



Reference Document
For Session 1 of the Senior Officials' Meeting
June 2017

Energy Sector Progress Report and Work Plan (August 2016–May 2017)

**Senior Officials' Meeting
Central Asia Regional Economic Cooperation
20–21 June 2017
Tbilisi, Georgia**

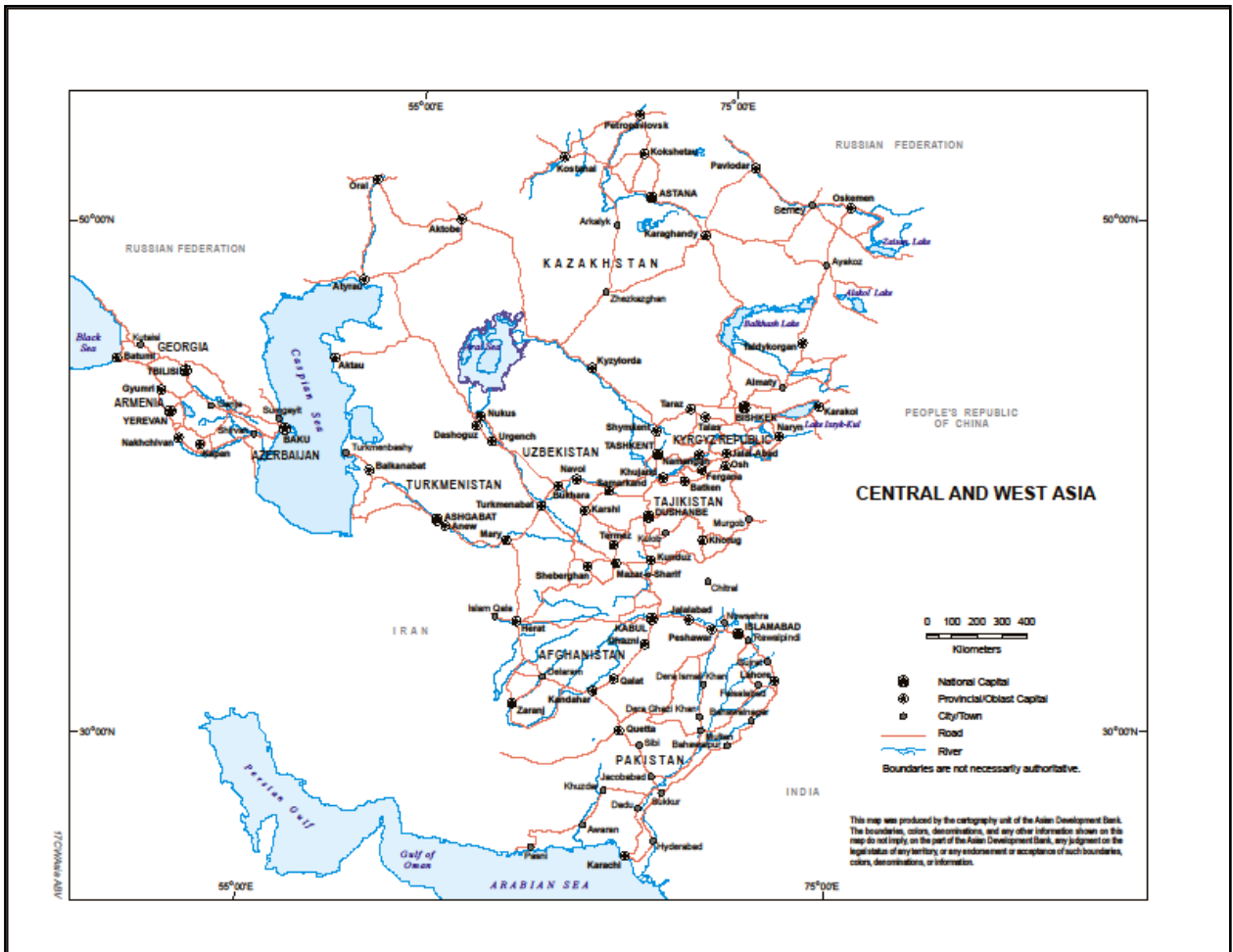


Figure 1: Central and West Asia Map

List of Acronyms

ADB	–	Asian Development Bank
AFG	–	Afghanistan
CAREC	–	Central Asia Regional Economic Cooperation Program
CASA	–	Central Asia South Asia
CASAREM	–	Central Asia-South Asia Regional Electricity Market
CDM	–	Clean Development Mechanism
DC	–	direct current
ESCC	–	Energy Sector Coordinating Committee
EUR	–	Euro
EWP	–	Energy Work Plan
GCF	–	Green Climate Fund
GGGI	–	Global Green Growth Initiative
GHG	–	greenhouse gas
GSPA	–	gas sales and purchase agreement
KAZ	–	Kazakhstan
KM	–	Kilometer
kV	–	Kilovolts
KYR	–	Kyrgyz Republic
MC	–	Ministerial Conference
MTPP	–	Medium-Term Priority Projects
MVA	–	megavolt amperes
MW	–	Megawatt
MWh	–	megawatt per hour
PPP	–	public-private-partnership
PVC	–	crystalline photovoltaic cells
RDF	–	Uzbek Reconstruction and Redevelopment Fund
RECA	–	Regional Cooperation in Central and South Asia
RESET	–	Regional Energy Security, Efficiency and Trade
RPMP	–	Regional Power Master Plan
SDC	–	Swiss Agency for Development and Cooperation
SOM	–	Senior Officials' Meeting
SPCC	–	special purpose consortium company
TA	–	technical assistance
TAJ	–	Tajikistan
TAPI	–	Turkmenistan-Afghanistan-Pakistan-India
TASA	–	Transaction Advisory Services Agreement
TPCL	–	TAPI Company Limited
TPP	–	thermal power plant
TUTAP	–	Turkmenistan-Uzbekistan-Tajikistan-Afghanistan-Pakistan
UNDP	–	United Nations Development Programme
UNECE	–	United Nations Economic Commission in Europe

UNESCAP	–	United Nations Economic and Social Commission for Asia and the Pacific
UNRCCA	–	United Nation's Regional Center for Preventive Diplomacy for Central Asia
US	–	United States
USAID	–	United States Agency for International Development
UZB	–	Uzbekistan
WBI	–	World Bank Institute

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I. EXECUTIVE SUMMARY

1. The Central Asia Regional Economic Cooperation (CAREC) Program member countries are committed to a shared vision for the region's energy sector. This vision will enable all member countries to have access to adequate volumes of reliable, affordable, financially sustainable, and environmentally sound commercial energy. It requires the implementation of consistent policies to ensure (i) energy security through balanced development of the region's energy resources, infrastructure, and institutions; (ii) stronger integration of the region's energy markets; and (iii) economic growth through energy trade. Within this framework, the Strategy and Work Plan (2016–2020) for Regional Cooperation in the Energy Sector of CAREC Countries, among other activities, aims to promote new technologies and remove market barriers for their adoption in the region.

