MONGOLIA

MINISTRY OF FUEL
AND ENERGY

The Potentials for Bioenergy Development in Mongolia

Ms. P.Sarangerel

/Ph.D in technical science/

Deputy Director
Fuel policy and Regulation Department
Ministry of Fuel and Energy, Mongolia

Email:narsarbat@yahoo.com

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1.Introduction

Climate change

Changes in the Ecosystem:

- desertification
- increase of cases of natural disasters
- depletion of water resources
- depletion animal species.

Climate change in Mongolia:

- The average temperature raised up by 3.6˚C
- The average of total annual precipitation has decreased by 8.7-12.5%
- Over 372 rivers and 1,158 springs dried out due to hot climate
- The duration of ice cover of the lakes and rivers has shortened by 2 weeks.
- Warm days to increase (by 15-20 days in average)
- Sparse and poor pastures weakening the livestock weight
- Climate becomes arid
- Carbon-nitrogen ratio or protein component is increasing in the plants.

Air pollution

The air pollution of the capital city severely increases during the cold seasons from ger (traditional housing) districts by burning coal.

The main contributors to city air pollution:

- families in ger districts
- power stations
- cars

Therefore solutions like producing smokeless briquette from coal to replace coal and promoting it, need to be encouraged more.

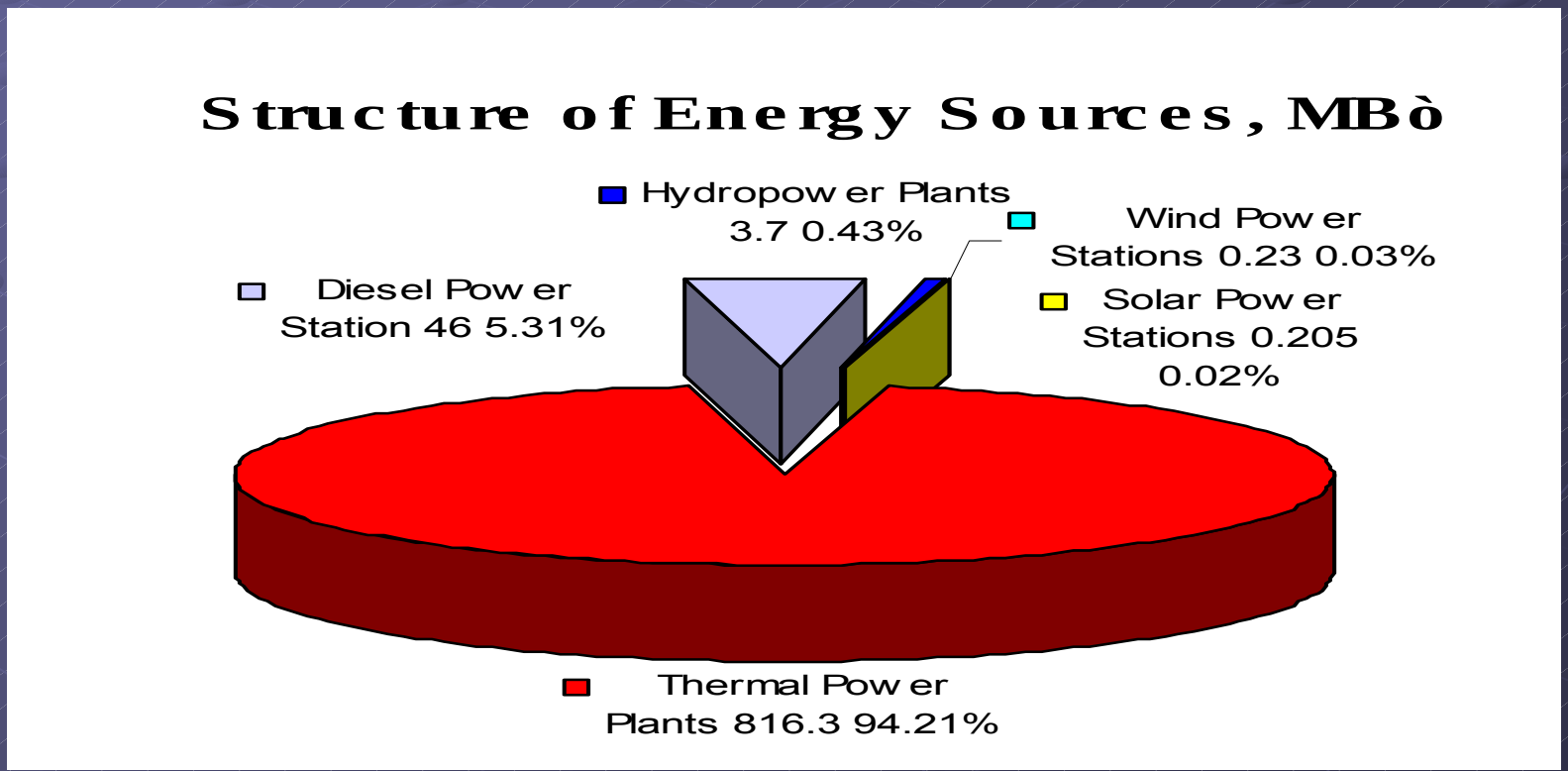
2. Energy development policy

Electricity utilization

Mongolia is one of the coldest countries in the world.

The Mongolian thermal power generation capacity is provided by

- seven coal fired combined heat and power (CHP) generation plants
- numerous Diesel power stations in some provinces.



Coal consumption

- Coal reserve of 150 billions tons at more than 240 deposits and finds.
- Coal is the cheapest and best source for Mongolia's future energy supply.

***"Coal" National program**, which is just introduced to the Parliament, is a key strategic goal for country's development, main reserve of energy, resource of liquefied petroleum and export.*

Priority purposes of program:

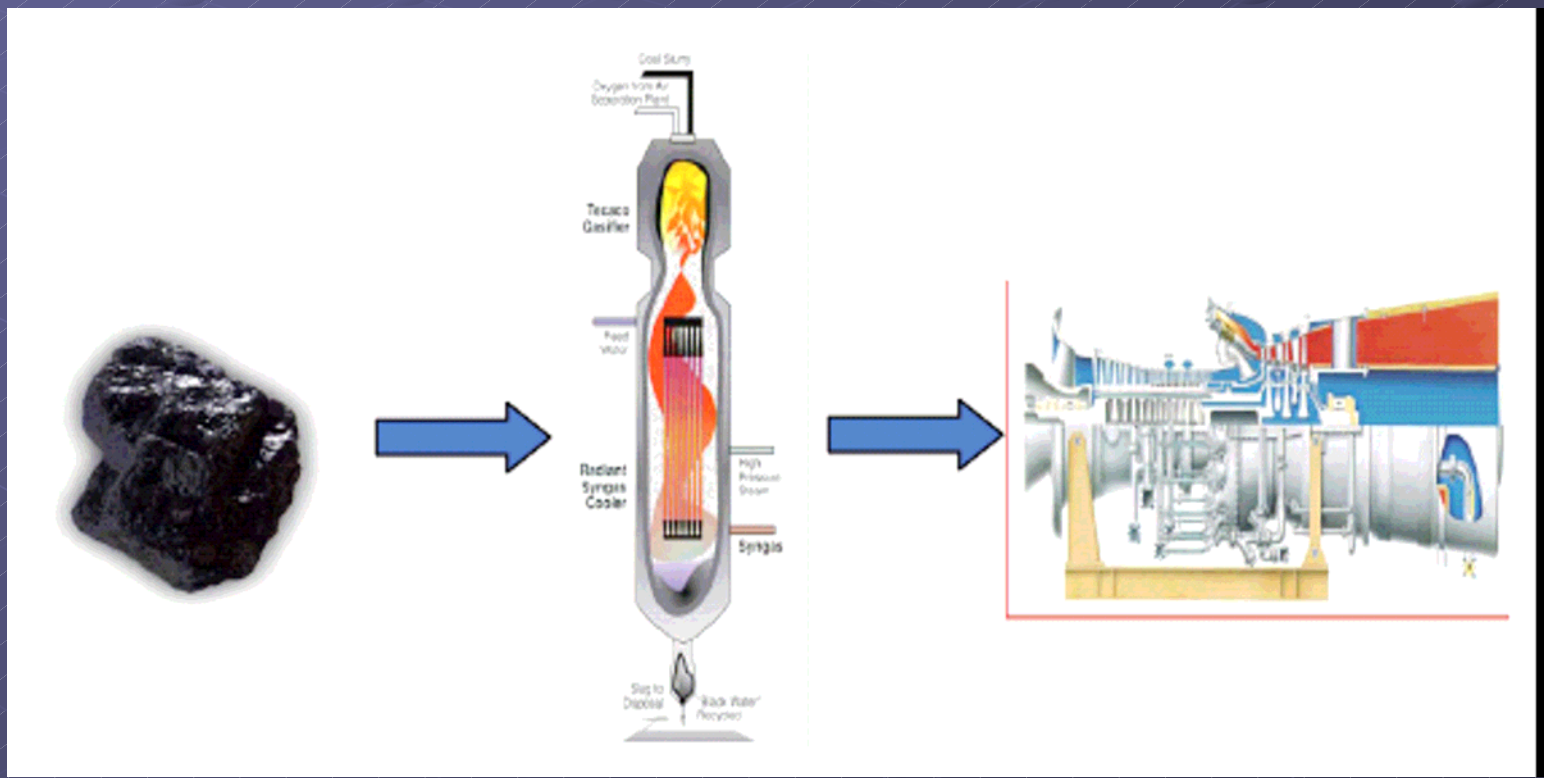
Development of clean coal technology, technology for coal gasification, liquefaction, coal briquette and coal coking etc.

