GOVERNMENT OF MONGOLIA

THE MINISTRY OF ENERGY

STRATEGY AND POLICY FOR DEVELOPMENT OF RENEWABLE ENERGY SECTOR

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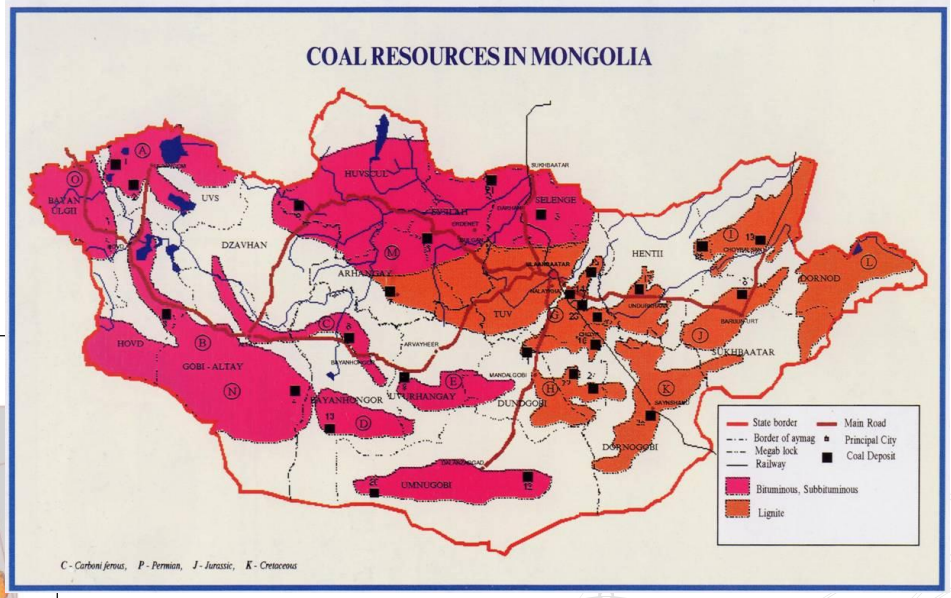
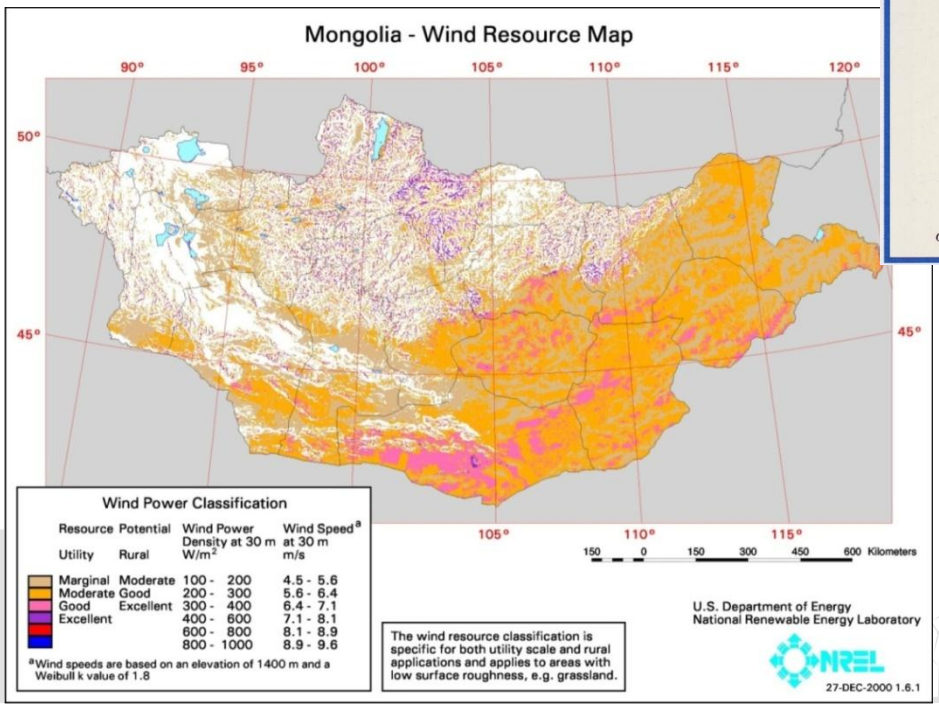
Energy potentials (Wind & Coal)

Preliminary estimates of geologists, geological reserves of coal in Mongolia is more than **162,3 billion tons**, which includes Mongolia, one of the 15 countries of the world, with large coal reserves.





