

THE PROSPECTS FOR NUCLEAR ENERGY AND DEVELOPMENT PROBLEMS IN BANGLADESH. ANALYSIS OF SEISMIC HAZARD PARAMETERS

ПЕРСПЕКТИВЫ АТОМНОЙ ЭНЕРГЕТИКИ И ПРОБЛЕМЫ ЕЁ РАЗВИТИЯ В БАНГЛАДЕШ. АНАЛИЗ ПАРАМЕТРОВ СЕЙСМИЧЕСКОЙ ОПАСНОСТИ

Аннотация. Целью настоящего исследования является оценка сейсмического состояния территории для строительства АЭС в Республике Бангладеш. Сейсмические эффекты зависят от уровня землетрясений и PGA (пиковое ускорение земли). Приводится анализ сейсмической активности территории Республики за период 400 лет. Это дает представление о внешних опасностях для будущего строительства АЭС в связи с природными явлениями.

Bangladesh is presently a mono energy country as far as power generation is concerned (Fig 1.). About 87 % power is generated from gas, while coal contributes a meager 3 % of the total generation and the rest of sources are imported oil (6 %) and hydro (5 %) and furnace oil (5 %).

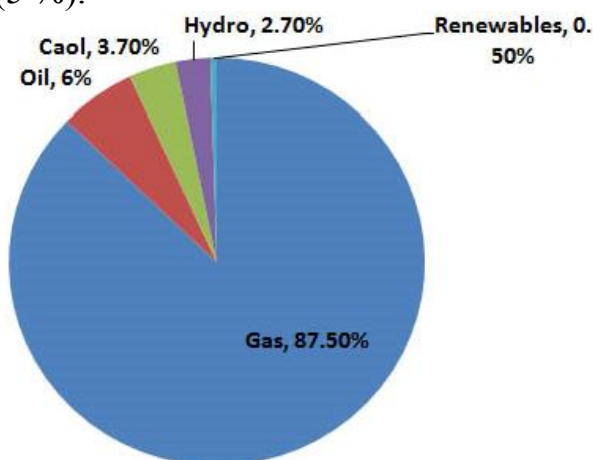


Fig 1. Energy mix diagram in Bangladesh

Renewable generate electricity amounting about 0,5 % of the total power generation. Now it is evident that the country's reserve of gas is fast depleting and if there was no new discovery of gas field, the present reserve is not sufficient to meet our upcoming demand.



Fig 2. Over view map of selected NPP site in Bangladesh
 Location: Ishwardi, Pabna Eastern bank of Padma River; 160 km north-west from Dhaka; Construction area 260 acres and total site area is about 1060 acres

The Perspective Plan and ‘Power System Master Plan 2010’ outlined the construction of 2000 MW(e) Nuclear Capacity by 2021 and 4000 MW(e) by 2030 (Table 1).

Table 1

The perspective Energy plan outlined construction of NPP in Bangladesh

Sl. No.	Description	Capacity (MW)	%
1	Domestic Coal	11,250	51
2	Imported Coal	8,400	
3	Domestic Gas/LNG	8,850	23
4	Regional Grid	3,500	9
5	Nuclear Energy	4,000	10
6	Others (Oil, Hydro and renewable)	2,700	7
Total		38,700	

Information on earthquakes in and around Bangladesh is available for the last 250 years. The historical earthquake in and around Bangladesh. It is seen that historically Bangladesh has been affected by five earthquake of large magnitude during the 61 year period from 1869 to 1930 (Table 2).

Table 2

Previous information on Earthquake magnitude during the year (1664-1930)

Date	Name of earthquake	Magnitude (Richter)	Approximate Epicentral Distance from site(km)
1664	Bangla Earthquake	7,8	92
1869	Cachar Earthquake	7,5	290
1885	Bengal Earthquake	7,0	90
1897	Grate Indian Earthquake	8,7	242
1918	Srimangal Earthquake	7,6	270
1930	Dhubri Earthquake	7,1	237

The site proposed for the first nuclear power plant of Bangladesh lies on the eastern bank of the river Ganges, in the west-central zone of the country. It is situated in the village Rooppur (selected site), The frequency of earthquakes in the near-field region of the site is relatively low. Although most of the faults are geologically old and inactive in this part of Bangladesh, and seismically active faults of recent age are rare, the possibility of future earthquakes cannot be ruled out. The magnitude of major earthquakes in and around Bangladesh (Fig. 3.).