Expected results of the program are:

Fulfil the obligations of international contracts on reducing the greenhouse effect and toxic components exhausted to the atmosphere due to coal-fired plants.

To solve air pollution problems the following advanced technologies are to be developed in Mongolia:

- Clean coal technology to produce the electricity
- Coal gasification technology
- Smokeless coal briquette producing technology
- Coal liquefaction technology
- Bituminous coal coking technology



Renewable Energy

Renewable energy resources:

- solar
- wind
- hydro
- geothermic
- biomass types.

These resources have not yet been included fully in the energy resource balance. Some studies are in progress to use these resources for energy production purposes.

The Government of Mongolia decided to provide power for almost all nomadic families and small rural centers using solar and wind power.

The main aim of the Government's program is:

- to increase the agricultural production
- to improve the living and working conditions of the Mongolian nomadic people through the expanded use of the renewable energy systems.

Hydro Energy Resources:

- 3800 big and small rivers with a total of 65000 km in length, is 3,46·1010 m3,
- energy resource 6300 MW and producible energy is 56·107 KW.h.

Under construction of hydro power plants:

- 100 MW at “Orkhon” river
- 11 MW at “Zavkhan” river
- 12 MW at “Durgun” river
- many sites were identified for the possible construction of hydro power stations to supply the energy needs of the rural centers.

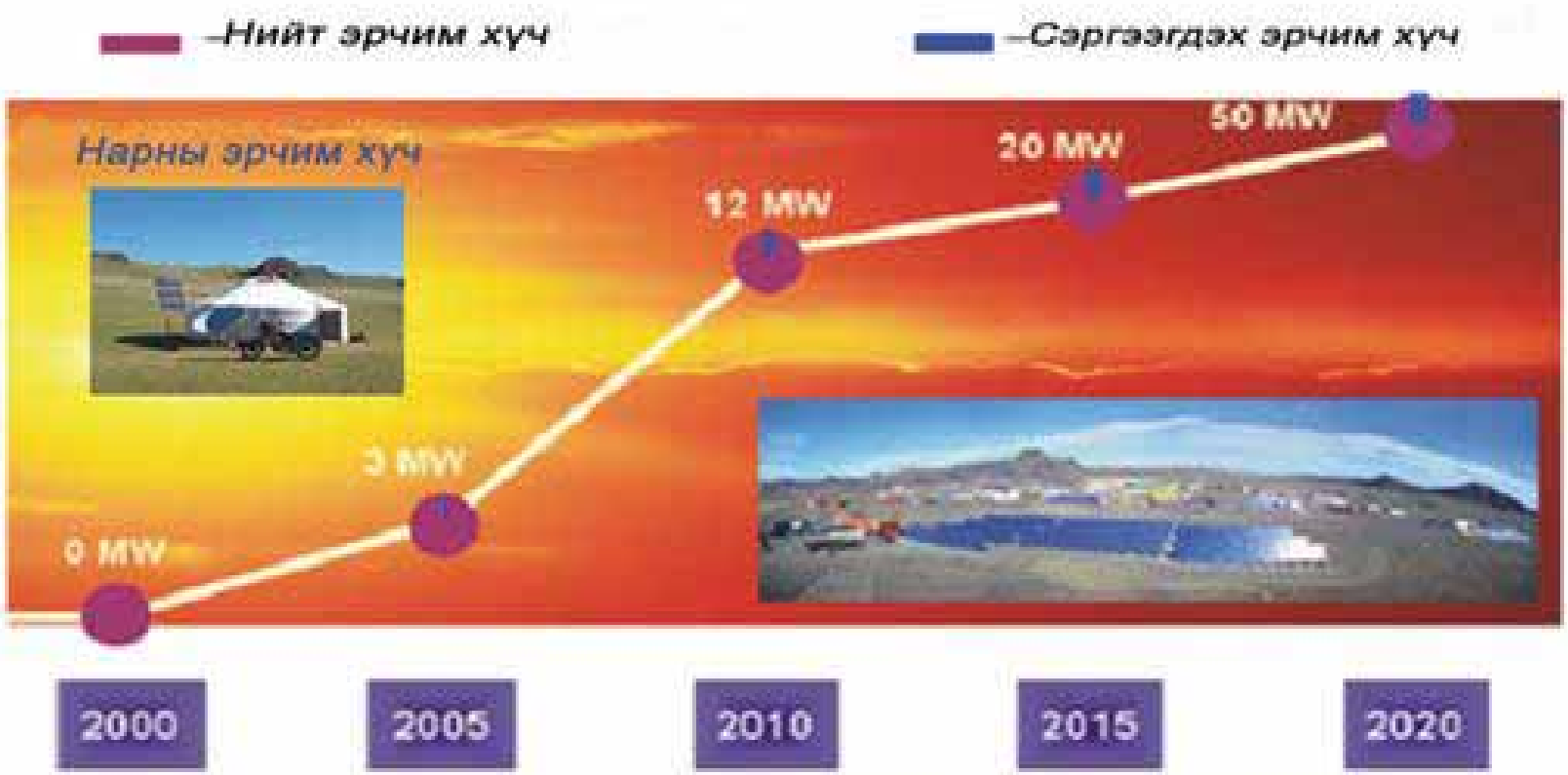
Development goal for hydro power generation

