

Central Asia Regional Economic Cooperation - CAREC Power Sector Regional Master Plan

2nd Draft Final Report

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Introduction - Overview of the Study

CAREC Energy Sector Action Plan

- **Pillar 1 – Energy demand and supply balance and infrastructure**
- **Pillar 2 – Regional dispatch and regulatory development**
- **Pillar 3 – Energy and Water Linkages**

РЕСПУБЛИКА КАЗАХСТАН

РЕСПУБЛИКА УЗБЕКИСТАН

ТУРКМЕНИСТАН

РЕСПУБЛИКА ТАДЖИКИСТАН

КЫРГЫЗСТАН

КАСПИЙСКОЕ МОРЕ

АРАЛЬСКОЕ МОРЕ

ИРАН

АФГАНИСТАН

АННЕКС 3.1-1

УСЛОВНЫЕ ОБОЗНАЧЕНИЯ

Строющиеся объекты

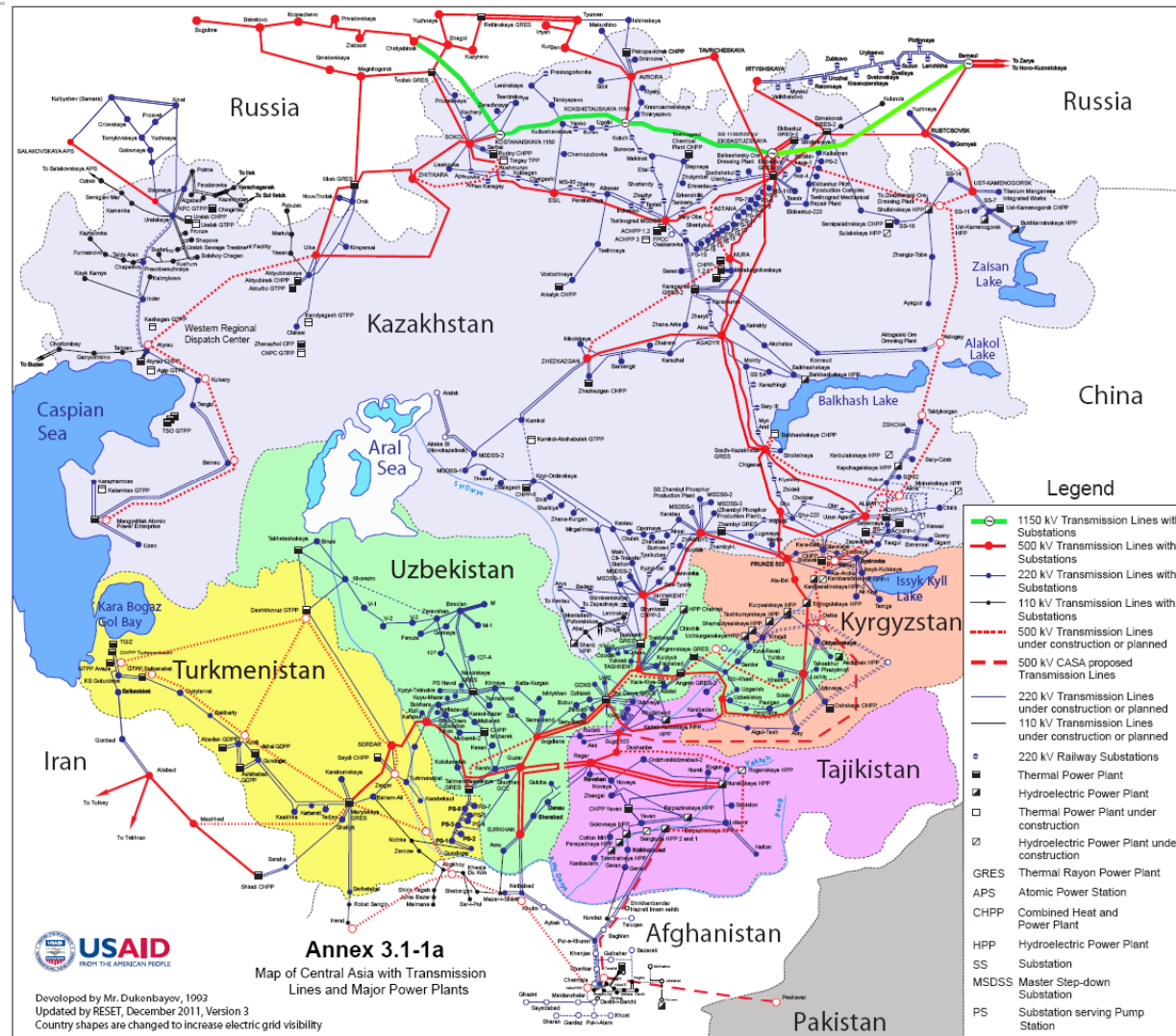
- ГЭС
- ТЭС
- ПС-500 кВ
- ПС-220 кВ
- ВЛ-500 кВ
- ВЛ-220 кВ

УСЛОВНЫЕ ОБОЗНАЧЕНИЯ

Действующие объекты

- ГЭС
- ТЭС
- ПС-500 кВ
- ПС-220 кВ
- ВЛ-500 кВ
- ВЛ-220 кВ

Introduction - Project Area - Central Asian Power Grid



Introduction - Objectives

Development of

Power Sector Regional Master Plan

Identification of Projects for Optimizing Transmission and
Generation Expansion between Kazakhstan, Kyrgyz
Republic, Tajikistan, Uzbekistan and Afghanistan