Wind resources assessment made by NREL (USA) 2001.

Good-to-excellent wind resources equivalent to **1,100 GW** of wind electric potential.

Potentially deliver over **2.5 trillion kWh** per year

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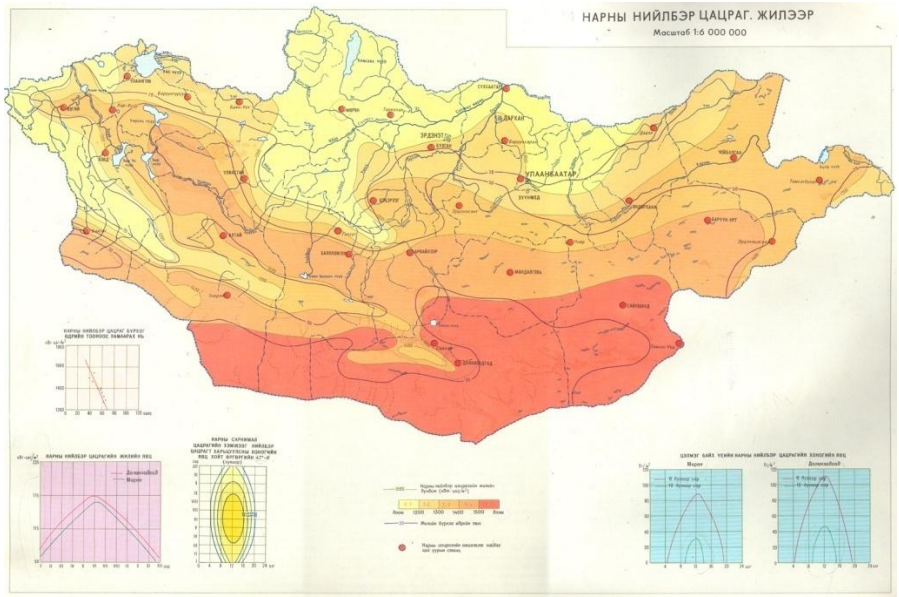
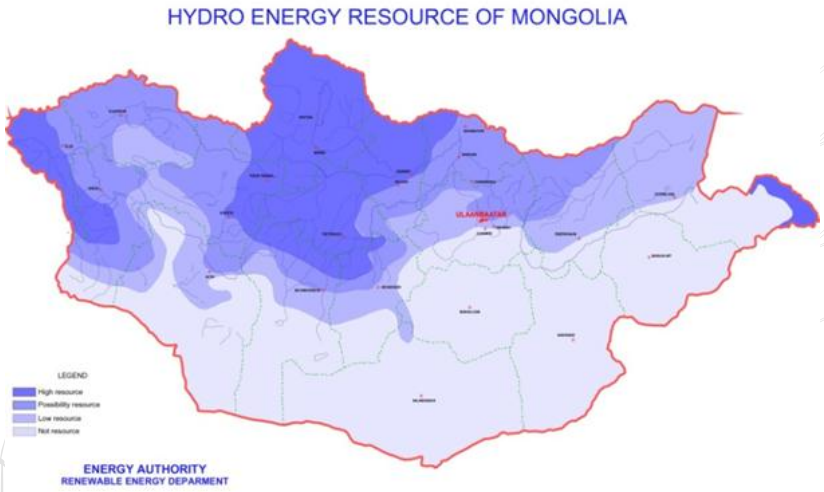
Energy potentials (Solar and hydro resources)



- There are 3800 small and big streams and rivers in Mongolia
- Available power could be **6417.7 MW**
- There will deliver **56.2 billion kWh** of electric energy in a year.

- An annual average amount of solar energy is 1,400 kWh/m^2/y with solar intensity of 4.3-4.7 kWh/m^2 per day.
- Total annual radiation intensity equals to **2.2*10^6 TW**.



