Ministry of Energy

DEPUTY MINISTER OF ENERGY

D.DORJPUREV

МОНГОЛ УЛСЫН ЗАСГИЙН ГАЗАР

ENERGYMONGOLIA INTERNATIONAL CONFERENCE & EXPO 2014 22-24 MAY CREATION-NEW POSSIBILITIES

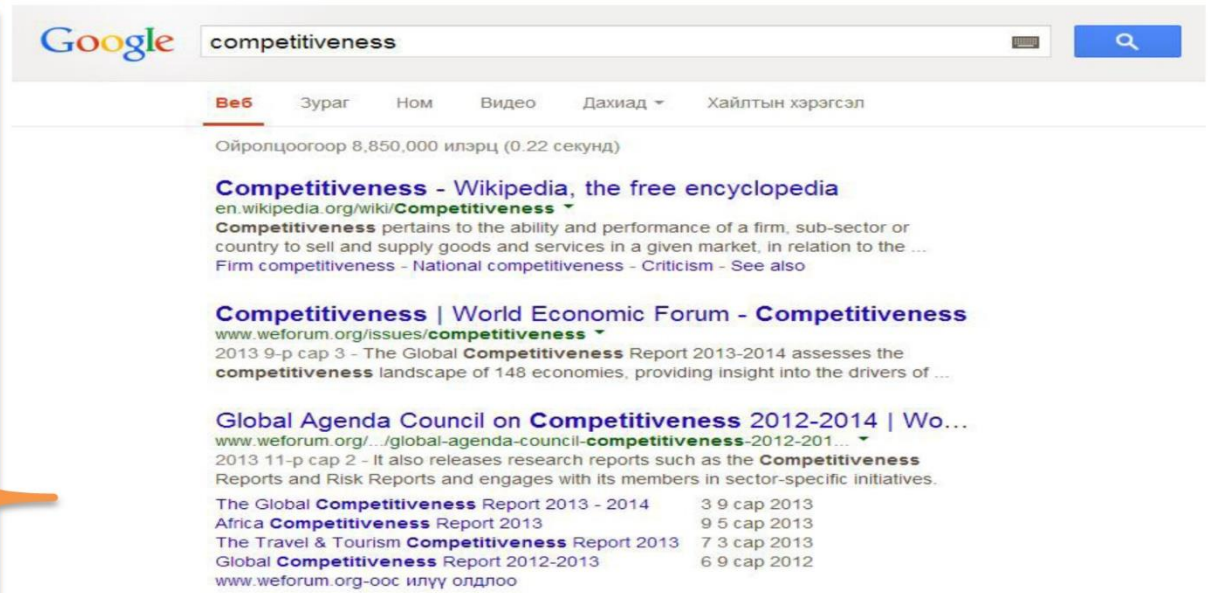
Competitiveness of Mongolian Energy sector

Contents

- About Competitiveness
- Competitiveness of Mongolia in global
- Competitiveness of Mongolian energy in global
- Competitiveness of Mongolian energy current status
- Possibility to raise Competitiveness

About Competitiveness

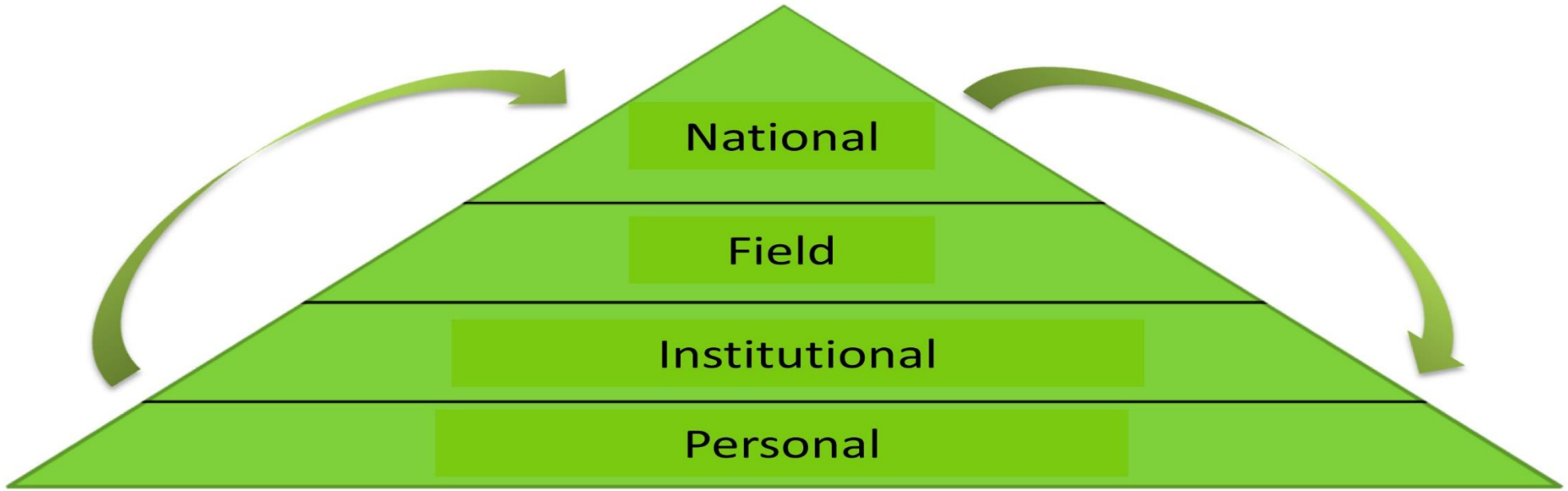
The simplest definition of competitiveness
”Be better than others"
But, how?



If you type "competitiveness" in Google, 30 million pieces of information will come out. Competitiveness is a multi-faceted concept and has been widely used in economics in the last 20 years.

About Competitiveness

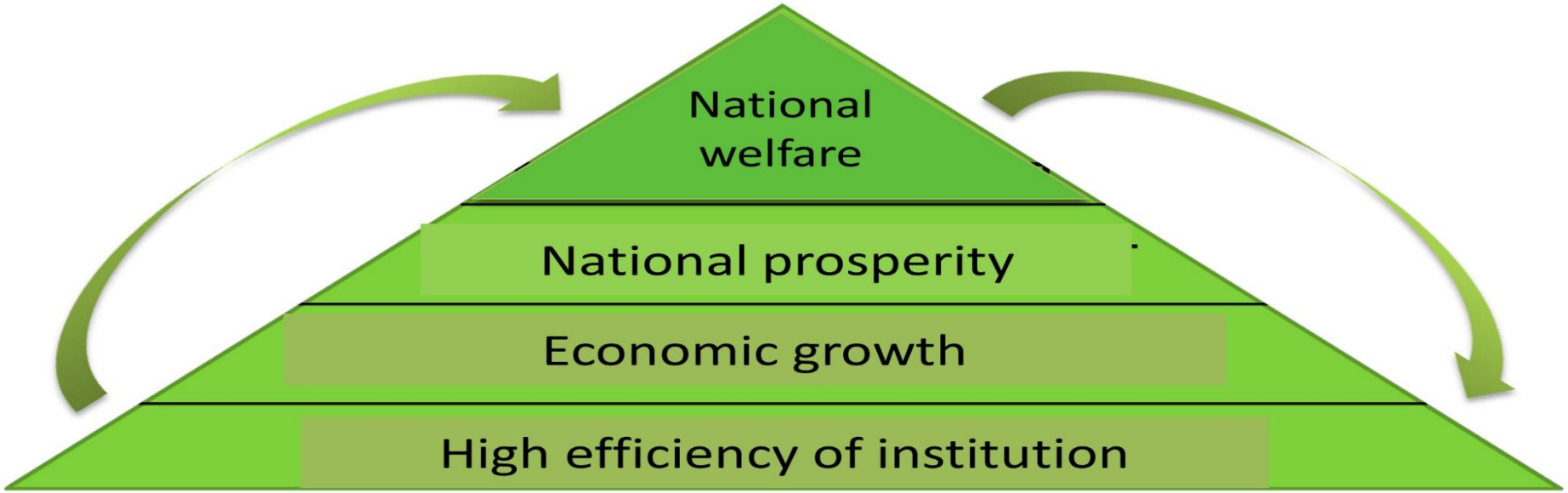
In order to provide national welfare government controls its advantage, capacity and strengthen its economy



About Competiveness

Purpose of increasing the competitiveness of the country

Raising the competitiveness is not the final purpose, This is a method of economical to achieve following purposes.



Competitiveness of Mongolia in global

1.1: The Global Competitiveness Index 2012–2013

Table 4: The Global Competitiveness Index 2012–2013

	OVERALL INDEX		Basic requirements	
Country/Economy	Rank	Score	Rank	Score
Switzerland	1	5.72	2	6.22
Singapore	2	5.67	1	6.34
Finland	3	5.55	4	6.03
Sweden	4	5.53	6	6.01
Netherlands	5	5.50	10	5.92
Germany	6	5.48	11	5.86
United States	7	5.47	33	5.12
United Kingdom	8	5.45	24	5.51
Hong Kong SAR	9	5.41	3	6.14
Japan	10	5.40	29	5.30
Honduras	90	3.88	101	4.08
Lebanon	91	3.88	116	3.79
Namibia	92	3.88	82	4.33
Mongolia	**93**	**3.87**	**92**	**4.17**
Argentina	94	3.87	96	4.15
Serbia	95	3.87	95	4.15
Greece	96	3.86	98	4.13
Jamaica	97	3.84	114	3.82
Gambia, The	98	3.83	103	4.01
Gabon	99	3.82	86	4.25
Tajikistan	100	3.80	105	3.97

Reference: World Economics Forum
"Global Competitiveness Report 2012-2013"

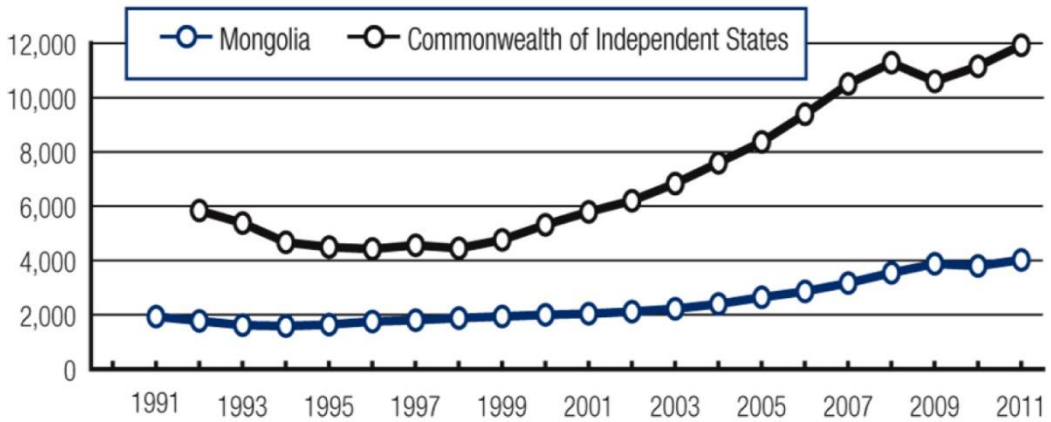
(Cont'd.)

Competitiveness of Mongolia in global

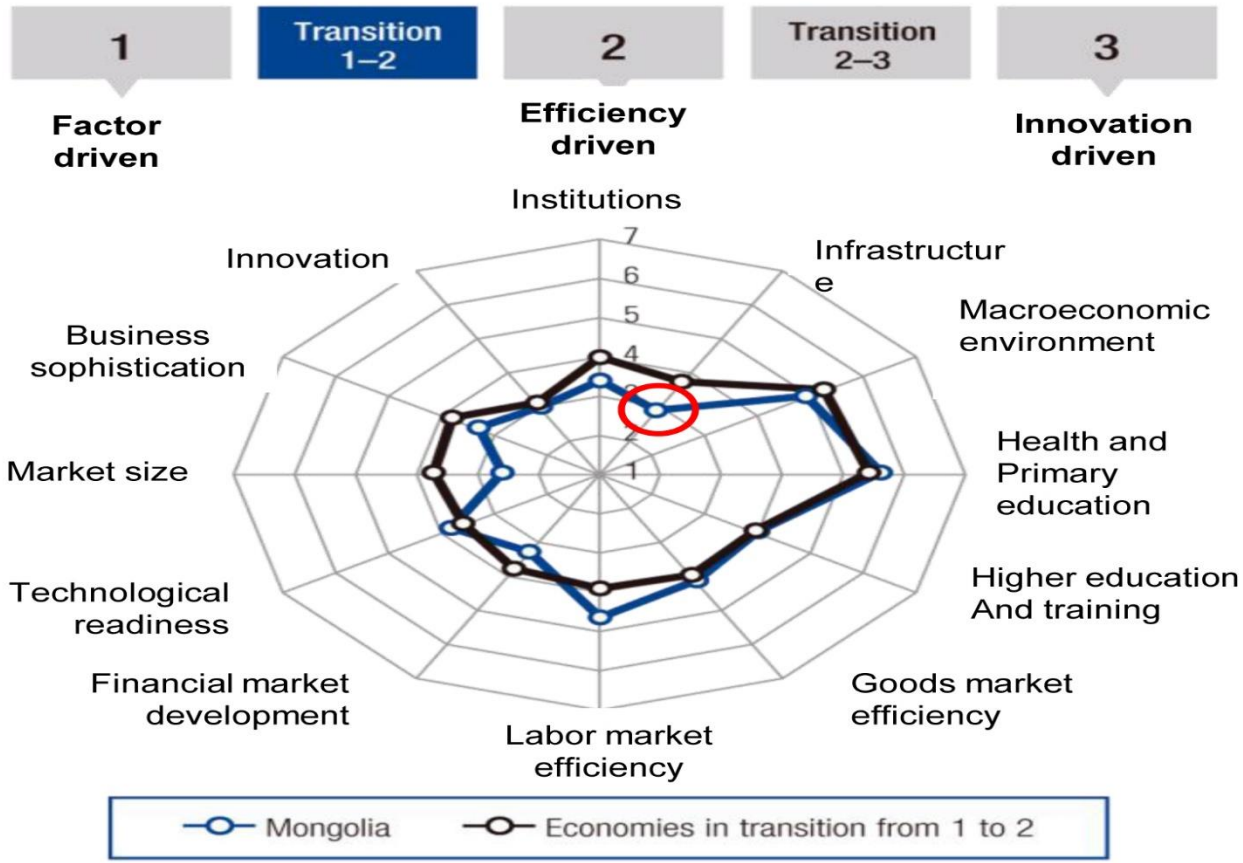
Key indicators, 2011

Population (millions) 2.8
GDP (US$ billions) 8.5
GDP per capita (US$) 3,042
GDP (PPP) as share (%) of world total 0.02

GDP (PPP) per capita (int'l $), 1990–2011



Хөгжлийн үе шат



Reference: World Economics Forum
"Global Competitiveness Report 2012-2013"

Competitiveness of Mongolia in global

KPMG International Cooperation, with headquarters in Great Britain, which provides professional financing and auditing services as well as consulting services in infrastructure sector worldwide, for the first time in 2012 listed 146 countries by their energy competitiveness capability worldwide.

Reference: KPMG international cooperation "2012 Global Energy Competitiveness Index"

Competitiveness of Mongolian energy in global

Based on many statistics and information sources such as World Bank (WB), International Energy Agency (IEA), Economics cooperation and development organization (OECD) and Britain Petroleum (BP) was submitted competitiveness capacity data.

