CRINES Seminar

NUCLEAR ENERGY PROGRAM IN MONGOLIAN

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Topics

- Universities in Mongolia: brief history and present situation.
- Brief introduction of NUM and Nuclear Research Centre,
- Energy problems in Mongolia and Ulaanbaatar,
- Uranium resources
- Nuclear Energy Program in Mongolia (Education, Research and Utilization)

MONGOLIA

- Population: 2.7 Million,
- Capital: Ulaanbaatar (1.2 M)
- Land: 1.565.000 square km.
- Domestic animals: 40 Million,
- Natural resources:
  copper, gold, coal, uranium ...

-13th Century: Mongolian Empire of Chinggis Khan
-1691-1911: Under Manchu
- 1921-1990: A country in Socialist Blok
- 1990: Market economy and Democracy

Higher Education in Mongolia

- 18th-19th: Mongolian Buddhist monasteries became the centers of higher education.
- Five great sciences: logic, philology, Buddhist doctrine, technology, medicine,
- Five small sciences: astrology, literature, allegory science, poetics and playwriting.
- In 1937, because of reactionary Stalinist policy, temples and monasteries were destroyed.
- 1942: National University of Mongolia was established.

Higher Education in Mongolia (cont)

- HEI 151=
  - National Uni & Colleges 42
  - Private Colleges 104
  - Foreign invested Colleges 5
- Students 160,000
- National Universities (5):
  - NUM
  - MUST
  - Agriculture Uni
  - Medical Uni
  - Education Uni

Higher Education in Mongolia (cont)

Credits for higher education:

- Bachelor degree 120 credits, 4 years
- Master degree 30 credits, 2 years
- Doctor degree 60 credits, 3-4 years

Higher Education in Mongolia (cont)

Government Policy in 2009-2010:
- Re-structuring National HEI
- Building University Campuses

National HEI = 42 ⇨15 (2010.07.01)

To NUM will merged:
- "Ulaanbaatar" University (MAS)
- College of Commerce & Business (1924)
- College of Custom and Economy (Training)

Higher Education in Mongolia (cont)

Affiliated branches of the NUM in countryside become non-legal entity:
- Business College in Zavkhan (1000 km)
- Business and Foreign Language College in Erdenet (400 km)

National University of Mongolia

- Faculty/School 12
- Department 76
- Research Unit 27
- Centre of Ecological Education 1
- Faculty members 700 + 100

	UG	Master	PhD	Total
Program/Major	100	94	69	263
Students	11,596	2,590	529	14,715
To be merged	6,700	100	30	6,800
2010-2011	18,000	2,700	600	21,300

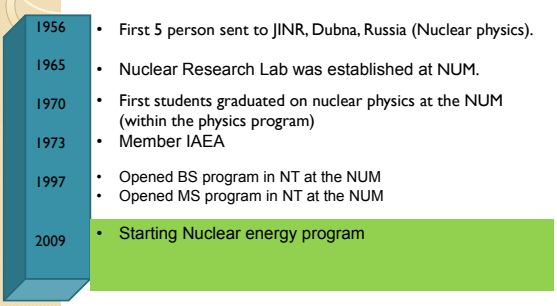
National University of Mongolia (cont)

International Students:
FT students (UG+M+PhD) = 101+42+3=146
- PG students = 35
- Language training = 77
- Summer School students +

National University of Mongolia (cont)

University Campus

Brief History of Nuclear Physics Development in Mongolia



Nuclear Research Centre

The NRC/NUM is the only educational and research institution in Mongolia, which carries out fundamental and applied research in low energy nuclear physics.

Academic work: education and training

Research and development:

- Fundamental research: spectroscopy, nuclear reactions and neutron physics.
- Development of nuclear analytical methods: Use of X-ray, gamma and neutron activation analysis on geological, biological, agricultural, environmental (urban air pollution) samples.
- Nuclear Energy

Human Resources of the NRC

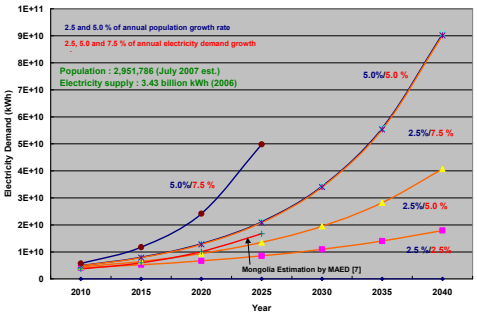
Full-time Professor	3
Emiritus Professor	2
Senior Researcher	5 (3 are part-time prof.)
Researcher	10
Engineer	3
Technicians	2
Total (now)	25

- Students (UG+MS+PhD)= 82+15+11

Energy Demand of Mongolia

- The installed total capacity of electric generation is about 800 MWe as of 2008. The main power plants in Ulaanbaatar are Power Plant 2, 3 and 4, which are coal fired plants.
- The total installed central heating capacity in Mongolia is about 2,300 MWth (2,000 Gcal/h) and about 1,500 MWth (1,300 Gcal/h) is supplied to Ulaanbaatar city.
- The estimated total electricity capacity will be about 1,000 MWe until 2020 or 3,000 MWe until 2030.

Energy Demand Forecasting



Why NE need in Mongolia?

- Electric and heating energy demand is increasing for quality of human life.
- Rapid development of mineral resources mining
- Coal fired power plants are ageing
- Global problem of CO2
- Air pollution in Ulaanbaatar
- Uranium resources

Main sources of air pollution of Ulaanbaatar City

- 3 of Electric Power Stations, which use 5 mln. tn. coal per year and produce electric energy,
- More than 80,000 auto cars
- Small size living houses, which burn 160,000 m^3 wood and 200,000 tn. coal
- Technology heating places, which burn 400,000 tn. coal
- Ash and waste storage from electric power stations and dust from land erosion.