Solar Energy Resources:

- from 270 to 300 days sunny
- the yearly average daylight time is estimated as 2250-3300 hours
- the yearly radiation is estimated as 1200-1600 kilowatts per square meter
- intensity 4.3-4.7 kilowatt per hour.

Government has programs and plans to exploit the solar resource.
The “100,000 Solar Gers” program has been established.

Development goal for solar power generation



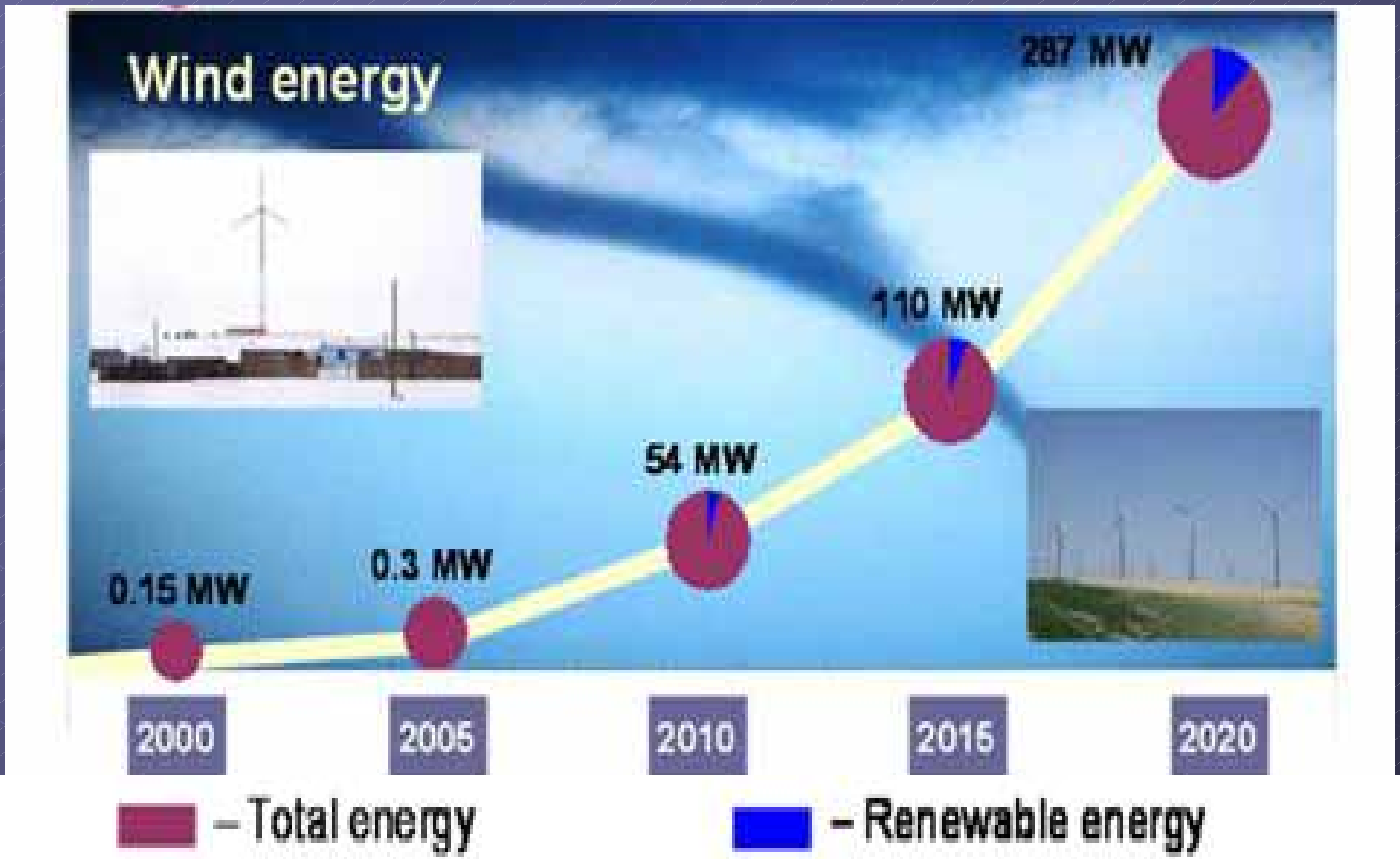
Wind Energy Resources

- Regions in Mongolia with more than 160000 sq. km area have possibility and are convenient to use high capacity wind power stations connected to the electric grid network.
- Ten percent of the whole territory has good wind resource.

Wind-solar hybrid system for soum centers institutions electrification

The total installed capacity of Mongolia is estimated as 0.8 MW.

Development goal for wind power generation



3. Bioenergy: Current situation and development

On top of above mentioned potential energy sources, Mongolia still needs to develop **bioenergy** sector in order:

- to utilize potential natural resources wisely
- to increase agricultural productivity
- to facilitate ecologically clean living environment
- to reduce poverty
- to improve the livelihood of rural citizens
- to decrease the green house gas emissions.

Mongolia certainly has plenty of bioenergy resources; what is of utmost importance is to carry out a feasibility study, planning and developing projects accordingly.

Biomass

Biomass types in Mongolia:

- dried cow dung, pellets
- horse-dung
- “khurzun” - hardened dung and urine of sheep and goats
- straw
- forest
- shrubs
- biomass waste of urban settlements.

Mongolians have a long tradition of herding livestock and using the biomass, an accumulated and converted form of energy, such as dried cow dung and “khurzun” as the source of fuel and this tradition continues today.

Dung is a cheap fuel that can be collected easily during anytime of the year in all regions of Mongolia, and has been the key source of fuel for herders, especially in regions with limited forest reserve or no forest reserve at all.

Livestock count of Mongolia: 30 million in biomass resource.
All forms of dung belong to high-quality compact fuel.