Reference: KPMG international cooperation
"2012 Global Energy Competitiveness Index"

Competitiveness of Mongolian energy in global

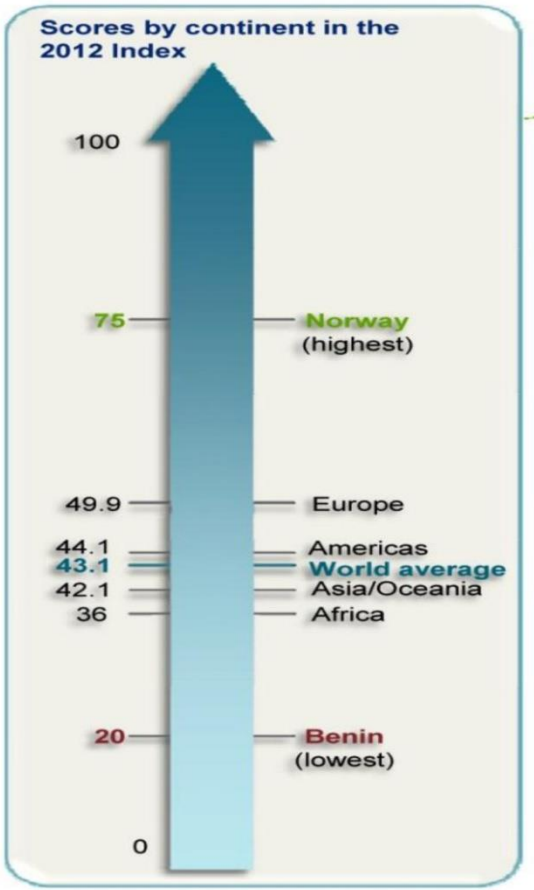
Main factors of Competitiveness

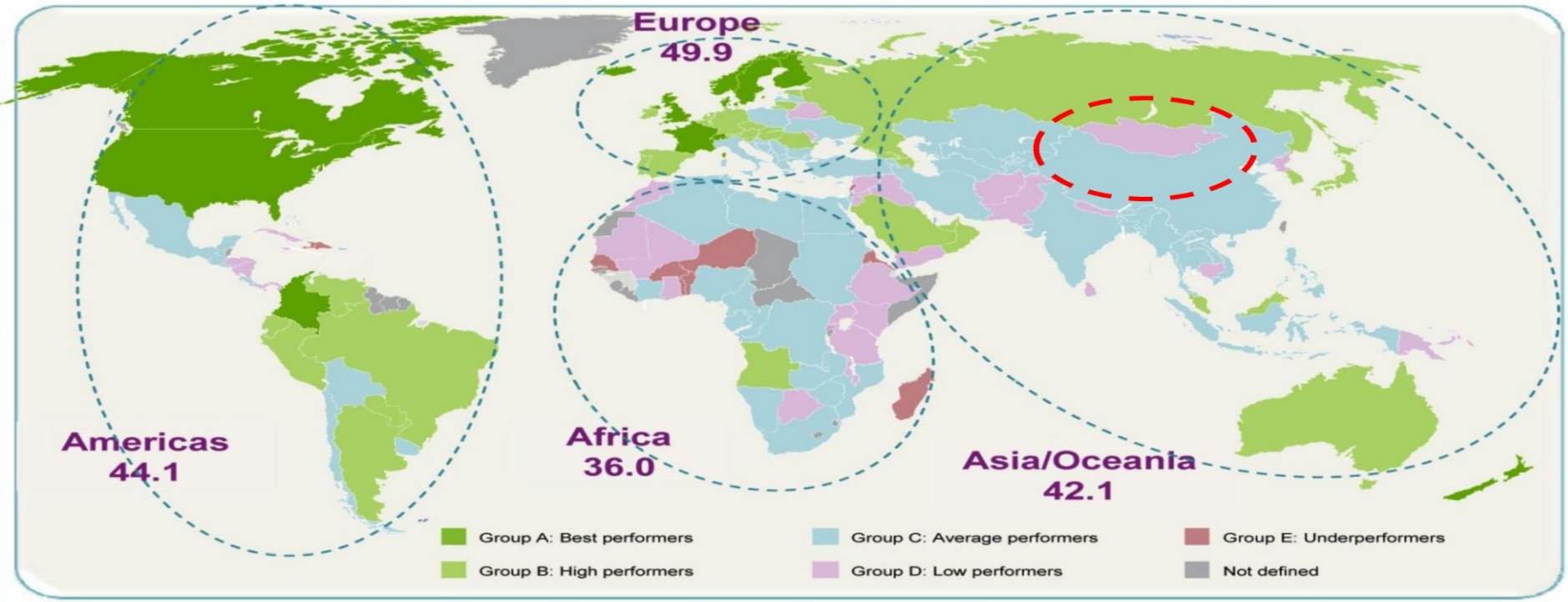
Energy mix quality	Electricity quality, availability, access	Compatibility with environmental issue	Other
• Energy self-sufficiency rate • Energy self-sufficiency rate with regard to oil • Share of oil in the energy mix • Share of renewables in electricity generation	• Electricity access rate • Electric power consumption per capita • Share of losses in electricity generation • Share of nuclear energy in electricity generation	• Energy intensity CO_2 emissions per capita • Share of renewables (excluding hydroelectric source) in electricity generation	• Number of power cuts in a typical month • Investment climate

Reference: KPMG international cooperation
"2012 Global Energy Competitiveness Index"

Competitiveness of Mongolian energy in global

World map of energy competitiveness index



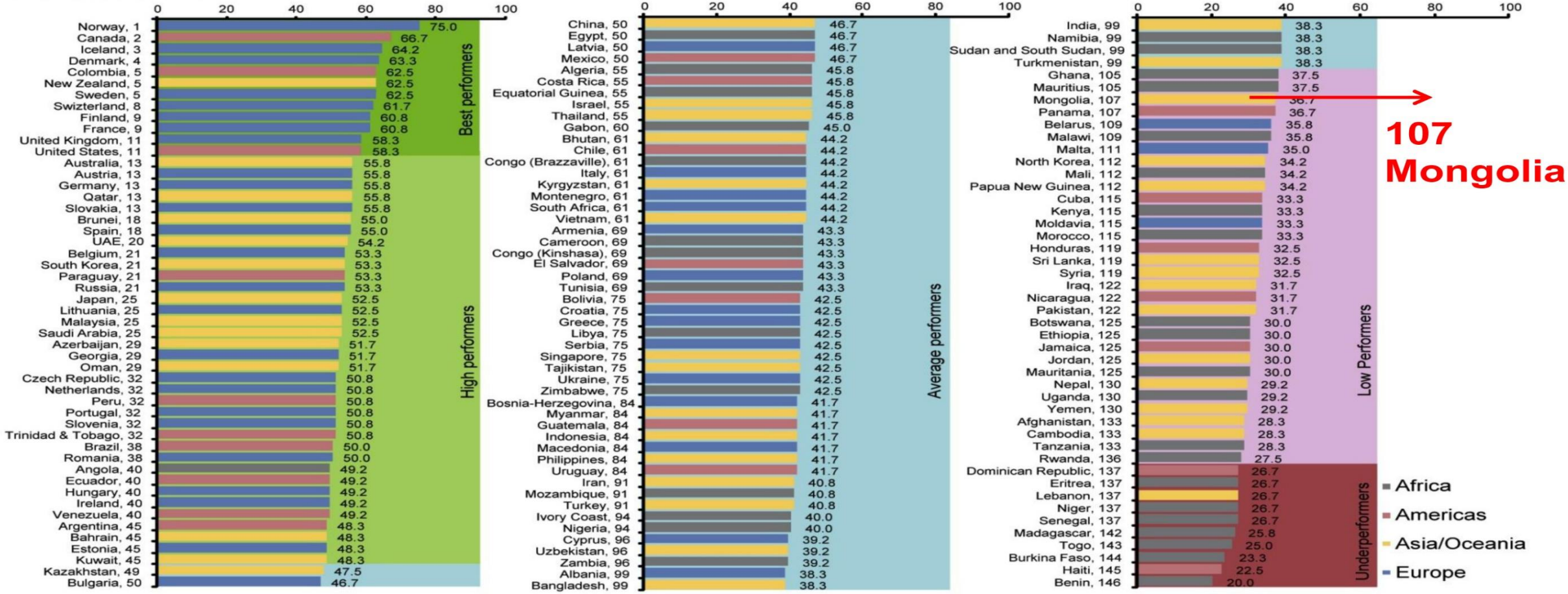


Average of world energy competitiveness index is 43.1 point

Reference: KPMG international cooperation
"2012 Global Energy Competitiveness Index"

Competitiveness of Mongolian energy in global

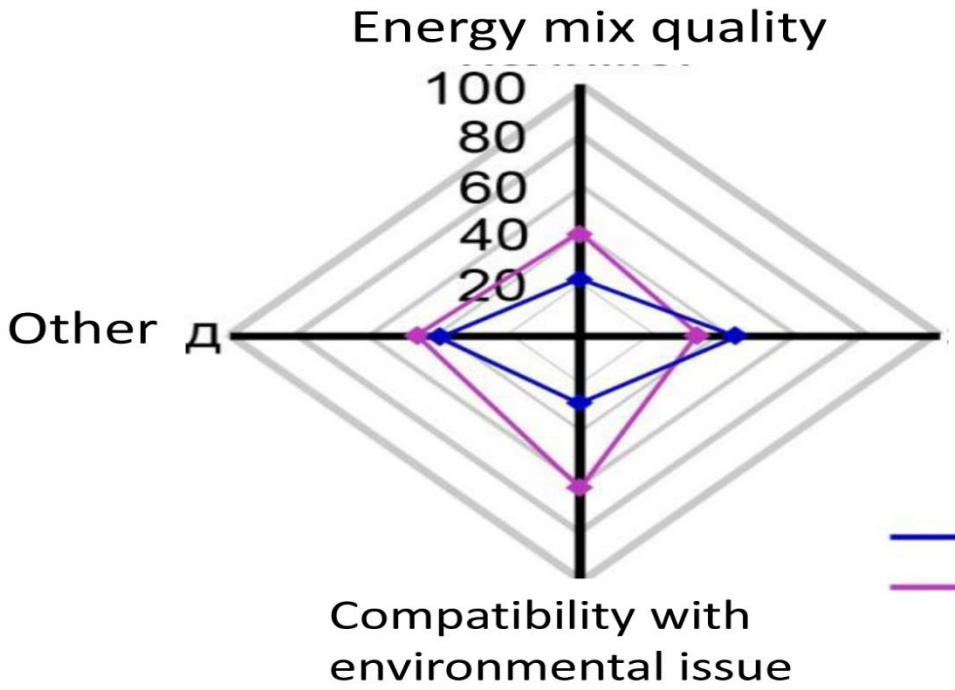
Energy competitiveness index of 146 countries

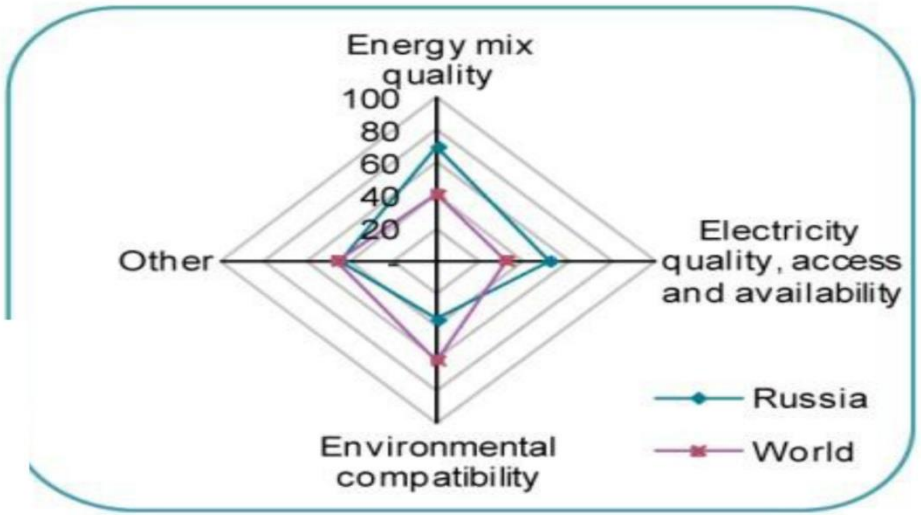


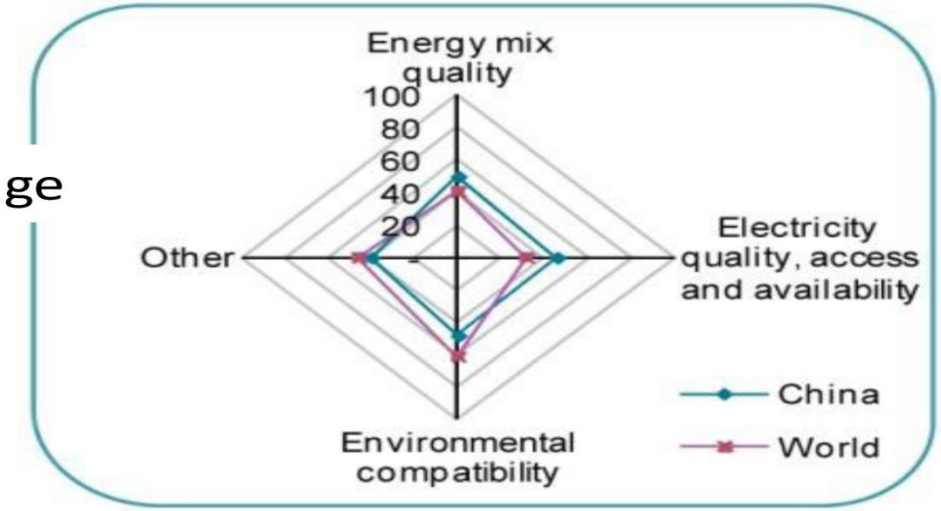
Reference: KPMG international cooperation, "2012 Global Energy Competitiveness Index"

Competitiveness of Mongolian energy in global

Mongolian energy competitiveness index analysis







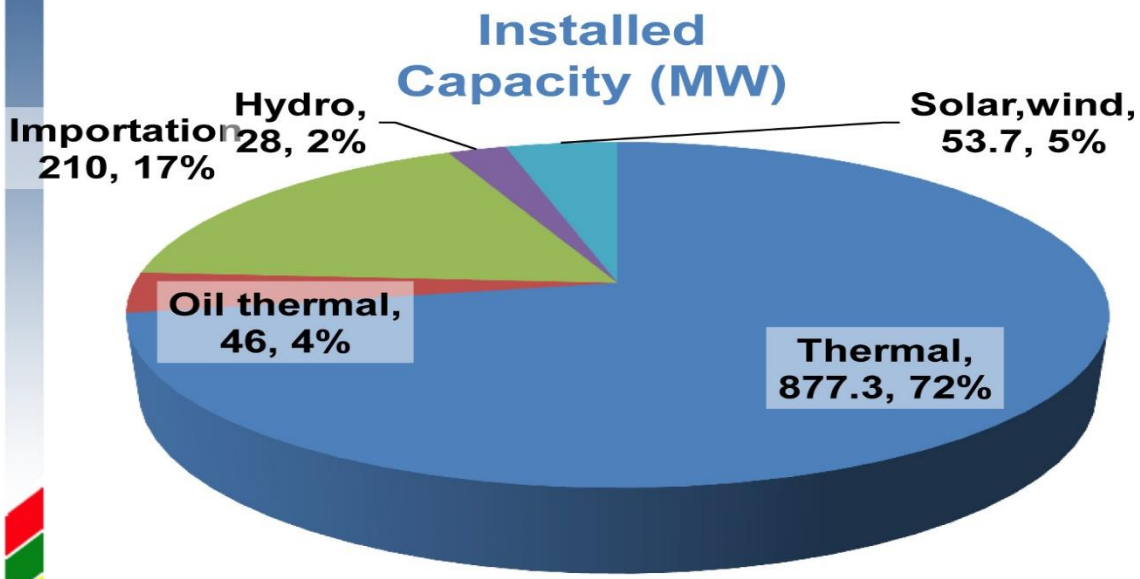
Mongolian energy competitiveness index with 36.7 score and is listed on 107th place from 144 countries.

