

Energy Utilities & Mining

***TA-8727 REG: Study for
Power Sector Financing
Road Map***
Mobilizing Funds for Building
Energy Assets

*Strictly Private
and Confidential*
Draft

September 2015

Agenda

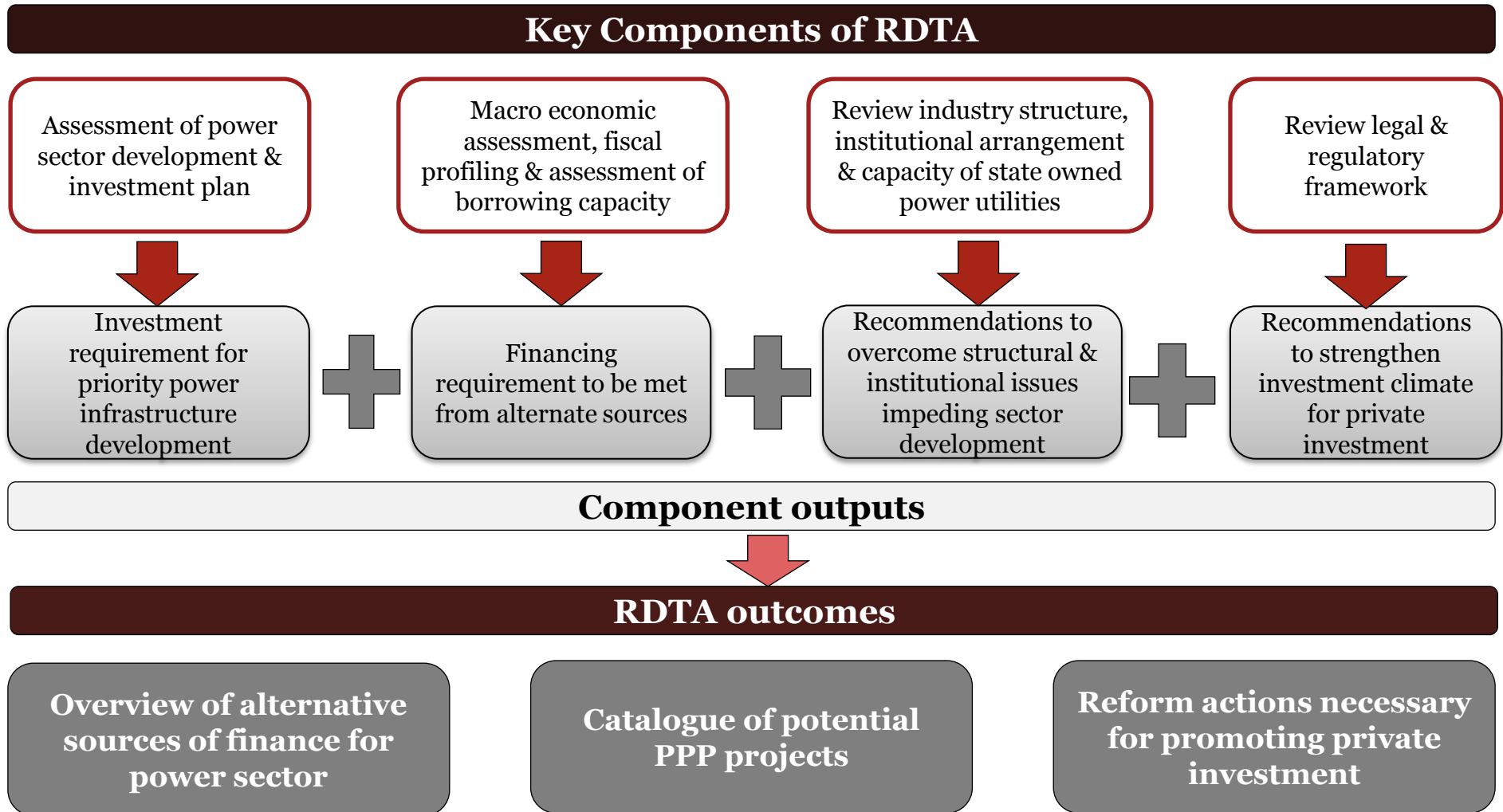
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| 2 | Sample Projects and Financing Options | 5 |
| 3 | Sample Project List for each Country | 11 |
| 4 | Way Forward | 20 |

