume of such increase | |
| 12 | Caspian Littoral Gas Pipeline 1000 km long running along the existing Central Asia Center IV pipeline from Turkmenistan to Russia via Uzbekistan and Kazakhstan. Capital cost: $ 1.0 billion to be built by a consortium and operated by Gazprom | 1,000.0 | 0.0 | 0.0 | 1,000.0 | 300.0 | 700.0 | 0.0 | To increase the gas transmission capacity from these countries to Russia by 10 BCM/year. | Actual increase in volume through this pipeline. | Costs to be met by the Consortium including Gazprom |
| 13 | Modernizing Central Asia Center III gas pipeline from Uzbekistan to Russia via Kazakhstan | | | | | | | | To expand gas transmission capacity from the present 45 BCM to 65 BCM/year | Actual increases in export to Russia passing through the line | |
| | Electricity | | | | | | | | | | |

| | **Kazakhstan (continued)** | **Capital** | **Self** | **IFI** | Other | 2008-09 | 2010-14 | 2015-27 | Outcome | Progress | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | electricity | **cost** | **financing** | **financing** | sources | Short-term | Medium-term | Long-term | | Indicator | |
| 14 | Construction of the second North-South 500 kV power transmission line (1,115 km long) in Kazakhstan to enable 600 MW of power to move from north to south Kazakhstan | 347.0 | 25.0 | 268.0 | 54.0 | 200.0 | 147.0 | 0.0 | Increase power flows north-south within Kazakhstan, also enabling possible export of Kazakh thermal power to CASAREM | Volume of such increased energy flows through this line. | |
| 15 | A project on the border river (Khorgos River) involving the construction of a series of dykes with flood control and irrigation benefits and with a cascade of small HPPs totaling 21 MW. All benefits to be shared equally between Kazakh and Chinese sides. | 21.0 | 10.5 | 0.0 | 10.5 | 21.0 | 0.0 | 0.0 | Flood control, irrigation and power benefits to both sides through joint exploitation of the border river | Completion of the project and actual volumes of benefits derived | China is believed to be funding $10.5 m |
| 16 | Construction of a 300 MW Moinak HPP on Charyn River in South Kazakhstan by a Kazakh-Chinese Joint Venture with a credit of $200 million provided by China. Scheduled for completion in 2009 and output will reduce power deficit in South Kazakhstan. | 310.0 | 110.0 | 0.0 | 200.0 | 150.0 | 160.0 | 0.0 | Reduction in the power deficits in south Kazakhstan | Electricity generated and supplied to the *southern* system | |
| | **Total for Kazakhstan** | 7,648.0, | 3,235.5 | 268.0 | 4,144.5 | 3,761.0 | 3,887.0 | 00 | | | |

| | **Kyrgyz Republic** | **Capital** | **Self** | **IFI** | Other | 2008-09 | 2010-14 | 2015-27 | Outcome | Progress | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Electricity | **cost** | **financing** | **financing** | sources | Short-term | Medium-term | Long-term | | Indicator | |
| 17 | Transmission and distribution rehabilitation in the power sector. | 250.0 | 0.0 | 50.0 | 200.0 | 50.0 | 200.0 | 0.0 | Better financial viability of the supply entities, Reduction of T& D losses | Percentages of loss reduction. Loss level in power: 42%and loss level in Gas: 12% in 2006 | Distribution Rehabilitation is likely to be funded by investors upon the privatization of the four distribution companies |
| 18 | Kyrgyz Link to CASAREM line: Rehabilitation of 140 km of 220 kV line between Alai S/S and Aigul Tash S/S, construction of a new 207 km long 220 kV line between Alai and Datka where a new 500/220 kV substation would be constructed | 83.3 | 0.0 | 83.3 | 0.0 | 25.3 | 58.0 | 0.0 | This will enable direct flow of electricity in both directions between Kyrgyzstan and Tajikistan. Thus Kyrgyz could export power to Tajikistan and then on to CASAREM project. Tajikistan can export power northwards to Kyrgyzstan and Kazakhstan and Russia | Volume of power flowing through this line | It is to be constructed as a component of CASAREM project |