Integrated Development of the Regional Power System

for increased

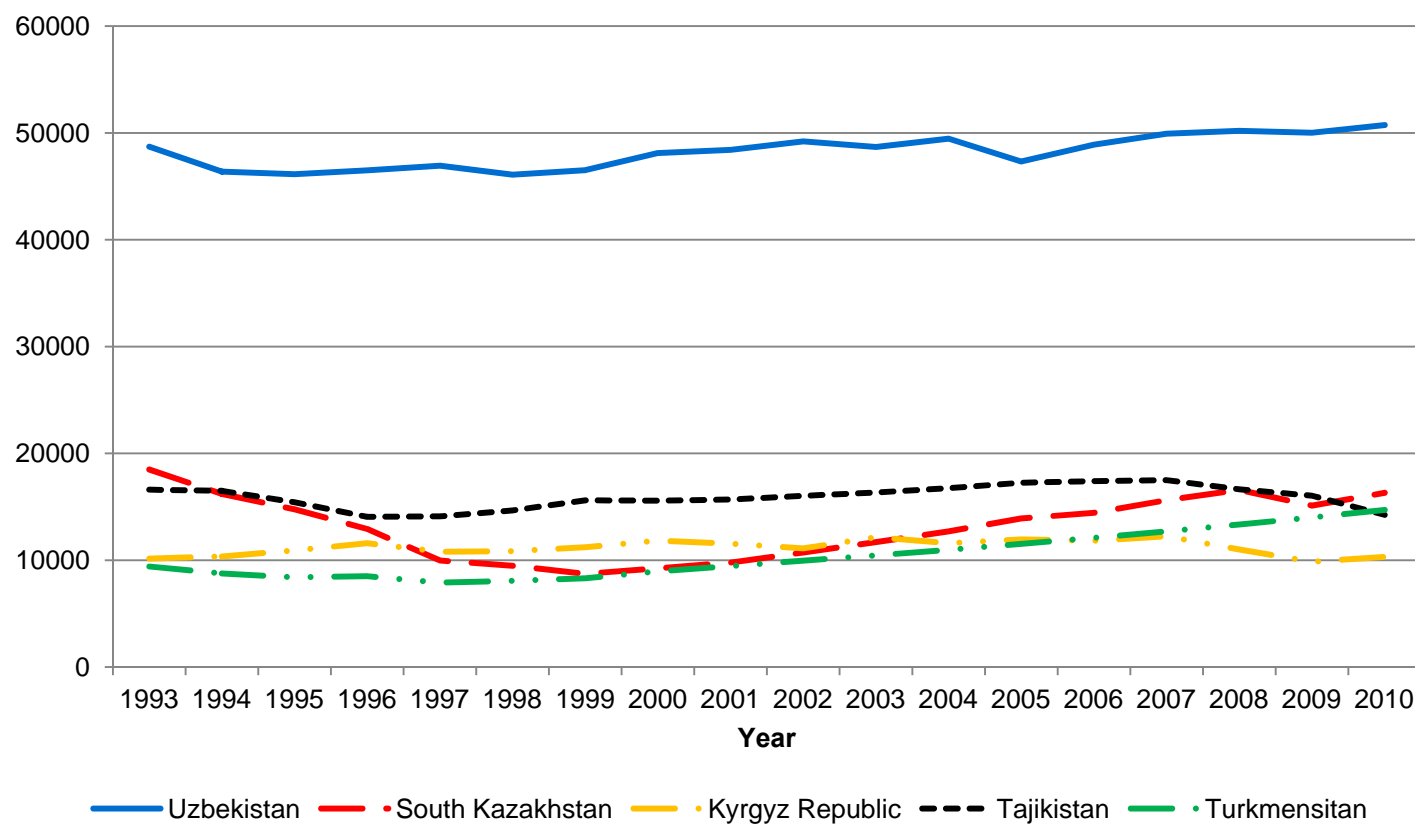
Energy Efficiency

Energy Security

Energy Trade

1. Electricity Consumption in Central Asia between 1993 and 2010

Потребление электроэнергии по государствам
Центральной Азии.
Electricity Consumption in Central Asian States
in Million kWh



2. Demand Forecast

Load Forecast - Base Case Scenario

Energy sent out to power system in GWh

	South-Kazakhstan	Kyrgyz Republic	Tajikistan	Uzbekistan
2011	15.720	11.850	18.960	51.490
2015	18.740	12.390	19.750	57.610
2020	22.910	12.520	20.830	64.020
2025	27.580	13.530	22.500	73.590
2030	33.210	14.800	24.370	88.310
Average annual growth rate of energy sent out	4,00%	1,20%	1,30%	2,70%
Average annual growth rate of net demand	4,00%	1,80%	1,40%	3,00%

Peak Load in MW

	South-Kazakhstan	Kyrgyz Republic	Tajikistan	Uzbekistan
2011	2.780	2.910	3.330	8.520
2015	3.400	2.920	3.550	9.820
2020	4.150	2.800	3.780	11.240
2025	5.000	2.970	4.080	12.920
2030	6.010	3.250	4.420	15.050
Average annual growth rate	4,10%	0,70%	1,50%	3,00%

3. Assessment of Existing Generation and Transmission Assets

Technical service life depends on:

- design / expected operating lifetime
- manufacturing quality
- operation and maintenance conditions.