Section 1

Overview of TA 8727

Key components and envisaged outcomes



Power Sector Financing Road Map Development

Key issues and challenges

Energy demand supply imbalance

Ageing of generation and transmission assets

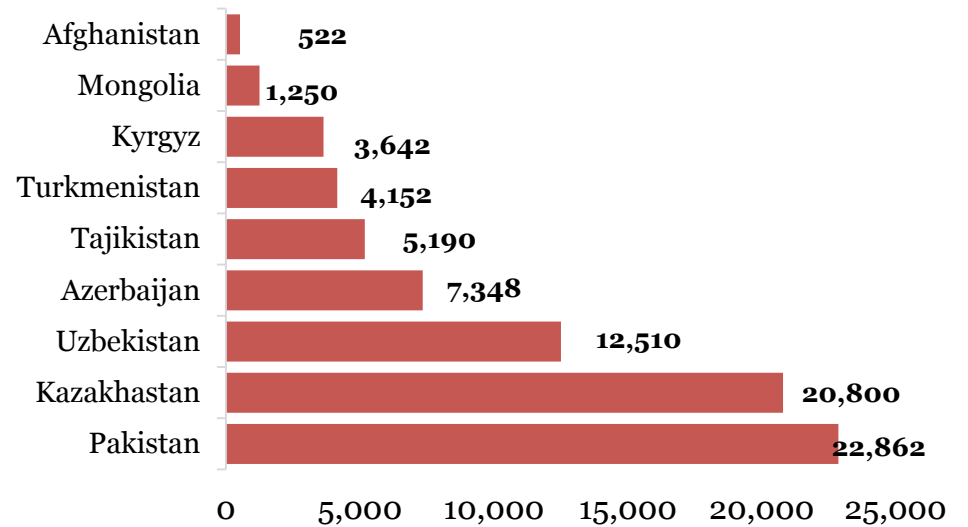
Limited regional cooperation on energy - water exchange

Absence of enabling regulations for cross border electricity exchange

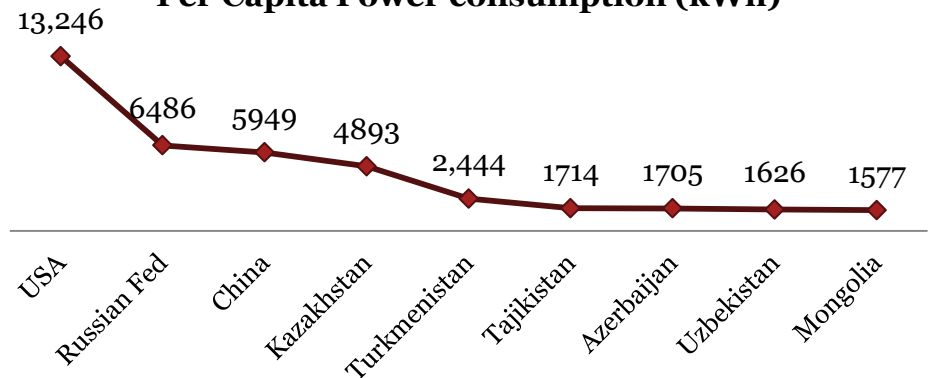
Lack of cost reflective tariffs and high loss levels

