

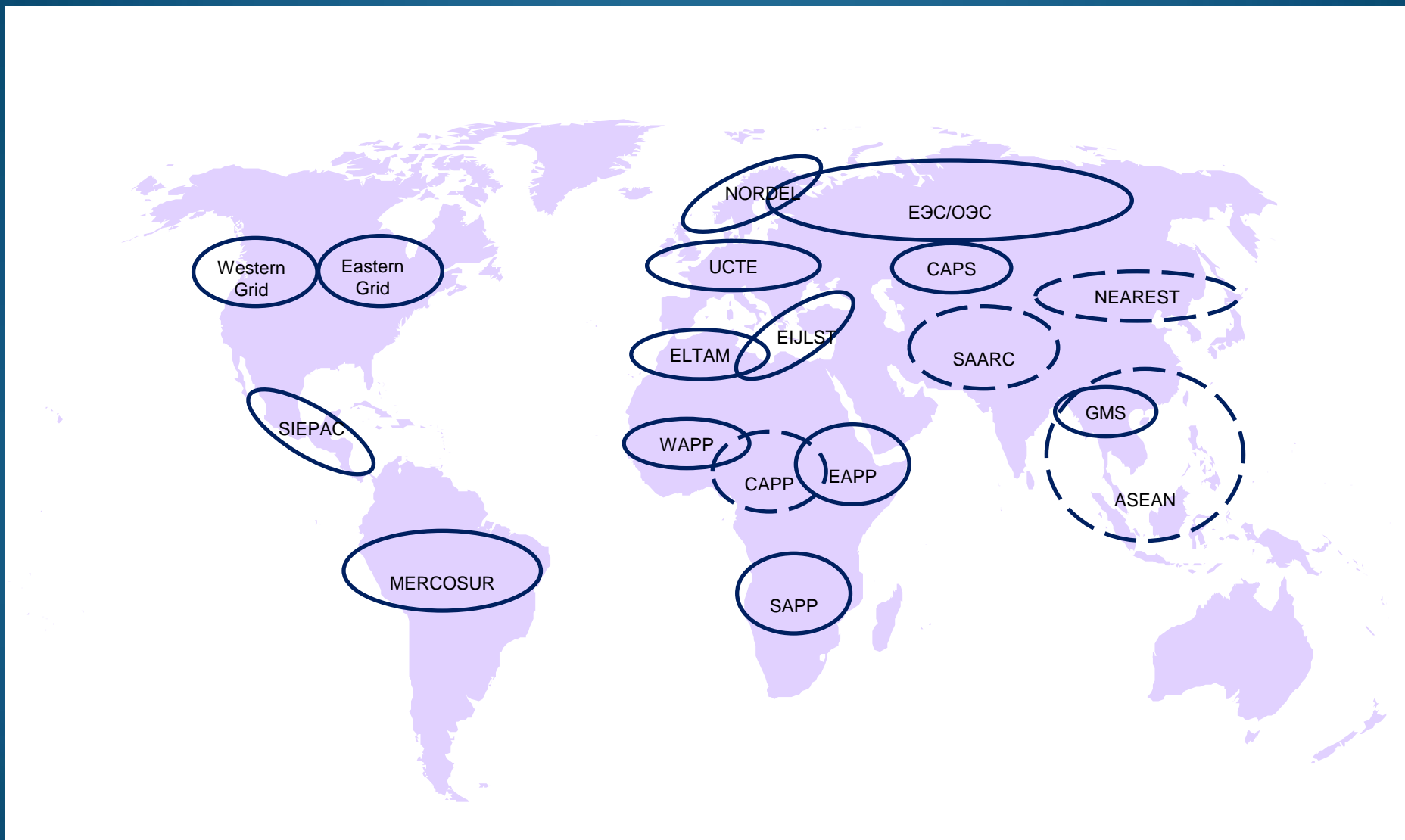


Electric power cooperation and trading in Asia Pacific Region: Russian view

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Interstate electric ties and power pools (ISETs and ISPPs) in the world





Lessons of electric power cooperation. I

- The formation of large ISPPs creates conditions for mutually beneficial trade of electricity among the countries as well as results in pronounced integration benefits in terms of capacity savings, cost reduction, improvement of the reliability of power supply to consumers and others (including the environmental and social ones).
- Gaining the abovementioned integration benefits leads to the interrelation of the power balances of the countries entering the ISPP and necessitates the conclusion of the adequate agreements among countries, and the creation of mechanisms providing energy security for each country.
- The formation of ISPPs and ISETs creates a network infrastructure of interstate electricity markets contributing to the intensification of electricity trade among the countries.
- The wider liberalization of the national and international electricity markets complicates the control of ISPPs. This, in turn, makes it difficult to gain benefits owing to the EPS interconnection. Therefore, the “non-market” structures including the authorized state bodies of participating countries should play an essential role in the formation and control of ISPPs and ISETs.