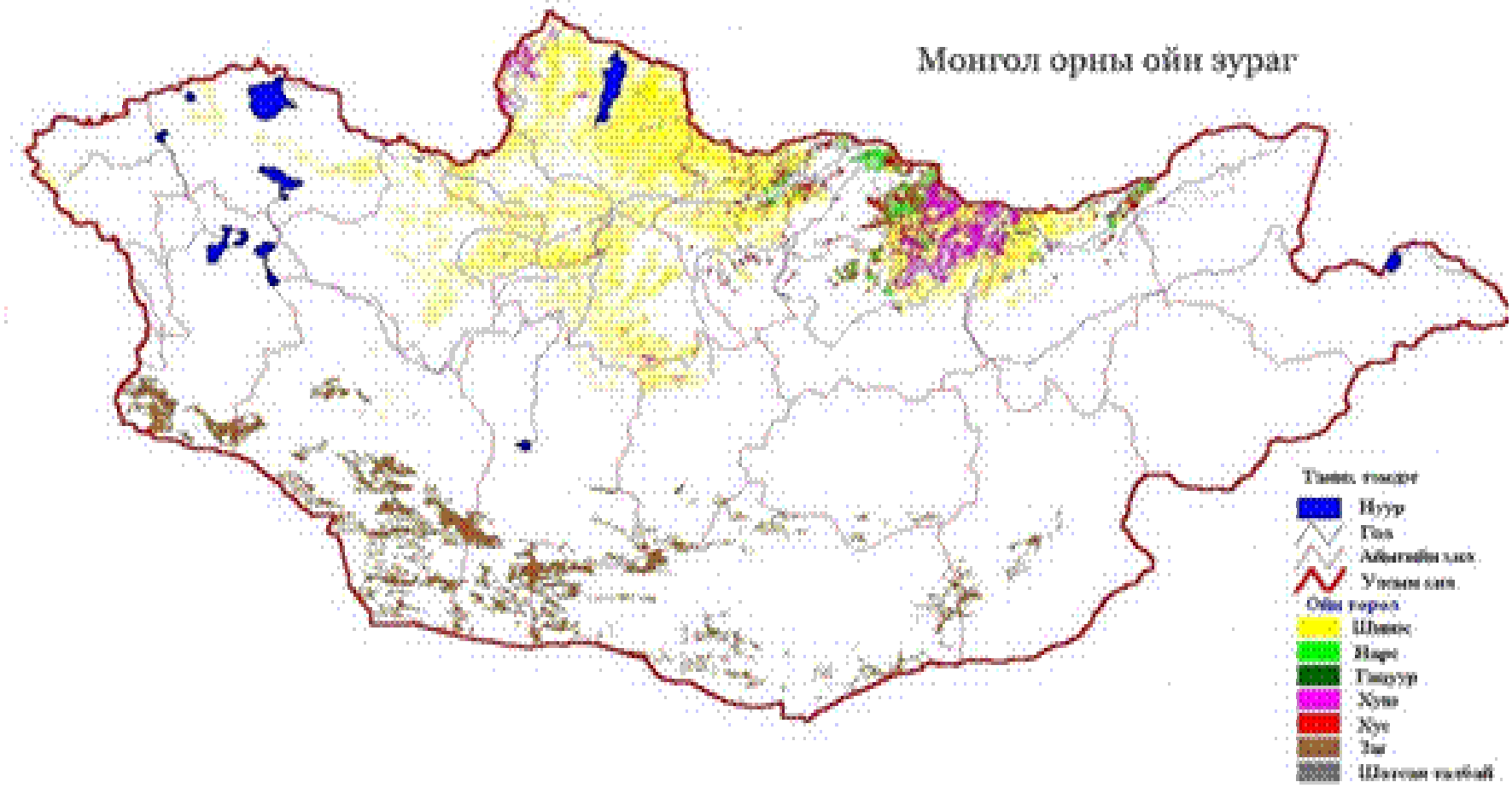
The thermal energy capacity of the different dung forms depend on seasons and regions. The minimum amount of thermal energy capacity:

- cow dung is 10800-13300 kJ/kg,
- pellets is 8800-16700 kJ/kg
- “khurzun” is 12500-14600 kJ/kg.

15.2 million hectares of Mongolian landscape is covered by forest, which makes the growing forest mass 1.2x109 м3. Eighty percent of that consists of pine trees and the rest is leaf tree. Another potential renewable energy source is straw left in wheat fields. The thermal energy capacity of straw is 9000-10 000 kJ/kg.

In Gobi desert area, widespread usage of saxaul (only tree-like plant grows in the Gobi desert) and shrubs is resulting in extinction of forests and green zones in desert area, consequently increasing sand movement/spread. Thus, using different types of dung for fuel and for generating biogas, will definitely help saving the plants in Gobi desert.

BIOMASS RESOURCES



Amount of dung produced from a cow per day

Season	Amount of consumed grass /kg/		Amount of produced biomass in absolute dry times /kg/
	In absolute humid times /kg/	On average from the pasture /kg/	
Autumn	21,6	12	3,36
Winter	16,1	7,9	2,4
Spring	18,0	8,8	2,68
Summer	20,3	11,3	3,16
Average	19,0	10,0	3,0

Amount of pellets produced from a sheep per day

Season	Amount of consumed grass /kg/		Amount of produced biomass in absolute dry times /kg/
	In absolute humid times /kg/	On average from the pasture /kg/	
Autumn	4,15	3,2	0,64
Winter	3,1	2,3	0,46
Spring	3.5	2,7	0,54
Summer	4,4	3,5	0,7
Average	3,8	3,0	0,6

In late 1980s, Mongolia started experimental studies on biomass technology to produce environmentally-friendly fuel.