Inadequate investment for power infrastructure development

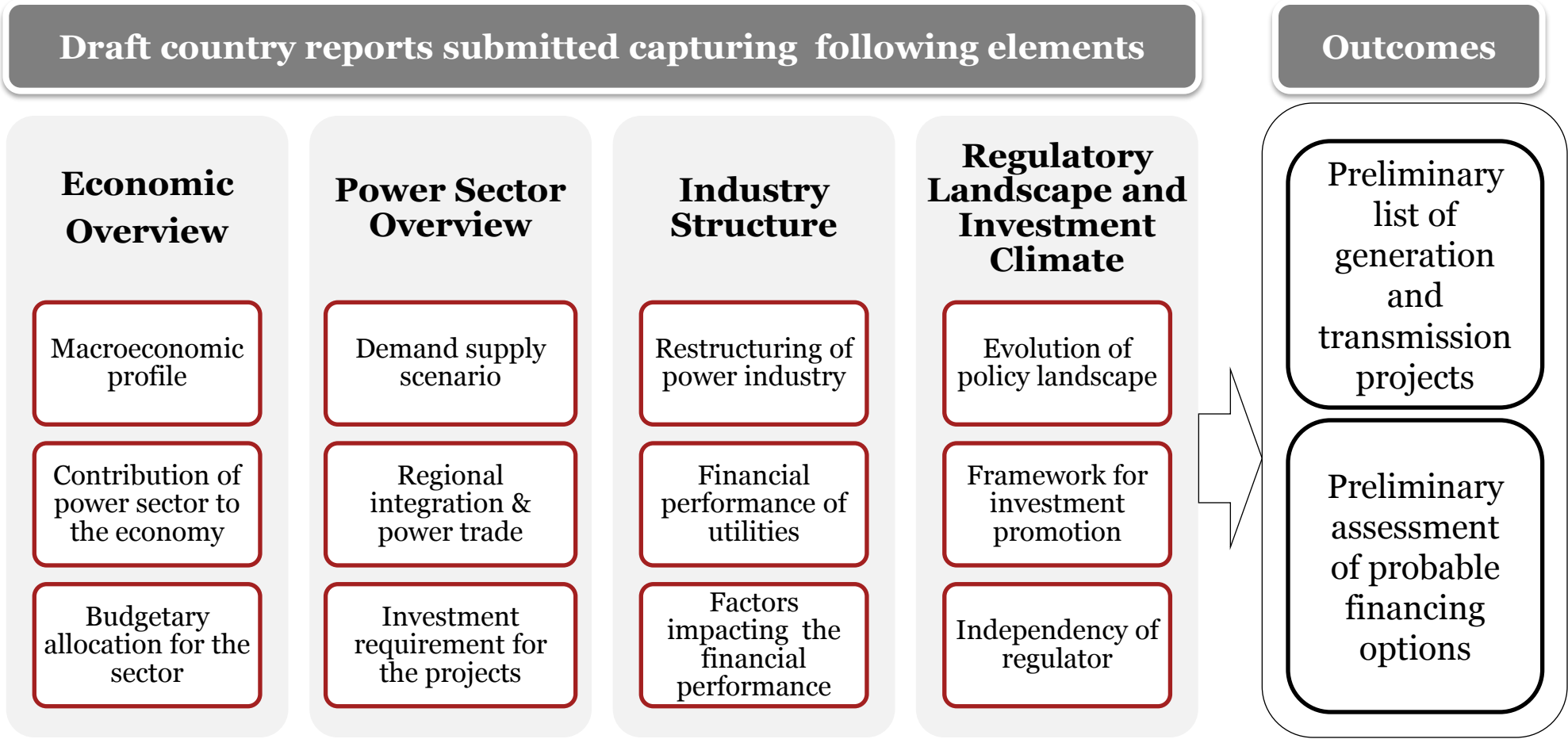
Installed capacity by Country (MW)



Per Capita Power consumption (kWh)



Status of progress of TA activities



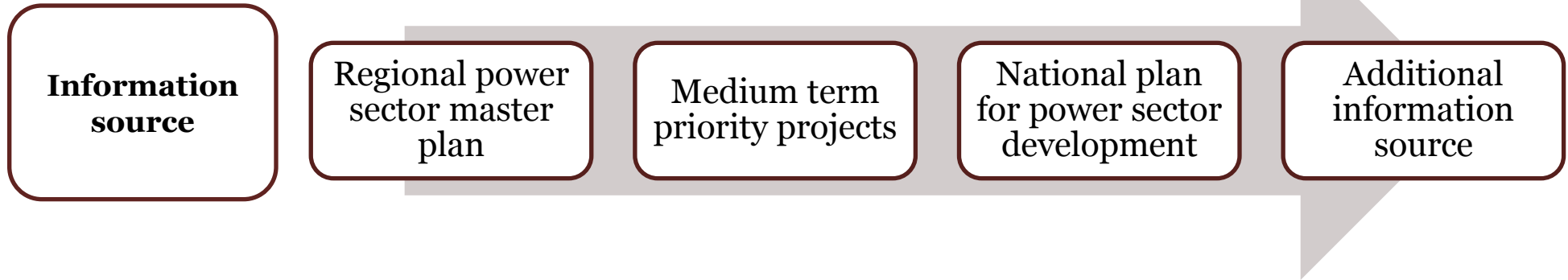
Data & information requested from member countries for further progress of the study