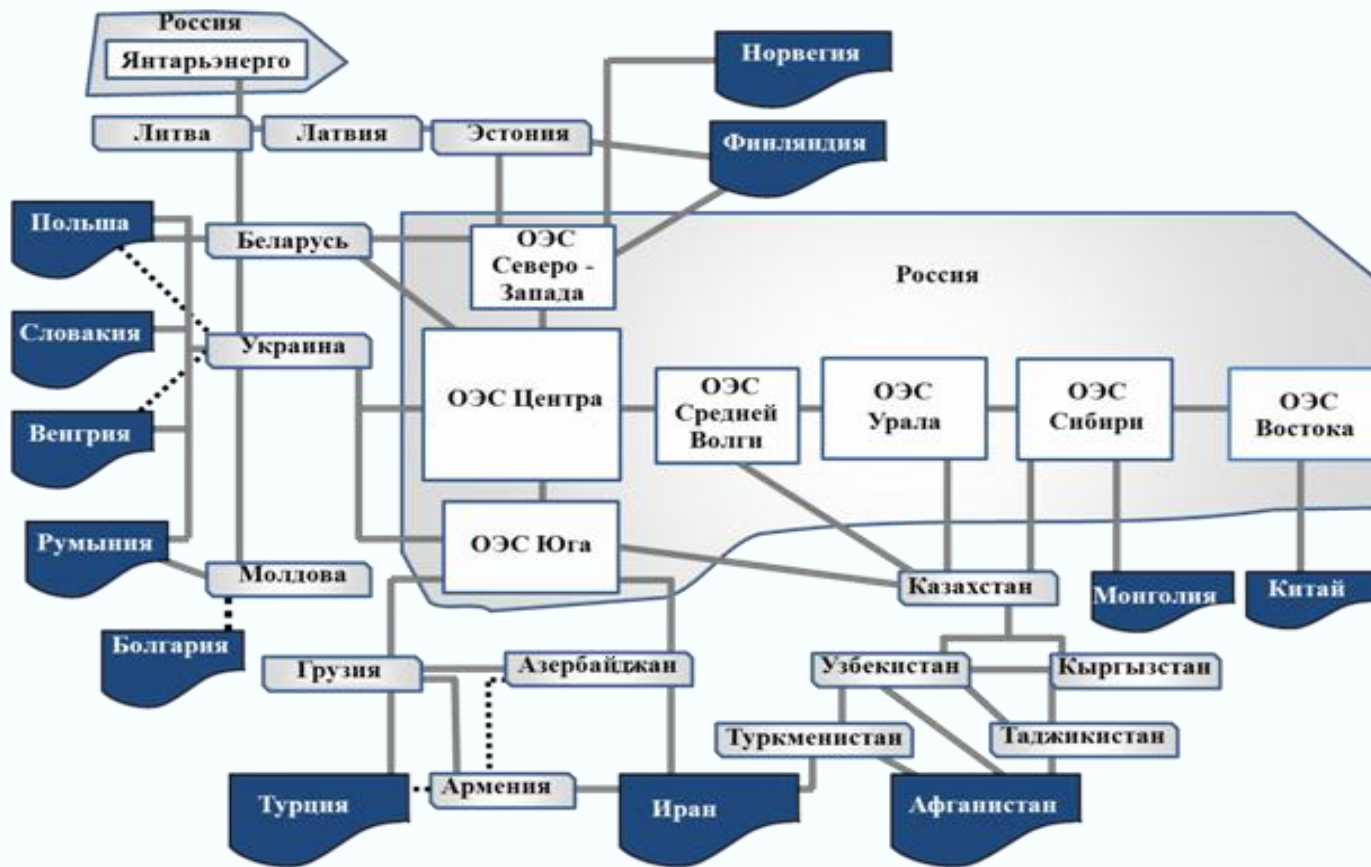


Lessons of electric power cooperation. II

- The interstate electric power integration contributes to the accelerated development of the countries with poorly developed economies and to the finding of solutions to their social problems.
- The successful promotion of works on ISPP formation, especially at the initial stages (including the study of its effectiveness; determination of priority facilities to be constructed; and the planning, designing, and construction of top-priority facilities) greatly depends on the availability of an organization which would be responsible for this.
- In ISPP formation, it is reasonable to jointly consider energy networks including ISETs, gas pipelines (particularly for fuel supply to power plants of the ISPP), and so on. It will result in the costs reduction of the energy network infrastructure as a whole. Coordination of developing the facilities of the ISPP and other energy industries (gas, oil, coal) will, in the long run, lead to the creation of common energy space in NEA for mutually beneficial trade in energy carriers, fuel, and electricity, as well as to integration benefits.



ISETs of Russia





ISETs of Russia (as of 2010)

Country	Line number	Length*, km	Rated voltage, kV	Electricity transfer, TWh	
				Export	Import
<i>Baltic region</i>					
Finland	6	266	20, 110, 400	11035	–
Norway	1	10	154	500	–
Latvia	1	171	330	7	–
Lithuania	6	361	110, 330	5106	3
Estonia	7	548	35, 110, 330	–	–
<i>Europe</i>					
Belarus	11	821	35, 110, 330, 750	29	–
Ukraine	19	2181	35, 110, 330, 500, 750; ±400	32	81
<i>Transcaucasia</i>					
Georgia	1	411	500	212	1117
Azerbaijan	2	231	110, 330	18	203
South Ossetia	2	–	110	118	–
Abkhazia	1	–	110	–	–
<i>Central Asia</i>					
Kazakhstan	63	5051	110, 220, 500	1376	1498
<i>East Asia</i>					
Mongolia	3	380	110, 220	214	21
China	3	206	110, 220, 500	983	–