Competitiveness of Mongolian energy current status

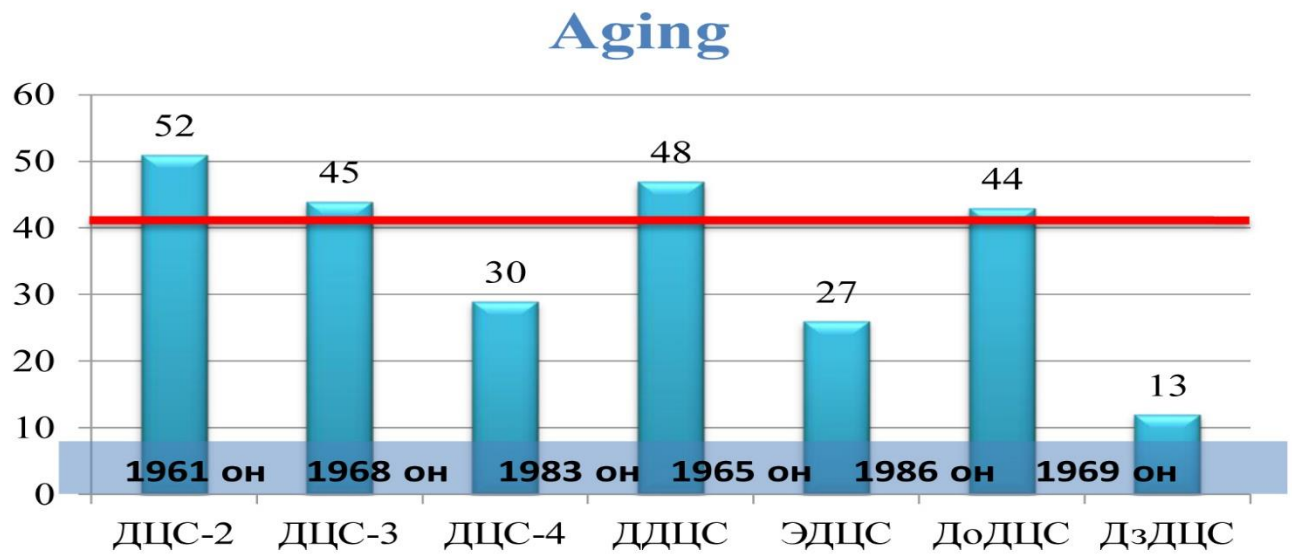
- **Energy mix quality**
  - Energy self- sufficiency rate
  - Energy mix proportion
- **Electricity quality, availability, access**
  - Electricity access rate
  - Power consumption per capita
  - Power loss
- **Compatibility with environmental issue**
  - Share of renewables (excluding hydroelectric source) in electricity generation
  - Energy intensity CO_2 emissions per capita
- **Other**
  - Number of power cut in typical month
  - Investment climate

Energy mix

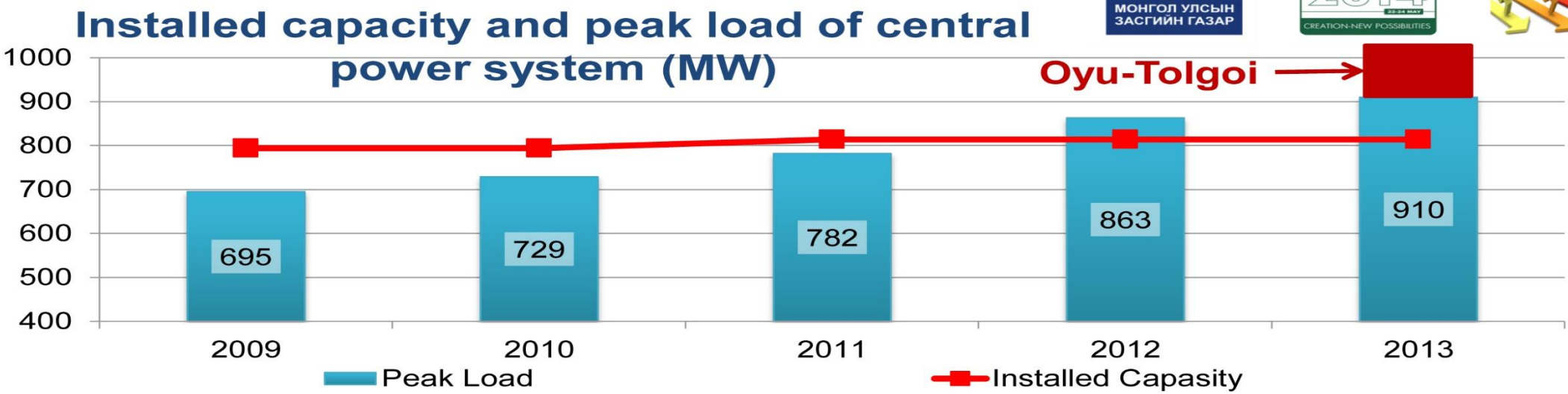
Mongolian power system stability and self sufficiency is become chaotic. Power system is now running in peak load with no extra generation capacity, high aging and decrepit of generators.

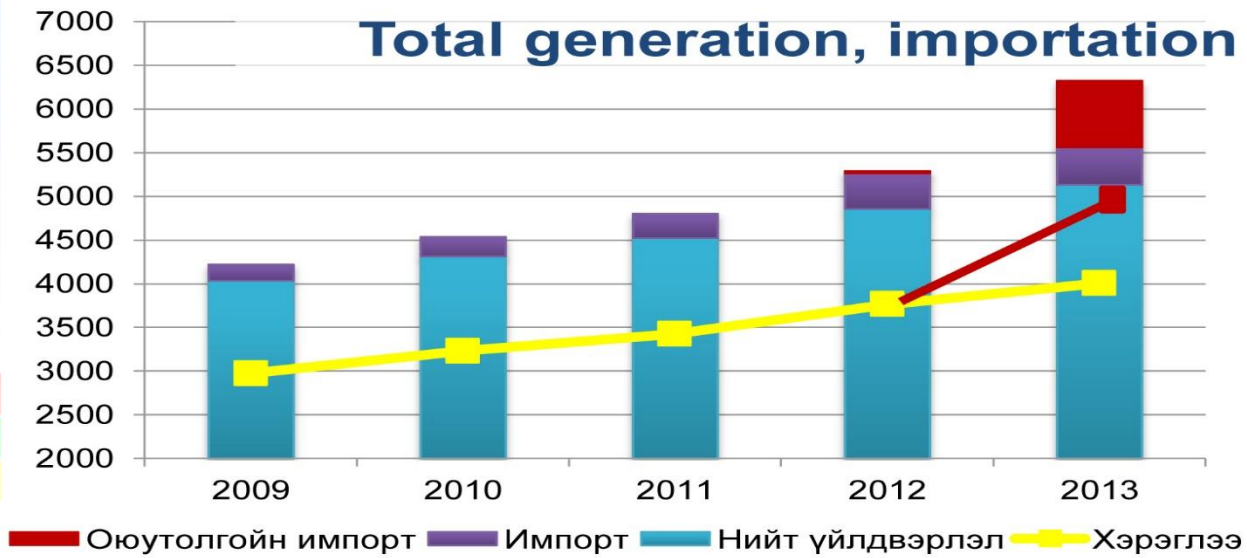


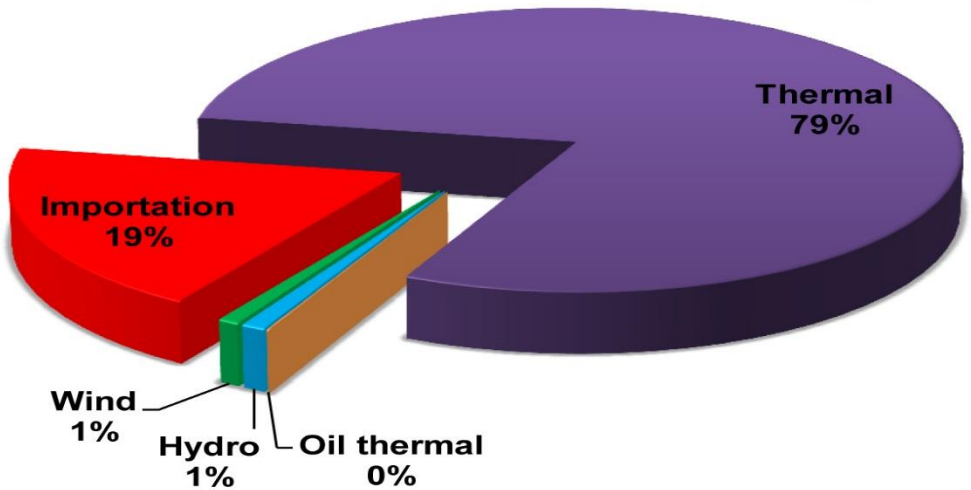
Reference: Energy ministry statistics



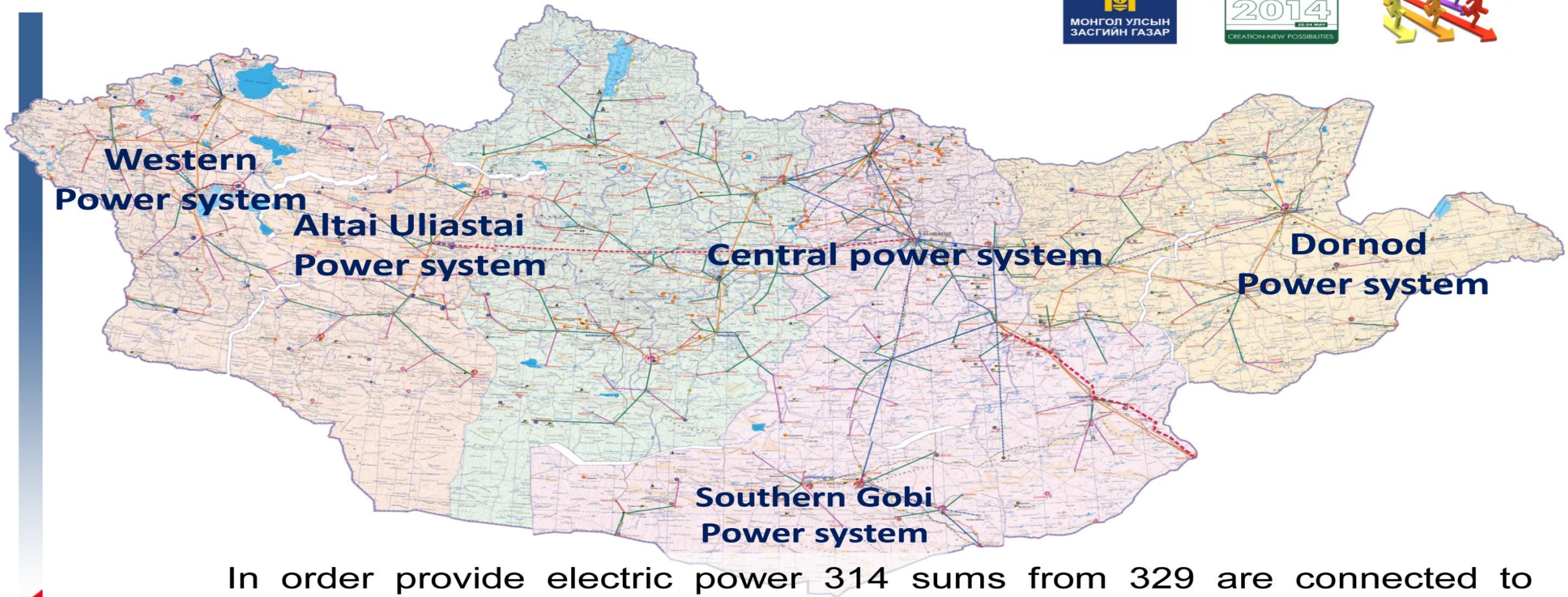
Energy mix


Installed capacity and peak load of central power system (MW)
1000
900
800
700
600
500
400
Oyu-Tolgoi
695
729
782
863
910
2009
2010
2011
2012
2013
Peak Load
Installed Capasity


Total generation, importation and consumption (million kWh)
7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
2009
2010
2011
2012
2013
Оюутолгойн импорт
Импорт
Нийт үйлдвэрлэл
Хэрэглээ


Thermal
79%
Importation
19%
Wind
1%
Hydro
1%
Oil thermal
0%

Electricity quality, availability, access



In order provide electric power 314 sums from 329 are connected to domestic central power system and the 15 are connected to Russian and Chinese borderland central power system or have their own renewable energy or oil sources.

Electricity quality, availability, access

Number of customers that connected to power system

№	Name	Factory, company	Households		Number of total customers
			apartment	"Ger" residence	
1	Central system	29 951	161 435	237 661	**429 047**
2	Western power system	2 643	2 880	25 035	**30 558**
3	Dornod power system	1 957	5 091	16 514	**23 562**
4	Dalanzadgad power plant	969	890	7 231	**9 090**
5	Altai Uliastai power system	4 444	1 736	10 440	**16 620**
6	**Total**	**39 964**	**172 032**	**296 881**	**508 877**

In 2013, there were 147 thousands of nomadic households in total 794 thousands of households. 120 thousands of nomadic households are using renewable energy due to "100 thousands of solar households " project.

Reference: Power system control center statistics 2013
National Statistic center, Statistics of 2013

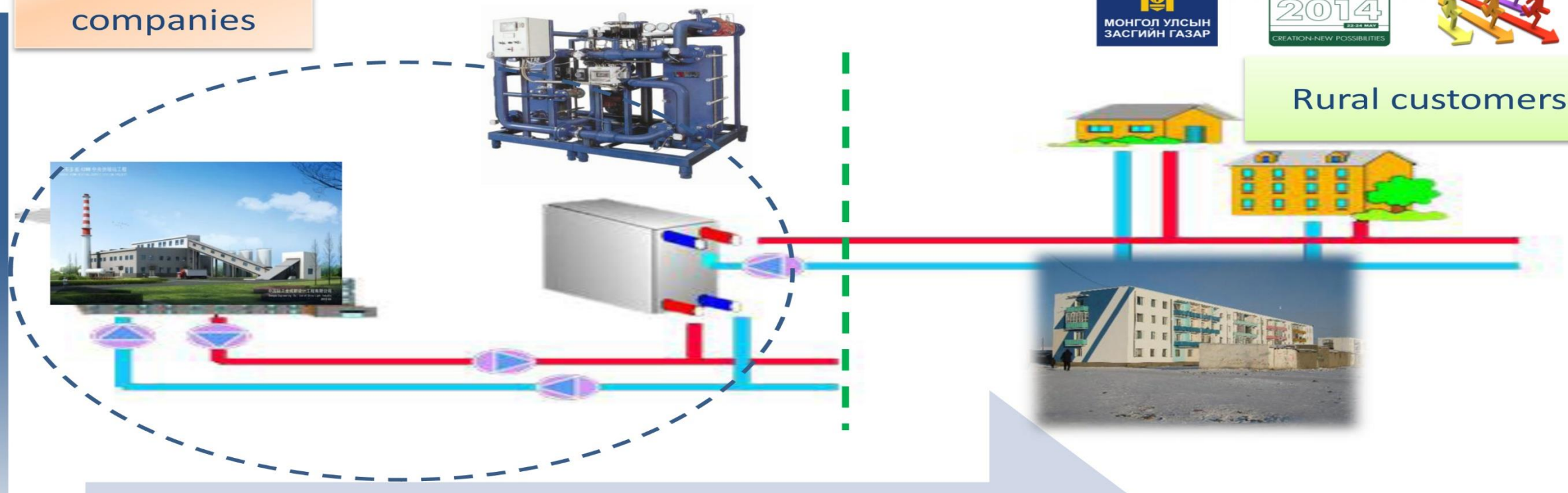
Renewing central heating system of provinces

Renewing central heating system of provinces

№	Province	Center of province	Peak demand MW	Peak load in 2020, MW	Coal type	Boiler type	Boiler choice
1	Bayan khongor	Bayan khongor	14,8	33,3	Coal	ЭБУШ	11,6 MW*3
2	UwurKhangai	Arwaikheer	11.88	37,68	Coal	ЭБУШ	11,6 MW*3
3	Khentii	Undurkhaan	12,14	33,8	Brown coal	ЭБУШ	14 MW*3, 7MW*1
4	Zawkhan	Uliastai	17,6	35,7	Coal	ЭБУШ	11,6 MW*2, 8MW*1
5	Arkhangai	Tsetserleg	13,1	31,1	Coal	ЭБУШ	14 MW*2, 7MW*2
6	Dundgovi	Mandalgovi	8,99	29,57	Brown coal	ЭБУШ	14 MW*2, 7MW*2
7	Tuw	Zuunmod	27,2	55,2	Brown coal	ЭБУШ	23,2MW*1, 11,6MW*1
8	Gobi-Altai	Altai	19,5	33,2	Coal	ЭБУШ	11,6MW*3