2. On 19 May 2017, a new agreement was finalized on Turkmenistan-Afghanistan-Pakistan (TAP) Power Interconnection Project, and countries have agreed to sign a joint ministerial statement and project framework and to initiate project preparatory work. The project concept was earlier endorsed by the three heads of governments in December 2015. TAP would complement the existing TUTAP and CASA power interconnections under the Central Asia South Asia Regional Energy Markets framework.

3. While significant progresses been on the traditional cross-border connectivity projects, in 2017, the CAREC energy sector cooperation also widened its efforts to move beyond the traditional definition of regional cooperation and included establish of common markets for energy, especially for new technology.

4. The support for new technology came in several fronts—training and capacity building to pilot projects to increase the technology credibility to counter the inherent challenge that the CAREC countries are slow in adopting new technologies because of both supply and demand constraints. On the supply side, the first energy investment forum encouraged the suppliers of new technologies to the CAREC countries as a single market—although some of the countries individually are relatively poor and difficult to access, but collectively, it is a significant market once the suppliers can familiarize themselves with the countries. Similarly, several technical assistances will support on the demand side, develop technical capacity and understanding of the government officials and institutions. These will create and enabling environment for policies and regulations to support new technology adoption by all. Pilot projects, and pro-active use of social media will reduce the perceived risk, resistance from the incumbents, and the negative image created by substandard new technology products in the nascent market.

5. This progress report describes the CAREC activities undertaken in the energy sector from October 2016 to May 2017. The report covers CAREC activities since the October 2016 Senior Officials' Meeting (SOM) and 15th Ministerial Conference (MC) held in Islamabad, Pakistan.

6. From October 2016–May 2017, the Energy Sector Coordinating Committee (ESCC) has conducted the following activities:

- i. ESCC Updating Meeting, Islamabad, Pakistan;
- ii. CAREC 2016 Energy Investment Forum;
- iii. ESCC Updating Meeting, Melbourne, Australia;
- iv. Off-Grid Training in Melbourne, Australia;
- v. CAREC Knowledge Sharing on ICT for Energy Training in Seoul, Korea; and
- vi. ESCC Meeting, Dushanbe, Tajikistan.

7. Recent developments from existing energy projects to enhance regional energy market and economic diversification were also covered in this report. Aside from regional power and gas transmission connectivity projects (*para. 18–37*), two ADB financed regional technical assistance projects and other new proposals for technical assistances were also discussed.

8. Under the guidance of the SOM, issues to be addressed in 2017 includes: (i) conduct of the CAREC 2017 Energy Investment Forum; (ii) endorsement of midterm review of ESCC 2016–2020 Work Plan; (iii) approve mainstreaming of energy efficiency in CAREC; and (iv) discussion for diversification of CAREC economies from fossil fuel dependency and stranded asset risks.

II. STRATEGY AND WORKPLAN (2016–2020) FRAMEWORK FOR CAREC-ESCC

9. The Strategy and Work Plan (2016–2020) for Regional Cooperation in the Energy Sector of CAREC Countries is an update to the 2008 Energy Strategy which was endorsed at the 7th Ministerial Conference on CAREC. The updated version contains accomplishments made by CAREC 2008, changes in the energy sectors of CAREC member countries, and current trends in the energy sector. The revised work plan widens the ESCC's vision from its traditional perspective enabling member countries to maximize from the benefits of new and emerging technologies to fast track development of the region.

A. Traditional Perspective

10. Overall sector goals for the region's energy sector are to ensure: (a) energy security through the balanced development of the region's energy resources, infrastructure, and institutions, (b) stronger integration of the region's energy markets to enable all physical and juridical persons has access to adequate volumes of commercial energy that is reliable, affordable, and financially sustainable.

11. **Figure 2** summarizes the strategic components and thematic priorities identified by the CAREC member countries which are consistent with the elements of the Energy Work Plan (EWP). Thematic priorities embody the long-term goal of the region to have developed and invested in priority projects, developed sustainable energy resources, developed capacity and knowledge on energy trade, clean energy, new technology and climate change. Meanwhile, the five elements play as support to the strategic components. These elements are: (i) developing Central Asia-South Asia corridor, (ii) promoting regional electricity trade and harmonization, (iii) managing energy-water linkages, (iv) mobilizing financing for priority projects, (v) capacity development/knowledge management, and (vi) promoting clean energy technologies. Elements 1 and 4 are backing-up the strategic components under investment measures; while Elements 3 and 5 are reinforcing capacity building and knowledge sharing; and Elements 2 and 6 are holding strategic component on policy support.

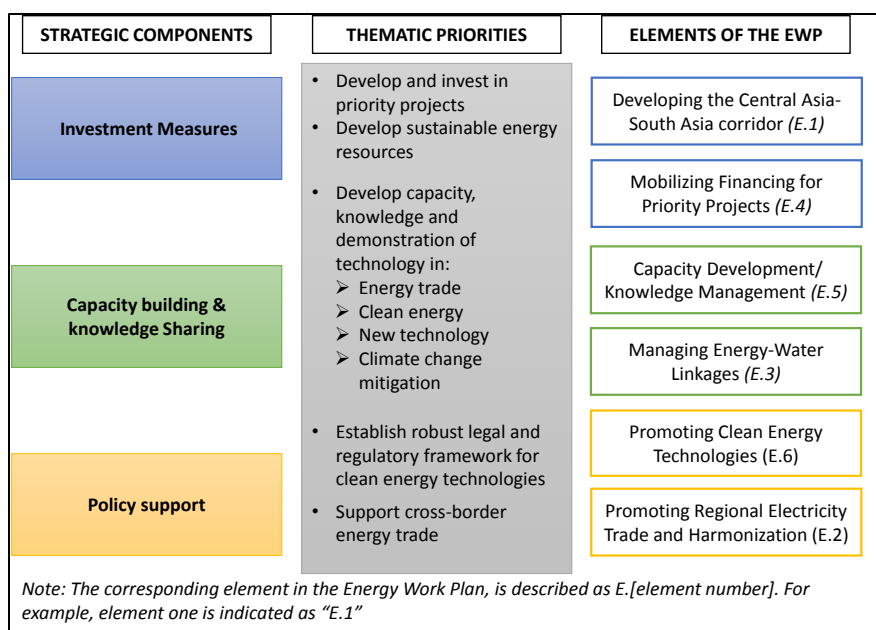


Figure 2: Strategic Components, Thematic Priorities and EWP Elements

B. Future Perspective

12. Globally, the electricity sector is in middle of a new technology led dramatic change. Many countries are experiencing zero or negative growth, and an overall slowdown of power generation from existing fossil fuel plants. Wider use of super-efficient appliances, and increasing use of renewable energy, especially solar, is driving these changes. These trends started in the developed countries over the last ten years, and soon, the developing counties will face the same changes. For CAREC countries, where assets are old, the impact will be even severe.