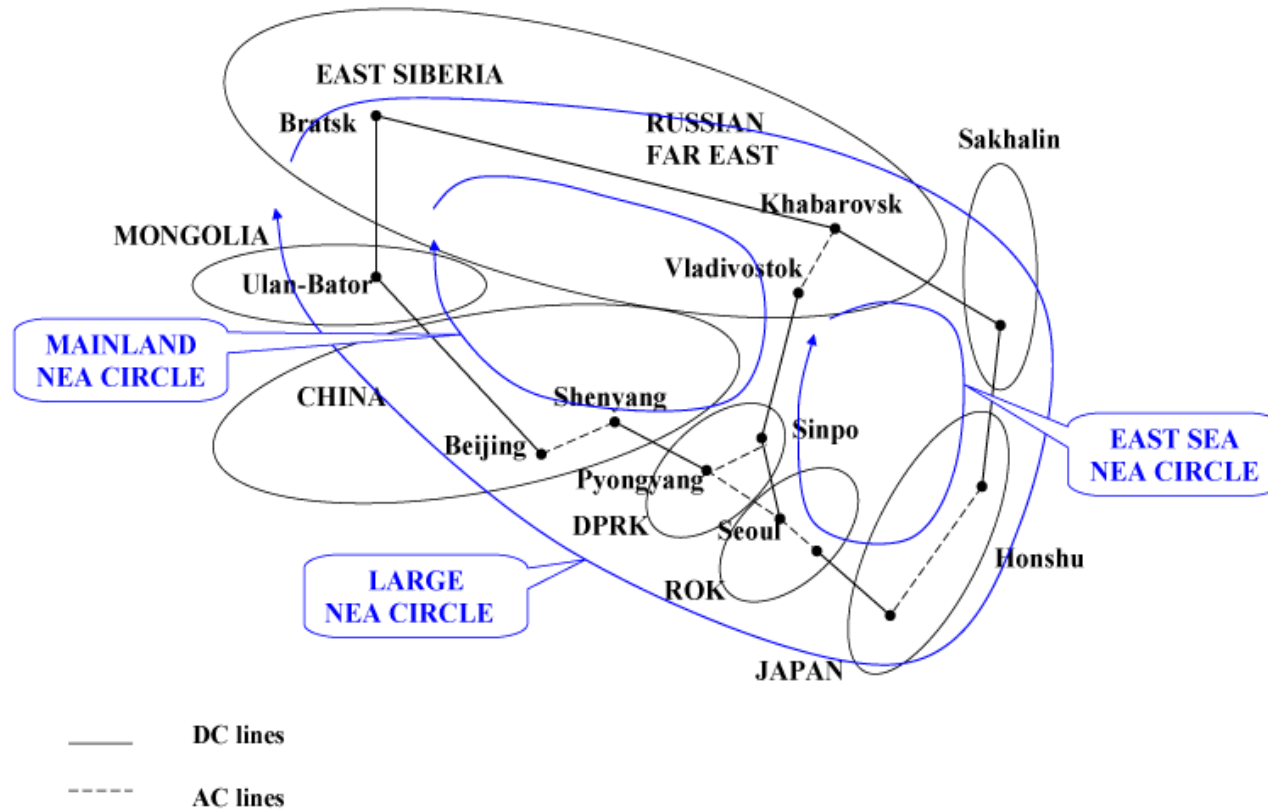


Projects of interstate electric power cooperation with Russian participation

- **Baltic ring**
- **ISETs with East and West Europe**
- **Black sea ring (Black sea regional transmission planning project – BS RTP)**
- **Central Asia – South Asia regional electricity market (CASAREM)**
- **North East Asia regional electric system ties (NEAREST)**
- **Large scale electricity export to China**
- **ISET Bratsk-Beijing (Siberia-North China)**
- **Russia-Japan power bridge**
- **Direct current bus "Siberia-Russian Far East"**