National Renewable Energy Center of Mongolia has developed an 100 m3 capacities) from livestock waste.

The by-product from the equipment can be used as fertilizers for agricultural purposes. But at present no biogas digesters are in practice.

We are facing the following difficulties in producing biogas:

- harsh weather condition
- additional expenses in general heating system
- lack of human resource/biogas specialists
- nomadic lifestyle
- no concentration of farms

What we can do to develop biogas technology is:

- to create master plan and feasibility study of biomass resources and utility of biogas technology
- to determine long-term objectives of biogas technology development
- to realise more economically viable projects
- to create legal environment
- to increase government support for development of biogas technology
- to advance Mongolian agriculture to new stage by new technology
- to cooperate with international organizations and experienced specialists
- to prepare future human resource/biogas specialists

Geothermal Energy Resource

- 43 hot springs in use in Mongolia, but they are not studied thoroughly.

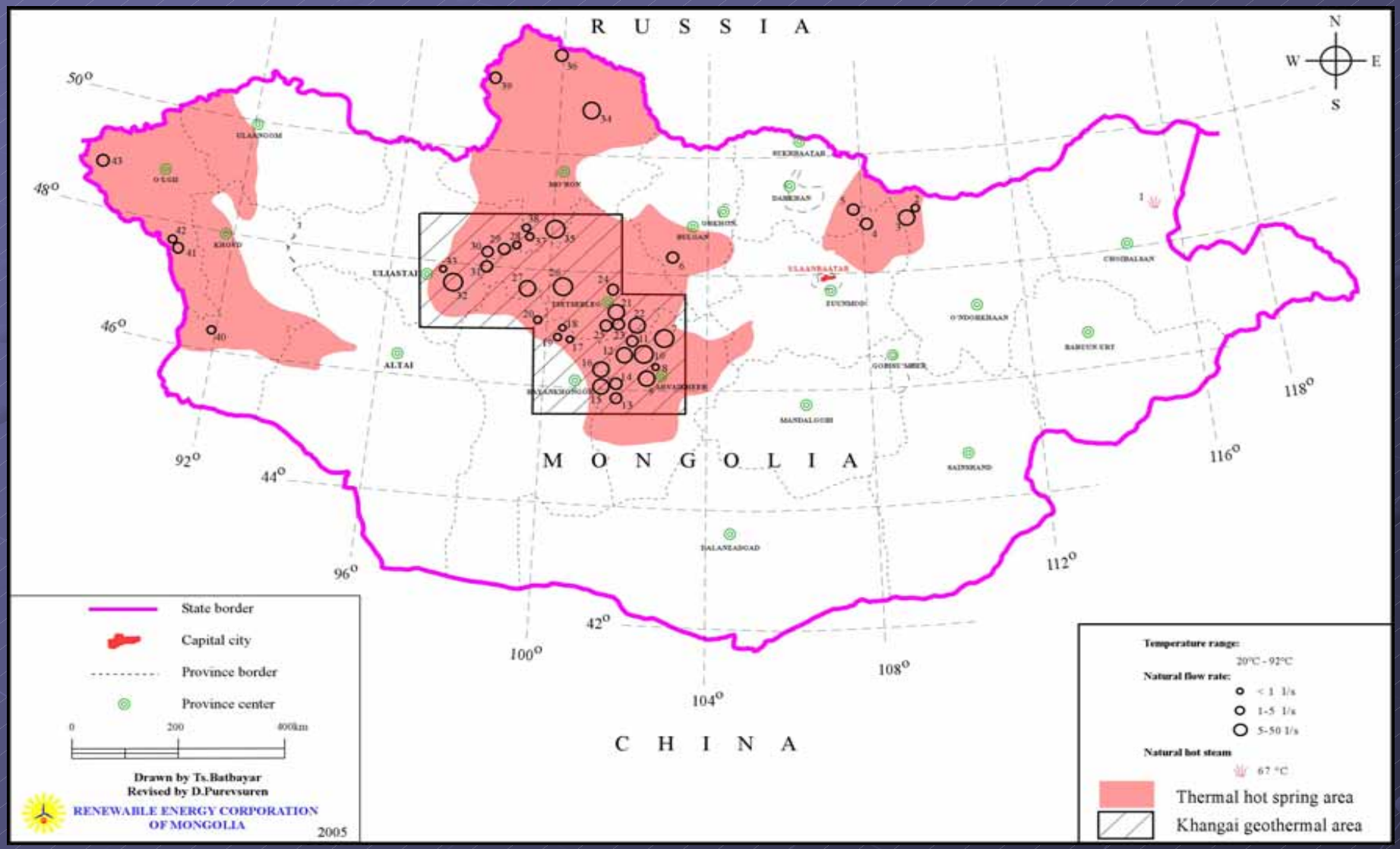
- Hot springs located in mountainous areas mountain ridges, where the infrastructure is not developed.