13. Technological changes, especially the cheaper renewable energy and long-life batteries, are diluting the natural monopoly elements of the power sector. With a consumer's ability to generate power and avoid a grid connection is introducing the risk of stranded assets—risk that a power asset may not be needed as demand falls and some consumers may start to move to off-grid

14. In the years, beyond 2020, policy makers and investors in public assets must ensure that their investment involves the right technology—individual investment choices and fiscal incentives—that increases public goods and increase shareholders' value. Currently policy makers in the CAREC region, in many cases, lack the skills, knowledge of the technology choices to understand their medium to long term impact. The ADB's CAREC energy vision for 2020 and beyond must find ways to bring in the new technology aspect in all investment decisions. The decision is analogous to our everyday decision of buying the right mobile phone that will stay relevant for at-least three years while its physical construction is robust enough to give it more than 10 years of life.

III. KEY DEVELOPMENTS AND RESULTS

A. Sector Implementation

15. Achievements in the energy sector are measured through five indicators which are intended to capture the contribution of CAREC's physical infrastructure expansion and rehabilitation operations to contribute to energy security, energy efficiency, and the region's ability to enhance power trade as a result of completed projects. The indicators were initially identified in 2013, and were expected to be evaluated annually in the CAREC Development Effectiveness Review process. Data collections from all members remain a challenge and needs to be addressed. Also, revalidation of baselines and yearly targets should be conducted to ensure effective and efficient monitoring of implemented projects in the region.

16. Table 1 and Table 2 show the energy sector output indicator. For Table 1, the indicator on transmission lines installed or upgraded transmission lines showed a consistent increasing trend from 2013 to 2016. Energy generation capacity presented an average annual change of 5.1% from 2013–2016. Also, impressive growths can be seen on energy generation capacity with 8.9 % and new substations at 6.0%. However, dismal performance was observed on rehabilitated generation capacity and upgraded substations with negative growths of 22.9% and 39.88% respectively.

Table 1. Energy Sector Output Indicators from CAREC member countries from 2013-2017

Indicator	Unit	2013 Baseline	2014	2015	2016	2017 (as of Q1)	Average Annual Change from 2013- 2016 (in Percent)
Transmission lines installed or upgraded transmission lines	Km	550,898	581,043	617,291	645,428	1,697	5.1
Increased energy generation capacity	MW	98,874	112,537	135,438	132,156	5,482	8.9
Rehabilitated generation capacity	MW	662	1,901	1,789	785	225	(22.9)
New substations	MVA	196,665	243,152	224,047	241,762	870	6.0
Upgraded substations	MVA	2,098	13,274	6,235	3,265	206	(40.0)

*All figures are based on data received from AZE, GEO, KAZ, PAK, PRC, TKM and UZB as of 19 May 2017.

17. **Table 2** shows the new energy sector output indicators which capture the changes in the new technology sectors such as wind, solar, electric vehicle, LED and energy efficiency. Wind power, solar power and LED public lighting showed increased growth from 2013–2016. Solar power capacity and generation revealed the highest progress of 43.2% and 38.0% followed by wind power capacity and generation with 19.1% and 18.9% respectively. LED public lighting which was measured in terms of number of kilometers of road indicated a 65.85% growth. It should be noted that this is due to non-availability of baseline data. Also, the table shows that efforts are needed to improve energy efficiency in the region which bared a 10.9% growth.

Table 2. New Energy Sector Output Indicators from CAREC member countries (from 2014–2017)

Indicator	Unit	2014 Baseline	2015	2016	2017 (as of Q1)	Average Annual Change from 2014- 2016 (in Percent)	
Wind power installed	Capacity	MW net	96,635	131,221	148,942	121	19.1
	Generation	MWh	156,042,142	190,285,259	237,528,613	144,789	18.9
Solar power installed	Capacity	MW net	25,042	42,228	77,924	0.80	43.2
	Generation	MWh	23,475,006	40,888,052	61,463,512	0.79	38.0
Electric vehicle adoption	Nos. ¹	53,500	247,820	-	-	-	
LED public lighting ¹	Km of roads ¹	-	3,642	5,333	5,410	65.85	
	No. of units	-	-	-	-	-	
Energy Efficiency Savings	MWh	80,000	85,000	100,000	40,000	10.4	

* All figures are based on data received from AZE, GEO, KAZ, PAK, PRC, TKM and UZB as of 19 May 2017.

¹ Targets will not be set initially for these indicators. The ESCC will instead monitor progress against these indicators in the coming years and decide whether targets should be set in the future. Electronic vehicle adoption data came from PRC only.

(i) **Priority Actions, Progress and Challenges in the CAREC Program for the Energy**

Element 1. Developing Central Asia – South Asia Energy Corridor

i. Turkmenistan-Uzbekistan-Tajikistan-Afghanistan-Pakistan (TUTAP) Power Interconnection Framework

18. TUTAP comprises of a modular technology and is designed to be built in stages to meet evolving needs and facilitates integration of remote and diverse resources. The first phase (\$35 million) was approved by ADB in 2003 and commissioned in 2009 with an all year power interconnection (~330 MW maximum) between Afghanistan and Uzbekistan operational since February 2009. The power purchase and sales agreement (PPSA) is negotiated every December for the following year. In 2016, 1,500 GWh were imported from Uzbekistan into Afghanistan at approximately 8.5 cents/KWh. The cost of diesel generation in Afghanistan is estimated to be 35 cents/KWh. In 2016, nearly 30% of Uzbekistan power replaced diesel generator sets and 70% supplied to existing and incremental customers, cost savings from diesel replacement amounted to \$119.2 million ($\$0.35 - \$0.085 = \$0.265 \times 450\text{GWh}$) while revenue from existing and incremental customers is \$105 million ($\$0.10 \times 1050\text{GWh}$) in 2016. The total cost of this 220-kV line including portion in Uzbekistan through till Kabul in 2008 was \$95 million.