Section 2

Sample Projects and Financing Options

Identifying sample projects

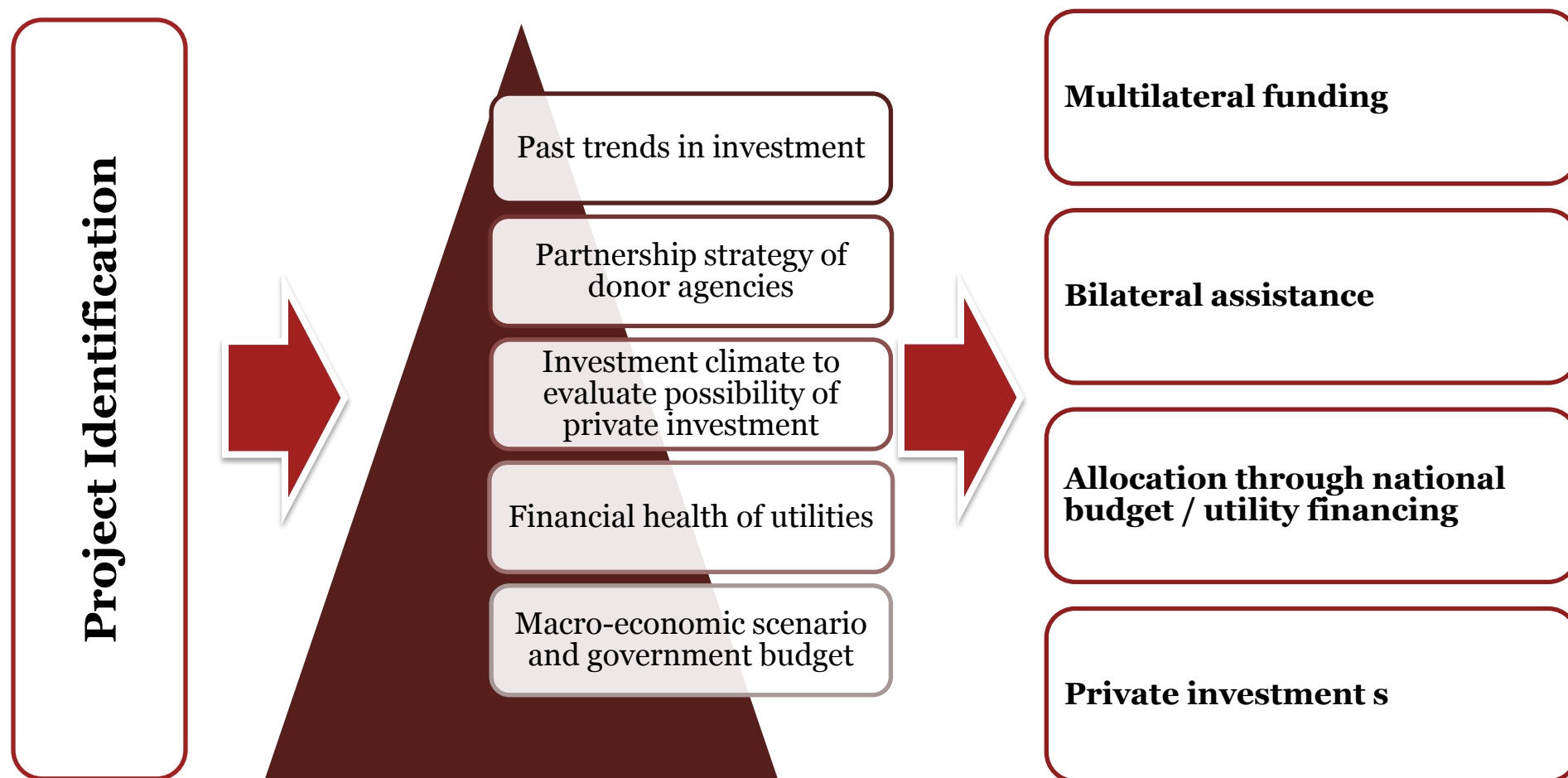
Approach and framework



| | | |
|--|----------------------------------|---|
| | <p>Type of Project</p> | <ul style="list-style-type: none"> • Thermal power projects • Hydropower projects • Transmission lines & substations |
| | <p>Nature of Project</p> | <ul style="list-style-type: none"> • Greenfield projects • Rehabilitation & modernisation |
| | <p>Purpose of Project</p> | <ul style="list-style-type: none"> • Domestic supply • Regional integration & power trade |
| | <p>Timeline</p> | <ul style="list-style-type: none"> • Short to medium term (up to 2020) • Long term (up to 2030) |