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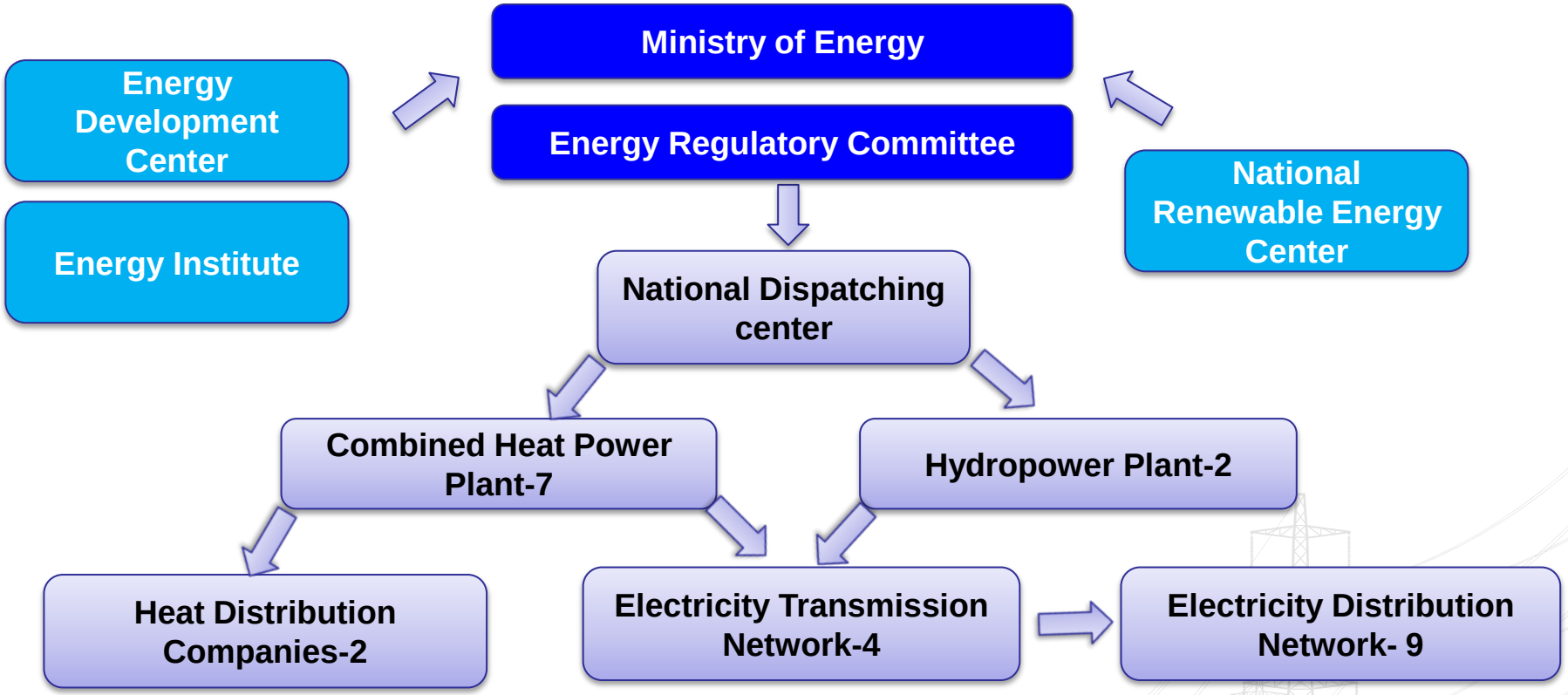
Key institutions and state owned energy companies



Energy sector of Mongolia

Mongolian power system consists of five detached segments,

- Central Energy System (CES),
- Western Energy System (WES),
- Altai- Uliastai Energy System (AUES),
- Eastern Energy System (EES),
- South Gobi Region

comprising 7 combined heat and power plants, 2 hydropower plants, coal-fired power plant, wind park, off-gird renewable energy systems, regional diesel generators and nine distribution systems.