19. The second phase (\$47 million) was approved by ADB in 2007 and commissioned in 2011 with a 300–450 MW power interconnection between Afghanistan and Tajikistan. It is operational since October 2011 and energy trade volume is agreed and negotiated annually. Current Tajikistan export price is estimated at 4.8 USD cents per kilowatt hour. In 2016, nearly 50% of Tajikistan power (1360 GWh) replaced diesel generator sets and 50% supplied to existing and incremental customers, cost savings from diesel replacement only is \$212.1 million ($\$0.35 - \$0.038 = \$0.265 \times 680 \text{ GWh}$) while revenue from incremental customers is \$68 million ($\$0.10 \times 680 \text{ GWh}$) in 2016. The total cost of this line including a portion in Tajikistan and through Pule Khumri is estimated to be \$57.5 million.

20. The third phase (\$140 million) was approved by ADB in 2012 and is under implementation for a 300 MW power interconnection between Afghanistan and Turkmenistan. The line will have a capacity to transmit up to 1000 MW power. Construction of the 500-kV line and three substations in Afghanistan is ongoing since early 2016 while the Turkmenistan portion of the line was completed in mid-2016. The third phase is expected to be completed by 2019. A PPSA between both countries was signed in November 2015 for a ten-year power trade till 2028 from 5.6 USD cents in 2019 increasing up to 7.1 USD cents per kilowatt hour in 2028. As per signed PPA, Turkmenistan energy to Afghanistan will be up to 1,516 GWh in 2028 at 7.1 cents/KWh in 2028. Under a 20% power scenario, replaced generator sets savings will come up to \$84.5 million ($\$0.35 - 0.071 = \$0.279 \times 303 \text{ GWh}$) and 20% exported revenue are estimated at 30 million ($303 \text{ GWh} \times \$0.1 \text{ export tariff}$) plus some \$10 million transit fee; and 60% used in Afghanistan will give revenues of \$91 million ($909 \text{ GWh} \times 0.1 \text{ distribution tariff}$). Total per year revenues is estimated at \$215.5 million/year.

21. The fourth phase (\$200 million) was approved by ADB in December 2015 to extend the Afghanistan-Turkmenistan interconnection through 500-kV transmission interconnection until Pul-e-Khumri in north-east Afghanistan, where CASA-100 line from Tajikistan and Kyrgyz Republic meets TUTAP line. The contract for this phase is under procurement for award in July 2017.

22. The fifth phase (\$240 million) was approved by ADB in December 2016 to install a 500-MW high voltage direct current back to back convertor station at Pul-e-Khumri in northern Afghanistan. This convertor station will synchronize Turkmenistan power with Afghanistan power, thereby allowing Afghanistan to supply power through its unified grid to its eastern and southern provinces, including Kabul. In addition, it will enable complementarity with CASA infrastructure for future power exports to Pakistan and Tajikistan. The procurement for this phase is ongoing and contract award is expected by end 2017.

23. **Next Steps.** The World Bank will work to develop open access arrangements for CASA-1000. ADB will continue rehabilitating infrastructure in Tajikistan and Kyrgyzstan. The projects will enable the two countries to maintain the availability of power for export, which is critical for the CASA-1000 and TUTAP projects. Both the World Bank and ADB will continue to report on project updates in subsequent meetings of the ESCC.

ii. Turkmenistan-Afghanistan-Pakistan (TAP) Power Interconnection Project

24. The proposed Turkmenistan-Afghanistan-Pakistan (TAP) power interconnection project is also under discussion among the participating countries, with a potential capacity of 2000 MW. On 19 May 2017, a new agreement was finalized on Turkmenistan-Afghanistan-Pakistan (TAP) Power Interconnection Project, and countries have agreed to sign a joint ministerial statement and project framework and to initiate project preparatory work. The project concept was earlier endorsed by the 3 heads of governments in December 2015. TAP would complement the existing

TUTAP and CASA power interconnections under the Central Asia South Asia Regional Energy Markets framework.

25. The 19 May 2017 agreements were supported by more than year worth of discussions among the countries, as explained below.

- **13 December 2015.** The three heads of government signed a Memorandum of Understanding (MoU) (Attachment) at Mary, Turkmenistan, after discussing the broad project concept and willingness for trilateral energy trade;
- **March 2016.** The three governments confirmed ADB to facilitate the tripartite discussions on the Project framework;
- **11 April 2016.** The ADB organized an introductory meeting and the three Governments agreed that an options analysis and/or pre-feasibility study would investigate the (i) timing, (ii) cost, and (iii) technical parameters of various power interconnection routes and options including Pakistan's preference for linkage of proposed interconnection project with CASA-1000. The study would analyze the phased approach for bulk power transfer and cost effectiveness of each scenario with respect to generation expansion in Turkmenistan and demand projections in Afghanistan and Pakistan;
- **18 July 2016.** The ADB organized the second meeting to update preparation progress and the three governments agreed to establish a steering committee and technical working group;
- **24 August 2016.** At a bilateral discussion between Afghanistan and Pakistan, it was agreed to sequence and implement the Project into two phases.
- **23 October 2016.** The ADB organized the third meeting to discuss and finalize the revised draft of the joint ministerial statement for TAP among the three participating countries and confirm project implementation timelines with next phases. It was agreed to defer the signing of the joint ministerial statement till the next meeting and the TAP routing options and due diligence study be revised and shared with the three governments. The study was completed and shared by ADB with the three participating countries in January 2017.

26. The Project will consist of power transmission infrastructure to enable power trade and exchange among the three countries. The power trade will utilize existing power infrastructure as well as promote collaboration through new transmission investments in the three countries.

