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Decision Making on Smart Energy Grid Development for Availability and Security of Supply Achievement Using Reliability Merits

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Abstract : The development of the smart grids concept is built around two separate definitions, namely: The European one oriented towards sustainable development and the American one oriented towards reliability and security of supply. In this paper, we have investigated reliability merits enabling decision-makers to provide a high quality of service. It is based on system behavior using interruptions and failures modeling and forecasting from one hand and on the contribution of information and communication technologies (ICT) to mitigate catastrophic ones such as blackouts from the other hand. It was found that this concept has been adopted by developing and emerging countries in short and medium terms followed by sustainability concept at long term planning. This work has highlighted the reliability merits such as: Benefits, opportunities, costs and risks considered as consistent units of measuring power customer satisfaction. From the decision making point of view, we have used the analytic hierarchy process (AHP) to achieve customer satisfaction, based on the reliability merits and the contribution of such energy resources. Certainly nowadays, fossil and nuclear ones are dominating energy production but great advances are already made to jump into cleaner ones. It was demonstrated that theses resources are not only environmentally but also economically and socially sustainable. The paper is organized as follows: Section one is devoted to the introduction, where an implicit review of smart grids development is given for the two main concepts (for USA and Europeans countries). The AHP method and the BOCR developments of reliability merits against power customer satisfaction are developed in section two. The benefits where expressed by the high level of availability, maintenance actions applicability and power quality. Opportunities were highlighted by the implementation of ICT in data transfer and processing, the mastering of peak demand control, the decentralization of the production and the power system management in default conditions. Costs were evaluated using cost-benefit analysis, including the investment expenditures in network security, becoming a target to hackers and terrorists, and the profits of operating as decentralized systems, with a reduced energy not supplied, thanks to the availability of storage units issued from renewable resources and to the current power lines (CPL) enabling the power dispatcher to manage optimally the load shedding. For risks, we have razed the adhesion of citizens to contribute financially to the system and to the utility restructuring. What is the degree of their agreement compared to the guarantees proposed by the managers about the information integrity? From technical point of view, have they sufficient information and knowledge to meet a smart home and a smart system? In section three, an application of AHP method is made to achieve power customer satisfaction based on the main energy resources as alternatives, using knowledge issued from a country that has a great advance in energy mutation. Results and discussions are given in section four. It was given us to conclude that the option to a given resource depends on the attitude of the decision maker (prudent, optimistic or pessimistic), and that status quo is neither sustainable nor satisfactory.

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