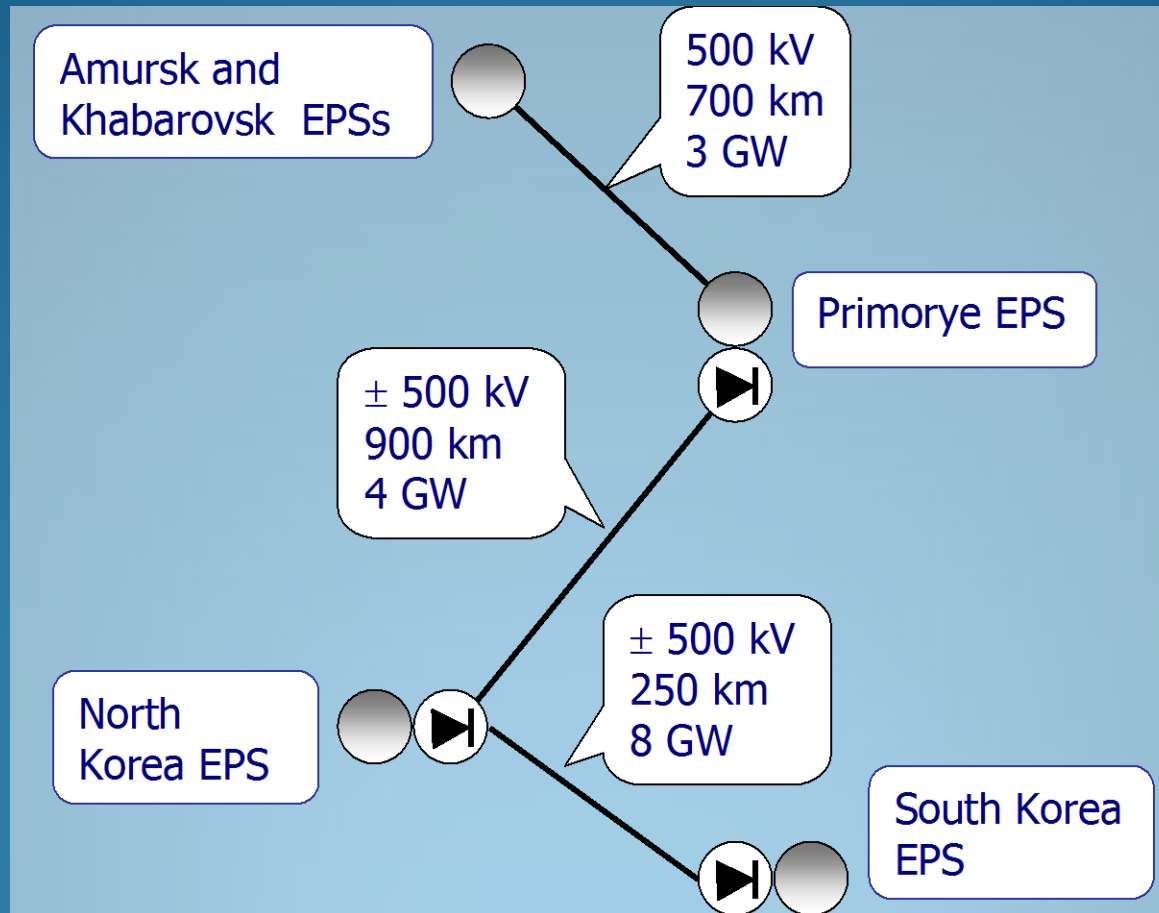


ISETs within East Asia. NEAREST



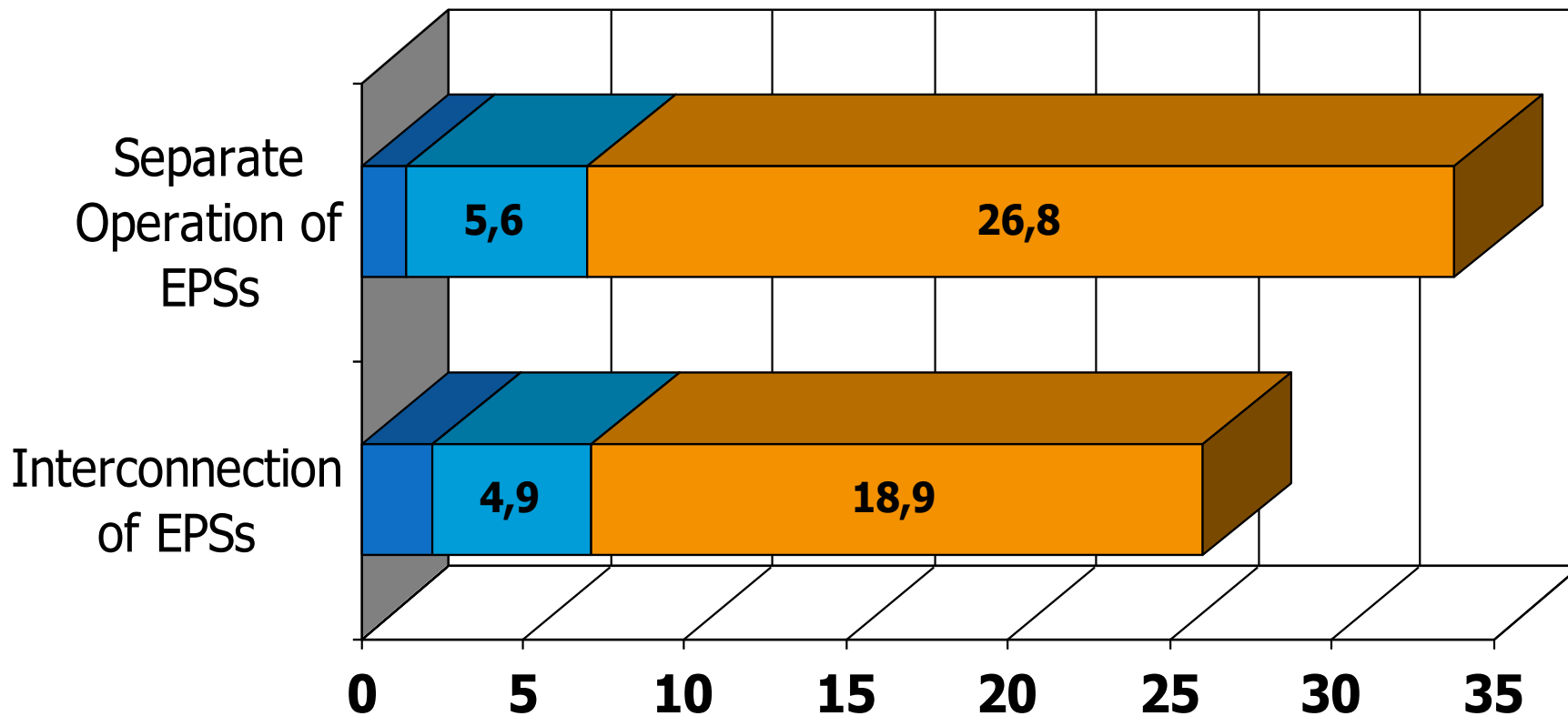