27. The two phases are:

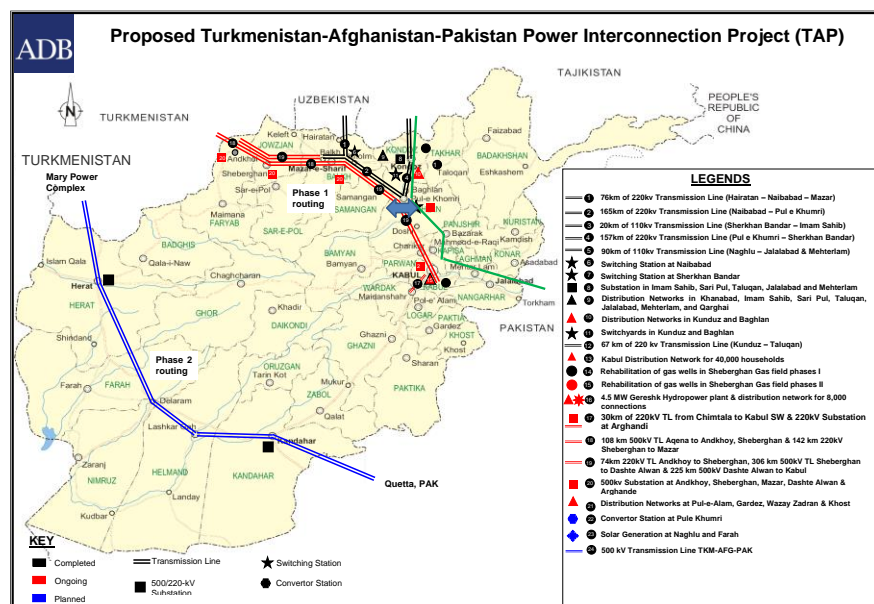
- a. First Phase (to be completed by 2019) will use the existing or financed infrastructure under the TUTAP to export Turkmen power to Afghanistan and Pakistan. Options will be explored to especially optimize and use any excess power or transmission capacity during the winter months (October–April) through integration with CASA system. The requirement of additional ancillary infrastructure to complement TUTAP and other planned infrastructure will be investigated;¹

¹ TUTAP is the acronym of Turkmenistan (TKM), Uzbekistan (UZB), Tajikistan (TAJ), Afghanistan (AFG), Pakistan (PAK). TUTAP is modular and is being expanded and phased as per available financing and exports energy power from for thermal/gas (TKM and UZB) and hydropower (TAJ) rich Central Asia countries to supply AFG grid with surplus power to be exported to PAK.

- b. Second Phase (to be completed by 2021) will transfer power from Turkmenistan from Serhetabad (TKM) / Torghundy (AFG) border into Herat, Kandahar and Spin Boldak in Afghanistan and export to Chaman and Quetta in Pakistan.

28. The respective Governments have requested the ADB to finance (and mobilize cofinancing) the infrastructure upgrades to implement the two phases of TAP. The ADB will work closely with the countries on respective country allocations and country operations and business plans and provide support components to facilitate Project from concept to commissioning.

Figure 3: The agreed phased approach for TAP



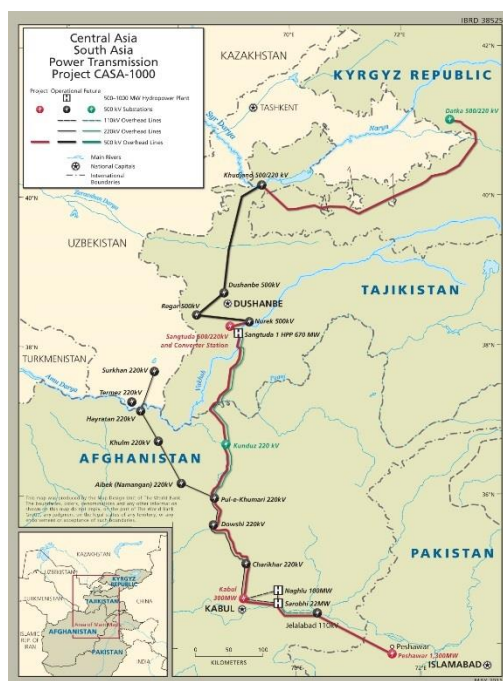
iii. CASA-1000 (inputs and updates from WB)

29. The CASA-1000 project catalyzes support of a wide number of multi and bilateral development partners including the World Bank (US\$ 526.5 million), Islamic Development Bank (US\$ 155 million), European Investment Bank (US\$180 million), European Bank for Reconstruction and Development (US\$ 110 million), the US (US\$ 15 million) and UK Governments (US\$ 46 million) and the Afghanistan Reconstruction TF (US\$ 40 million).²

30. Procurement of CASA infrastructure is progressing with contract awards for various infrastructure components expected to be concluded in 2017.

² Exchange rates have changed from the approval date of the financing. Amounts above retain XR at approval date of each financing.

Figure 4. The CASA-1000 Project Map



31. In October, 2016, the invitation for bids for converter stations in Sangtuda, Tajikistan and Nowshera, Pakistan was published. With multiple extension of bids, in May 2017, all five industry leaders in HVDC manufacturing—ABB, GE/Alstom, Siemens, TBEA and CEEC—submitted their technical proposals for the convertor stations component. For the other packages, nine prequalified companies submitted their proposals, which are being evaluated.

iv. The CASA-1000 project is scheduled to be completed in the winter of 2017–2018. Turkmenistan-Afghanistan-Pakistan-India Natural Gas Pipeline Project (TAPI)

32. The TAPI pipeline will export up to 33 billion cubic meters of natural gas per year from Turkmenistan to Afghanistan, Pakistan and India over a commercial operations period of 30 years. The estimated length of the TAPI pipeline is about 1,600km, from the Afghan/Turkmen border to the Pakistan/Indian border. Independent consultants estimated the total cost to be \$15 billion. Using data and assumptions from the TAPI gas companies, the total cost was optimized to less than \$8 billion. The final estimates for the total project cost will be determined upon completion of the detailed design and the arrangements for the procurement of long-lead items (i.e., line pipe, compressor stations and related equipment), construction and other services.

33. TAPI represents unprecedented level of regional cooperation; supports regional peace and security; and, provides significant capital investments in Turkmenistan, Afghanistan and Pakistan. ADB has acted as TAPI Secretariat since 2003. This role was instrumental in the progress made to date by facilitating discussions and balancing the interests of the parties. ADB has provided more than \$4 million in technical assistance grants to date, plus staff time and expenses, to finance pre-feasibility studies; risk analysis and mitigation; underground storage; legal advice; market analyses; security studies, etc.

34. ADB chairs meetings of the Technical Working Group and the ministerial-level Steering Committee (most recent Steering Committee meeting was held on 7 April 2016 in Ashgabat, Turkmenistan). With the Secretariat mediating among the parties, several key agreements were successfully concluded and signed at the governmental and commercial levels: notably the Inter-Governmental Agreement, Gas Pipeline Framework Agreement, Operations Agreement, and three Gas Sales and Purchase Agreements.