Renewing central heating system of provinces

Government, companies



Rural customers

Combining heating boilers
New thermal power plant

Heating system line,
supply of hot tap water

Heating system line

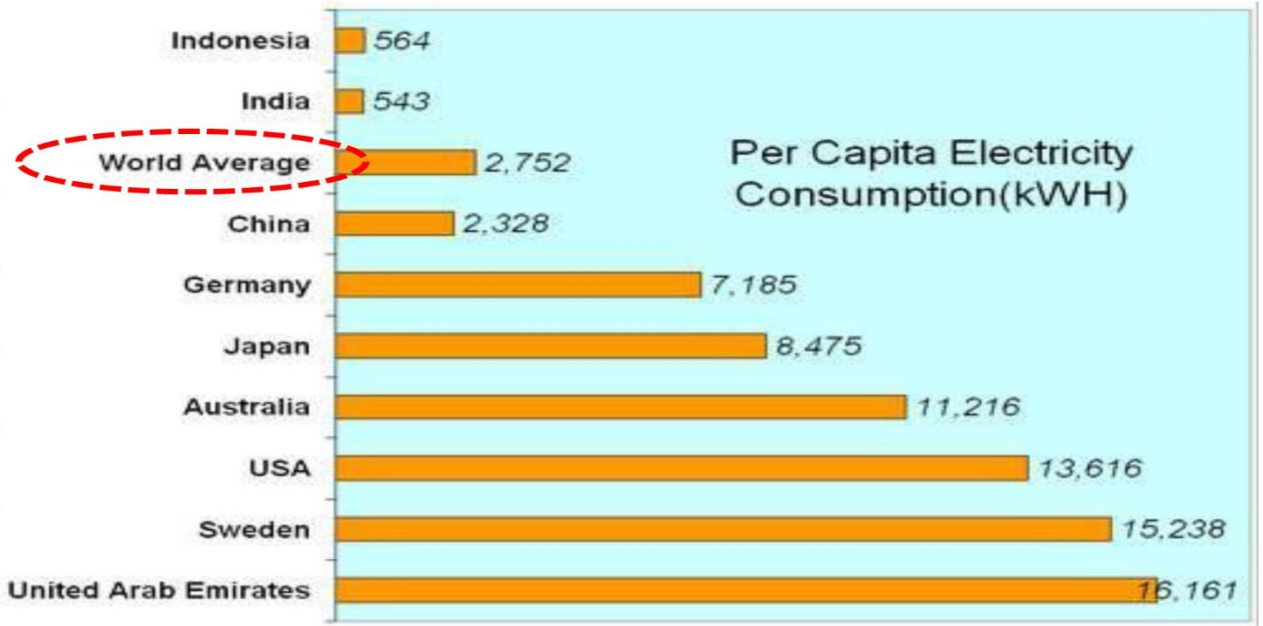
Total 8 province with 160 billion tugrugs of budget

Rural attention

Electricity quality, availability, access

In 2013, power consumption per capita is 1889kWh

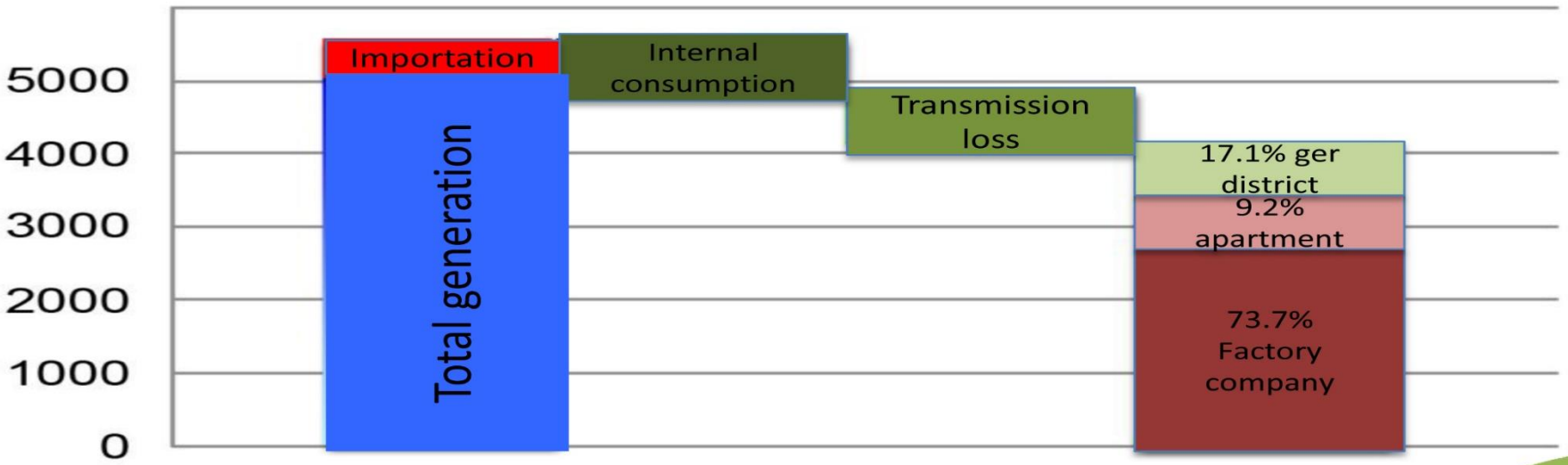
Power consumption per capita [kWh]			
	low	average	peak
2012	1,739	1,739	1,739
2015	2,269	2,272	2,503
2020	3,914	4,232	5,015
2025	4,994	5,408	6,425
2030	6,172	6,692	7,959



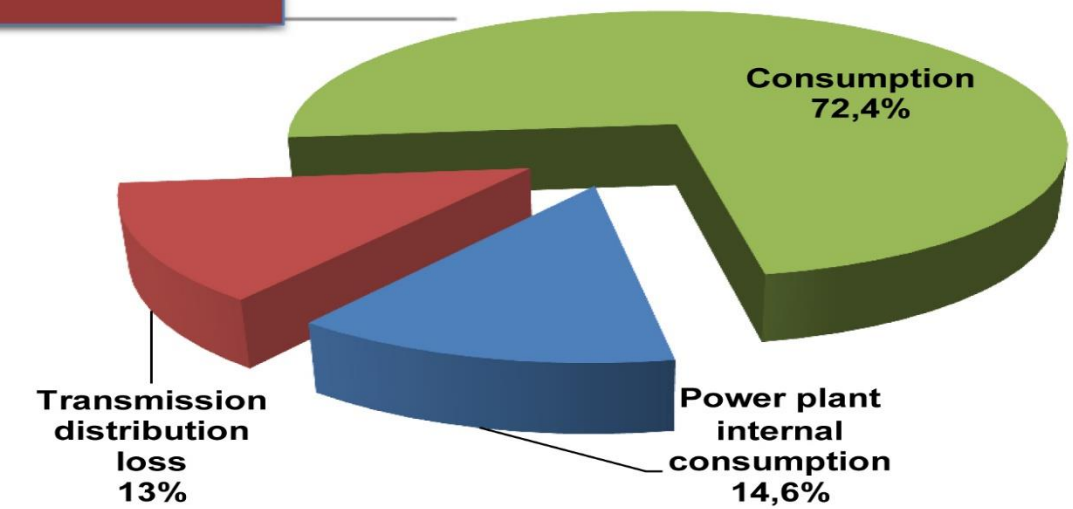
Reference: Energy master plan 2013

Electricity quality, availability, access

Power loss

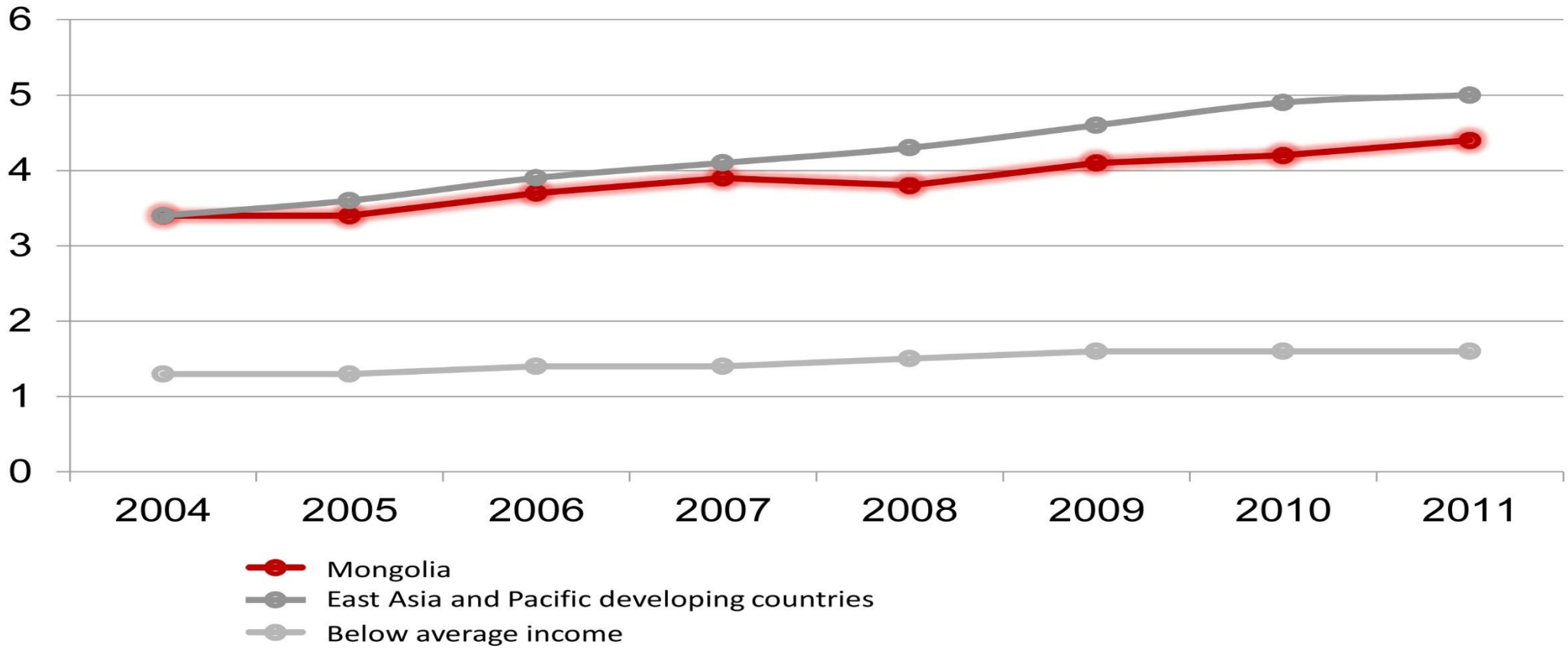


Total loss to customer from the power plant is 28%, which means about one-third of the total power generation is transmission loss and power plant internal consumption.



Compatibility with environmental issue

Emission carbon dioxide per capita (MT)

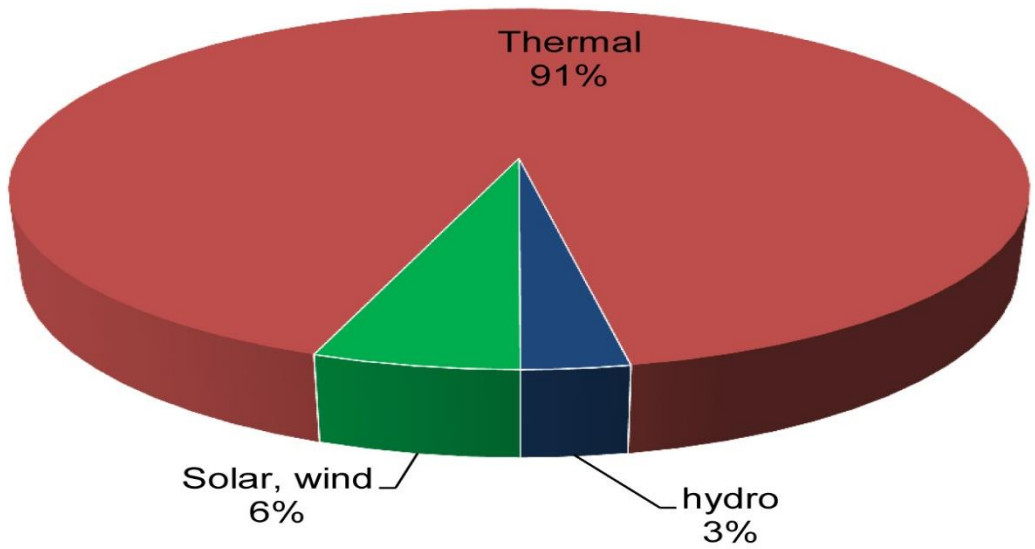


Reference: http://data.worldbank.org/country/mongolia/mongolian

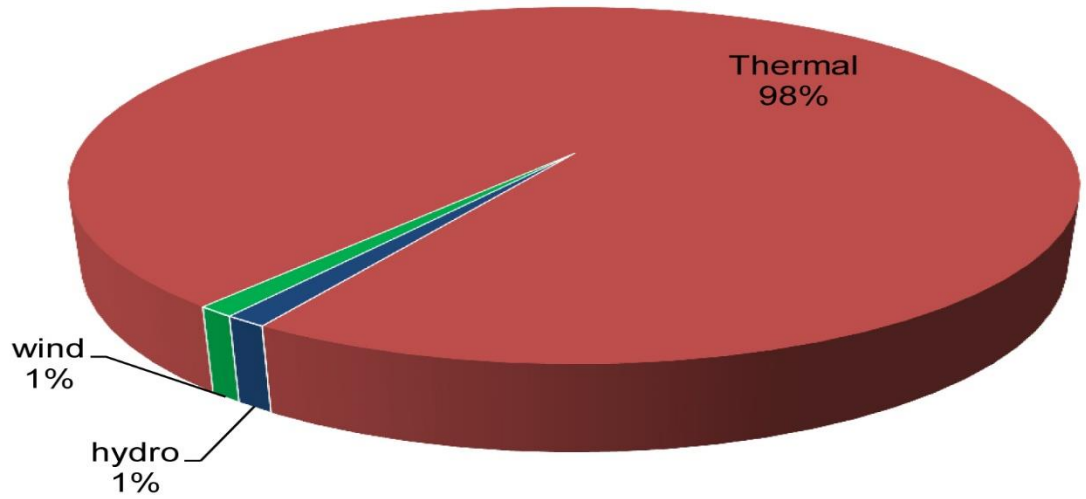
Compatibility with environmental issue

Renewable energy generation proportion

Renewable energy proportion in installed capacity (MW)



Renewable energy proportion in total generation (million kWh)



Reference: Energy control center, Statistics 2013

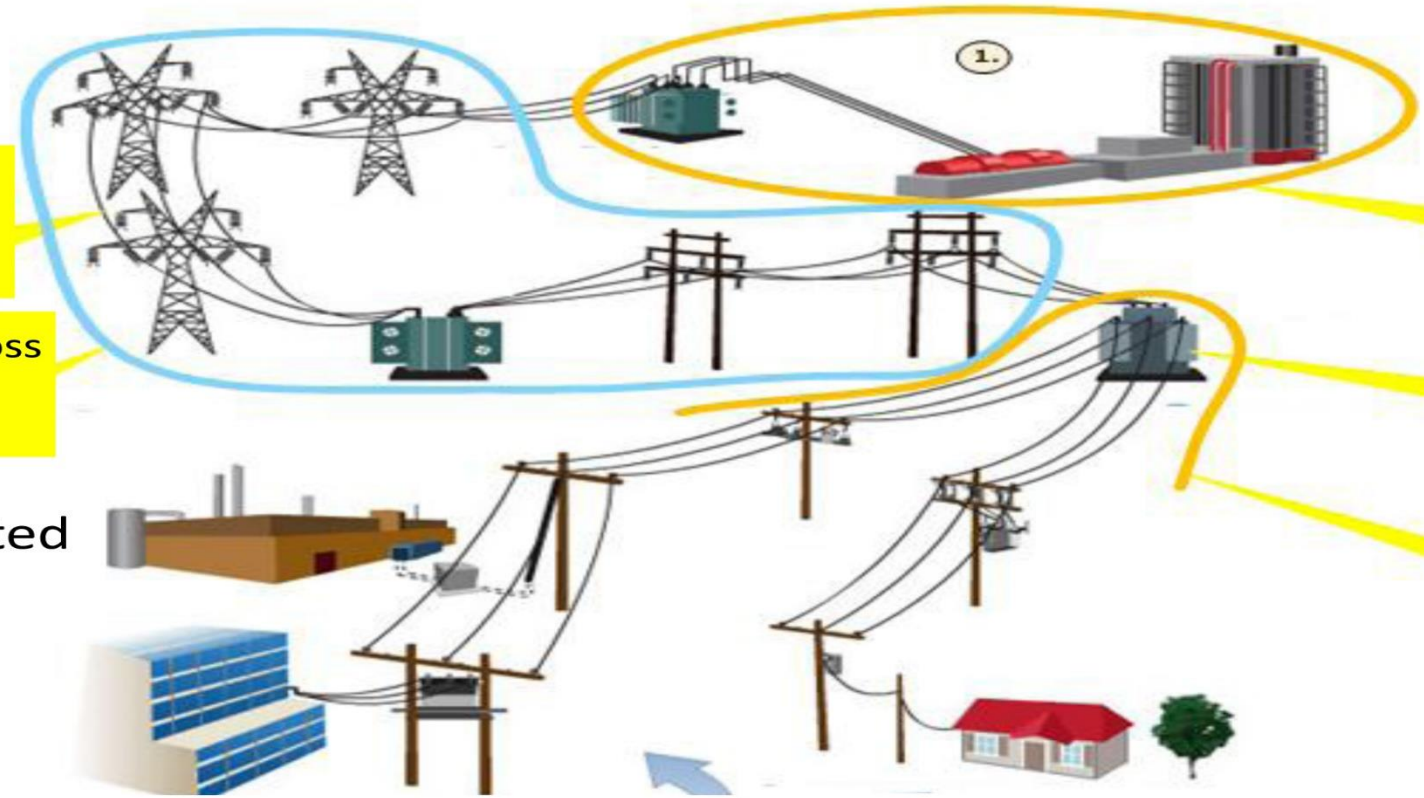
Investment environment

IN THE LAW OF ENERGY PRICING PRINCIPLE DEFINED AS FOLLOWS:

- **To base on operation real costs;**
- **To meet the appropriate level of costs and estimated return on investments of profit which required to operate License activities;**
- **To provide price stability;**
- **To ensure the income of the financial capacity of the licensee in normal level,**

Investment climate

Power rate of central power system (2013)



Transmission cost
5.91 tugrug/kWh

Cost of transmission loss
2.07 tugrug/kWh

Customer related to mining

Generation cost
52.95 tugrug/kWh

Cost of distribution loss
9.02 tugrug/kWh

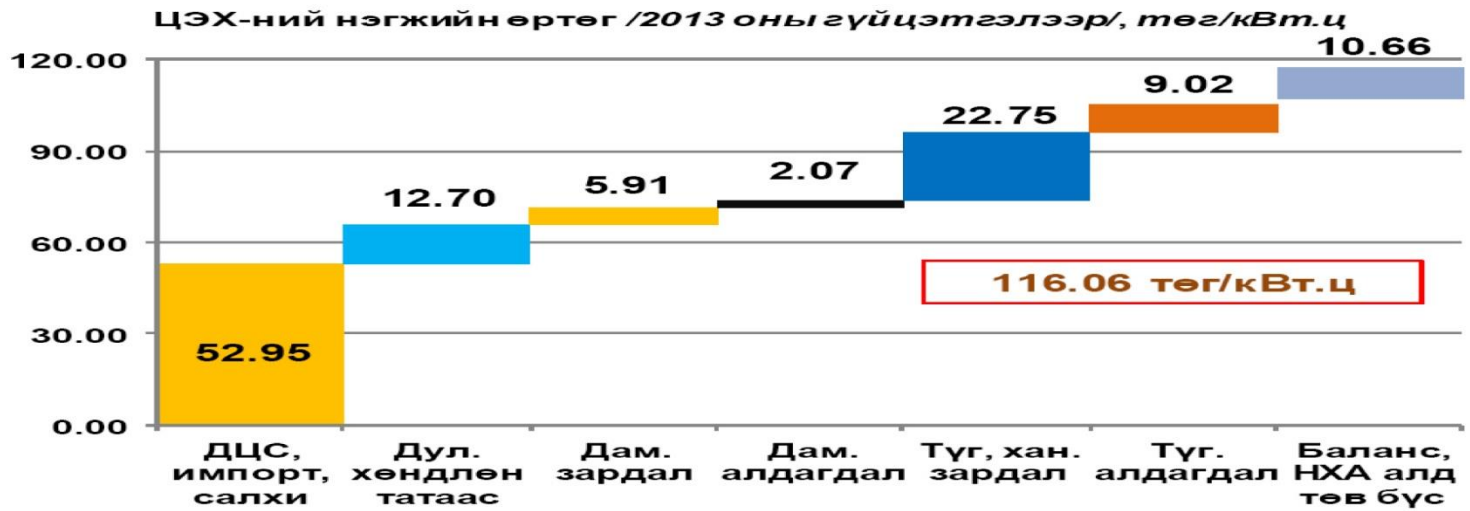
Distribution cost
22.75 tugrug/kWh

Other institutional customer

Individual customer

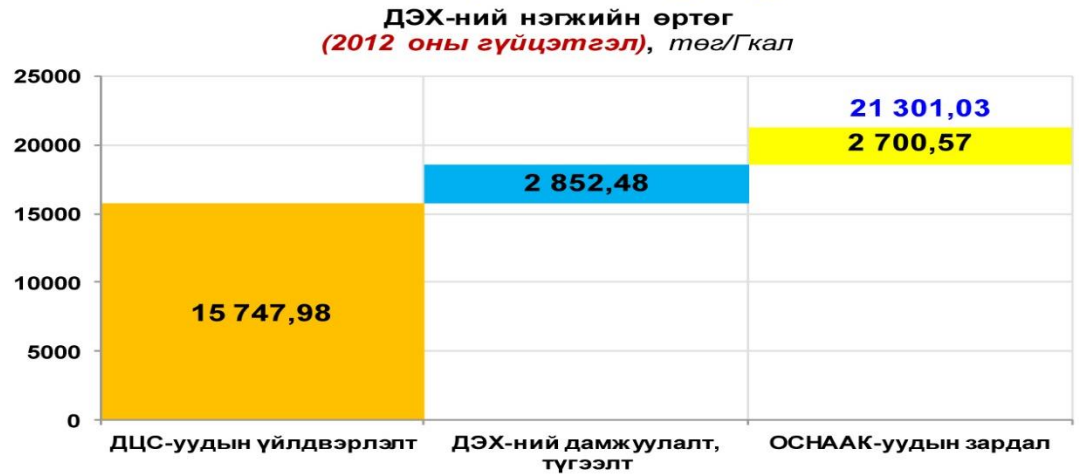
Power rate 92.7 tugrug/kWh

Investment climate



Power generation total cost of 2013 is 116.06 tugrug / kWh, the electricity tariff was provide to our customers is 95.05 tugrug/ kWh which means 21.04 per 1kWh tugrug is loss.

Heating system tariff 12,295.5 tugrug/Гcal



Reference: Energy control center, Energy statistics 2014

Opportunity to develop the competitiveness

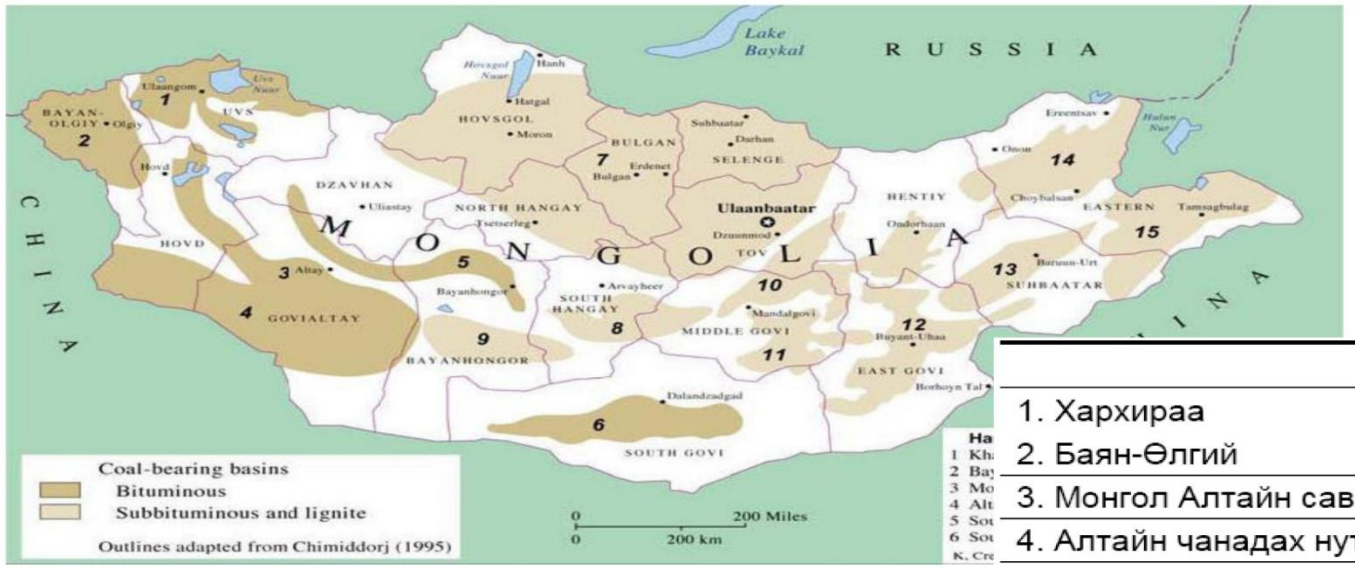
Advantages:

- The primary source of energy
- Renewable energy resources
- Geographical location
- Per capita availability of electricity

Opportunity:

- To overcome the energy deficiency
- To provide domestic needs
- To export and produce electricity using energy coal
- To be center for regional network

Coal resource



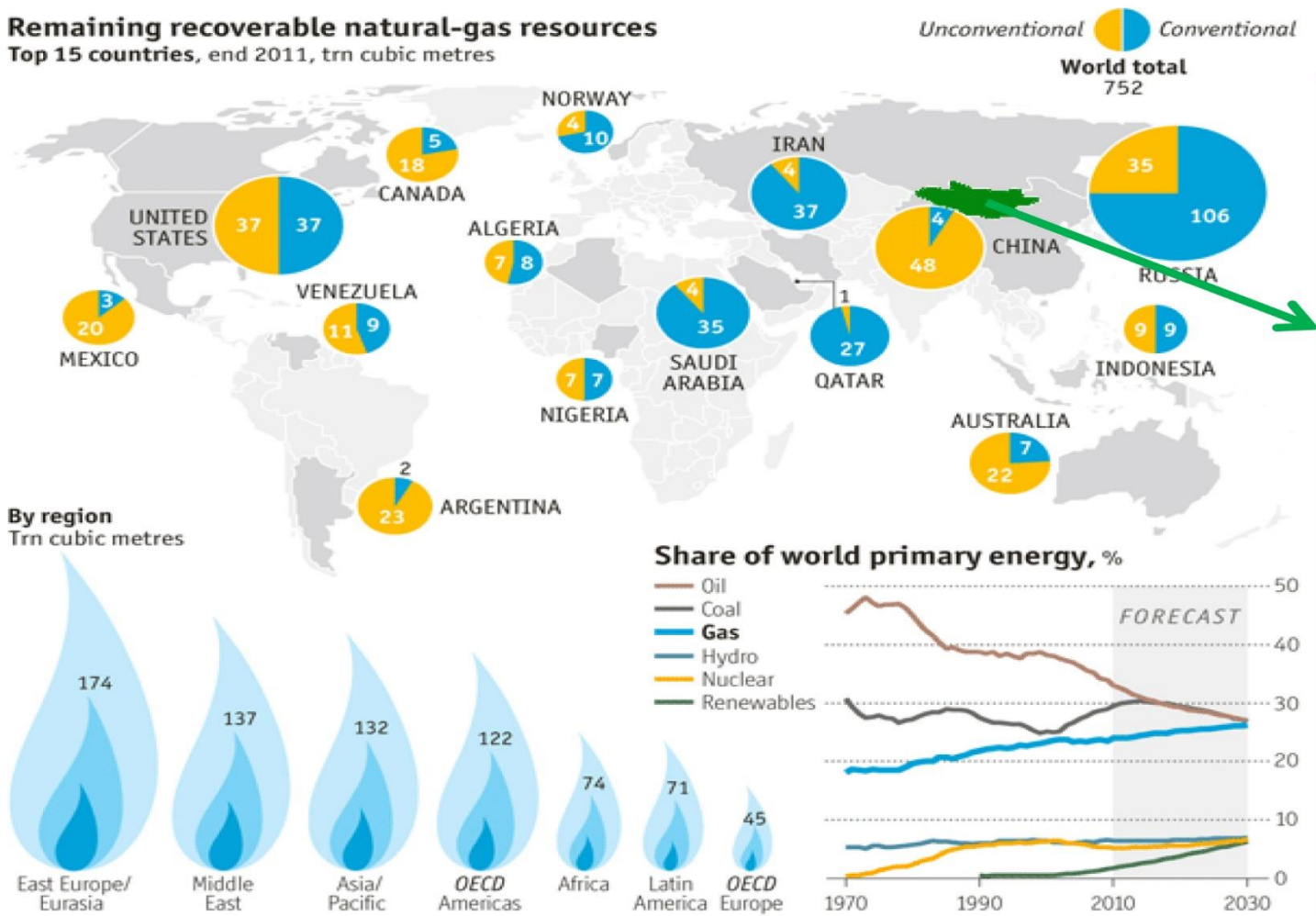
There are 15 mine of approximately 170 million tons of coal resource in Mongolia

22 billion tons of coal resources is proved by further investigation

	Судлагдсан	Таамнал	Нийт
1. Хархираа 2. Баян-Өлгий	172.5	4,592.7	4,765.2
3. Монгол Алтайн сав газар	49.0	10,040.6	10,089.6
4. Алтайн чанадах нутаг	2.1	3,821.4	3,823.5
5. Өмнөд Хангайн сав газар	4.2	1,221.9	1,226.1
6. Өмнөговийн сав газар	15,960.0	10,070.0	26,030.0
7. Орхон-Сэлэнгийн бүс	408.8	7,295.3	7,704.1
8. Онгийн голын сав газар	42.6	1,471.1	1,513.7
9. Их богдын сав газар	5.2	1,950.9	1,956.1
10. Чойр-Нялгын сав газар	5,932.0	14,401.1	20,333.1
11. Дундговийн сав газар	104.1	13,117.0	13,221.1
12. Зүүн говийн сав газар	Na	23,534.0	23,534.0
13. Сүхбаатарын сав газар	68.0	4,190.0	4,258.0
14. Чойбалсангийн сав газар	213.2	14,699.0	14,912.2
15. Тамсагийн сав газар	190.0	31,803.0	31,993.0
Нийт	**23,151.7**	**142,208.0**	**165,359.7**

Reference: General energy revolution plan report, 2013

Natural gas resource /CBM/



Reference: International Energy Agency

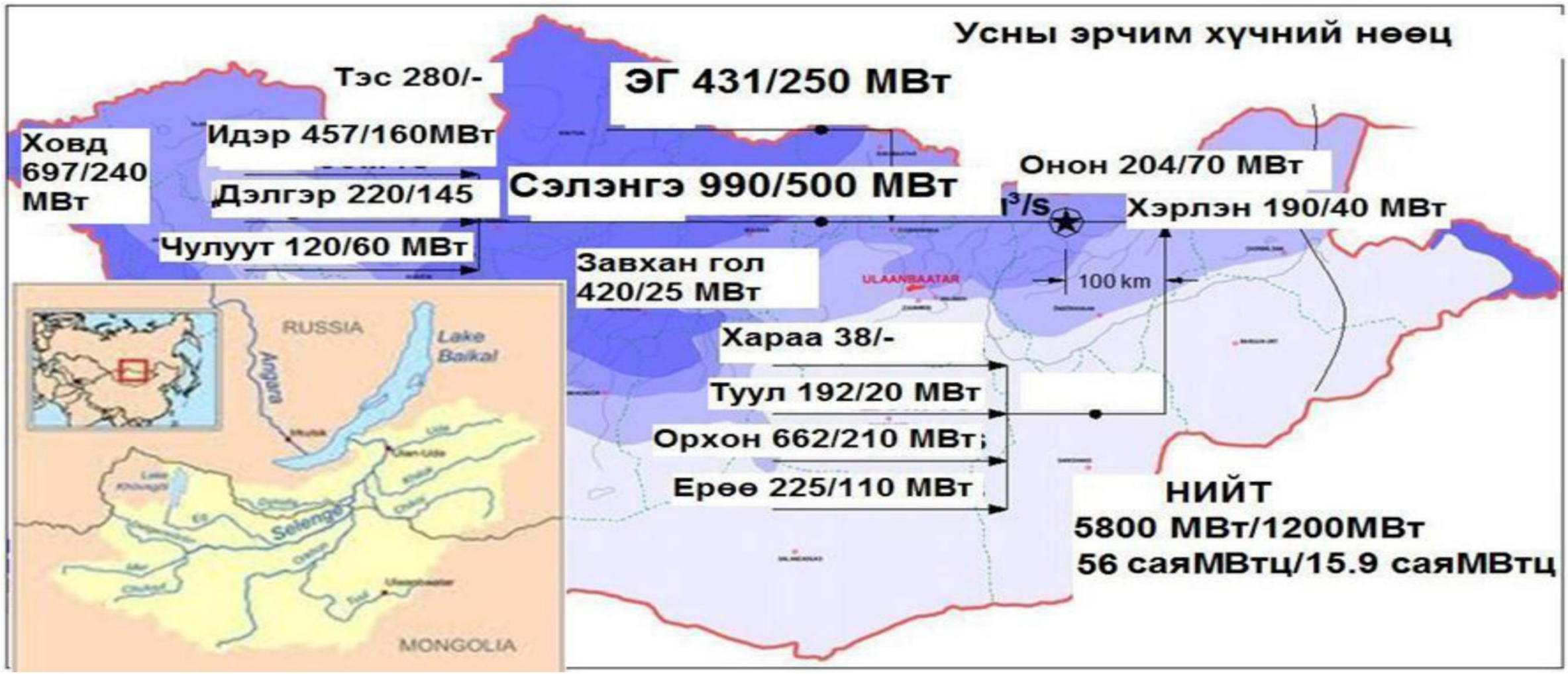
- Methane of coal layer: According to a survey of Canada, South Korea, Australia and the United States, it is estimated that there is a resource of 5-10 trillion cubic meters.
- Shale gas: there is a resource of 20 trillion cubic meters. Study of the United States researchers has revealed that there is a large amount of shale gas in Mongolia.