Scheme of ISET «Russia - North Korea - South Korea». NEAREST





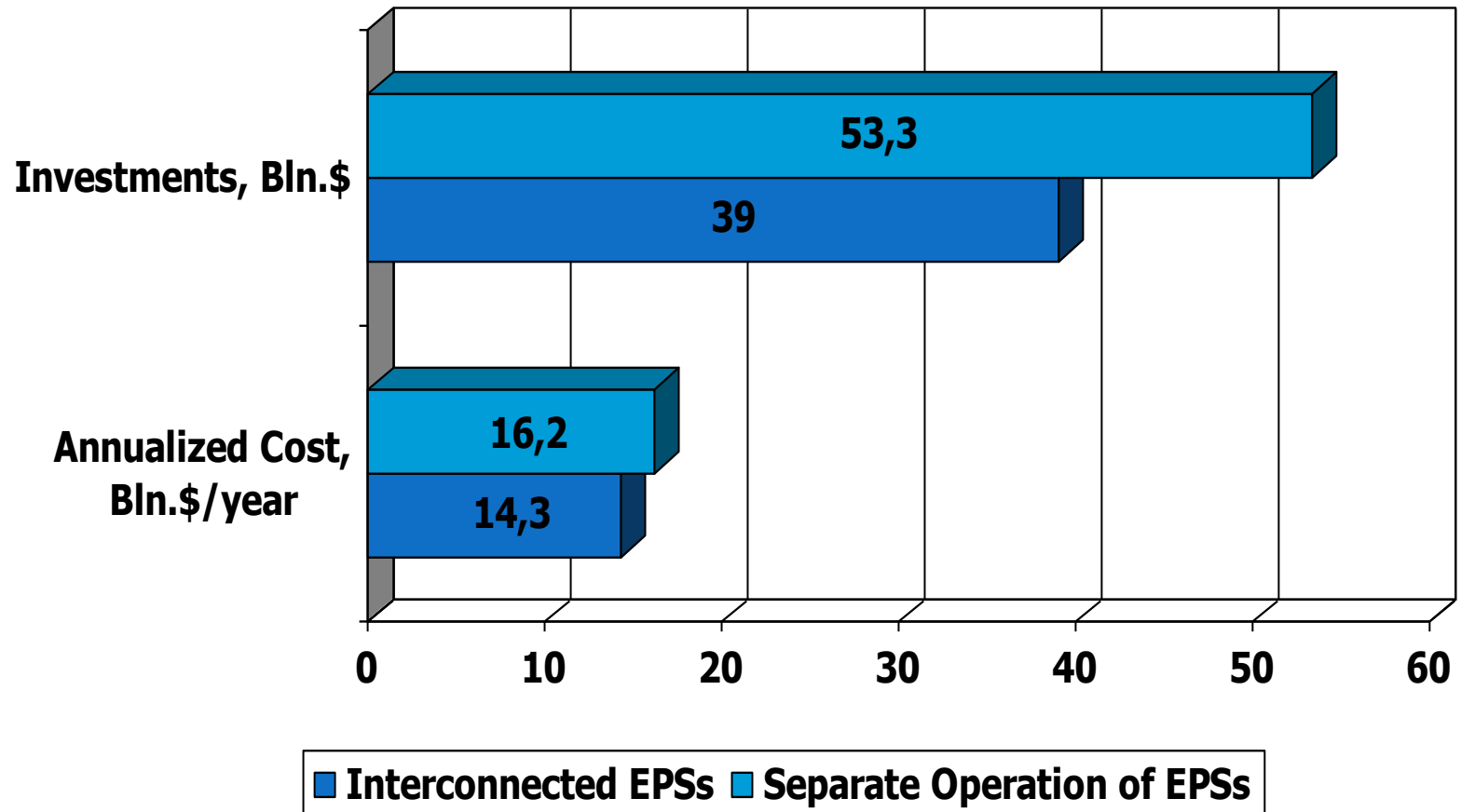
Commissioning new generating capacities, GW



