UNIVERSITI TEKNOLOGI MARA

UNIT COMMITMENT IN POWER SYSTEM USING MULTI-AGENT EVOLUTIONARY PROGRAMMING INCORPORATING PRIORITY LISTING OPTIMISATION TECHNIQUE

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of the requirements for the degree of
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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledge as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

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ABSTRACT

Escalating cost of electrical energy generation becomes one of the major issues faced by almost all electrical power producers around the globe. High price of fuel, generating unit unavailability, fix loaded requirement, the must run generators, maximum or minimum power capacity or even generating units derated capacity are factors that influenced this cost increase. Most of generating units are restricted to its scheduled interchange with sufficient operating reserve and regulating margin in order to prepare the power system operation for emergency response. Furthermore, the time variance of the demand for electricity has increased the complexity in ensuring the request is satisfied while the costs of generation is minimised. As demands for electricity grows from time to time, power systems become larger and more complex, which, lead to the issues of high operation cost and resulting long computational time for the execution process. In power system operation and planning study, the main platform in discussing this issue is referred as unit commitment (UC) problem. This research presents an approach to solve the UC problem using a newly developed Multi-agent Evolutionary Programming incorporating Priority Listing optimisation technique (MAEP-PL). The objective of this study is to search for generation scheduling such that the total operating cost can be minimised when subjected to a variety of constraints, while at the same time reducing its computational time. The proposed technique assimilates the concepts of Priority Listing (PL), multi-agent system (MAS) and Evolutionary Programming (EP) as its basis. In the proposed technique, deterministic PL technique was first applied to produce a population of initial solutions. The search process then being refined using heuristic EP-based algorithm with multi-agent approach to produce the final solution. The developed technique was tested on the 10 generating units test system then up to 20 generating units in a 24-hours scheduling period and the results was compared with the basic EP, Evolutionary Programming with Priority Listing (EP-PL) and Multi-agent Evolutionary Programming (MAEP) optimisation techniques. From the result obtained and the comparative study conducted, it is proved that the proposed MAEP-PL optimisation technique has able to solve the unit commitment problem where, the total daily generation cost is effectively minimised and the computation time is reduced as compared to other techniques.

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CHAPTER THREE: METHODOLOGY