POTENTIALS FOR ADVANCED NUCLEAR TECHNIQUE (REACTOR) DEMONSTRATION IN EASTERN PART OF INDONESIA

A.N. LASMAN
National Atomic Energy Agency , BATAN

KUSNANTO
Gadjah Mada University

B. MASDUKI
PPNY-BATAN

A.S. DASUKI
BPP Teknologi
Indonesia

Abstract

Because the differentiation of the ground water, the mining resources, the climate, the people density and the distance between one and another island so the national industry development becomes unique and complex. The main requirement for the national industry development is the supply of adequate energy, especially for developing of eastern part of Indonesia. The advanced nuclear reactor should be an energy source which can be universally used for the electric power and non electric application. It means, that using of this technology could the development of eastern part of Indonesia be done.

INTRODUCTION

There are more than 13,000 islands in Indonesia and only 5 islands, i.e. Kalimantan, Sumatera, Irian Jaya, Sulawesi and Jawa, are categorized as the big islands. The distance between west and east is about 1/8th of equator length. The total area of Indonesia is about 7 million sq.km., which is more than 70% sea. Because the differentiation of the ground water, the mining resources, the climate, the people density and the distance between one and another island so the national industry development becomes unique and complex.

The energy in industry, which is the motor of the industry development centers, has several effects, i.e.: to propagate and develop the economic spread, to fulfill the local and nation vital necessity and to increase the local and national capabilities in field of software and hardware. Because about 65% of the energy production in the end of year 1993 was produced by oil and because the oil reserves are finite so the energy diversification policy are needed and done by the government to reduce the domestic oil consumption and promote the other energy sources, i.e. hydro, coal, geothermal, solar, wind, sea and biomass inclusive nuclear energy.

THE POTENTIALS OF EASTERN PART OF INDONESIA

Indonesian has divided into 3 times zone, i.e. the western, middle and eastern time zone. This zone dividing is similar with the western, middle and eastern part of Indonesia. The difference between one and another adjacent time zone is one hour.

The island conditions are not the same. Some islands have coal resources and or oil, geothermal, gas etc, but the other islands do not have any energy resources. Some islands have enough ground water resources, but the others have a lot of sea water intrusion. Other condition is the heterogeneous density of the people in each islands. For example the people density in Irian Jaya is about 3 person per sq.km, in Maluku is between 3 - 15 person per sq.km. In general it is difficult to develop for an island, which doesn't have enough energy resources, but rich with costly natural resources.

The natural resources

It is divided into 2 kinds of resources, i.e. the mineral and agriculture resources.
In Seram islands there is an oil resources. Another places are in Tenggara, Sorong, Babo, Kamano and Biak. Coal resources is in Cenderawasih Peninsula. Copper and iron sand are in Irian Jaya. Nickel, which is used for stainlessteel fabrication, is in Gag island. Asbest resources are in Seram and Halmahera islands.
Seram islands is well-knowned with 'sugar trees' and Maluku islands is famoused with a lot of kind of fishes.

Base Indutrial zones in Indonesia

There are 29 base industrial zones in Indonesia (see Fig. 1). Seven base industrial zones are located in Sumatera, 12 in Jawa, 5 in Kalimantan, 3 in Sulawesi, 1 in Kupang and another one base industrial zone is in Seram. It means that there are 2 base industrial zones there.

ADVANCED NUCLEAR TECHNIQUE (REACTOR)

The advanced nuclear technique (reactor) should be an energy source which can be universally used for electric and non electric application. It should be operated in long cycle time and has a better passive safety system. The current state of technology, i.e. in the application of High Temperature Reactor (HTR), is still being developed. The long term objective of this advanced reactor development is to use this reactor type for extracting nuclear heat at temperatures up to 950°C. Chemical industry such as synthesis gas factory, natural gas subsitution and hydrogen production could be served by using HTR with temperature of more than 800°C. For long term period it will be understood that synthesis gas, which is a mixture between H_2 and CO, can be used as reduction gas for steel industries, and H_2 gas can be used