35. ADB was appointed Transaction Advisor by the gas companies of the TAPI countries under a Transaction Advisory Services Agreement (TASA) signed on 19 November 2013. As Transaction Advisor, ADB: i) helped establish the TAPI Pipeline Company Limited (TPCL) in the Isle of Man in November 2014; ii) managed the due diligence activities leading to the production of the technical and financial feasibility studies; iii) facilitated the appointment of State Concern “Turkmengas” as Consortium Leader in August 2015; and iv) facilitated the negotiations and finalization of a Shareholders Agreement (signed in December 2015) and an Investment Agreement (IA) (signed in April 2016).

36. The signing of the IA marked the conclusion of ADB’s work under the TASA. The IA reflects the strong commitment of the TPCL shareholders to advance quickly to the next phase of the Project. It contains clear provisions regarding the amounts and uses of their own funds for detailed design, safeguards, and procurement and financing activities. The 24th TAPI Steering Committee—comprising petroleum ministers from the TAPI countries, with participation by senior ADB staff—met on 7 April 2016 and expressly endorsed the IA prior to its signing, thereby aligning the TAPI countries with the TPCL shareholders.

37. TPCL and ADB have completed their negotiations on a Financial Advisory Services Agreement (FASA). As Financial Advisor, ADB will advise on detailed financial due diligence, fund raising strategy and activities, and assist in the multiple actions associated with achieving financial close; ADB will also have input on environmental and social safeguards. On 23 December 2016, the TPCL negotiations team advised ADB regarding its agreement to the 14 December 2016 draft of the FASA, containing the specific scope of ADB’s services and commercial terms. Negotiations on FASA are continuing.

38. In January 2017, TPCL awarded the Front End Engineering Design and project management & supervision contract to a German firm, ILF Beratende Ingenieure GmbH. ADB has no knowledge of the procurement process involved, nor the terms of reference of the consultant.

Figure 5. The TAPI pipeline



Element 2. Resolving Regional Energy Dispatch and Trade Issues

39. **Action Initiated.** A study on “Regional Power Trade Development in Central Asia” was proposed by the Kazakhstan representative during the 19th ESCC Meeting. The study was supported by the World Bank. The Study estimated the aggregated benefits for the Central Asia countries, and distribution of the benefits for each country, if efficient regional power trade had been pursued during the 2010–2014 period. Results of the study were reported by the World Bank at April and October 2016 ESCC Meetings. A follow up presentation was made by the World Bank in the ESCC Dushanbe meeting in May 2017 that highlighted the benefits of regional electricity market, some constraints commonly observed in developing regional electricity markets, design and best practices to address some of these challenges, and suggested next steps for development of a regional electricity market in Central Asia.

40. **Next Steps.** During the May 2017 ESCC Meeting, and following the World Bank’s presentation, several representatives (most notably Afghanistan, Kazakhstan, Kyrgyz Republic, and Pakistan) expressed interest in taking the regional energy market agenda to the next level. It was agreed at the meeting that a small working group would be established with Kazakhstan and Pakistan taking the lead in coming up with possible next steps. The ToR for the working group would be developed and discussed in future ESCC meetings.

Element 3. Managing Energy-Water Linkages

41. **Action Initiated.** The World Bank has initiated several activities, including a study on energy sector vulnerability to climate change, energy-water modeling training and establishment of a Central Asia energy-water knowledge data portal and network.

42. The Energy Vulnerability to Climate Change Study aims to support Central Asian countries in understanding climate change-induced energy sector vulnerabilities and building resilience to these vulnerabilities through the development of coordinated adaptation policies. The study will present three climate scenarios which take into consideration changes in the components of water flow (glacier melt, snow, and precipitation) and provide insight into energy sector adaptation policies. Using models and other resources, the study will consolidate a vulnerability assessment of the impacts, risks and adaptive capacity of the energy sector. The results of assessment will provide guidance for decision-makers on options for investments in and management of power generation, transmission, and distribution assets, with a focus on challenges and opportunities for effective regional coordination of climate change adaptation. The study is currently under finalization with expected completion by July 2017.

43. There have been a number of activities to improve access to global good practice. Both the Central Asia Water and Energy Portal and the energy-water modeling training strengthened capacity for decision support by laying the knowledge foundation for the implementation of regional projects in integrated water resource management. A major event, the Central Asia Water Future Forum and Expo was held in September 2016 to highlight global and regional good practice in water resources monitoring, analysis, and management, accompanied by training sessions and an exposition with significant participation from private sector, academia, and other organizations.

44. The Central Asia Water and Energy Portal improve access to public domain data to strengthen evidence-based dialogue on energy and water resources. Public-domain online access of relevant spatial data has been achieved through the development and promotion of a new mobile application, Spatial Agent, which provides access to such data. The work has been showcased in several fora globally and in the region, including to a wide array of stakeholders (e.g. regional organizations, national ministry officials, academies of sciences, academia, development partners, etc.). It is well-appreciated for its innovative approach to providing a world of development data at the user's fingertips.

45. Capacity Strengthening for Integrated Water Resource Management (IWRM) Modeling followed requests from countries to strengthen capacity for water resources modeling and, more generally, analysis through technical knowledge building and exchanges. A Model Advisory Group was convened to share modeling knowledge, prioritize capacity strengthening needs and approaches, and guide development of a longer-term training curriculum. Trainings were held to improve awareness and understanding of the skills necessary for water resources modeling, of emerging technology and of the most recent regional models developed for the Basin. These trainings, which involved a range of senior and junior water specialists, also served as a pilot for a longer-term training curriculum, and refining a curriculum for Model Capacity Building which will be made available online later in 2017.

46. In September 2016, the Central Asia Water Futures Forum & Expo took place in Almaty, Kazakhstan. Over 200 policy and technical experts from government, academia, private sector, and CSOs participated in this international event. The discussion revolved around established and evolving modern approaches and tools for integrated water resources management –

including observation systems, remote sensing, decision-support modeling and capacity building and regional institutions and partnerships. The Expo encouraged participants to explore progress on water management in Central Asia, showcased global good practices on modernization of water management information systems, and exhibited state-of the art water technologies from international and regional good practice (to consolidate progress and envision future investments in water resources modeling and analysis).

47. **Next Steps.** Building on the studies and trainings the World Bank is engaging with countries to identify investment needs into information systems to improve planning and management of water and energy linkages. The products developed will be made available. In addition, the World Bank is currently preparing a third funding phase for the Central Asia Energy and Water Development Program, a multi-donor trust fund to promote energy and water security at regional and national level. The program was presented at the recent ESCC meeting in Dushanbe and further discussions are planned.

Element 4. Mobilizing Financing for Priority Projects

i. CAREC Power Sector Financing Roadmap

48. **Action Initiated.** The October 2013 CAREC SOM endorsed ADB's proposed technical assistance (TA) to develop the CAREC Power Sector Financing Roadmap for CAREC member countries. The study under this TA (ADB RETA-8727) assessed priority power infrastructure in CAREC countries with potential sources of financing, for both national and cross-border projects.