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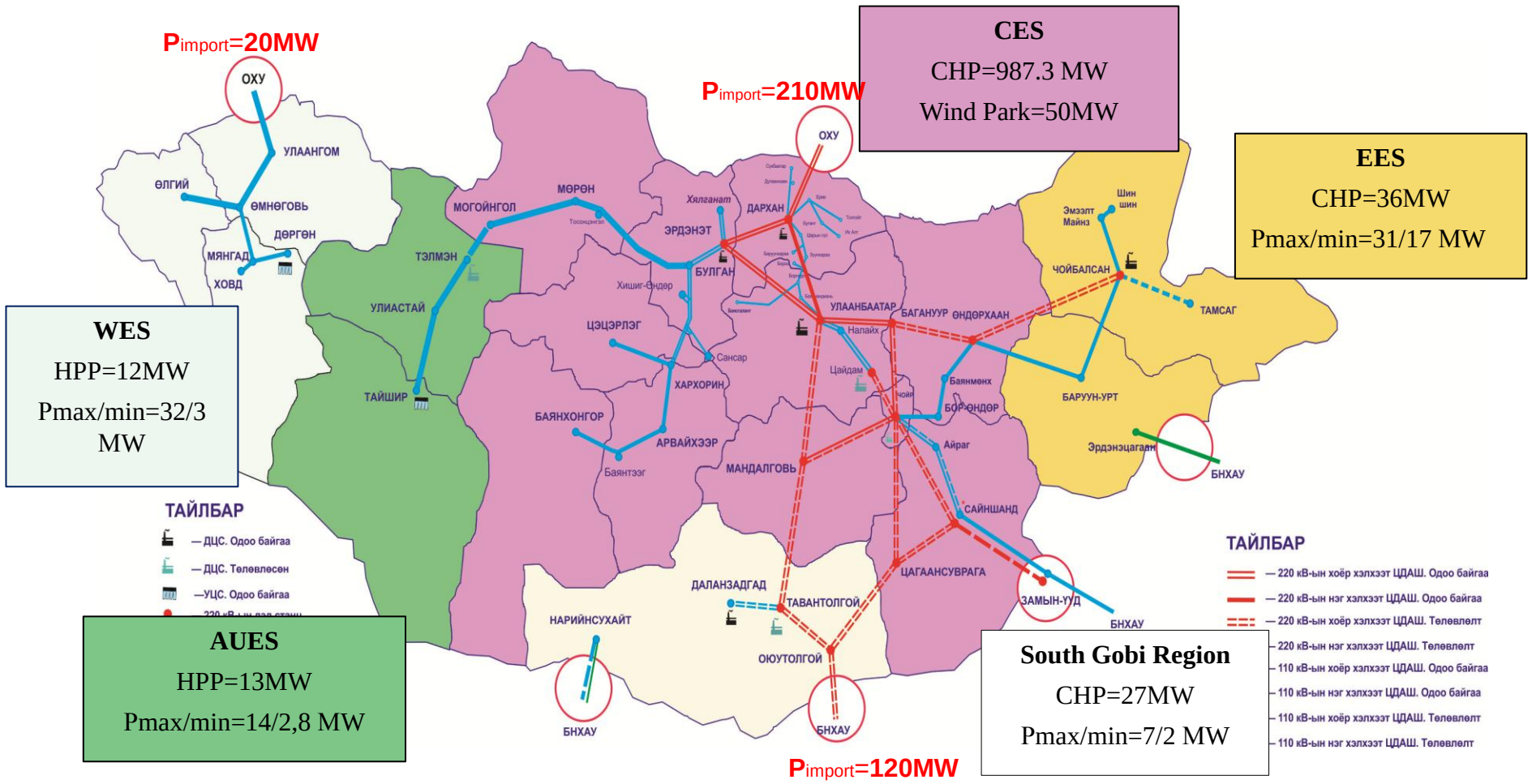
Power integrated system and installed capacity



CES

CHP=987.3 MW

Wind Park=50MW

EES

CHP=36MW

Pmax/min=31/17 MW

WES

HPP=12MW

Pmax/min=32/3 MW

AUES

HPP=13MW

Pmax/min=14/2,8 MW

South Gobi Region

CHP=27MW

Pmax/min=7/2 MW

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Installed capacity

Electricity Generation		
Type of sources	**MW**	**%**
Combined heat and power plants	1050.3	89%
Hydropower plant	28.2	2%
Wind and solar power plants	53.7	5%
Diesel stations	46.1	4%
Total	**1178**	**100%**
Imported electricity (Russia & China)	**350**	**-**