| | **Kyrgyz Republic (continued)** | **Capital** | **Self** | **IFI** | Other | 2008-09 | 2010-14 | 2015-27 | Outcome | Progress | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Electricity | **cost** | **financing** | **financing** | sources | Short-term | Medium-term | Long-term | | Indicator | |
| 19 | Construction of 400 km long 500 kV transmission line from Kemin (northern border) to Datka (Capital cost $210 million) and a 350 km long 500 kV line from Datka to Khodjent (Tajikistan) at a cost of $170 million. | 380.0 | 38.0 | 200.0 | 142.0 | 0.0 | 270.0 | 110.0 | Enables (a) increased direct export of Kyrgyz power to Tajikistan and to CASAREM; (b) export of Kyrgyz power to Kazakhstan and Russia; and c) export Kazakh power to CASAREM through Kyrgyzstan in future. Also will enable export of power from Kambarata HPP I and II | Amount of power export from Northern Kazakhstan/Kyrgyz to the Northern Tajikistan and then on to CASAREM could be increased by 600-1000 MW | Completion may slip to 2015. Would be needed for increased exports of 4000 MW in CASAREM |
| 20 | Construction of Kambarata II HPP (360 MW) (1,100 GWh), along with associated 500 kV transmission line | 280.0 | 28.0 | 100.0 | 152.0 | 40.0 | 240.0 | 0.0 | Helps meet winter power deficits and increase summer exports | Volume electricity generated, consumed and exported | Other sources could be investors from Russia, Kazakhstan and elsewhere |
| 21 | Construction of Kambarata I HPP (1,900 MW storage) (5,100 GWh) with associated 500 kV transmission links to Kemin in Kyrgyzstan. Capital cost $1,940 million. | 1,940.0 | 200.0 | 200.0 | 1,540.0 | 0.0 | 200.0 | 1740.0 | Helps meet winter power deficits and increase summer exports | Volume electricity generated, consumed and exported | Other sources could be investors from Russia, Kazakhstan and elsewhere |

| | **Kyrgyz Republic (continued)** | **Capital** | **Self** | **IFI** | Other | 2008-09 | 2010-14 | 2015-27 | Outcome | Progress | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Electricity | **cost** | **financing** | **financing** | sources | Short-term | Medium-term | Long-term | | Indicator | |
| | Natural Gas | | | | | | | | | | |
| 22 | Transmission and distribution rehabilitation in the Natural Gas Sector. | 50.0 | 10.0 | 40.0 | 0.0 | 10.0 | 40.0 | 0.0 | Reduction of T&D losses | Losses at 12% in 2006 to be brought down to about 2% | |
| | **Total For Kyrgyz Republic** | 2,983.3 | 276.0 | 673.3 | 2,034.0 | 125.3 | 1,008.0 | 1,850.0 | | | |
| | **Mongolia** | | | | | | | | | | |
| | Electricity | | | | | | | | | | |
| 23 | Distribution rehabilitation and Power System loss reduction in Mongolia. | 34.5 | 6.2 | 23.4 | 4.9 | 7.0 | 27.5 | 0.0 | Helps to reduce power imports or supply more electricity to people | Percentage of loss reduction. Present losses are 20% (aux) and 25% (T&D) | |
| 24 | Interconnection of the three major grids in Mongolia | | | | | | | | To help in the evolution of the national grid and to become a better transit grid | Completion and operation of the interconnecte d system | |
| 25 | Feasibility Study for the construction of 3 x 3,600 MW coal fired thermal power plants along with (a) development of three coal mines each producing 12 million tons of coal per year, and (b) 500 kV DC lines to China | | | | | | | | For export of thermal power to China | Completion and acceptance of the study by Chinese and Mongolian governments | Study being carried out on the basis of the MOU (2005) between State Grid Corporation of China and the regional Electricity Transmission company of Mongolia |
| | Total Mongolia | 34.5 | 6.2 | 23.4 | 4.9 | 7.0 | 27.5 | 0.0 | | | |

