

SMALL MODULAR REACTOR TECHNOLOGY TO SRI LANKA AS AN ALTERNATIVE FOR MULTIPURPOSE GENERATION REQUIREMENTS

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Abstract

Historically, Sri Lankan electric power generation was dominated by hydroelectricity. Due to the increasing demand and of the limitation in hydroelectric generation especially in drought seasons, the use non-economical emergency power sources such as petroleum oil was initiated. To minimize this monetary loss, much economical thermal generation technologies were introduced to the generation system as well. At present the power generation in the island consists of thermal generation (coal and oil), hydro and other renewable energy (ORE) sources (solar and wind). Although the local installed generation capacity is much higher than the recorded maximum peak demand, several intermittent power shortages which affects the reliability and the quality of the electricity were observed. And also, future demand forecasts show significant growth of base demand due to the large-scale development projects in next 10 to 15 years with variations between day and night peak demands. Under this situation, Ceylon Electricity Board (CEB) presented few generation expansion scenarios under the national energy policy and Liquid Natural Gas (LNG) and coal was the least cost scenario with high ORE integration as a major objective. The energy mix with nuclear is one of the expansion scenarios considering two 600 MW large nuclear power plants (NPP) to the system. However, the conventional challenges regarding to the NPPs make this case unrealistic for local context. Small modular reactor technology (SMR) is one of the advanced nuclear power generation technique focused to mitigate the negative impacts of large NPPs. The study intended to assess the compatibility of SMR under Financial, Technical and Socioenvironmental aspects according to the considerations in local context. The capital investment cost estimation shows that SMRs are highly viable than the NPPs. And also, the significant features of SMR such as modularity, scalability, flexibility, high safety feature and

contribution to development in other sectors makes it suit the local context. Specially, the flexible operation with high ORE integrated system makes SMRs more compatible for local energy policies. In this study, a decision scoring method based on broadly defined parameters were used to assess the SMRs in a rational manner by comparing with other thermal candidates. The results show that SMRs have high potential than all other thermal candidates to local context being second to the LNG.

Keywords: Decision score analysis, Demand forecasting, Generation expansion, Nuclear power generation, Small modular reactor technology