Heat Generation		
Type of sources	**Gcal/h**	**%**
Combined heat and power plants	2235.5	77.62%
Heat only power plants	392.5	13.63%
Boiler Houses	252	8.75%
Total	**2880**	**100%**

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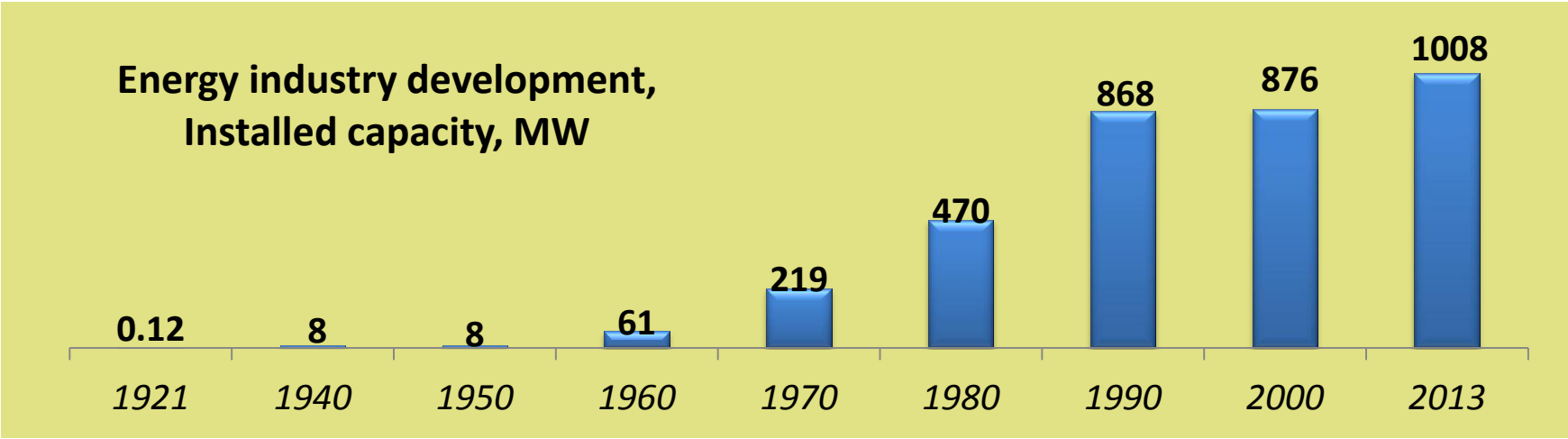
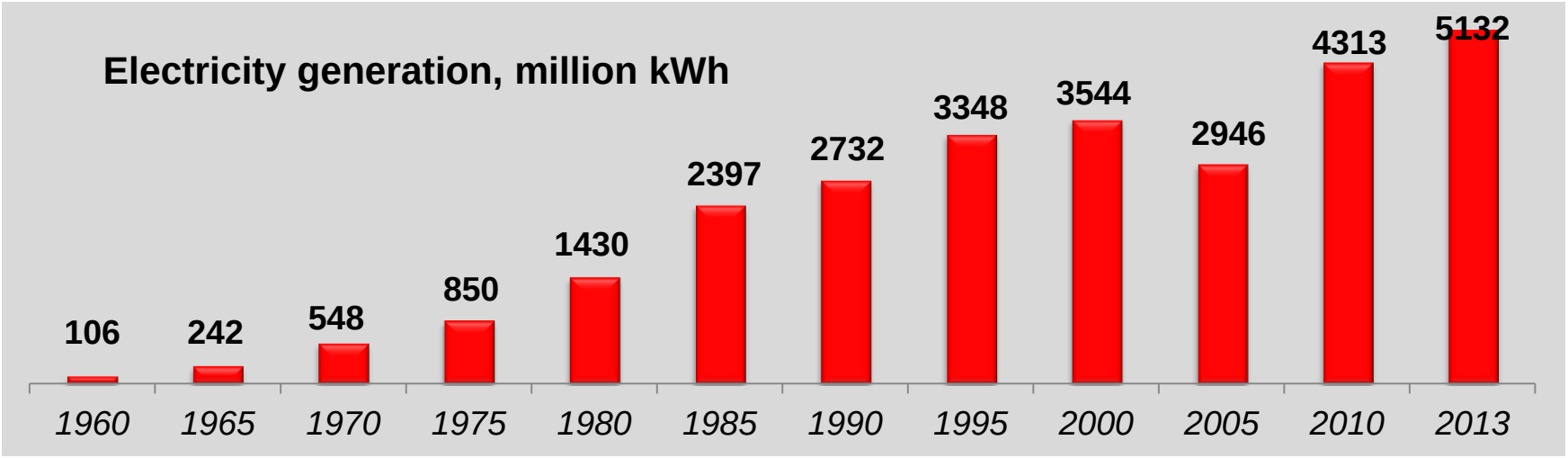
Electricity and heat production