Identifying financing options

Approach and framework

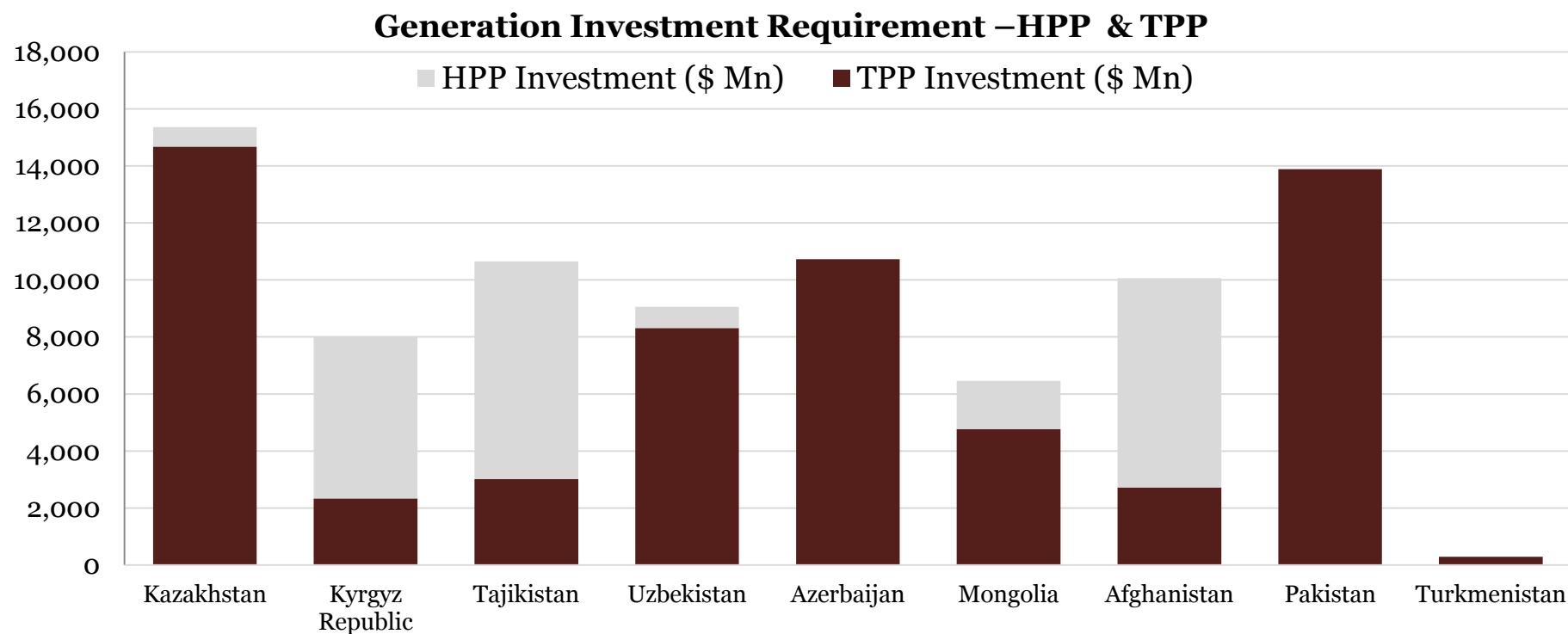


Financing options

Historical trend of financing power projects in CAREC countries

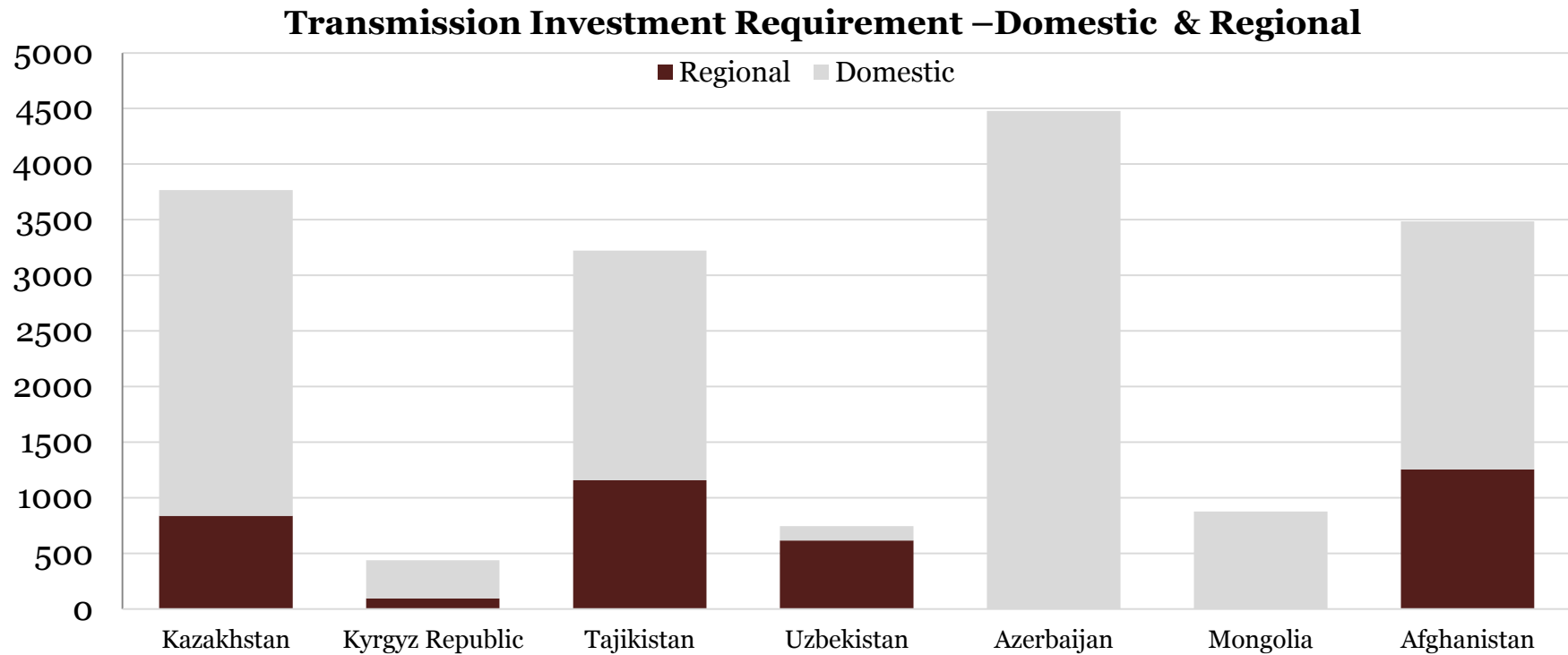
| | Donor agencies | National budget | Utility funding | Assistance from other countries | Private investment (Domestic) | Private investment (Foreign) |
|------------------------|----------------|-----------------|-----------------|---------------------------------|-------------------------------|------------------------------|
| Kazakhstan | High | High | High | Low | High | High |
| Kyrgyz Republic | High | Medium | Low | High | Low | Low |
| Tajikistan | High | Medium | Low | High | Low | Low |
| Uzbekistan | High | High | High | Low | Low | Low |
| Mongolia | High | Medium | Medium | Low | Medium | Medium |
| Pakistan | High | High | Medium | High | Medium | Medium |
| Azerbaijan | High | High | Medium | Low | Medium | Medium |
| Turkmenistan | High | Low | Low | Medium | Low | Low |
| Afghanistan | High | Low | Low | High | Low | Low |