The use of natural gas will lead to revolution of energy

- Generate clean energy
- Decrease power loss
- Affordable power rate
- Control power flow and make an extra capacity
- Rural energy efficiency
- To avoid high amount of investment

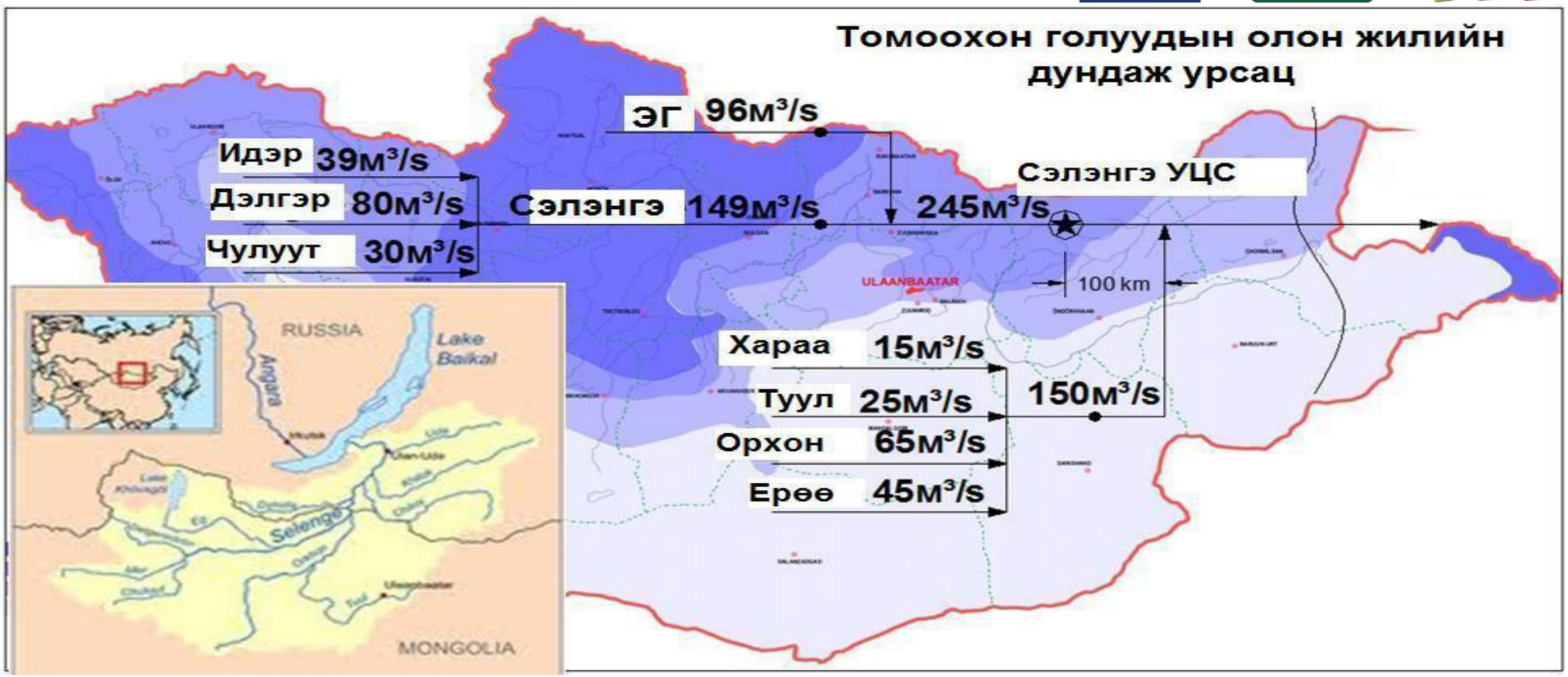
D.Altanchimeg will present about Natural gas

Hydro resource



Reference: National energy center, Renewable energy center

By using the rivers across the border to our country's development



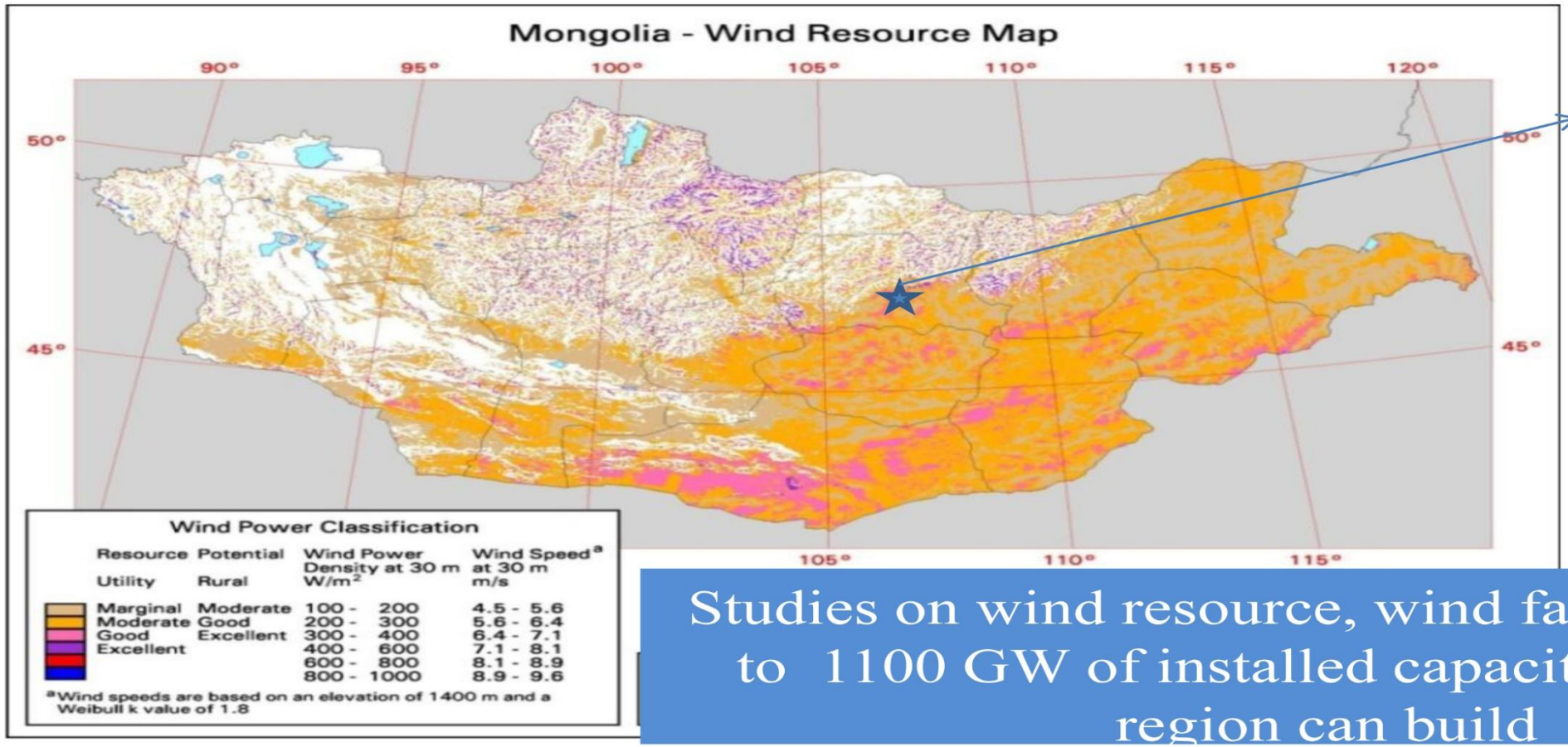
Reference: National energy center, Renewable energy center

New hydro power plant projects

	Shuren hydro power plant	Egiin hydro power plant
Capacity [MW]	300	220
Power generation million kWh per year	599.37	488
Progress	Project team has selected	Reviewed whether the technical and economical inspection, Created the blueprint

Wind resource

Wind resource 836.8 billion kWh



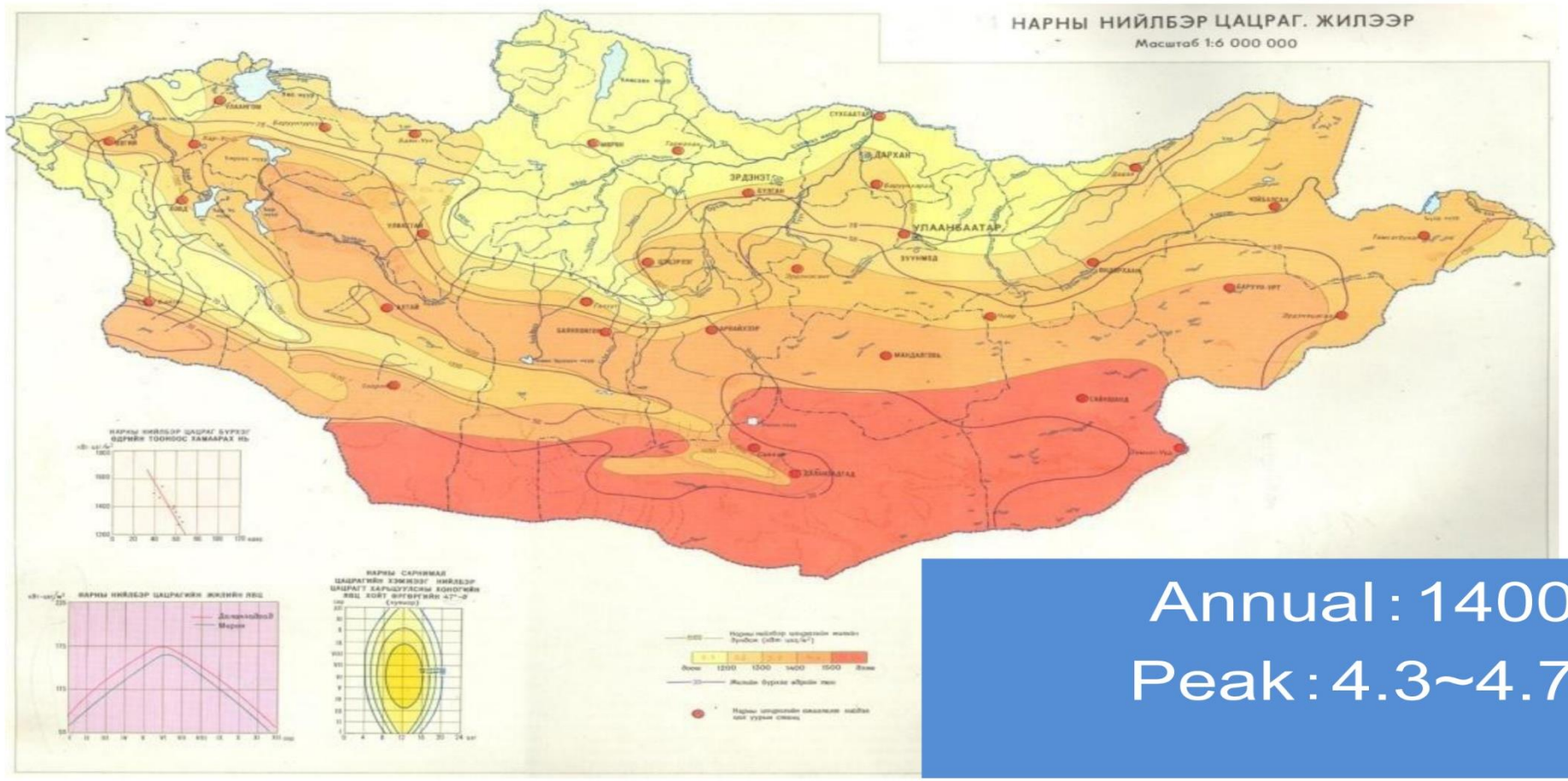
50MW capacity of Wind park of Salkhit

Studies on wind resource, wind farms that has up to 1100 GW of installed capacity in the Gobi region can build

Reference: National renewable energy policy report

Solar resource

Solar resource 1200-1400 kW/m²



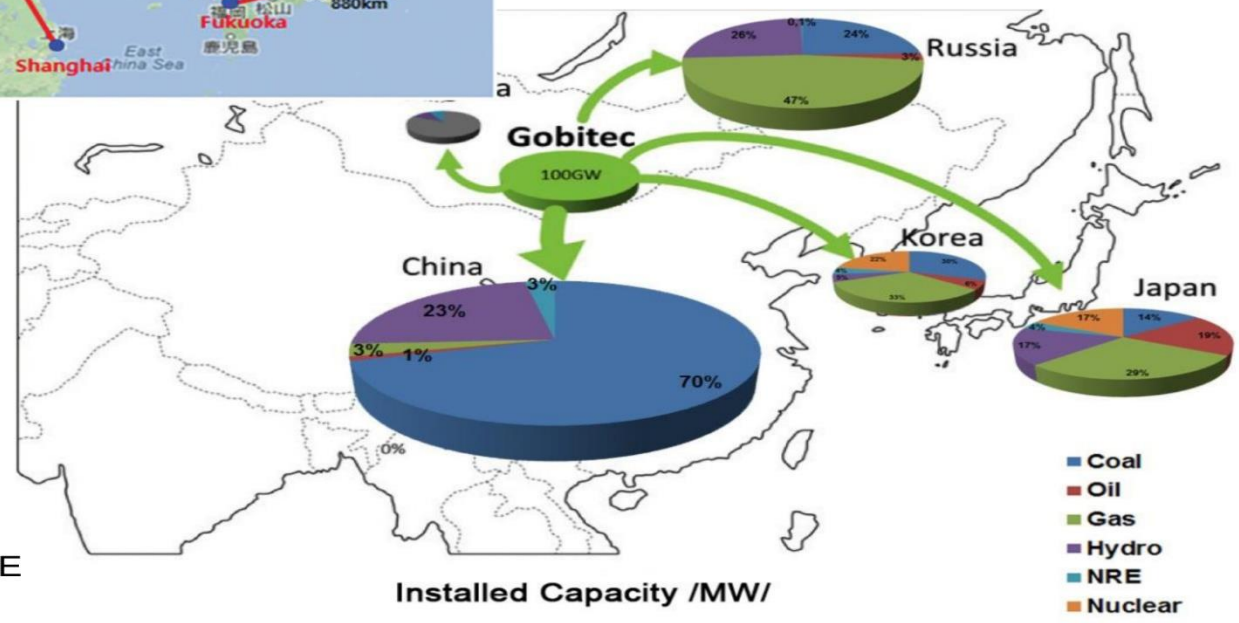
Annual : 1400kWh/m²

Peak : 4.3~4.7 kWh/m²

Reference: National renewable energy policy report

Using renewable energy resource

Asian super grid



Resource: "GOBITEC AND ASIAN SUPER GRID FOR RENEWABLE ENERGIES IN NORTHEAST ASIA" Report 2014

Nuclear resource

It has become clear that 73,000 tons of uranium resources. In addition, it is estimated resource 1.47 million tons, which 16 place in the resources in the world .