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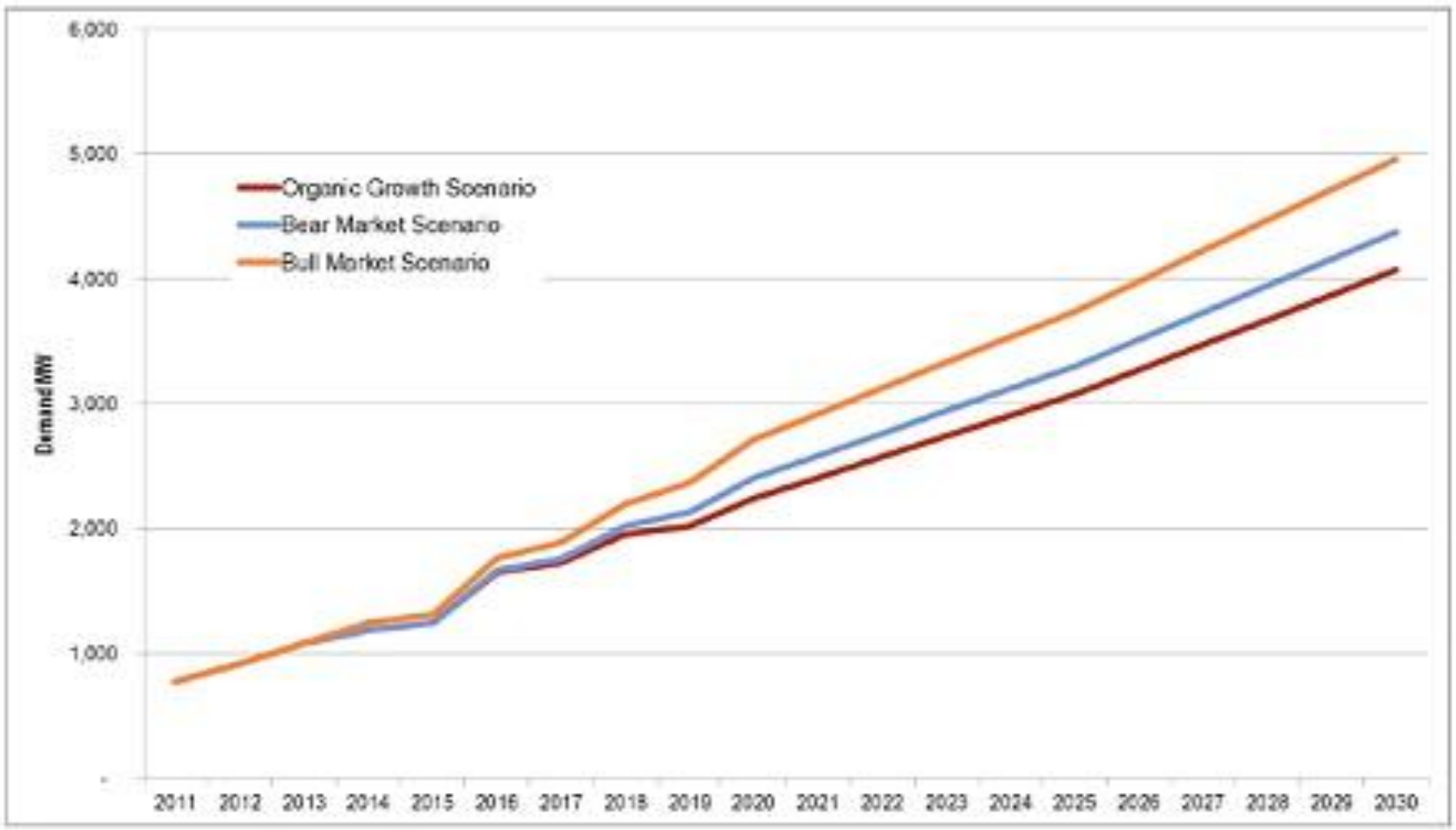
Electricity demand forecast by 2011 – 2030