In general, following service life time can be expected:

for generation equipment:

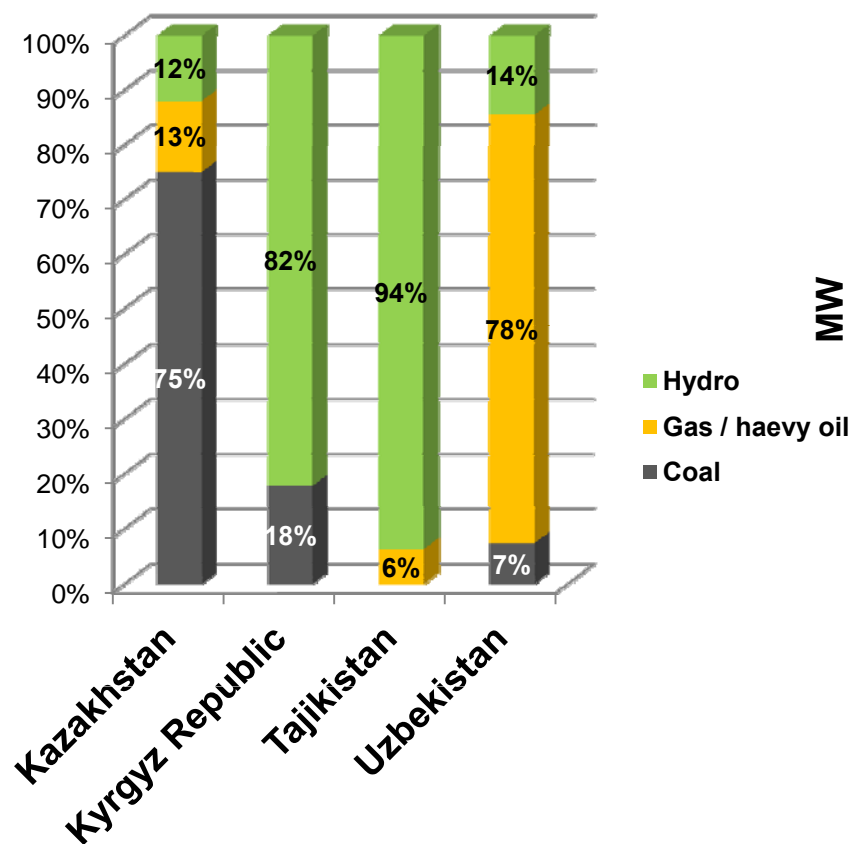
- Thermal power plants 40 – 50 years
- Hydro power plants
 - Hydraulic construction 80 - 100 years
 - E- and M-Equipment 40 years

for transmission equipment:

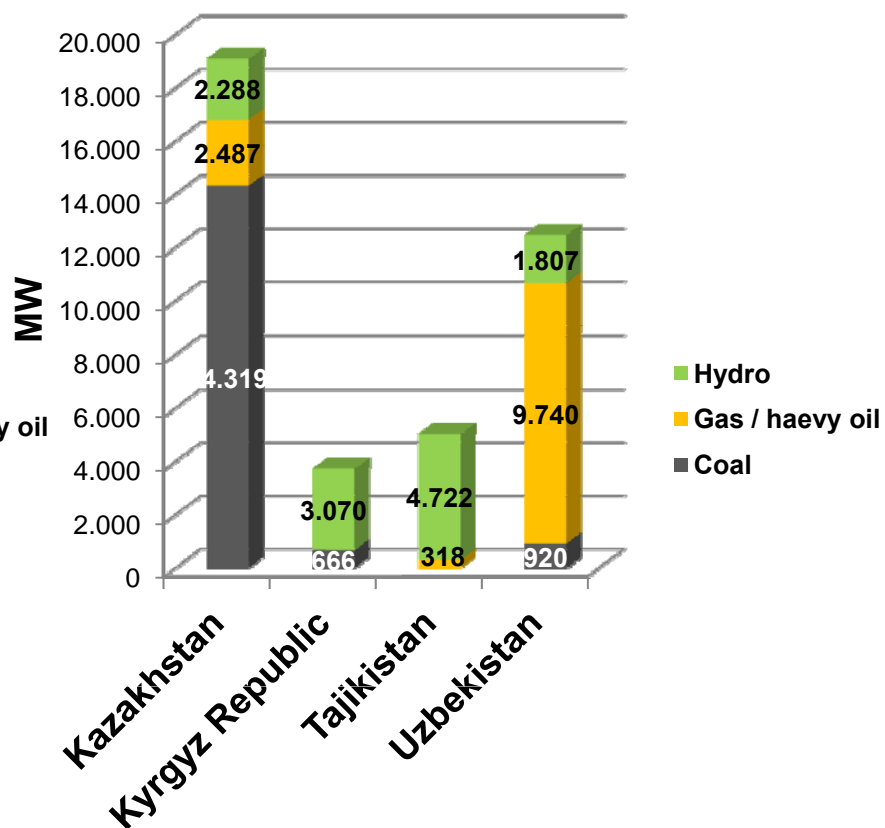
- switchgear 35 years
- transformers 40 years
- transmission lines 50 years.