The average underground heat flow at the hot springs:

- in the Central region 52 ± 6 MW/m2
- in the Northern region 80 ± 10 MW/m2
- in the South Western region 54 ± 24 MW/m2
- in the Eastern region 44 ± 6 MW/m2.

Although the local population makes some use of the hot springs, no commercial power or heat development has been done.

Geothermal energy resource map



It is necessary to conduct relevant research and studies to explore the potential to use hot springs to provide heating for the sanatoriums established on the springs, build greenhouses to operate with solar and thermal energy and geothermal power stations.

According to the comments made by the specialists worked on the possibility of utilizing the hot springs, the heat from the hot springs can be used for heating purpose without harming the nature and environment.

Biodiesel

The necessities to develop production of biodiesel in Mongolia are the following:

1. Supply of diesel fuel for Mongolia is completely dependant upon import. Subsequently, the price fluctuates as oil price changes at international markets. Currently, one liter of diesel is sold for about 1 USD and it is expensive, especially for the population in the countryside far from Central energy system use diesel power stations. Despite the price, constant shortage of supply is a big problem.
2. There are 1 million hectares of former wheat fields which were abandoned after the 1990 change of political regime. These fields can be used for vegetables, of which plant oils can be produced in order to make biodiesel.
3. As air pollution levels in the capital city due to sudden increase in urbanization, has become a serious problem, the Government is paying more attention to different possibilities to change the causative sources, such as motor vehicles, smokeless coal burning, etc.
4. There is already a strong legal environment that favours foreign investment in place.

The benefits of developing biodiesel factory in Mongolia are:

- plantation of oil vegetables
- production of plant oil
- production of biodiesel
- make fodder and fertilizers as by-products
- others: tourism, bee farm etc.

In 2003, JICA organization started a project titled “Biodiesel from plant oils”. They have been experimentally planting oil plant since 2004 and in Sep 2006, they purchased 2191 hectare area formerly used as wheat field. In 2007, they planted rapeseed in 860 hectare area and hope to increase it to 50 000 hectare by year 2012. Research on regional climate, irrigation and other infrastructures are being carried out within the project vision.

The following are what we need to solve in first place in order to develop this area:

1. Supply of methanol
    - Needed about 1/10 – 1/5 of the volume of fuel to be produced
    - Locate affordable suppliers in China and Russia.
2. Use of the by-products, i.e. glycerine
    - Will be produced 1/10 – 1/5 of the produced fuel volume
    - Manufacturing soap and other beauty products
    - Use in fertilizers, boiler fuel, and in producing biogas
3. Purification of the waste water
    - Waste water contains significant amounts of methanol and glycerine
    - Study the cost of acid-neutralization and purification by bacteria

In the bigger picture, we have other problems, such as:

- Lack of human resource
- Lack of necessary equipments
- Lack of development of mechanical agriculture
- Waste water management
- Building a satellite facilities to utilize the by-products

Upon developing biodiesel production, Mongolia will benefit:

- By introducing biodiesel to replace petroleum diesel, the carbon dioxide and other gas emissions that cause air pollution will decrease
- The infrastructure in the isolated places in the countryside will improve
- Contribute in country’s socio-economical situations

4. Conclusion

1. Since Mongolia is rich in coal reserve, but dependant on fuel imports, it is concentrating on promoting clean coal technology, produce own source of energy, and developing ecologically clean gas and liquid fuels.

2. Developing bioenergy using own bioenergy resources will definitely benefit the regional development of the country, infrastructure improvement and poverty reduction plans.

We are planning to do the following measures in that regard:

- Prepare human resource for developing bioenergy sector
- Develop projects addressing every aspect of bioenergy source
- Accelerate studies, calculations, experiments in order to develop and promote bioenergy utilization
- Encourage investments in this area according to Clean Development Mechanism
- Include bioenergy sector in the priority areas of country's development issues
- Create a competitive environment, introduce tax, legal and tariff benefits, and financial supports for businesses in this area
- Start bioenergy projects to attract international investments


Thank you for
your attention