Source: Master Plan by ADB

LEGAL ENVIRONMENT OF THE ENERGY SECTOR

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Government policy and programs on energy development

	Name of Documents	Approved	Update and Status
Legal frameworks			
1	Energy Law of Mongolia	2001	2011 and 2015
2	Concession Law	2010	-
3	Renewable Energy Law of Mongolia	2007	2015
Development programs			
4	State Policy on Energy	2015	-
5	“100000 Solar Ger” National Program	1999	end 2012
6	Program on Integrated Power Energy System	2002	2007 and end 2015
7	National Renewable Energy Program	2005	end 2015
Action plan			
8	Government Action Plan 2012-2016	2012	-

State Policy on Energy (2015-2030)

Expected Results

- **In the 1st stage 2015-2023:** The stage to develop energy safety resources and backup capacity, establish a foundation for the development of renewable, enhance normal documents and improve legal environment.
  - The installed power capacity will be doubled, and start using critical technology with high parameters. Hydro will be taken place at least 10% of the total installed power capacity and it will increase packup capacity to 10%, and create fundament for renewable sector to development intensively, enhance tariff system.

- **In the 2nd stage 2024-2030:** The stage to export secondary energy and develop sustainably the renewable sector.
  - The backup capacity of power system will be reach at 20% and share of renewables will be reach at 30%. Integrated smart energy system will be created by connecting regions with high capacity transmission lines. State owned Power companies will be become a public company. Distribution and supply service will be privatized and energy sector will be worked as a competitive marked with regulation. Secondary energy will be exported by connecting with North east Asian countries with high capacity DC lines.

State Policy on Energy (2015-2030)

Expected Results - Criteria

Indicators	2014 он /Base year/	1st stage /by 2023 /	2nd stage /by 2030/
Reserve Capacity for Electricity Generation	-10%	10 % ≤	20% ≤
Reserve Capacity for Heat Generation in Cities	3%	10 %≤	15 % ≤
Profit Share on Tariff Structure in Central Region	-16.22 %	0%	5%
Own Use of CHP's	14.4 %	11.2%	9.14 %
Transmission & Distribution Loss /excluding Oyutolgoi/	13.7%	10.8%	7.8%
Share of Renewables on total Installed Capacity for Domestic Supply	7.62%	20%	30%
Greenhouse Gas Emission per 1 Gcal Power Generation	0.52 ton CO_2 equivalent	0.49 ton CO_2 equivalent	0.47 ton CO_2 equivalent
Reduction of Building Heat Loss	0%	20%	40%
Technological Achievements that have to be utilized in Energy Sector	CFB	Sub Critical Coal Bed Methane, Battery Energy Storage, Pumped Storage	Super Critical, Ultra S/Critical, Hydrogen, Concentrated Solar Plant

Law on Renewable energy

Purpose: Promotes and supports the production of energy from renewable sources by regulating electricity pricing.

- Feed-in tariffs (FIT) for renewable power sources

	Hydro			Wind	Solar
	up to 0.5 MW	from 0.5 to 2 MW	from 2 to 5 MW		
Grid-connected	0.045 - 0.06	0.045 - 0.06	0.045 - 0.06	0.08 - 0.095	0.15 - 0.18
Stand alone	0.08 - 0.10	0.05 - 0.06	0.045 - 0.05	0.10 - 0.15	0.2 - 0.3
Prices are given in USD per kWh					

- Law was recently updated by Parliament in June 29, 2015
- New term – “Encouraging tariff” /gap between feeding tariff and consumer’s tariff