Reference: State owned "Mon-Uran" LLC, http://www.monatom.mn/content/2489.shtml?alias=news

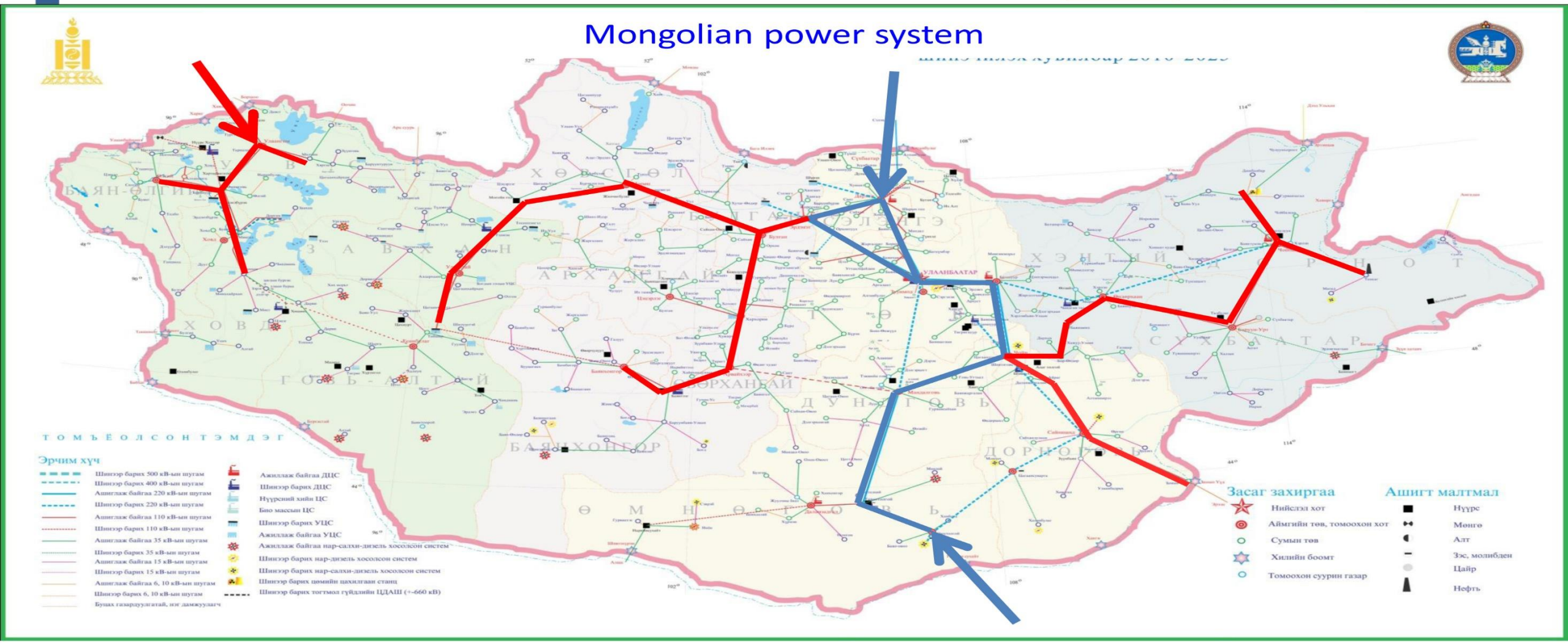
Other resources

It is possible to generate electricity using biomass energy and other garbage

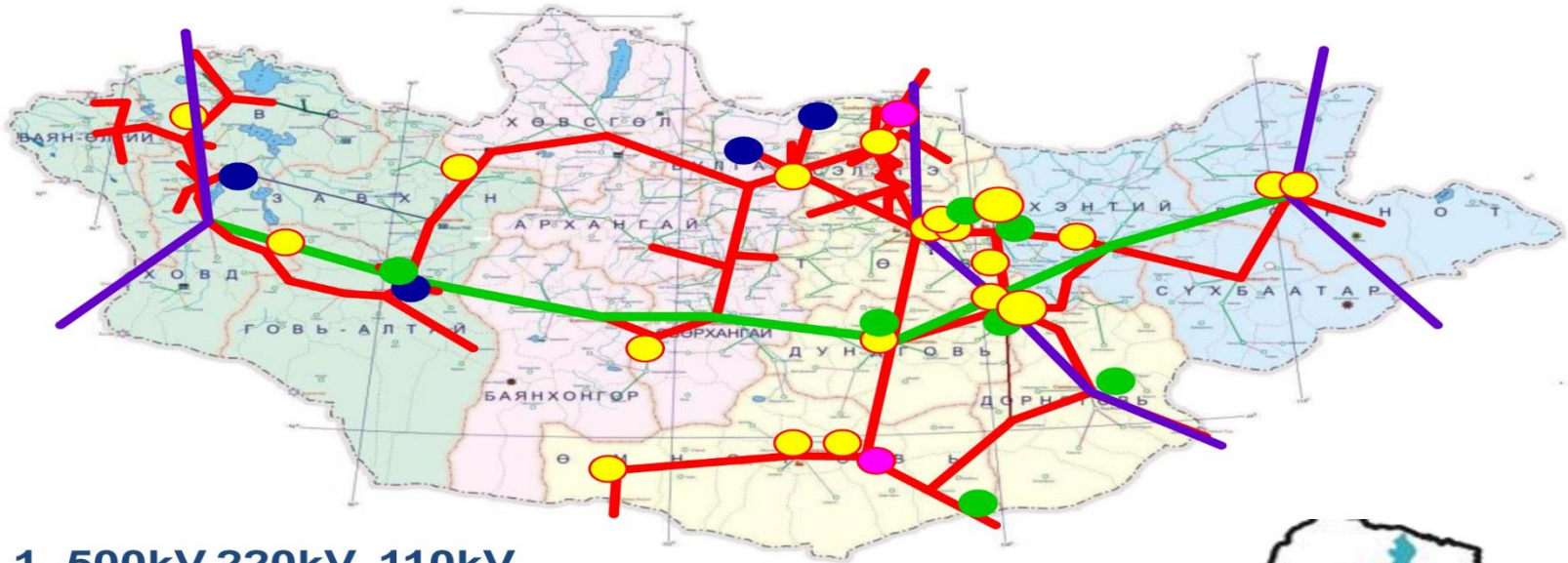
Miscanthus Tatai: Miscanthus can be used as bio fuel

Reference: Ministry of energy, Renewable energy department

Current power system

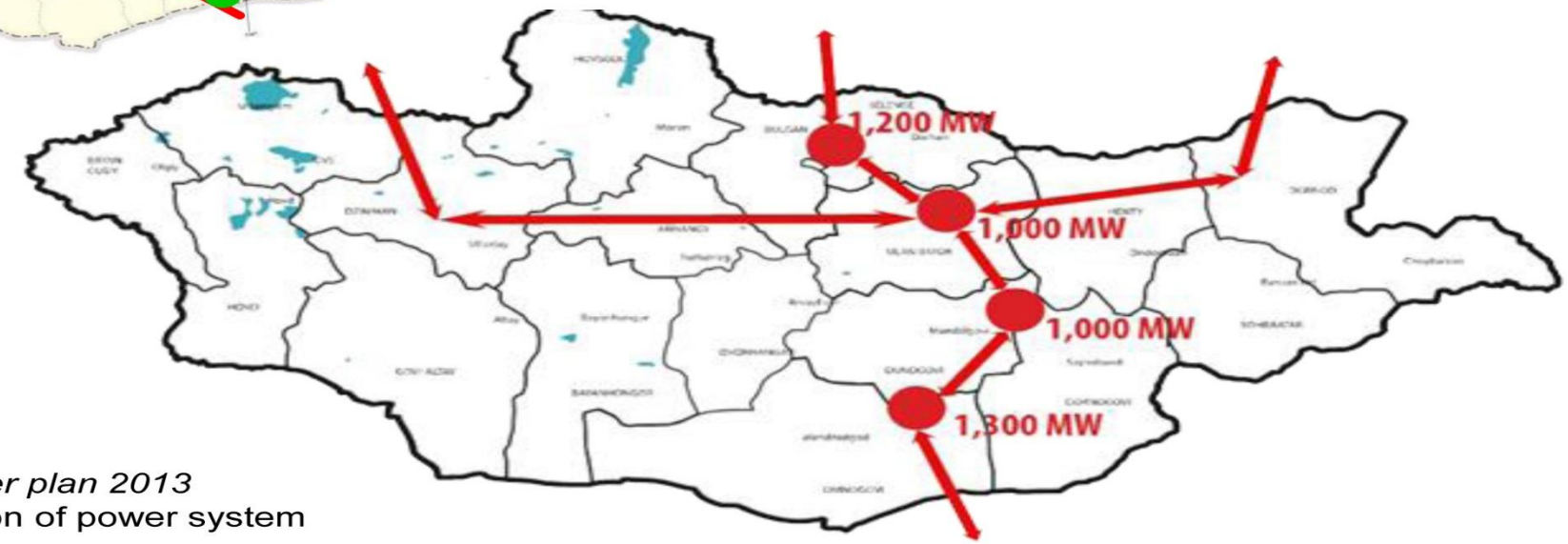


Future power system



- Central power system
- 500 kV transmission line
- Direct current transmission line
- Hydro power plant
- Fossil-fuel thermal power plant
- Wind power plant
- Gas power plant

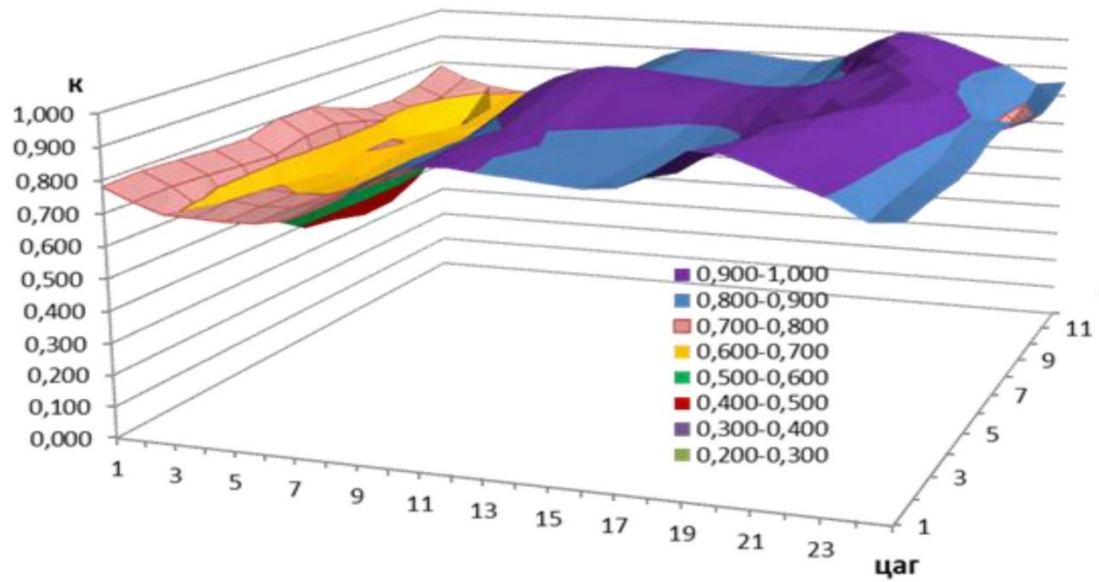
1. 500kV,220kV, 110kV transmission line and direct current transmission line
2. Electricity access will raise
3. Can be connected to the vertically and horizontally
4. Possibility of exportation

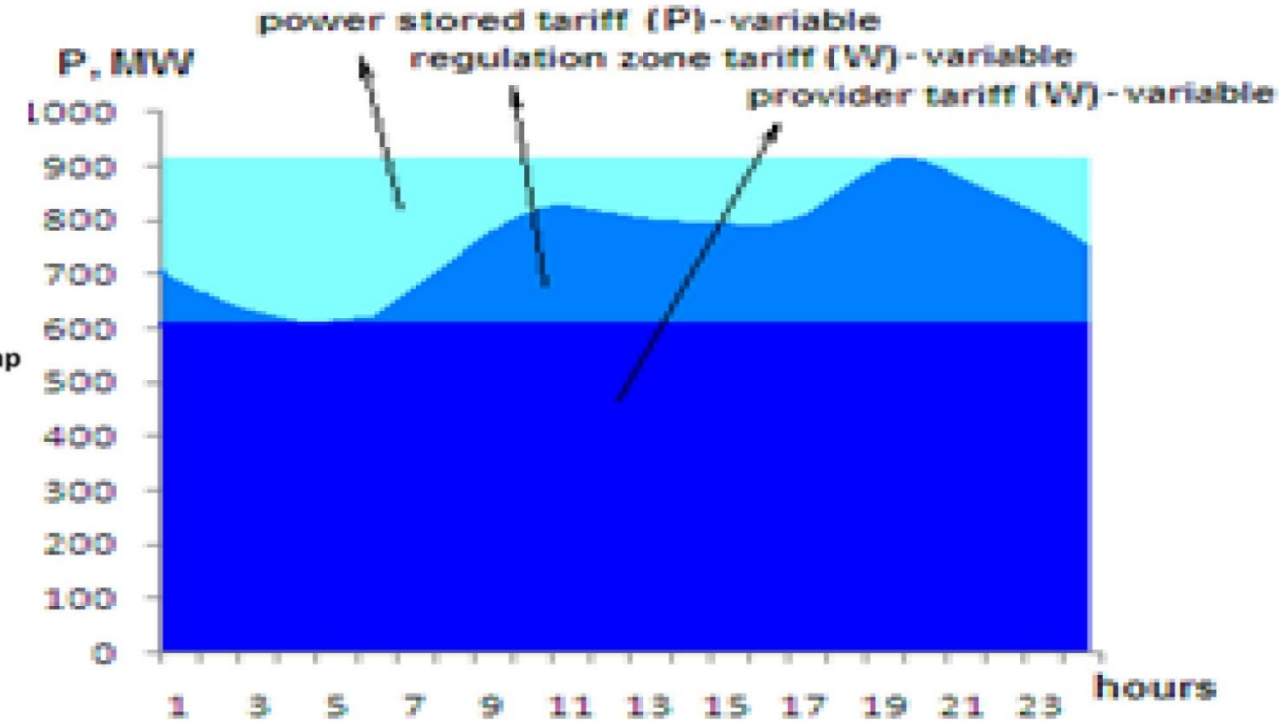


Reference: Asian development bank, Master plan 2013
National dispatching center, Current situation of power system

Connection with the electricity pricing policy and management of the national power dispatching center

In consideration of the amount of power generation and load curve and overall management of power delivery, to calculate the electricity prices at peak load.