■ Russian Far East EPSs ■ North Korean EPS ■ South Korean EPS



Costs



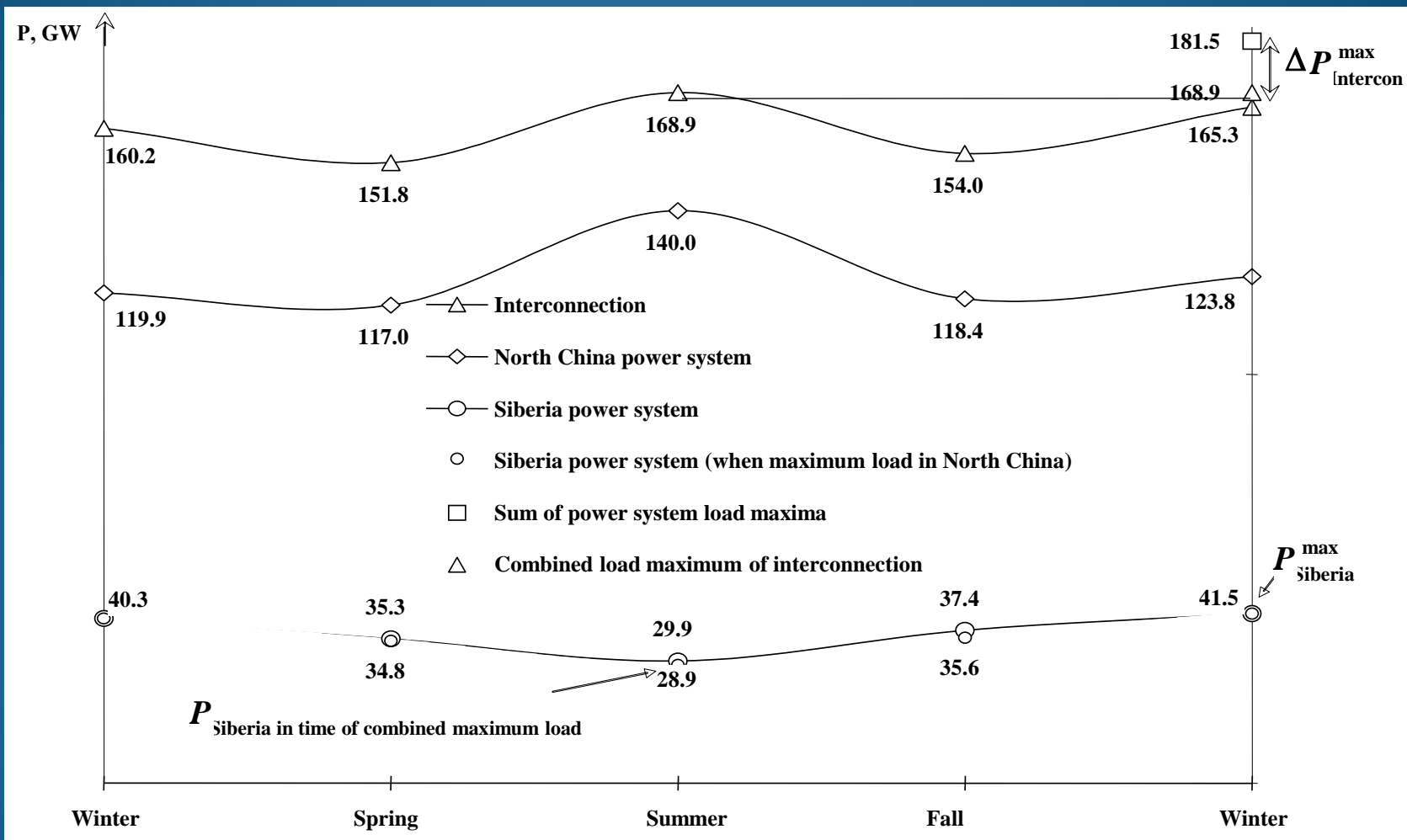


Large scale electricity export to China

- Stage 1 – Electricity export of 4 TWh/year
- Stage 2 – Electricity export of 22 TWh/year
- Stage 3 – Electricity export of 60 TWh/year
- To supply indicated amount of electricity five coal-fired thermal power plants are supposed to be built in Transbaikalia and Russian Far East with total capacity of about 11 GW and ISETs to North-East China with voltage of ± 600 kV and length of 3400 км. Cost of the project is estimated to be \$18 Bln.



Seasonal maximum loads for “Siberia–North China” power system interconnection





“Siberia-North China” power system interconnection capacity benefits, GW

Shape of yearly load curves	Potential benefit	Repair of equipment	Transfer capacity	Capacity saving	
				Siberia	North China
Flat	12.6	3.1	5.0	4.5	4.5
Uneven	15.2	3.8	6.0	5.4	5.4