3.1 Assessment of Existing Generation Assets (1)

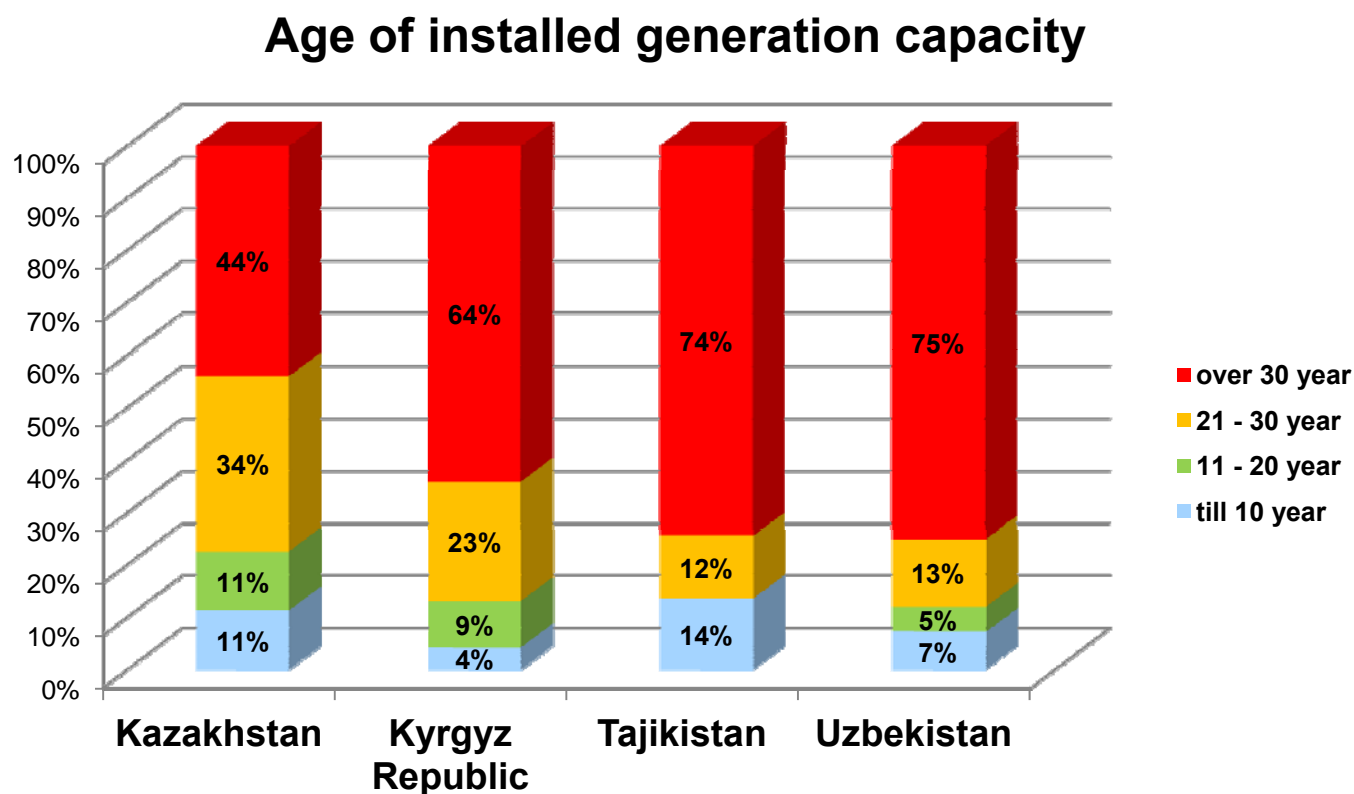
Breakdown by energy carrier



Installed capacity (01.01.2011)



3.1 Assessment of Existing Generation Assets (2)



Power plants older than 20 years: in case of hydro - rehabilitation, in case of thermal - replacement

4. Ongoing Projects - Generation

TA 7558-REG - CAREC Power Sector Regional Master Plan

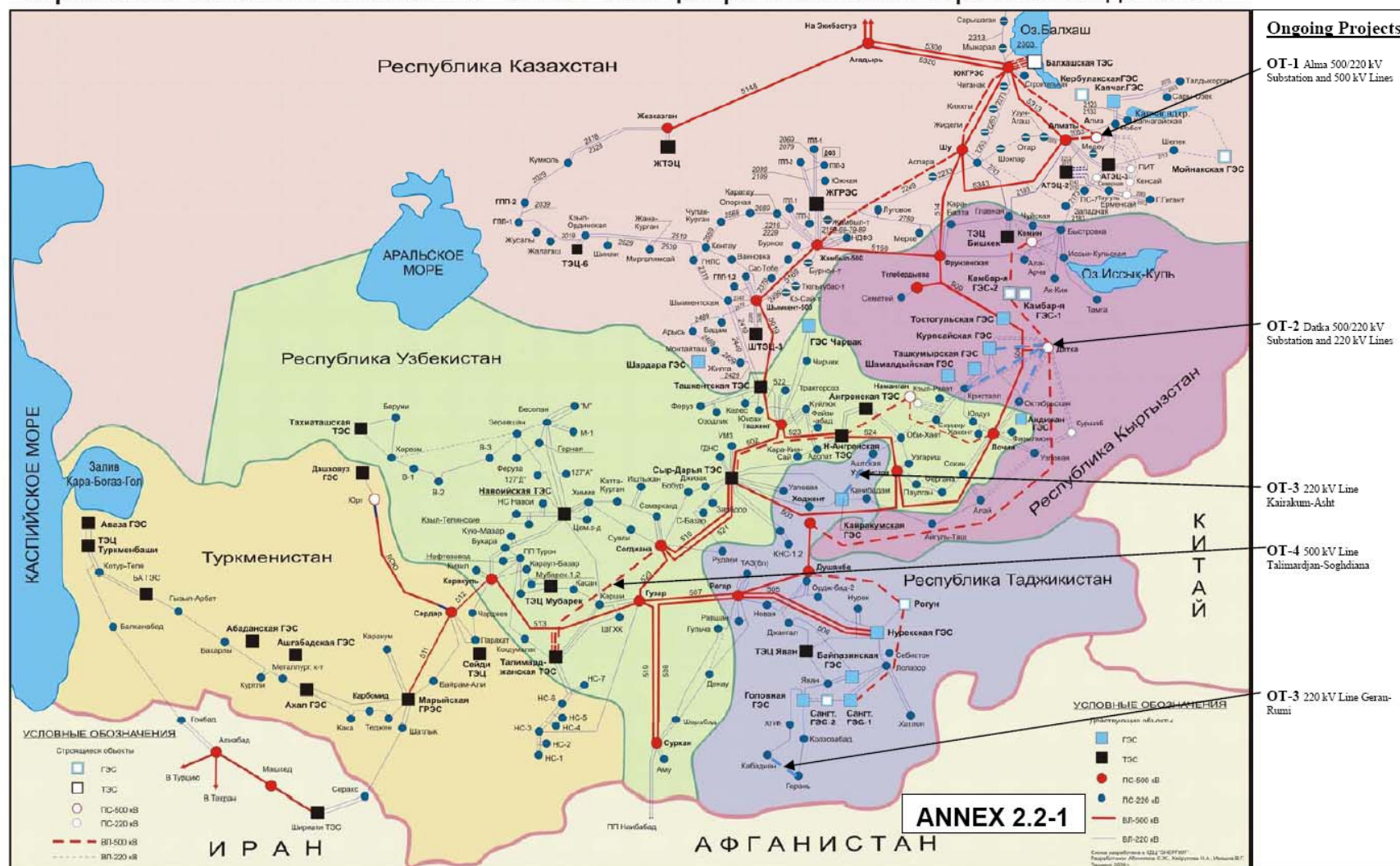
Карта-схема основных эл.сетей 220 - 500 кВ ОЭС Центральной Азии с перспективой до 2020 г.