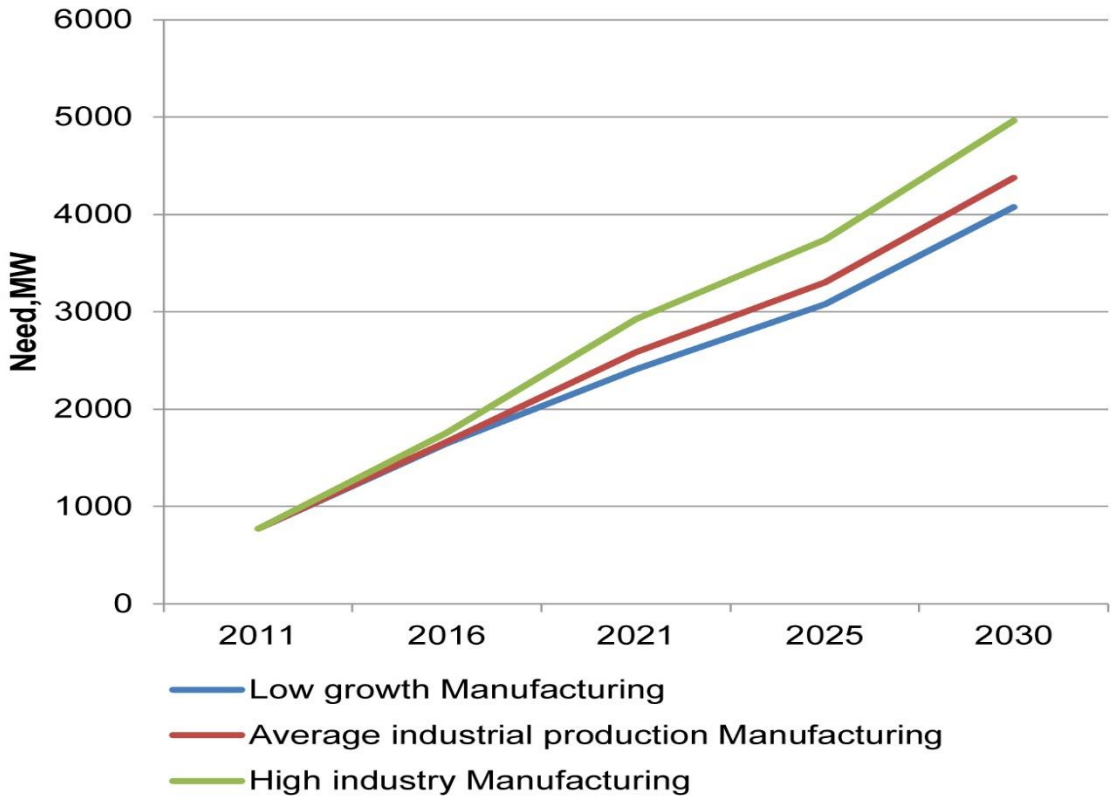


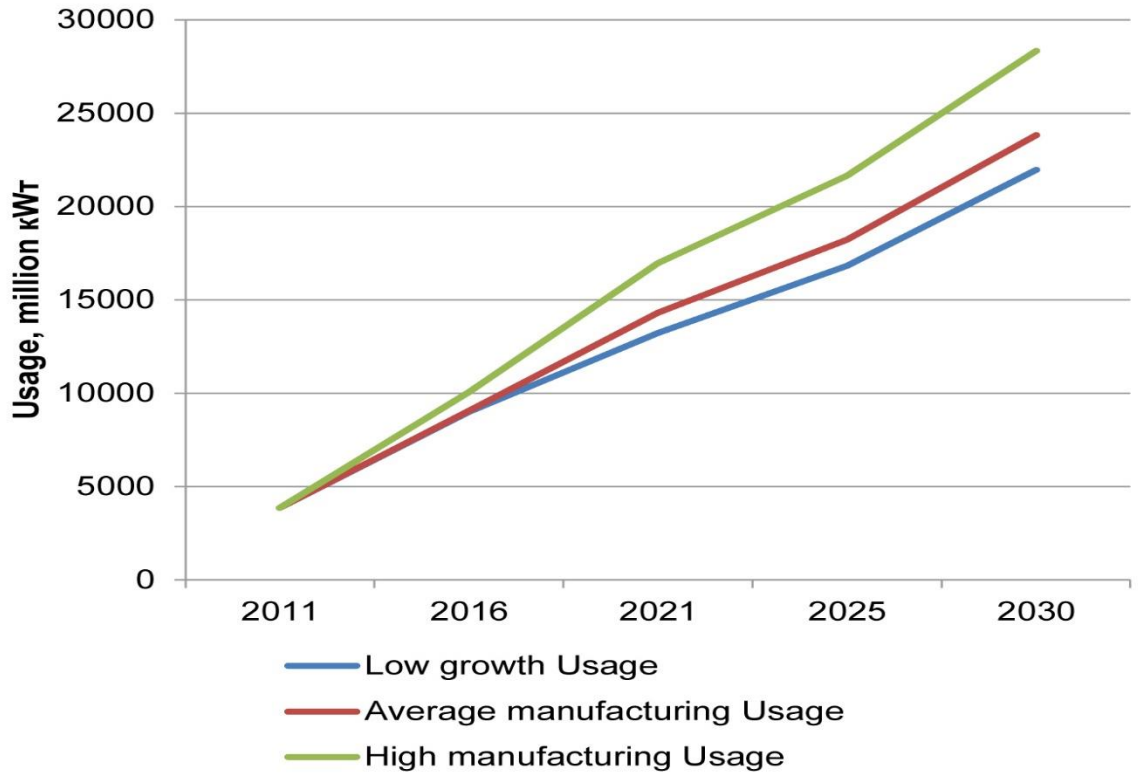


Ts.Unurmaa of national power dispatching center will present in the topic of "Connection with the electricity pricing policy and management of the national power dispatching center."

Opportunity to develop the competitiveness

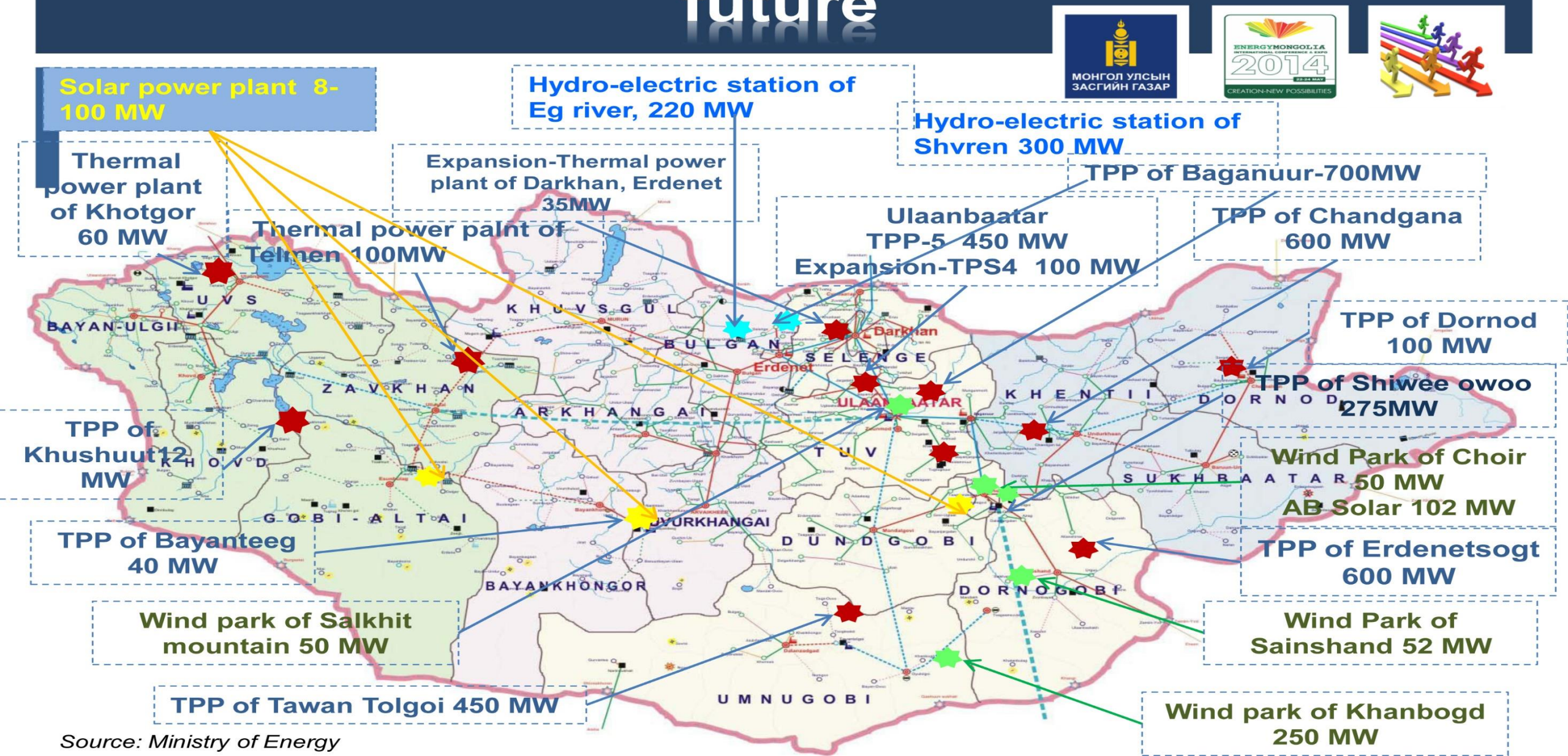
MONGOLIAN POWER SYSTEM HYPOTHESIS (INCLUDED OT BA TT) /MW-NEED, MILLION kWh-USAGE/





Resource: ADB, Master Plan 2013

Planned sources to be implemented in the future



Source: Ministry of Energy

Planned sources to be implemented in the future

№	Type	Sources	Power MW	Special Licence term	Work process
1	Wind Electric Station	“Newcom" LLC WES	50	2013	Built
2		“Klintech" LLC WES	250	2013	Sales and purchase agreement of Electric power
3		“Sainshand Wind Park" LLC WES	52	2016	Sales and purchase agreement of Electric power
4		“AB Solar Wind" LLC WES	100	2016	Sales and purchase agreement of Electric power
5		" Aidenir Global" LLC WES	50,4	2016	Sales and purchase agreement of Electric power
6	To run by coal Thermal Power Plant	“Monenko" LLC TPP	12	2013	
7		“East Energy Development" LLC TPP	600	2016	Sales and purchase agreement of Electric power
8		“Tsetsen’s mining“ LLC TPP	600	2016	
9		“New Asia mining group" LLC TPP	100	2017	Concession agreement
10		“Tsaidam Energy" LLC TPP	600	2017	
11		“Erdenes Tawan Tolgoi" LLC TPP	450	Licence acquired	technical and economical evaluability done
12		“Erdene Tsogt Energy" LLC TPP	600	2017	

Sources: Ministry of Energy, Strategy policy and planning division

Planned sources to be implemented in the future

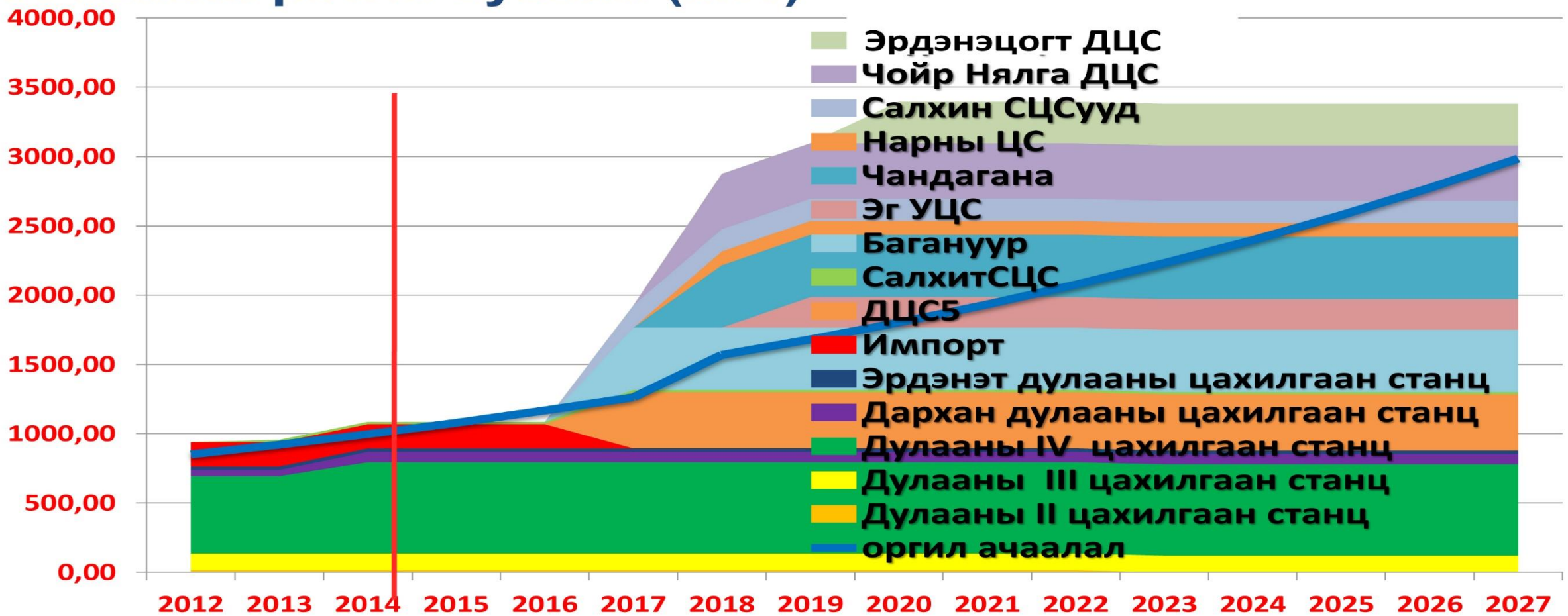
№	Type	Sources	Power MW	Special Licence term	Work process
14	To run by coal Thermal Power Plant	"Bayan Erch" LLC TPP	21	2017	
15		Baganuur TPP	700	licence needed	technical and economical evaluability needed
16		Nvvrst Khotgor TPP	60	Licence needed	technical and economical evaluability needed
17		Bayanteeg TPP	40	Licence needed	technical and economical evaluability needed
18		Shiwee Owoo TPP	275	Licence needed	technical and economical evaluability needed
19		Expansion TPS 4 State owned company	100	began	
20		Exansion Darkhan TPP state owned company	35		Will end in 2014
21		Ulaanbaatar TPP 5	450		Concession agreement
22	Hydro-electric station	Eg river HES	220		technical and economical evaluability done
23		Shvren HES	300	Licence needed	technical and economical evaluability needed

Licence acquired		Licence needed	
Wind Electric Station	452,4	Wind Electric Station	
Hydro-electric station		Hydro-electric station	520
Thermal Power Plant	3421	Thermal Power Plant	1075
Total	3873,4	Total	1595

Sources: Ministry of Energy, Strategy policy and planning division

Possibility to raise competitiveness

Installed capacity and consumption of central power system (MW)



Reference: Ministry of energy, Strategy and policy division

Opportunity to develop the competitiveness

To overcome the lack of energy sources :

- To accelerate project process supported at the policy level
- To improve the efficiency of thermal power plants which operate currently
- To expand and update thermal power plants of Choibalsan, Darkhan and Erdenet until the use of new sources
- To have the appropriate amount of power to secure resources which provide domestic energy needs
- To start and support coal-based power plant projects

Opportunity to develop the competitiveness

To improve the mixture of sources:

- To develop the renewable energy which based on hydro energy
- To create the gas station participation to mixture of energy sources
- To introduce an advanced technologies like high pressure parameter

Opportunity to develop the competitiveness

Power availability:

- To connect new users by upgrading and expanding the transmission and distribution networks
- To use and transmit new sources and renewable energy to the power supply of users in remote areas
- To connect the regional power system by high voltage power transmission and establish the integrated energy system
- To distribute the power of Mongolian national integrated energy system and provide the integrated arrangement of economical effective dispatcher to the operation to regulate the procedure

Opportunity to develop the competitiveness

To improve the investment environment:

- To strengthen the price tariff system based on the real value
- To index price tariff and to create power tariff
- To improve the management structure of industrial companies and to build the system of operator service
- To establish business fund, to have vitality and capacity to finance itself by the fund

Implementing above objectives:

We will get the position above the global average by the competitiveness of energy.

Energy sector has opportunity to develop regarding to the Mongolian social and economic sector.

It will put together the condition of industrialization projects.

To influence to the GDP growth and to improve living condition of people

To cherish the competitiveness of Mongolia in the global stage

THANK YOU FOR YOUR ATTENTION

MINISTRY OF ENERGY 2014