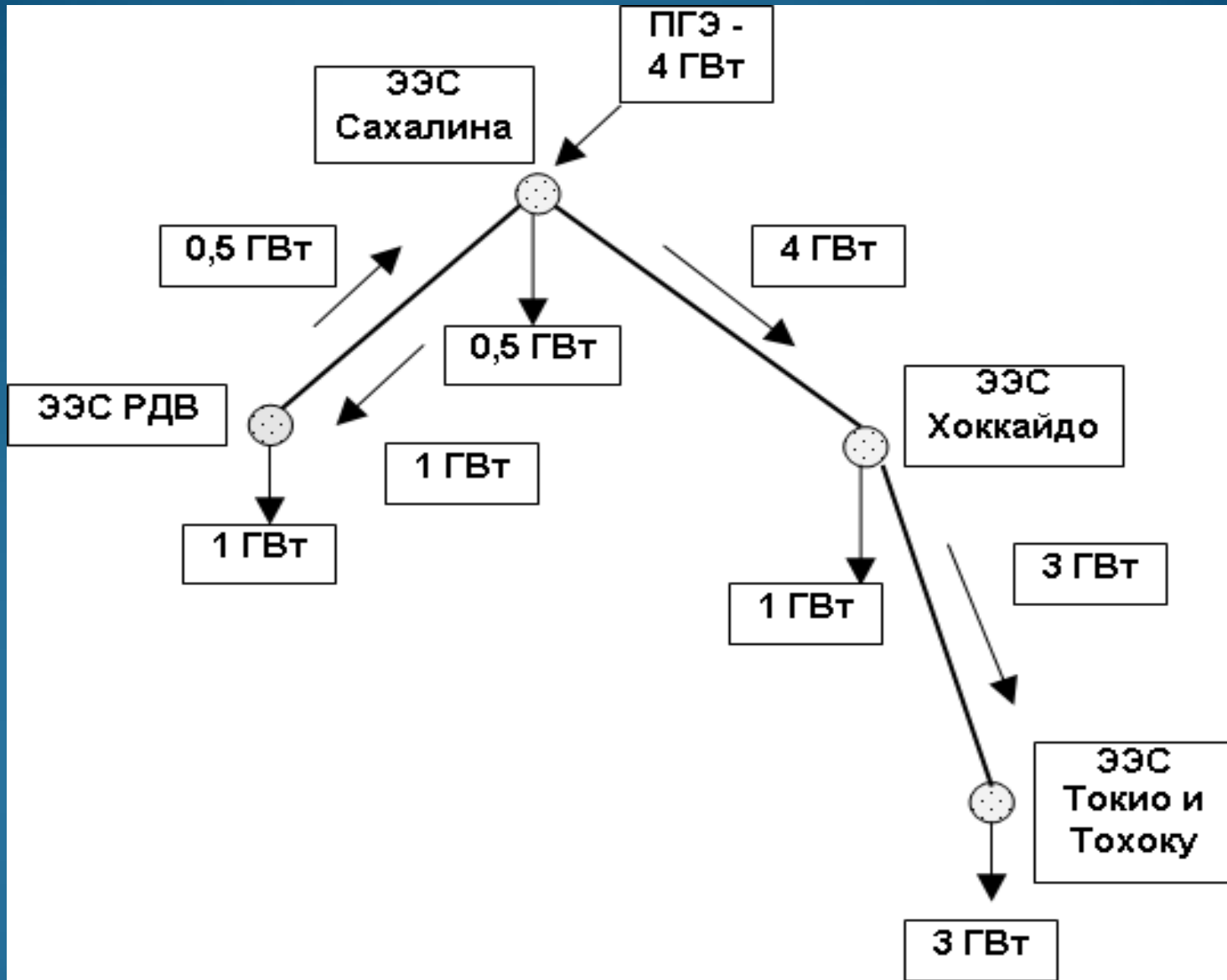


Cost and benefits of “Siberia-North China” power system interconnection, \$ Bln.

Transfer capacity of ISET, GW	ISET investment	Investment saving			Economic benefit
		Siberia	North China	Total	
5	2.2	4.3	3.6	7.9	5.7
6	2.5	4.9	4.3	9.2	6.7