Identified projects (Generation) – Summary



| Thermal Power Project Investment (USD Million) | Hydropower Project Investment (USD Million) |
|--|---|
| 60,724 | 23,771 |

Identified projects (Transmission) – Summary



| Domestic Transmission Investment (USD Million) | Regional Transmission Investment (USD Million) |
|--|--|
| 13,046 | 3,966 |

Section 3

Sample Project List for each Country

Kazakhstan

| Sr. No. | Name of the project | Project description | Period | Project cost (million USD) |
|----------------|---|--|--------------------|-----------------------------------|
| 1 | Integration of the Power System of the Western Kazakhstan with Kazakhstan UPS | <ul style="list-style-type: none"> Ensure power delivery in Aktau and integrate Zone West with Kazakhstan UPS with the lines in the territory of Kazakhstan Implementation will depend on deadlines for commissioning of new generating capacities in the western region of Kazakhstan | 2013 - 25 | 534 |
| 2 | 500 kV North – East – South Electricity Transmission Project | <ul style="list-style-type: none"> Strengthen connection of the East region with Kazakhstan UPS Enable Shulbinsk hydro power plant (HPP) to deliver its full capacity into the grid after the commissioning of Bulak HPP. Enhance reliability of power supply in the East zone, Almaty region and to strengthen North-South transit | 2011 – 18 | 645 |
| 3 | Balkhash Electricity Transmission Project | <ul style="list-style-type: none"> Ensure power delivery from Balkhash TPP (2640 MW) to the KEGOC grid through 500kV overhead transmission line from Balkhash TPP to YuKGRES substation | 2011 – 20 | 130 |
| 4 | Astana Electricity Transmission Project (250 km) | <ul style="list-style-type: none"> Ensure reliability of power supply in Astana and Akmola oblast | 2021- 25 | 127 |
| 5 | Kerbulak HPP | <ul style="list-style-type: none"> HPP (50 MW) in Kerbulak will function as a counter-regulatory station for Kapchagay HPP | Completion by 2020 | 190 |

Kyrgyz Republic

| Sr. No. | Name of the project | Project description | Period | Project cost (million USD) |
|----------------|---------------------------------------|--|---------------|-----------------------------------|
| 1 | Sary Djas hydropower project | <ul style="list-style-type: none"> Sary-Djaz HPP aggregate installed capacity of 1200 MW | 2012-25 | 1,200 |
| 2 | Kara-Keche TEPP | <ul style="list-style-type: none"> Thermal power plant with the capacity of 1200 MW at the Kara-Keche coal deposit | 2016 - 25 | 1,725 |
| 3 | Datka-Kemin line and Kemin substation | <ul style="list-style-type: none"> Constructing a new 400 km, 500kV power transmission line from Datka 500kV substation in the southwest part of Kyrgyzstan to a new 500/220kV substation Kemin near Kazakhstan border in north-east Kyrgyztsan. | 2013 - 17 | 342 |
| 4 | Kemin-Almaty and Kemin-Torugart power | <ul style="list-style-type: none"> Planned to build Kemin-Almaty and Kemin-Torugart power lines. These transmission lines will allow Kyrgyzstan to save money which the country spends on electricity transit through Kazakhstan and Uzbekistan. | 2013 - 17 | 151 |