| | **Tajikistan** | **Capital** | **Self** | **IFI** | Other | 2008-09 | 2010-14 | 2015-27 | Outcome | Progress | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Electricity and gas | **cost** | **financing** | **financing** | sources | Short-term | Medium-term | Long-term | | Indicator | |
| 26 | Loss reduction in power and gas sectors in Tajikistan. Capital cost: $62 million essentially only for metering program. WB and Swiss Government funding, Barki Tajik and Tajik Gas funding to the extent of $30 million arranged. Rest of the funds mainly for the power sector has to be arranged. For T&D loss reduction $300 m would be needed. | 362.0 | 36.0 | 163.0 | 163.0 | 100.0 | 262.0 | 0.0 | To augment domestic supplies and to improve the financial viability of the entities | Percentage of loss reduction. Present loss level in power:18% Loss level in gas: 19% | |
| | Electricity | | | | | | | | | | |
| 27 | Rehabilitation of Nurek HPP and its switch yard, Kairakum HPP, Golovnaya HPP, Varzob Cascade HPPs, to increase capacities by 550 MW (270-300 GWh) in Tajikistan. These have been funded partly by ADB, EBRD and some other financiers. | 400.0 | 40.0 | 260.0 | 100.0 | 200.0 | 200.0 | 0.0 | To augment domestic supplies and to increase exportable surplus | Volume of incremental generation | |
| 28 | Construction of Sangtuda I HPP (670 MW) (2,700 GWh). Estimated cost including the sunk cost is about $700 million. RAO UES is the majority share holder of the company implementing the project | 700.0 | 200.0 | 0.0 | 500.0 | 700.0 | 0.0 | 0.0 | To augment domestic supplies during winter and to increase exportable surplus in summer | Volume of incremental generation | Other sources are Russian investor (RAO UES) and financiers. Its output will provide the initial export to CASAREM |
| 29 | Sangtuda II HPP (220 MW) (930 GWh). Capital cost $200 million. Investment will be from Iranian government through a Tajik-Iranian JV. Iranian credit amount is $180 million. | 200.0 | 20.0 | 0.0 | 180.0 | 50.0 | 150.0 | 0.0 | To augment domestic supplies and to increase exportable surplus | Volume of incremental generation | Other source is the Iranian Credit |

| | **Tajikistan (continued)** | **Capital** | **Self** | **IFI** | Other | 2008-09 | 2010-14 | 2015-27 | Outcome | Progress | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Electricity | **cost** | **financing** | **financing** | sources | Short-term | Medium-term | Long-term | | Indicator | |
| 30 | Rogun Storage hydro (3,600 MW) (13,000 GWh). Incremental capital cost for completing the project: $2,450 million. | 2,450.0 | 250.0 | 250.0 | 1,950.0 | 0.0 | 250.0 | 2,200.0 | To augment winter domestic supplies and to increase exportable surplus rear round | Volume of incremental generation | Ignores sunk cost incurred so far. Other sources could be investors from Russia, Kazakhstan, China and elsewhere. |
| 31 | Tajikistan North-South 500 kV transmission line (350 km long) and associated substations. Power transfer capacity 600 to 800 MW. | 281.0 | 19.0 | 0.0 | 262.0 | 200.0 | 81.0 | 0.0 | Enables direct flow of Tajik power from South to North and the direct flow of Kyrgyz and Kazakh power north-south for CASAREM | Volume of power flowing through the line | Chinese Export credit ($261.7 million) has been provided. 25 year maturity and interest rate and other charges of 2.4% per year. Completion by 2009/2010 |
| 32 | 220 kV double circuit transmission line from Sangtuda I HPP to Puli Kumri-a section to Afghanistan border (about 110 miles) to enable 300 MW of export to Afghanistan. | 33.0 | 3.0 | 22.0 | 8.0 | 33.0 | 0.0 | 0.0 | Export of Tajik power to Afghanistan | Volume of export through the line | ADB has already approved a loan covering this line and its continuation into Afghan territory up to Phul-e-Kumri. |
| 33 | CASAREM transmission line (750 km long) from Sangtuda I HPP area in Tajikistan to Peshawar in Pakistan via Afghanistan. 450 kV HVDC line | 526.0 | 0.0 | 526.0 | 0.0 | 26.0 | 500.0 | 0.0 | Export of 1000 MW of power from Central Asia to South Asia initially and expanding to 4000 MW in the later stages. | Volume of power flowing through the line | IFI financing is expected from World Bank, ADB, IsDB. The AC transmission link to Kyrgyz Republic is given under that country. |