49. ADB-funded consultants, PricewaterhouseCoopers, presented the preliminary results of the Study for Power Sector Financing Road Map financed at the ESCC meeting in April 2016. The final reports and presentations with detailed country-by-country analyses were made available at CAREC first Energy Investment Forum and also published on the CAREC website. The results in these reports include the priority project lists identified by the consultants; investment requirements for the priority projects and potential funding sources; and barriers to private investments and mitigation measures. The study estimates that the total investment costs for priority projects in CAREC countries (excluding China and GOBITEC initiative in Mongolia) is USD 103 billion with a funding requirement of USD 93 billion between 2017 and 2023.

50. **Next Steps.** The ESCC reaffirmed the importance of mobilization of financing on clean energy, especially to implement the Nationally Determined Contributions under Paris Agreement. The ESCC re-acknowledged the need for attracting further private sector investment in energy projects and supported the TA proposal by ADB on "promoting private investment in clean energy in Central Asia".

ii. CAREC Energy Investment Forum

51. **Action Initiated.** The first CAREC Energy Investment Forum was organized on 24–25 October 2016 in Serena Hotel, Islamabad, Pakistan. The 2016 EIF was organized as an invitation only event intended to present and discuss the CAREC countries' energy infrastructure investments promotion schemes, challenges in attracting investments and priority projects. Over 240 participants attended from 15 countries (including 10 CAREC), about 120 organizations (50 from private sector).

52. **Next Steps.** ADB in cooperation with the Ministry of Energy-Government of Kazakhstan and the Astana EXPO 2017 is organizing the CAREC 2017 Energy Investment Forum: Financing

Future Energy, from 18–19 July 2017 in Astana. The forum seeks to increase investment in clean energy in the Central Asian. Target audience includes project developers/sponsors, financiers, equipment/technology suppliers, and EPC contractors. Last year, EIF focused on policies and incentives governments have put in place to promote investments in clean energy. For 2017, the focus will be on financing clean energy investments with representatives from export-import banks, export credit agencies, multilateral development banks and insurance providers taking part in the discussions. High-level government ministers and officials from 11 CAREC member countries are also expected to attend the event.

53. The event will be part of EXPO 2017 Astana: “The Future Energy,” which runs from 10 June–10 September 2017. The expo’s three subthemes – Reducing CO2 Emissions, Living Energy Efficiency, and Energy for All – will allow the Expo to present the current state of energy and to showcase sustainable solutions and innovative technologies. Over 100 countries have signed up to host pavilions and the organizers are expecting over 5 million visitors.

Element 5. Capacity Development and Knowledge Management

i. Off-Grid Training in Melbourne, Australia (21–24 November 2016)

54. The Off-Grid Systems and New Technology Training was held through the facilities of Australian government-owned utility – Hydro Tasmania, in partnership with the Asian Development Bank (ADB). The training included sites visit through the southern region of Australia to go to see an energy dispatch center, off grid-systems and see global energy innovation trends as well as advanced energy projects in Flinders and Kings Islands in Tasmania.

55. The training enabled ESCC to develop plans and programs to meet its INDC commitments, which were also endorsed by the SOM. Twenty-one (21) participants from various CAREC government agencies attended the training activity.

ii. ICT for Energy Training in Seoul, Korea (17–20 April, 2017)

56. The knowledge sharing program on ICT for energy is designed to improve understanding of the ICT and other key technologies for energy sector development through some case studies in Korea focusing on key success factors and policy implications related to those programs. The participants learned from a number of key initiatives on ICT for energy programs implemented in Korea through site visits which included wind-farm energy storage system, floating solar power plant, K-Water Integrated Water Management Center, Green Climate Fund and Global Green Growth Initiative. Interactive discussion sessions were also included in the program.

57. Thirty-five (35) high profile participants from Ministry of Energy, energy utility companies from CAREC countries will join the program in addition to ADB staff relevant to the energy sector program. The knowledge sharing program was sponsored by Ministry of Trade, Industry and Energy and supported by Korea Smart Grid Association.

Element 6. Promoting and Prioritizing Clean Energy Technology

i. TA 9168: Access to Electricity with New Off-Grid Solar Technology in Central Asia

58. The TA, for \$2 million funded from the Clean Energy Fund under the Clean Energy Financing Partnership Facility and administered by ADB was approved and became effective on

14 September 2016. The TA aims to demonstrate the technical and financial viability of solar off-grid technology combination in the CAREC region, and enable the off-grid community to move from basic lighting to a range of basic battery-operated appliances using larger solar panels and long-life lithium-ion batteries. The closing date of the TA is 28 December 2018.

ii. TA 9299: Leapfrogging of Clean Technology in Central Asia Regional Economic Cooperation Countries through Market Transformation

59. TA 9299 was approved and became effective on 13 February 2016 and is financed by the Clean Energy Fund under the Clean Energy Financing Partnership Facility for the amount of \$2 million. The TA aims to build capacities through targeted training, demonstration projects, and knowledge products.

iii. TA on Energy Integration in Central Asia

60. The proposed TA seeks to address the technical barriers at the grid side that are hampering greater adoption of intermittent renewable energy (solar and wind power generation) in the CAREC region. The TA aims to strengthen the capacity of transmission grid by providing training to transmission grid operators on modernized control technique and by analyzing regional cooperation arrangement option to secure balancing reserve capacity of backup generators and storage.

iv. TA on Promoting Private Investment on Clean Energy in Central Asia

61. The proposed TA aims to assist CAREC countries in developing an enabling policy and regulatory environment for private sector clean energy investment and identify priority investments to achieve NDCs of each country. Proposed study and gap analysis on countries' NDCs will identify priority area in clean energy and investment needs, and lead to the development of action plans based on the study, including the proposal of reforms in policy and regulatory framework to attract clean energy investment by private sector, capacity building support to achieve reforms, and prioritization of clean energy investment projects.

Other Initiatives

ii. Climate Change: The Elephant in the Room

62. Several countries, including CAREC members, have made commitments to the UNFCCC Paris Agreement³ that states that each Party shall prepare, communicate, and maintain successive nationally determined contributions (NDCs) that it intends to achieve. Further, parties shall pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions. However, countries have no clue on how climate change mitigation measure through NDCs be implemented.