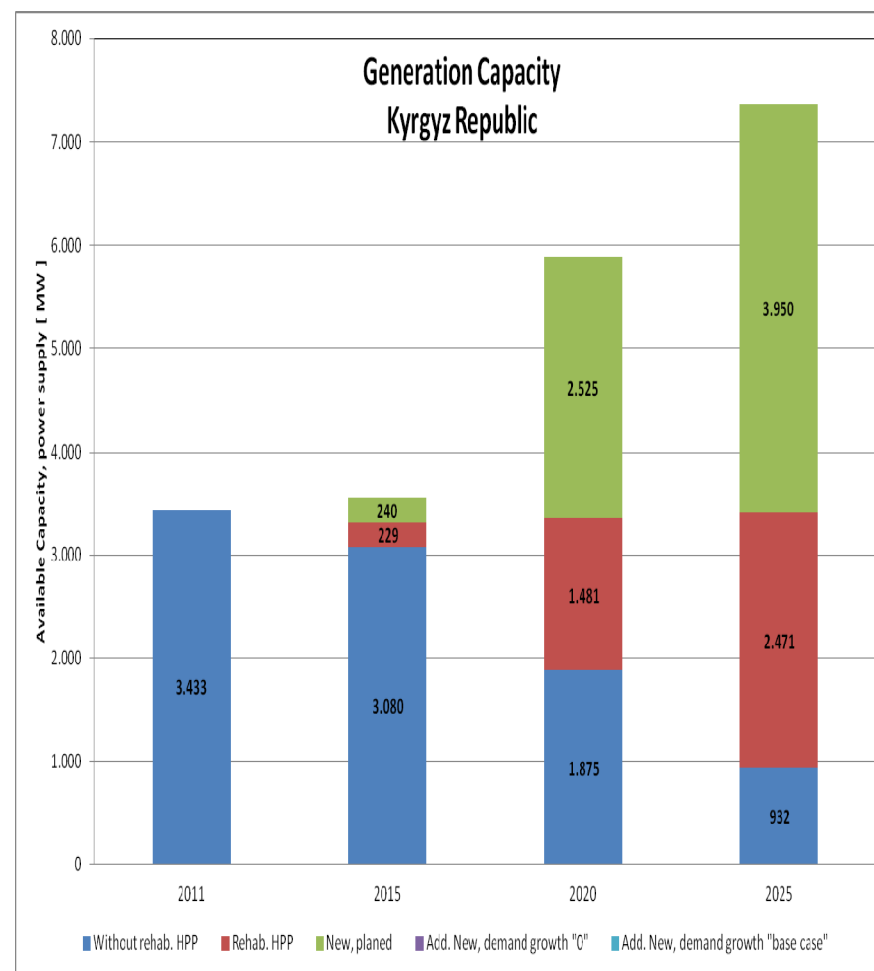
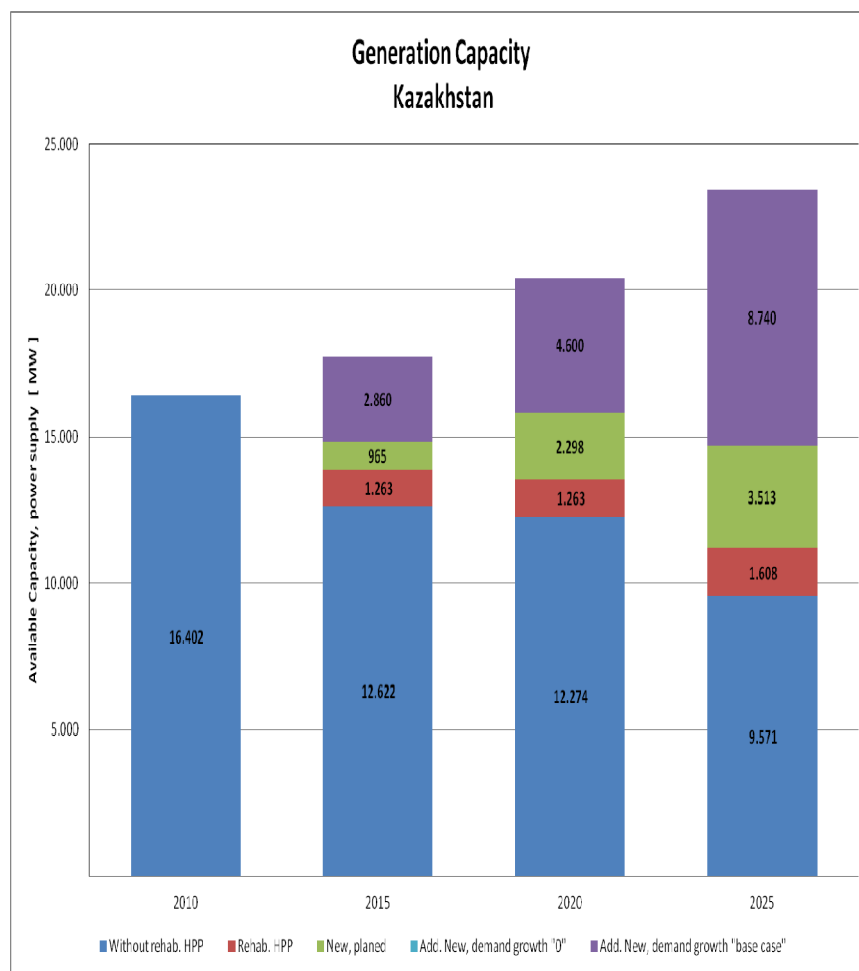
4. Ongoing Projects - Transmission