| | **Tajikistan (continued)** | **Capital** | **Self** | **IFI** | Other | 2008-09 | 2010-14 | 2015-27 | Outcome | Progress | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Electricity | **cost** | **financing** | **financing** | sources | Short-term | Medium-term | Long-term | | Indicator | |
| 34 | Yavan HPP on Zarafshan river (150 MW) (540 GWh) including 60 km of associated 220 kV transmission lines Construction during 2008-2011 | 260.5 | 60.5 | 0.0 | 200.0 | 50.0 | 210.5 | 0.0 | Annual output 537 GWh (of which only 119 GWh will be during the low flow season October to April) will increase domestic supply freeing additional quantities for export. | Volume of incremental generation | Construction by Sinohydro Corporation with a concessional Chinese credit of $200 million with a maturity of 25 years. Possible water issues. The financier may be looking for alternative project, |
| | **Integrated development of a coal mine and a thermal power plant** | | | | | | | | | | |
| 35 | Development of a captive coal mine at Fon Yagnob and construction of a coal fired power plant (1000 MW) (6000 GWh) in Tajikistan. About 30% of its output will go to meet the winter demand in Tajikistan and the remaining 70% will be exported as a part of the CASAREM project. Capital cost for power plant alone would be about $1,100/kW. Mine development costs would be additional. | 1,600.0 | 100.0 | 500.0 | 1,000.0 | 100.0 | 1,500.0 | 0.0 | Will meet winter demand in Tajikistan and enable exports year round | Volume of incremental generation | Other sources will be the private investors to be selected for the project |
| | **Total for Tajikistan** | 6,812.5 | 728.5 | 1,721.0 | 4,363.0 | 1,459.0 | 3,153.5 | 2,200.0 | | | |

| | **Uzbekistan** | **Capital** | **Self** | **IFI** | Other | 2008-09 | 2010-14 | 2015-27 | Outcome | Progress | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Electricity and gas | **cost** | **financing** | **financing** | sources | Short-term | Medium-term | Long-term | | Indicator | |
| 36 | Construction of 220 km of 500 kV transmission line from Syrdarya TPP to Sogdiana Sub Station. Construction started in 2007. | 67.9 | 42.8 | 25.1 | 0.0 | 67.9 | 0.0 | 0.0 | This will reduce losses and relieve transmission constraints in the Uzbek power system. It will also enable it to export 300 MW of power to Afghanistan. | Incremental power flows in this part of the grid. | Completion may slip to 2009. IFI financing is from IsDB |
| 37 | Construction of 217 km of 500 kV transmission line from Sogdiana SS to Talimardjan TPP. | 95.0 | 25.0 | 70.0 | 0.0 | 0.0 | 95.0 | 0.0 | Same as above | Incremental power flows in this part of the grid. | IsDB financing is considered. |
| 38 | Construction of a 190 km long 500 kV line along with associated substation expansions from Surhan 500 kV substation to Guzar 500 kV substation. | 109.0 | 34.0 | 75.0 | 0.0 | 51.5 | 57.5 | 0.0 | Same as above | Incremental power flows in this part of the grid. | IsDB financing ($25m) and Saudi Fund financing ($50m) is envisaged |
| | Gas | | | | | | | | | | |
| 39 | Gas transit to China through a 530 km long gas pipeline (Uzbek section) from Turkmenistan to China to transport 30 BCM of gas /year for 25 years . | | | | | | | | Earning of transit revenues | Amount of earnings from transit | . |
| | Gas | | | | | | | | | | |
| 40 | Pipeline reinforcements in Uzbekistan to augment the transport capacity of (a) Bukhara-Ural gas pipeline and (b) Central Asia Center gas pipeline to Russia and (c) expansion of compressor station No.5 at Ghazli. | 214.0 | 100.0 | 0.0 | 114.0 | 100.0 | 114.0 | 0.0 | Increase gas exports capacity to Russia from 5 to 6 BCM/year to 16 BCM/year | Increase in export volume | |
| | **Total for Uzbekistan** | 485.9 | 201.8 | 170.1 | 114.0 | 219.4 | 266.5 | 0.0 | | | |
| | **Total for all seven countries** | **20,625.5** | **5,077.3** | **3,871.8** | **11,676.4** | **5,972.0** | **9,903.5** | **4,750.0** | | | |

**Memo Item**:

## Items relating to China

| No. | Item | Included under |
|---|---|---|
| 1. | Kenkiyak-Kumkol Oil pipeline in Kazakhstan | Kazakhstan |
| 2. | Kazakhstan to China 30 BCM gas pipeline feasibility study | Kazakhstan |
| 3. | Kazakhstan to China 30 BCM gas pipeline project | Kazakhstan |
| 4. | 21 MW hydro cascade on the Khorgos river on the China-Kazakhstan border | Kazakhstan |
| 5. | 300 MW Moinak Hydropower project in Kazakhstan | Kazakhstan |
| | | |
| 6. | Three large coal mines and 3 x 3600 thermal power stations in Mongolia and associated 500 kV DC lines to China: Feasibility study | Mongolia |
| 7. | 350 km long North-South power transmission line in Tajikistan | Tajikistan |
| 8. | 150 MW Yavan Hydropower project on Zarafshan river in Tajikistan | Tajikistan |
| 9. | Uzbekistan-China 30 BCM gas pipe line for the transit of Turkmen Gas to China | Uzbekistan |