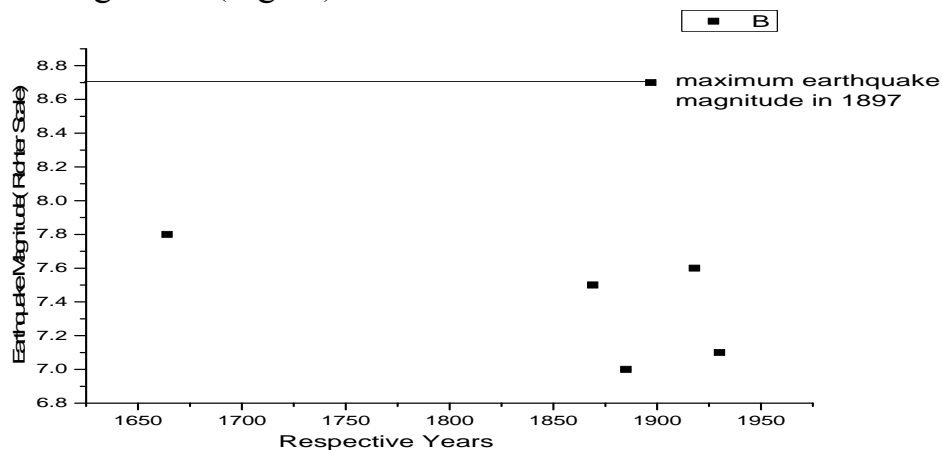


Fig. 3. Graph of Earthquake magnitude in respective years

Peak Ground Acceleration (PGA). In our present study, the following Duggan's Equation (Benio Gutenberg and Charles Richter) has been used to determine the Earthquake Magnitudes against the PGA values (Fig. 4). The Duggan's Equation of motion is as follows:

$$Y = 227.3 \cdot 10^{0.308M} (d+30)^{-1.201} \quad (1)$$

Where, Y=PGA (in cm/sec^2); d=Epicentral distance (in km);
M=Earthquake magnitude (in Richter scale).

We can calculate it by the Equation relation between earthquake energy and earthquake magnitude, and earthquake energy & distance.

$$\text{Log}_{10} E = 11.4 + 1.5M \quad (2)$$

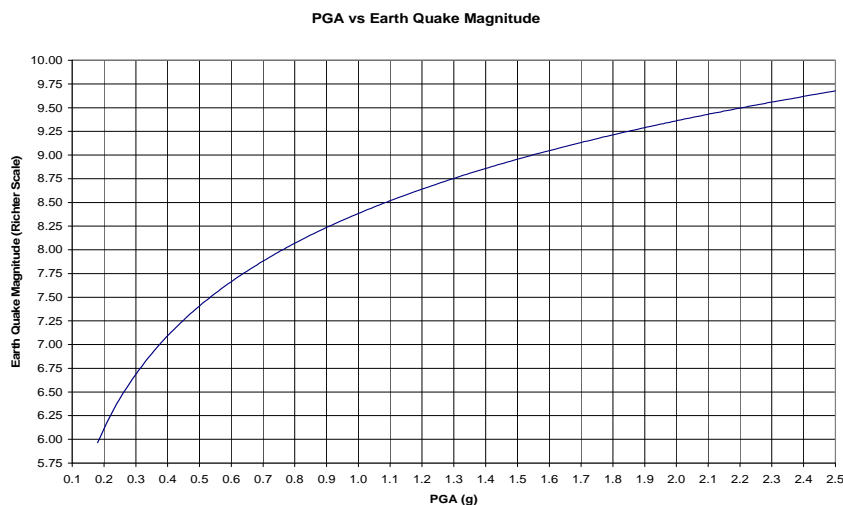


Fig. 4. Graph for Earthquake Magnitude (Richter scale) Versus PGA (g)

Table 3

The estimated data of maximum possible earthquake level at respective selected site (Rooppur) due to Madhupur Fault (Aerial distance from selected site is 116 km)

Madhupur Fault (M)	Selected Site (M)
9	7,6
8,5	7,1
8	6,6
7,5	6,1
7	5,6

The estimated data of the peak ground acceleration describes the suitability of the nuclear project. The design basis parameters are determined which help us in determining a suitable nuclear power technology appropriate for Bangladesh.

References

1. Petrobangla and the indigenous natural gas and coal resources of Bangladesh, Prof Dr. Md. Hossain Monsur // Financial Express. 2010. Vol. 18.
2. National security Bangladesh 2009, Edited by-Golam Mohammad. Dhaka : The university press Ltd, First published 2011.
3. Present Status of Rooppur Nuclear Power Plant : presentation / Project- Engineer Mahmud Hossain/ P. 3-10.

УДК 621.316.1.05

Четошников С. А.
Южно-Уральский государственный университет
tchetser@gmail.com

ИНТЕГРАЦИЯ ВОЗОБНОВЛЯЕМЫХ ИСТОЧНИКОВ ЭНЕРГИИ В ЛОКАЛЬНЫЕ ЭЛЕКТРИЧЕСКИЕ СЕТИ

Аннотация. Интеграция возобновляемых источников энергии (ВИЭ) в энергосистему России один из шагов к построению новой эффективной системы распределения энергии. Существующая схема распределения энергии не позволяет в полной мере использовать установки возобновляемой энергетики, из-за непостоянства их выработки и, зачастую, низкого качества электрической энергии, производимой ими. Использование ВИЭ, таких как небольшие ВЭУ сопряжено с рядом трудностей, которые препятствуют развитию возобновляемой энергетики в целом.

Одной из основных проблем интеграции ВИЭ является высокая цена оборудования, чтобы легко отказаться от централизованного электроснабжения. Расчеты показывают, что экономически целесообразно применение ВИЭ лишь в случае невозможности подключения к местной электрической сети [1].