TA 7558-REG - CAREC Power Sector Regional Master Plan

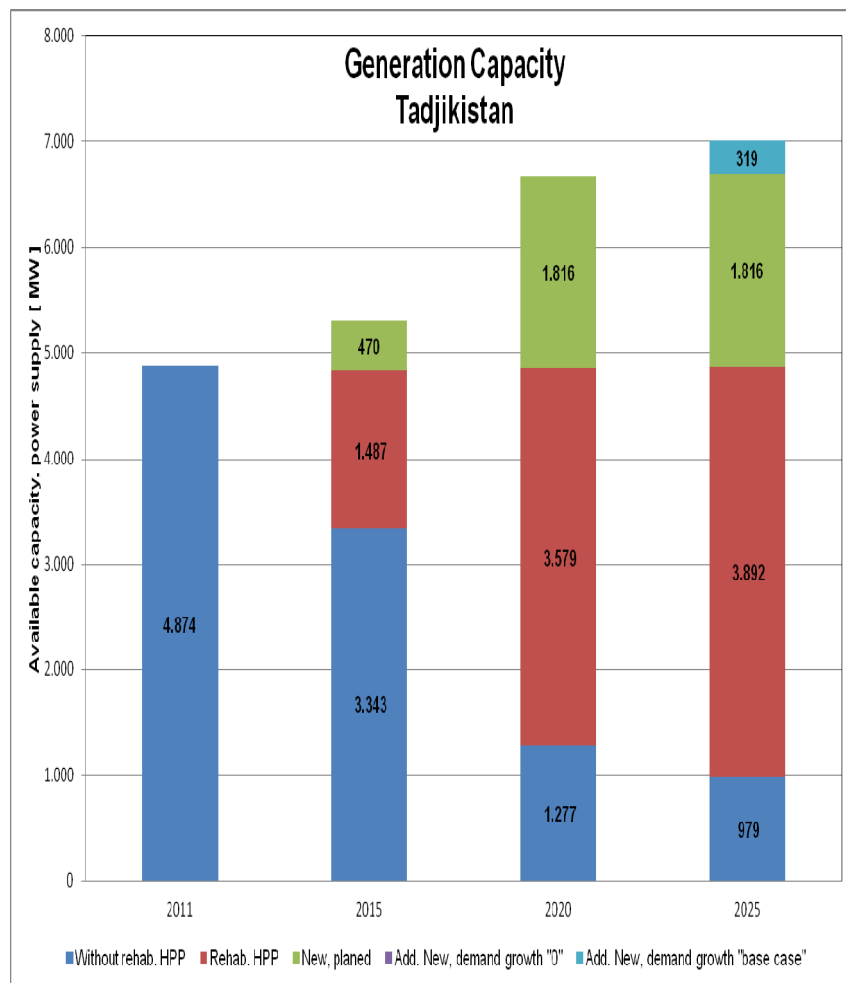
Карта-схема основных эл.сетей 220 - 500 кВ ОЭС Центральной Азии с перспективой до 2020 г.



