INTELLIGENT LOAD SHEDDING MECHANISM FOR CEB NETWORK

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DECLARATION OF THE CANDIDATE AND SUPERVISORS

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ABSTRACT

Load Shedding plays a major role as the guard which protects the power system from a disturbance-induced collapse. In Sri Lanka, Ceylon Electricity Board being the major power network authorizer practice ‘under-frequency load shedding’ with the support of under-frequency load shedding relays.

There are some drawbacks of this under frequency load shedding scheme which promotes power system authorizers to shift into a computerized power management system to form an ‘automated load shedding scheme’.

An intelligent load shedding system can provide faster and optimal load relief by utilizing actual operating conditions and knowledge of past system disturbances [1]

As the first step in this study, a research survey was done about present load shedding system practiced in Ceylon Electricity Board. Past failure analysis was done to identify major drawbacks of the system.

During literature survey characteristics of an intelligent load shedding system were observed and the way of forming an intelligent load shedding system in a power network was studied.

Through selection of southern part of CEB network including seven grid substations, two major hydro power plants, two thermal power plants and three mini hydro power plants, model was designed using MATLAB software.

Initially a data bank was formed including load data, generation data for the selected network. Load data at each grid substation for a week day, Saturday and for Sunday were formed based on the load equations derived depending on the time of the day (off-peak, day-peak, night-peak). Generation data was adjusted according to the total load requirement. Feeders that can be shed were selected considering the category of load

connected at each feeder and categorization by System Control center as high priority feeders and low priority feeders.

Coding was built up in MATLAB software after importing excel sheets consisting all the data collected and modeled to create a ‘Graphical User Interface’(GUI). Further code was extended for the load shedding process which activates once a power imbalance occurs between generation and demand. Simulation was done for tripping of major hydro power plants which contribute to load shedding process.

Further comparisons were done between existing load shedding mechanism which is under frequency load shedding(UFLS)and Intelligent Load Shedding (ILS) mechanism in Power System Simulator for Engineering(PSS/E) software which is the software used by System Control Center branch in transmission division for analyzing and simulating power system performance.

It is concluded that reasonable improvements can be achieved through application of intelligent load shedding mechanism to CEB network which contributes to quality of uninterrupted supply to consumers.

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LIST OF ABBREVIATIONS

Abbreviation	Description
CEB	Ceylon Electricity Board
UFLS	Under Frequency Load Shedding
ILS	Intelligent Load Shedding
PSS/E	Power System Simulator for Engineering
GUI	Graphical User Interface
GSS	Grid Sub Station
PS	Power Station
GIS	Gas Insulated Substation
DFR	Digital Fault Recorder
KCCP	Kelanitissa Combined Cycle Power plant
SCADA	Supervisory Control and Data Acquisition
PLC	Programmable Logic Controller
MH	Mini Hydro
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
STM-1	Synchronous Transport Module level-1
SDH	Synchronous Digital Hierarchy management
ITU-T	International Telecommunication Union- Telecommunication Standardization Sector

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