63. The Global Green Growth Initiative (GGGI) and Green Climate Fund (GCF) are new organizations with limited exposure to CAREC. However, GGGI has the technical expertise on the formulation of NDCs as they have successfully provided assistance to several countries while GCF has committed funds to help countries develop their own NDCs. ADB was asked at the last SOM (October 2016, Islamabad) to support countries to undertake gap analysis which will include components related to NDC commitments and plan of actions. In line with this, ADB has been

³ According to Article 4 paragraph 2 of the Paris Agreement.

working on forming a partnership with GGGI and other climate institutions to help CAREC member countries formulate their own NDCs.

ii. Technology Leapfrogging as a strategy

64. Leapfrogging in technology is a major consideration in infrastructure investment because of the looming stranded asset risk as technologies become obsolete. Today, many developing country policy-makers worry about investing in a coal-fired power plant or a remote distribution network that will last more than 30 years, but the cash flow projections in 15 to 20 years are uncertain.

65. Millions of people with no access to electricity in Afghanistan, Bangladesh, India, Pakistan and all over Africa are taking an interest in solar power and off-grid technologies. People in these developing countries use their mobile phones to Google for businesses that sell solar technology, or look up technical answers from Wikipedia, as the new generations don't appreciate the concept of waiting for the next year's updated version of the Yellow Pages or the Encyclopedia Britannica for their research. This is a new world, where one's inability to leapfrog will only ensure being leapfrogged by others.

66. Today 4.5 million people in rural Bangladesh and millions all over Africa have leapfrogged from depending on kerosene to generating their own power from solar panels. The days of waiting for a grid are gone; off-grid is the new lifestyle. Hundreds in the developed world are also leaving the grid, as a lifestyle choice and for cheaper power, creating huge pressure on regulators to find ways to pay the utilities for the connection assets.

67. CAREC strategy will explore the option to bring off-grid DC solar with lithium batteries to sparsely populated remote rural areas, rather than building or waiting for grid connection to arrive. Micro-grids are the wave of the future, and leapfrogging from power grids to energy self-generation is a viable option for 1.2 billion people worldwide.

iii. Participation of Women in the Energy Sector

68. The energy sector has been traditionally seen as a men's world and CAREC-ESCC activities are no different from this trend. To change this traditional tendencies and to increase the participation of women, a different strategy was implemented early 2017. Originally, when CAREC members were requested to nominate two government delegates to participate to CAREC-ESCC activities the result would lead to men being requested to attend. However, early this year, request for nominations included a condition that a third candidate may be nominated if it is a female participant. This strategy has resulted to an increased number of female participants substantially.



Figure 6. Female participants during the ICT for Energy in Seoul, Korea from 17–20 April 2017.

iv. Communication Plan

69. The Communication Strategy is based on the Strategy and Work Plan (2016–2020) for Regional Cooperation in the Energy Sector of CAREC Countries and will provide a cohesive and consistent visual identity for the CAREC's Energy Sector Coordinating Committee (ESCC).

70. With the changing global environment of the energy industry and risk of stranded assets, countries need to make informed decision on infrastructure investments. Our communication will enable a range of stakeholders to understand the impact of the new technology, associated risks and the risk of inaction--status quo exposing to maximum stranded asset risk. A multi-media awareness campaign will support all training programs to extend duration of the impact of training as well as widen its target audience.

71. Depending on the specific Target Audience, Concepts and Ideas will be then tailored on specific media/channels and in individual campaigns through a number of different executions.

IV. KEY ISSUES FOR GUIDANCE BY THE SOM

i. CAREC 2017 Energy Investment Forum

72. After the success of the 2016 EIF, the ESCC, together with ADB, Government of Kazakhstan - Ministry of Energy and Astana Expo 2020 will again organize the 2017 EIF from 18–19 July 2017 in Astana, Kazakhstan. The event is envisioned as a “high level, invitation only” that seeks to bring together project developers, financiers, equipment manufacturers, and EPC contractors to showcase investment potential in CAREC. This year the event's theme is “Financing Future Energy.”

73. The EIF aims to demonstrate successes realized and identify needed improvements in the energy sector to i) attract interest of national and foreign private sector to invest in the region; and ii) develop partnerships, with assistance from ADB and other multilateral development

agencies, to maximize potential investments. Initial discussions were conducted with the Government of Kazakhstan - Ministry of Energy as the host country.

74. The ESCC seeks the support of Senior Officials and asks that the EIF will be well-attended event to facilitate the creation of more investments for CAREC countries and the region as well.

ii. Endorse midterm review of 2016–2020 ESCC Work Plan.

75. Annual reporting is deemed necessary to determine the effectiveness of CAREC and ESCC as advocates of energy development and economic growth in the region. However, data submission has remained a struggle. Consistency of data submission, appropriateness of indicators including identification of targets should be made necessary to make reporting effective. Review of current procedures and indicators is strongly recommended to ensure that CAREC-ESCC Work Plan is still valid, relevant and responsive to the needs of the CAREC members.

76. The ESCC seeks the support of Senior Officials to endorse the conduct of midterm review of the 2016–2020 ESCC Work Plan.

iii. Approve mainstreaming of Energy Efficiency in CAREC

77. Energy Efficiency, is one of the most important tools for mitigating climate change and address a countries NDC obligations by reducing use of fossil fuels. Energy efficiency and demand management are the cheapest cost solution to reduce CO2 emissions but remains unexplored. Mainstreaming of energy efficiency would cover: (i) deploying energy-efficient technologies in end-use appliances and efficiency in power generation, transmission and distribution; (ii) demand response programs to reduce peak loads; (iii) design “future proof” buildings by optimizing building orientation, insulation and climate appropriate windows; (iv) design building codes to make buildings and cities more efficient; (v) encourage distributed generation and efficient combined heat and power (CHP) plants; and reduce water use and reduce energy use for pumping and treating water.

iv. Diversification of CAREC Economies from Fossil Fuel Dependency and Stranded Asset Risks

78. With many countries experiencing zero or negative growth, an overall slowdown of power generation from existing fossil fuel plants, wider use of super-efficient appliances, and increasing use of renewable energy, especially solar, is driving major changes in the power sector. Some of these trends started in the developed countries over the last ten years, and soon, the CAREC countries, where assets are old, face the changes and the impact could be even severe. Technological changes, especially the cheaper renewable energy and long-life batteries, are diluting the natural monopoly elements of the power sector. With a consumer’s ability to generate power and avoid a grid connection is introducing the risk of stranded assets—risk that a power asset may not be needed as demand falls and some consumers may start to move to off-grid.

79. Countries need to be aware of these challenges and prepare for it with support of an objective study of the stranded asset risk.