5. Identification of Proposed Generation Projects (1)



5. Identification of Proposed Generation Projects (2)



6. Major Generation Projects

Kazakhstan

- Rehabilitation of HPPs: Buchtarmin HPP, Kapshagay HPP, Almaty HPP cascade, Karataisk HPP
- Balchash TPP, Phase 1, 1320 MW

Kyrgyz Republic

- Rehabilitation of HPPs: Toktogul HPP, Utschkurganskaja HPP, Atbaschinskaja HPP
- Kara-Keche TPP, 300 MW, Kambarata-1 HPP

Tajikistan

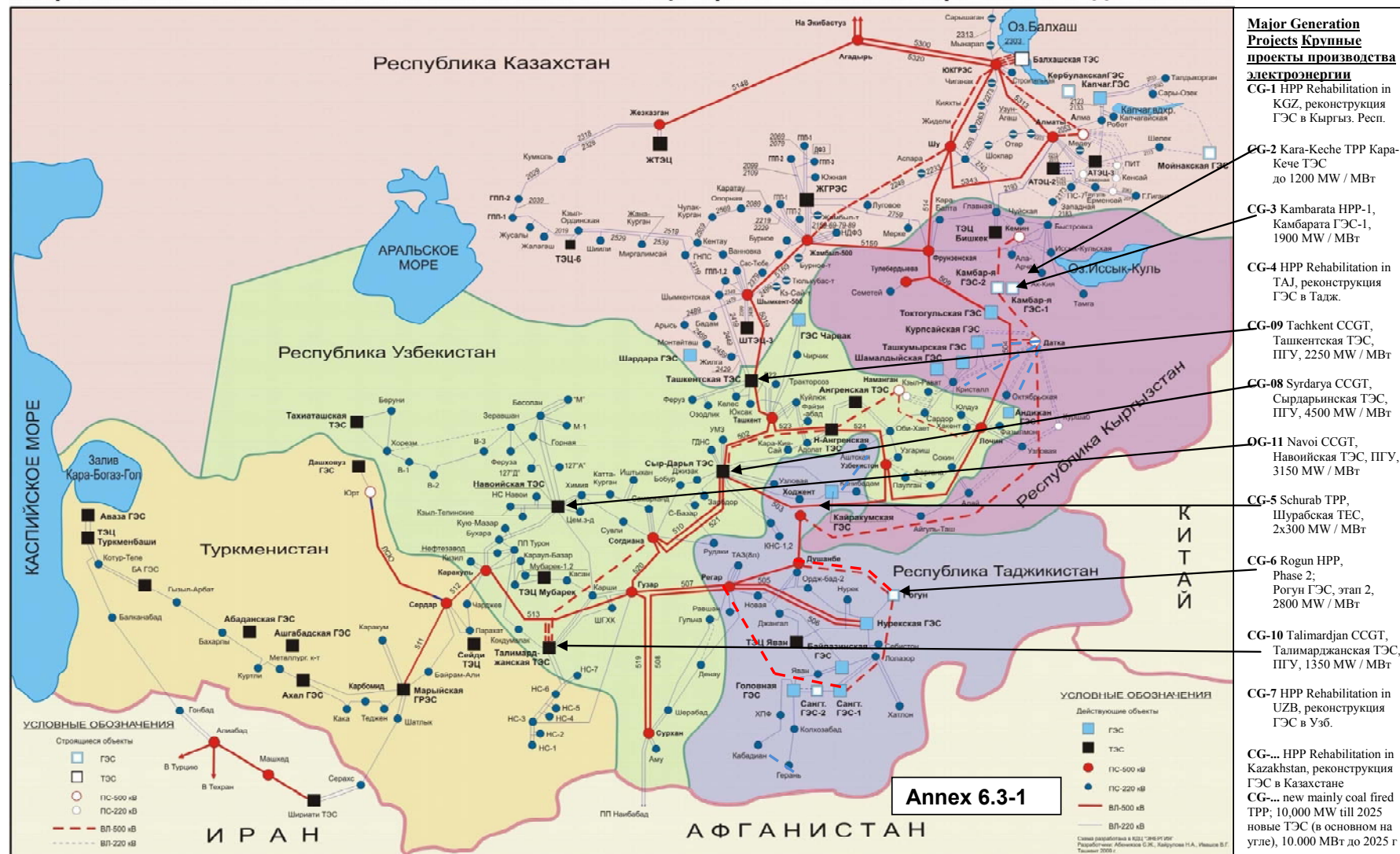
- Rehabilitation of HPPs: Nurek HPP, Glovnaja HPP, Peredadnaya HPP, Centralnaja HPP, Varzob Cascade HPP
- Dushanbe CHPP-2, 260 MW (BOT with China, Shurob TPP, 300 MW, Nurabad HPP-1 and 2, 160 MW + 200 MW, 200 MW Rogun HPP, 3600 MW

Uzbekistan

- Rehabilitation of HPPs: Urta-Chirchik HPP cascade, Chirchik HPP cascade, Kadyr'in HPP cascade, Taschkent HPP cascade, Lower Bozsui HPPs, Farchad HPP, Fergana plain HPPs, HPPs in Samarkant region
- New TPPs: Talimarjan TPP, 900 MW (ongoing project), Navoi TPP, 476 MW, Tashkent TPP, 370 MW, Angren TPP, 150 MW, Tashkent CHPP, 81 MW
Tashkent TPP, 2 x 450 MW, Syrdarya TPP, 2 x 450 MW, Navoi TPP 3 x 450 MW

6. Major Generation Projects

Карта-схема основных эл.сетей 220 - 500 кВ ОЭС Центральной Азии с перспективой до 2020 г.