Amendment of Law on Renewable energy

- Purpose:
  - Enhance financial situation of single buyer model of Power sector and ensure feeding tariffs in the Law on Renewable Energy
- Amendments:
  - New term – “Encouraging tariff” /gap between feeding tariff and consumer’s tariff /
    - Definitions
    - Regulation to relating matters in tariff system
  - Power Purchase Agreement and its regulations
    - Regulation to relating matters

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JCM Potential projects

- Upgrading and Installation of Centralized Control System of High-Efficiency HOB
- 10 MW scale Solar Power Plant and Rooftop Solar Generation System /Durgun, Khovd province/
- Centralization of Heat Supply System by Installation of High-Efficiency HOB
- 10 MW scale Solar Power Generation for Stable Power Supply /Altai city, Gobi-Altay province/
- Wind Power project Feasibility Study in Mongolia /Tsogt-Tsetsii soum, Umnugobi province/
- The Demonstration and Verification project for a High efficiency and loss power transmission and distribution system in Mongolia

10MW-scale Solar Power Generation for Stable Power Supply

FS Entity: myclimate Japan

Outline of GHG Mitigation Activity

10MW-scale solar power generation system will be constructed in the neighboring site of the Taishir Hydropower Plant. The electricity generated will be sold to the national grid (Uliastai Altai grid) assisting the Feed-in-Tariff (FIT) scheme. This solar power project will contribute to an urgent issue of stable power supply in conjunction with the shortage of expected power generation outputs from the 11MW Taishir hydropower, mitigation of GHG emissions, and abatement of serious air pollution.

Reference: Embassy of Japan in Mongolia HP
URL:http://www.mn.emb-japan.go.jp/news/20121008cleanene.html

Site of Project

Reference: The World Factbook
URL:https://www.cia.gov/library/publications/the-world-factbook/geos/mg.html

The project is located in Gobi-Altai aimag Taishir Soum. The solar power system will generate power for the Uliastai-Altai grid, which has been also connecting to the 11MW Taishir Hydropower Plant since 2008.
Implementation of the solar power system is expected to provide further stable power to the region.

Draft JCM Methodology

Referring to the approved CDM methodologies, reference emissions are calculated by multiplying the amount of electricity supplied and CO_2 emission factor (EF) of the grid. CO_2 EF will be determined conservatively taking into account the Mongolian government's policy for renewable energy promotion.

Expected GHG Reductions

17,537tCO_2/yr

← Assuming that the solar power project will supply 15,943,200kWh/yr to replace Uliastai Altai grid electricity (CO_2 EF of the grid: 1.1tCO_2/MWh).

Introduction technology outline

- High adaptability to wind condition changes
  - → Reduce failure by appropriately responding to wind condition changes that cause damage to equipment. The number of repair times could be lessened.
- Technology and know-how related to grid-interconnected wind power generation
  - → When interconnecting large-scale wind power generation to a grid, effects on power quality (such as frequency, voltage) can be lessened.
- Control and operation management that is suitable for the terrain and climate
  - →Can support harsh weather conditions of Mongolia (minimum temperature: -30 to -40 ℃, maximum temperature: 25 ℃).

Case study of Komai Haltec

It's products can bear turbulence intensity level is Iref = 0.18 which exceeds the international standard of Iref = 0.16. Endurance to wind speed is 70m/s, which is the maximum level of international standards. In addition, Komai Haltec is currently examining the implementation of wind power plant in Russia with extreme cold climates. Thus, it has accumulated know-how necessary to implement wind power technology under sever circumstances.

- Main specifications of wind machines for cold climates -

	Specifications of cold climate wind machines	General specifications
Operating temperature	-30℃～+30℃	-15℃～+45℃
Standby temperature	-40℃～+40℃	-20℃～+55℃
Blade surface	Anti-icing coating	Normal coating
Sensors	Ultrasonic wind direction and wind speed sensors, freeze sensors	Normal specification, no freeze sensor
Output control	Available (Corresponds to air density increase at low temperatures)	Not Available


Komai Haltec Wind Machine

※Suitable wind machine & operating technology for this project will be examined during the FS. It is not decided that Komai Haltec's products will be used.

Thank you for your attention

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