Tajikistan

| Sr. No. | Name of the project | Project description | Period | Project cost (million USD) |
|---------|---|--|----------|----------------------------|
| 1 | 500 kV Overhead Power Transmission Line Rogun-jirgatal-Kyrgyzstan-china | <ul style="list-style-type: none"> About 550 km of Transmission line length to transmit electricity to China . | 2013- 18 | 160 |
| 2 | 500 kV Overhead Power Transmission Line Rogun-sangtuda- Kunduz- Puli Khumri - Kabul | <ul style="list-style-type: none"> Overhead Transmission Line is proposed to transmit generated electricity to the large settlements of Afghanistan, in accordance with Sangtuda and Roghun Hydro Power Plants Power Output Scheme. | 2013- 18 | 158 |
| 3 | 500 kV Overhead Power Transmission Line - Rogun - Kunduz-puli Khumri - Kabul-Jelalobod- Peshovar | <ul style="list-style-type: none"> Proposed project will transmit 4.0 billions kWh of electricity to Afganistan and Pakistan | 2013- 18 | 296 |
| 4 | 500 kV Overhead Power Transmission Line Rogun-sangtuda- Kunduz- Puli Khumri - Kabul- Gerat – Meshhed (Iran) | <ul style="list-style-type: none"> 1560 km of Transmission line length to transmit generated electricity to the large settlements of Afghanistan and Iran, in accordance with Sangtuda and Roghun Hydro Power Plants Power Output Scheme. | 2013- 18 | 544 |
| 5 | Shurab HPP 300 MW | <ul style="list-style-type: none"> Construct the Shurab hydro power plant (HPP) on the Vakhsh River in Tajikistan | 2013 -16 | 320 |
| 6 | Zarafshon HPP 160 MW | <ul style="list-style-type: none"> Construct the hydro power plant (HPP) on the Zarafshon River in Tajikistan | 2018 | 320 |

Uzbekistan

| Sr. No. | Name of the project | Project description | Period | Project cost (million USD) |
|----------------|---|--|---------------|-----------------------------------|
| 1 | Chodjiket HPP | <ul style="list-style-type: none"> Rehabilitation of 165 MW Chodjiket Hydro Power Plant | 2016 - 19 | 88 |
| 2 | Sirdarya TPP | <ul style="list-style-type: none"> Build two combined-cycle gas turbine (CCGT) at Syrdarya with a total capacity of 900 MW | 2016 -19 | 1,080 |
| 3 | Upgrading of Takhiatash TPP | <ul style="list-style-type: none"> Upgradation of 2x140 MW Thermal power plant | 2012–18 | 331 |
| 4 | Conversion of Units 6 &7 Novo-Angren TPP to coal firing | <ul style="list-style-type: none"> Conversion of boilers of the Novoangren TPP from gas to coal burning arrangement. | 2014-16 | 304 |
| 5 | Upgrading of Chirchik HPP | <ul style="list-style-type: none"> Upgrading of Chirchik HPP | 2013–15 | 24 |
| 6 | Namangan-Lochin 500 k V line | <ul style="list-style-type: none"> Construction of 500 kV TSS “Namangan” including 500 kV overhead power line TPP- TSS Namangan and cut-in of two single-circuit 220 kV overhead lines at Namangan. | 2017 – 19 | 36 |

Azerbaijan

| Sr. No. | Name of the project | Project description | Period | Project cost (million USD)* |
|----------------|---|---|------------------------|------------------------------------|
| 1 | Yashma | <ul style="list-style-type: none"> A CGCT power plant of 920 MW to be constructed within Yashma locality | 2018 | 855 |
| 2 | Agh Sheher | <ul style="list-style-type: none"> Agh Sheher 300 MW combined heat and power plant (CHP) within the framework of the White City project in Baku | 2020 | 1,188 |
| 3 | Azerbaijan | <ul style="list-style-type: none"> CCGT 600 MW Power plant Azerbaijan TPP with CCGT units instead of oil-fired steam turbines in the developing Absheron region | 2021 | 2,442 |
| 4 | Baku Electric Grid | <ul style="list-style-type: none"> Renovation & Expansion of Baku's Electricity Network | 2020 | 637 |
| 5 | Azerbaijan TPP - Mingachevir HPP - Salutapa | <ul style="list-style-type: none"> 330 kV DC Overhead Transmission Lines | To commence after 2018 | 67 |
| 6 | Sumgayit - Hovsan | <ul style="list-style-type: none"> 330 kV DC Overhead Transmission Lines | To commence after 2018 | 29 |