7. Major Transmission Projects

500 kV Line Kemin – Alma (Kyrgyz Republic – Kazakhstan)

500 kV Line Chu – Zhambul (Kazakhstan)

500 kV Line Yuk – Chu (Kazakhstan)

500 kV Line Kemin – Alma (Kyrgyz Republic – Kazakhstan)

500 kV Line Datka – Kemin (Kyrgyz Republic)

500 kV Line Syr Darya – Novo Angren (Uzbekistan)

500 kV Line Novo Angren – Namangan (Uzbekistan)

500 kV Line Namangan – Lochin (Uzbekistan)

500 kV Line Datka – Hogzhent (Kyrgyz Republic – Tajikistan)

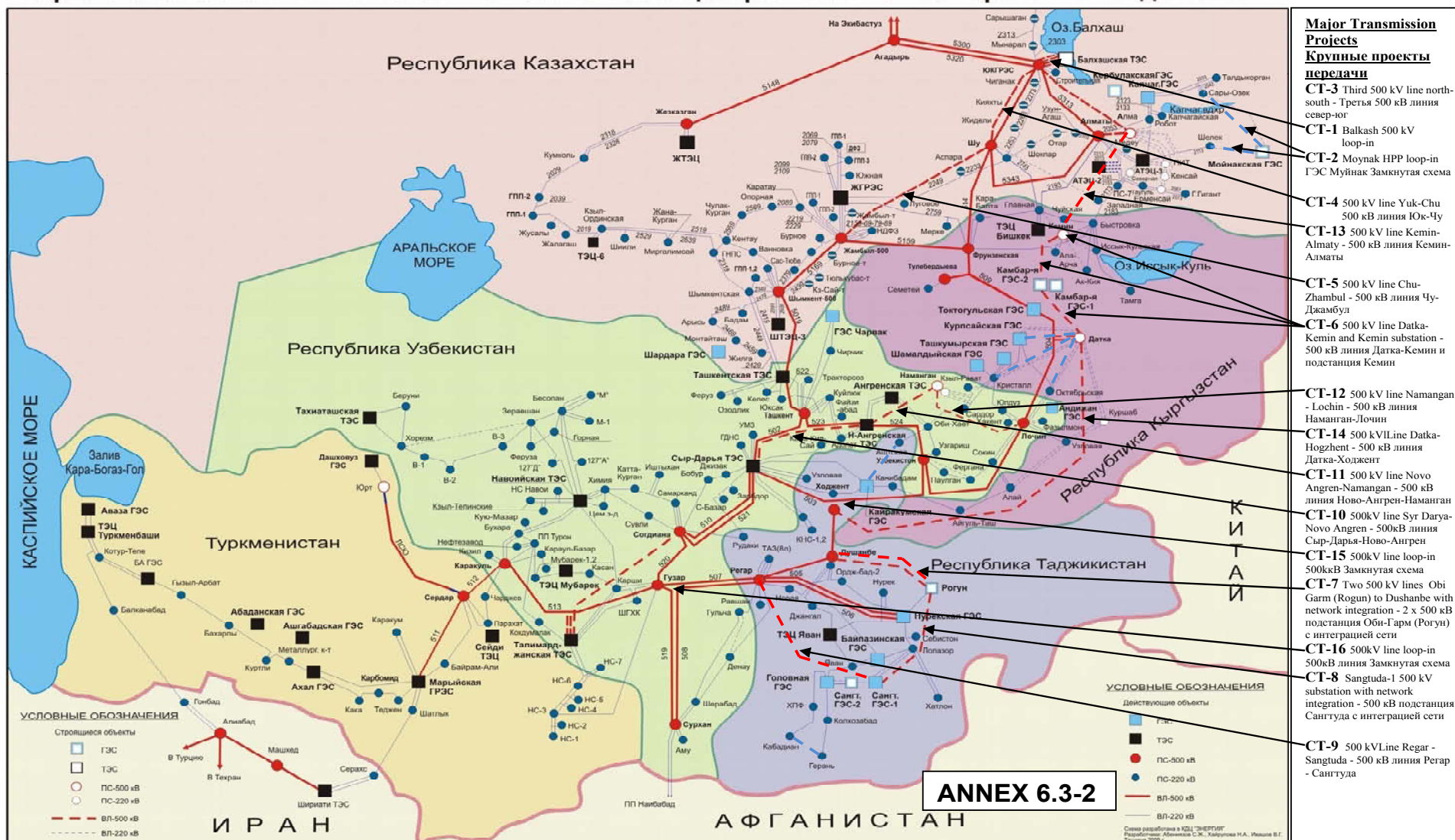
500 kV Line Dushanbe – Obi Garn (Rogun) (Tajikistan)

500 kV Line Obi Garn (Rogun) – Sangtuda-1 (Tajikistan)

500 kV Line Sangtuda-1 – Regar (Tajikistan)

7. Major Transmission Projects

Карта-схема основных эл.сетей 220 - 500 кВ ОЭС Центральной Азии с перспективой до 2020 г.



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8. 10-Years Investment Plan

Investment Plan 2012-2022

Million US\$

	South-Kazakhstan	Kyrgyz Republic	Tajikistan	Uzbekistan	Coss-Border Lines
Rehabilitation of existing HPPs	456	765	1.291	747	
Construction of new HPPs and TPPs	2.644	6.095	1.866	6.331	
Rehabilitation of 500 kV and 220 kV Substations and Transmission Lines	210	96	104	426	
Construction of new 500 kV and 220 kV Transmission Lines and Substations	704	342	327	317	552
Total Investment Costs	4.014	7.298	3.588	7.821	552

Roghun Phase 2 (Tajikistan) and Kambarata 1 (Kyrgyz Republic) are not included

Total Investment in CAPS 23.273 Million US\$

9. Economic Benefits of Regional Cooperation

Total Annual Savings in Fuel and O & M Costs for CAPS in 2020:
1,670 million US\$

- reduction of generation in old and less efficient TPPs which use natural gas by hydro power generation
- generation of peak load by HPPs instead of TPPs
- .Frequency regulation by HPPs and not by TPPs

Additional savings are possible by chairing reserve capacity, however, this reduces energy security (countries are not independent on supplies from neighboring countries)

THANK YOU!