**Appendix 8 Key International Agreements and Programs relevant to energy and transboundary river cooperation and respective membership of CAREC countries.**

**Bilateral Investment Agreements Among CAREC countries**

| | Afghanistan | Azerbaijan | China | Kazakhstan | Kyrgyzstan | Mongolia |
|---|---|---|---|---|---|---|
| **Afghanistan** | | | | | | |
| **Azerbaijan** | | | April 1, 1995 | Sep 16, 1996 (signature) | | |
| **China** | | | | | | |
| **Kazakhstan** | | | Aug 13, 1994 | | | |
| **Kyrgyzstan** | | Aug 28, 1997 | Sep 8, 1995 | April 8, 1997 (signature) | | Dec 5, 1999 |
| **Mongolia** | | | Nov 1, 1993 | May 3, 1995 | | |
| **Tajikistan** | | | Jan 20, 1994 | Nov 20, 2001 | Jan 19, 2000 | |
| **Uzbekistan** | | Nov 2, 1996 | Apr 12, 1994 | Sep 8, 1997 | Feb 6, 1997 | |

Note: all dates refer to entry into force unless indicated otherwise
Source: United Nations Conference on Trade and Development (UNCTAD)

**Status of membership of CAREC countries in multilateral instruments for disputes resolution and investment guarantees**

| | Afghanistan | Azerbaijan | China | Kazakhstan | Kyrgyzstan | Mongolia | Tajikistan | Uzbekistan |
|---|---|---|---|---|---|---|---|---|
| United Nations Convention on the Recognition and Enforcement of Foreign Arbitral Awards (New York Convention) entered into force on June 7, 1959 | Feb 29, 2005 | May. 29, 2000 | April 22, 1987 | 18 February 1996 | 18 March 1997 | Jan.22, 1995 | | 7 May 1996 |
| Convention on the Settlement of Investment Disputes between States and Nationals of Other States entered into force on October 14, 1966 | Jul 25, 1966 | Oct 18, 1992 | Feb 6, 1993 | 21 October 2000 | *9 June 1995 - Signature* | Jul 14, 1991 | | 25 August 1995 |
| MIGA (Multilateral Investment Guarantee Agency) | Member | Member | Member | Member | Member | Member | Member | Member |

**Appendix 8 (continued) Key International Agreements and Programs relevant to energy and transboundary river cooperation and respective membership of CAREC countries**

| Conventions and Rules | Protocols | Afghanistan | Azerbaijan | China | Kazakhstan | Kyrgyzstan | Mongolia | Tajikistan | Uzbekistan |
|---|---|---|---|---|---|---|---|---|---|
| UN ECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes | Convention itself entered into force on October 6, 1996 | | August 3, 2000 | | 11 January 2001 | | | | August 9, 2007 |
| | Protocol on Water and Health entered into force on August 4, 2005 | | January 9, 2003 | | | | | | |
| | Protocol on Civil Liability. Not yet entered into force | | | | | | | | |
| UN Convention on the Law of the Non-navigational Uses of Watercourses | Adopted by UN General Assembly on May 21, 1997. Not yet entered into force | | | | | | | | August 9, 2007 |
| Helsinki Rules on the Use of Waters of International Rivers, approved by the International Law Association in 1966 | | | | | | | | | |
| Energy Charter | Energy Charter Treaty entered into force in April 1998 | Dec.7, 2007[7] | Dec.17, 1997 | Obser ver | 6 August 1996 | 7 July 1997 | member | 25 June 1997 | 12 March 1996 |
| | Protocol on Energy Efficiency and Related Environmental Aspects entered into force in April 1998 | | | | 6 August 1996 | 7 July 1997 | | 25 June 1997 | 12 March 1996 |
| | Amendment to the Trade-Related Provisions of the Energy Charter Treaty (April 1998) | | | | | | | | |

**Note:** An international convention comes into force, when it is ratified by a certain number of the states among the members of the body which approved the convention. The resolution approving the convention usually stipulates the number of member-states who need to ratify it to enable it to come into force

[7] Date of the Energy Charter Conference's approval of Afghanistan's request for admission to the Energy Charter Treaty. The dates for the other countries indicate the date of deposition of membership ratification instruments.