**Cumulative Investment*

Afghanistan

| Sr. No. | Name of the project | Project description | Period | Project cost (million USD) |
|----------------|-----------------------------|---|---------------|-----------------------------------|
| 1 | Baghdara HPP | <ul style="list-style-type: none"> • Baghdara HPP planned in the mountains near the mouth of the Panjshir River gorge in the Kohi Safi District of Parwan Province, and lies within the Ghorband and Panjshir watershed region | 2021 | 600 |
| 2 | Kunar A HPP | <ul style="list-style-type: none"> • Hydro Power Plant on the Kunar River | 2022 | 2,000 |
| 3 | Dara-i-Suf TPP | <ul style="list-style-type: none"> • Thermal Power Plant at e Dara-i-Suf coal district in Samangan Province | 2029 | 1,360 |
| 4 | Hindu Kush crossing | <ul style="list-style-type: none"> • Hindu Kush crossing project will enable the operation of a national grid with all Afghan generation units synchronized | 2,032 | 310.1 |
| 5 | NEPS to SEPS interconnector | <ul style="list-style-type: none"> • Connection between NEPS and SEPS(NEPS-Kandahar tactical tie-in) will necessitate the construction of a new substation south of Kabul in the future | 2,032 | 238.2 |

Mongolia

| Sr. No. | Name of the project | Project description | Project cost (million USD) |
|----------------|---|---|-----------------------------------|
| 1 | Ulaanbaatar Fifth Combined Heat Power Plant (CHP-5) | <ul style="list-style-type: none"> • Develop Combined Heat Power Plant For Ulaanbaatar City • 450 MW Power plant | 1,500 |
| 2 | Baganuur Combined Heat Power Plant | <ul style="list-style-type: none"> • Develop Power Plant Based On Baganuur District And Coal Ore • Capacity of 700 MW Capacity Power Plant | 950 |
| 3 | Dornod Combined Heat Power Plant | <ul style="list-style-type: none"> • Develop CHP Power Plant For Dornod Province • 100 MW Capacity Power Plant | 160 |
| 4 | Khovd Irver Hydro Power Plant Project | <ul style="list-style-type: none"> • Develop Hydro Power Plant On Khovd River, Khovd Aimag-64 MW HPP | NA |
| 5 | Chandgana Power Plant, Power Line From Baganuur To Undurkhaan And Undurkhaan To Choibalsan & Substation | <ul style="list-style-type: none"> • Develop Power Plant Based-600 MW on Chandgana Coal Ore and Power Line From Baganuur Province To Undurkhaan & Undurkhaan To Choibalsan | 1,600 |
| 6 | Tevshiin Govi Power Plant | <ul style="list-style-type: none"> • Develop Power Plant Based On Tevshiin Gobi Coal Ore | 900 |

Pakistan

| Sr. No. | Name of the project | Project description |
|----------------|---|--|
| 1 | 2 x 660 MW TPP at Qadirabad (Sahiwal) | <ul style="list-style-type: none"> • Construction of a 1,320 MW Thermal Power plant at Qadirawal |
| 2 | 2 x 660 MW TPP at Bhikki (Sheikhupura) | <ul style="list-style-type: none"> • Construction of a 1,320 MW Thermal Power plant at Bhikki |
| 3 | 2 x 660 MW TPP at Haveli Bahadur Shah (Jhang) | <ul style="list-style-type: none"> • Construction of a 1,320 MW Thermal Power plant at Jhang |
| 4 | Dasu HPP 4320 MW | <ul style="list-style-type: none"> • Construction of a 4,320 MW Hydro Power plant at Qadirawal a run of river scheme located 7 km upstream of Dasu village on Indus River |
| 5 | Diamer Bhasa HPP 4500 MW | <ul style="list-style-type: none"> • Construction of an hydroelectric power plant on the Indus River • Project cost – USD 6.6 million |
| 6 | 2 x 660 MW TPP at Keti Bunder | <ul style="list-style-type: none"> • Construction of a 1,320 MW Thermal Power plant at Keti Bunder |

Section 4

Way Forward

Addressing coordination issues

Data & information required from member countries on budgetary allocation, utility financials, policies & regulations, priority projects, financing plan, etc.

Stakeholder engagement meetings to be facilitated during consultant's visit to the member countries in the next few months

Feedback and observations on preliminary study outcomes

Next steps to mobilise fund for developing energy assets

Finalization of list of priority projects and financing options based on further data/ information and feedback

Developing catalogue of projects suitable for PPP mode of development

Developing a reform action plan for facilitating private investments

Project structuring and financial structuring for few critical projects

Thank you!

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