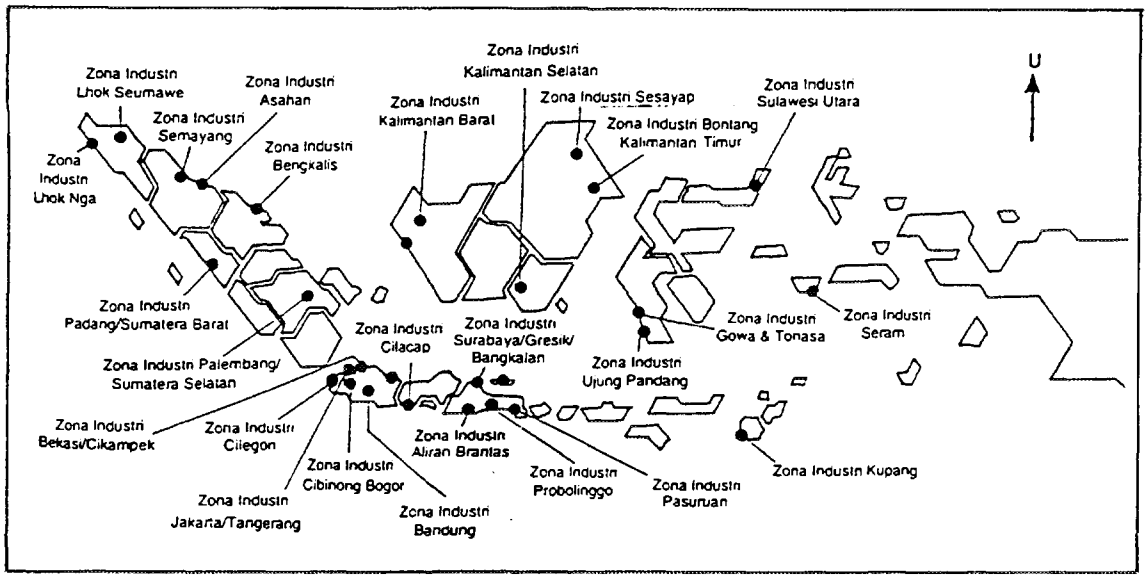

Fig. 1. Base industrial zones in Indonesia

by petrochemical industry, for example to change the heavy oil to become short chain of hydrocarbon. In the field of oil industry the HTR is used to produce steam for tertiary oil recovery. Table 1 shows the heat application of some industries.

TABLE 1. PROCESS HEAT APPLICATION

Temperature level	Application
1. Low temperature 80° - 250°C	Water heater (household), boiling, evaporation, distillation, organic and petrochemistry, hot forming of plastic, food chemistry, etc.
2. Medium temperature 250° - 550°C	Distillation and purification of petrochemical, catalytic methane reforming, hydrogenating petrochemistry, reforming processes of organic chemistry, steam power process, etc.
3. High temperature 550° - 950°C	thermal reforming of petrochemistry, warm forming of metal, metal annealing processes, coal gasification, steam gasification, etc.

There are 2 base industrial zones in eastern part of Indonesia, i.e. in Kupang and Seram. Because Seram is in the middle of eastern part of Indonesia and also because some natural resources are there, so the demonstration plant of advanced nuclear reactor for eastern part of Indonesia has some advantages if be build here. Therefore this energy supply could give some positive effects, i.e. to propagate and develop the economic spread, to fulfill the local and nation vital necessity and to increase the local and national capabilities in field of software and hardware.

CONCLUSION

One of the national policy is the developing of eastern part of Indonesia. Two places are chosed here as the base industrial zone, i.e. Kupang and Seram. Because Seram has some natural resources and the location of Seram is in the middle of eastern part of Indonesia, so the building of advanced nuclear reactor demonstration in this place has some advantages, i.e. to use it for electric generation and heat application. It means that using of this advanced nuclear reactor demonstration could accelerate the local and national key industries in eastern part of Indonesia.

REFERENCES

[1] P. Ginting, et al, "Geografi", Penerbit Erlangga, 1995.

[2] Patmosukismo, Suyitno, "Perkembangan kegiatan minyak dan gas bumi dalam pemenuhan kebutuhan energi nasional serta menunjang perekonomian Indonesia", Lokakarya energi 1994, BPP Teknologi, Jakarta 25-27 October 1004.

[3] Djojonegoro, Wardiman,"Peran energi nuklir dalam pembangunan industri energi Indonesia", Seminar PII-BATAN, Serpong July 15, 1992

[4] Mangunwidjaja, Ambyo, "The Development of Indonesian Coal Resources Issues and Challenges", Workshop for Effective Utilization of Coal in Indonesia on November 22-23, 1993, Jakarta.

[5] Busron Masduki et.al,"Survey on alternative energy for industrial processes in Indonesia", 2nd seminar on HTR technology and application, Jakarta, Januari 1995