Uranium Resources of Mongolia

Ордын нэр	Нөөцийн зэрэг	Агуулга, %	Нөөц	
			Хүдэр (x1000тн.)	Металл (тн.)
Дорнод (Дорнод)	C1+C2	0.179	16,467	28,868
Гурванбулаг (Дорнод)	C1+C2	0.208	5,449	16,073
Мардайн гол (Дорнод)	C1+C2	0.120	924	1,104
Хараат (Дунд-Дорноговь)	C2	0.02	52,088	15,000
Нэмэр	C2	0.146	1,730	2,528
Дүн			76,659	**63,573**
Таамаглал				**1,400,000**

Mongolia Nuclear Program

- **2009 June-25** **Parliament of Mongolia** - **State policy of Mongolia on exploitation of radioactive minerals and nuclear energy**
- **2009 July-16** **Parliament of Mongolia** - **Nuclear energy law of Mongolia**
- **2009 July** **Government of Mongolia** - **Implementation program for state policy of Mongolia on an exploitation of radioactive minerals and nuclear energy**

State Policy of Mongolia on Exploitation of Radioactive Minerals and Nuclear Energy, by The Parliament of Mongolia (2009.06.25, Decree No. 45)

6.6. To train national specialists in foreign countries in the field of radioactive minerals, nuclear energy and high technology, in accordance with specific national program.

Personnel in the field of nuclear power engineering for Mongolia will be developed with strong assistance from the international community:

- ❑ **International cooperation:**
  - ➢ **IAEA: TC & RCA projects - training, equipment**
  - ➢ **International Networks: JINR (Dubna, Russia), ANENT, ICTP (Trieste, Italy) +FNCA**
- ❑ **Intergovernmental cooperation :**
  - ➢ **Bilateral Cultural Agreement: Russia, Japan, France, India**
  - ➢ **Send students abroad through Mongolia government scholarships: Russia-8, France +**

- ❑ **University level exchange Agreements (exchange of students, professors, and information):**
  - ➢ **Tokyo Institute of Technology (Japan),**
  - ➢ **Tomsk Polytechnic University, Russia**
  - ➢ **Hokkaido University, Japan**
- ❑ **Open scholarships:**
  - ➢ **KAIST (Korea),**
  - ➢ **USA,**
  - ➢ **EU… (UK, Sweden)**
- ❑ **Work experience in foreign companies:**
  - ➢ **Career development program for foreign students from Asia, Japan (Tokai University GIANT Program)**

MOU on Nuclear Energy & Uranium Resources

Country	Date	Organization	Comment
JAPAN	2009.06.16	The Agency for Natural Resources and Energy of the Ministry of economy, Trade and Industry of Japan	
INDIA	2009.09.14	Department of Atomic Energy of the Government of the R. of India	
FRENCH	2009.10.05	AREVA Group, A Company of the French Republic	
RUSSIA	2000.11.14	The Government of RF	
	2009.03.17	The "ROSATOM", Government Corporation of Atomic Energy	
	2009.05.?	The "ROSATOM", Government Corporation of Atomic Energy	HRD of uranium & energy
	2009.08.25	The Government of RF	To establish "Dornod Uran" LLC

Common Objectives and Scopes of MOU

MAIN OBJECTIVES

To promote cooperation in the development of radioactive minerals and nuclear energy in field of peaceful use.

COMMON SCOPE OF COOPERATION

To facilitate cooperative activities, which include:

1) **Training of human resources in nuclear energy sector;**
2) **Development of uranium resources;**
3) **Improvement of investment environment; and**
4) **Other activities to be decided by both sides.**

Implementations of MOU

Both sides will consuls each other for the effective implementation of cooperation under the Memorandum of Cooperation, including following subjects:

- **Exchange of information;**
- **Exchange of visits;**
- **Training of human resources;**
- **Improvement of investment environment including legal framework for uranium resources development;**
- **Cooperation and support of development of uranium resources including minimizing the investment risks; and**
- **Other activities to be decided by both sides.**

Cooperation of NRC/NUM & CRINES/TIT

- **Agreement for Cooperation between TIT & NUM (2007 - Presidents Masuo Aizawa & Ts.Gantsog)**
- **Exchange scholars for lecture, talk and sharing experince (since 2006 – 12 times):**
  - **TIT team (H.Sekimoto etc) -5**
  - **NUM team (SD & NN) -2**
  - **Prof. Minato - 3/4**
  - **S.Davaa -1**
- **Exchange scholars to participate in conference (in UB 2007 & 2008, and in Tokyo 2010 INES-3)**
- **Exchange information**
- **Cooperation in HRD (Munkhbat, Odtsetseg)**
- **Joint research in development of Road Map of Mongolia Nuclear Program**

Working Group of Small Reactor Program:

Mongolia (NUM):

- **NRC**
- **Mongolian University of Science & Tech**
- **Institute of Physics & Tech (MAS)**
- **MonAme Scientific Research Centre.**

Japan (TIT):

- **TIT**
- **Hokkaido University**
- **Tokyo City University**
- **Tokai University**

Development of Road Map of Mongolia Nuclear Program

olUtilization of NE & RA resource in Mongolia should be implemented according to following stages:

- **2009-2011:**
  - **Legal environment**
  - **Selection of RR and research field**
  - **HRD (mainly for RR)**
- **2012-2016:**
  - **Installation of RR**
  - **HRD for NPP**
- **2017-2021:**
  - **Installation of Heating Reactor**
  - **Preparation a plan of NPP**