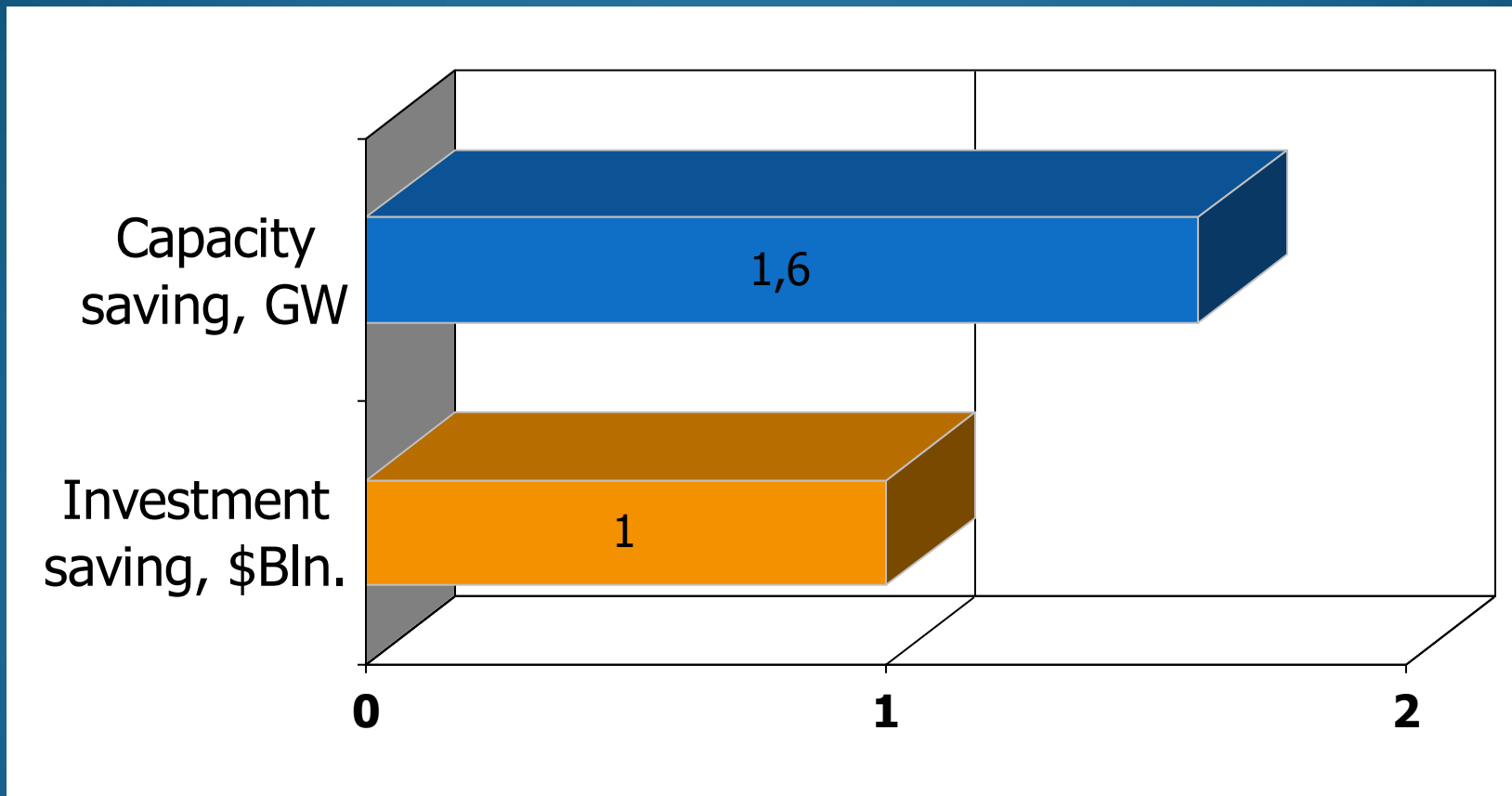


Russia-Japan power bridge



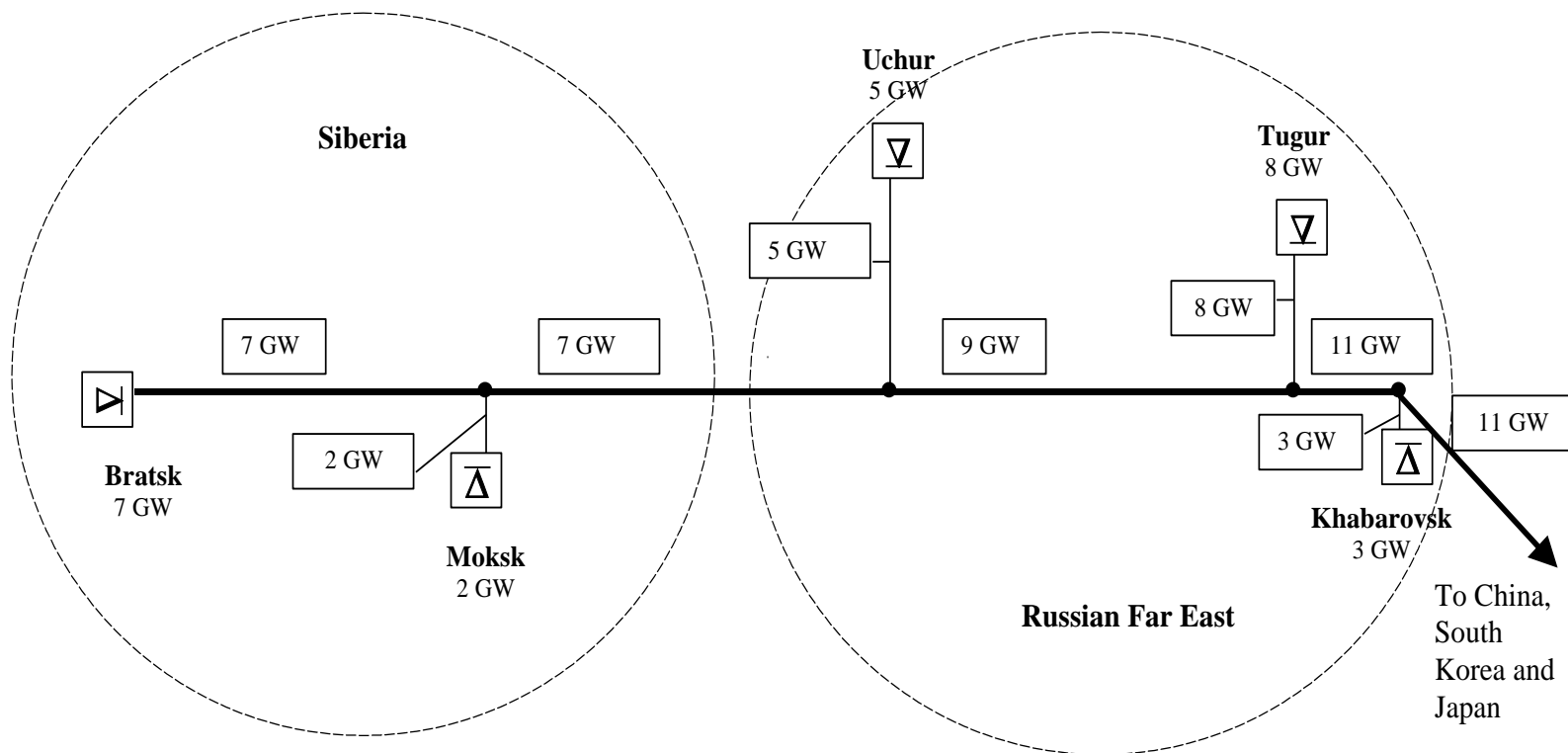


Russia-Japan power bridge. Economic benefits





“Siberia – Russian Far East” HVDC bus





Conclusions

- **Russia has quite developed ISETs and power exchange with Western, and Southern adjacent countries. However ISETs with East Asian countries are virtually not developed**
- **There exists large potential for electric power cooperation of Russia with East Asian/Asia-Pacific Region countries both in terms of power trading and obtaining integrating system benefits**
- **As conducted studies found out, electric power cooperation in Northeast Asia/Asia-Pacific Region with formation of ISETs and ISPP can bring about substantial economic benefits for countries – participants**
- **More joint studies are needed to investigate the problem of electric power cooperation and electricity trading in Asia-Pacific Region thoroughly considering economic, technical, environmental issues and interests of participating countries**
- **APERC is the right body who can organize and lead the studies that contribute very much to developing and strengthening electric power cooperation in this key region of the world**