SMART GRID: A MANAGERIAL PERSPECTIVE

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Abstract

In POWER GRIDS many issues are involved, namely, storage, generation, quality (fluctuating frequency, fluctuation in power voltage), distribution, power consumption and deciding the rates at which customer needs to be charged. Complexity of power grids is very high, namely storage, generation and distribution; and in it role of technocrats is very high. Aging assets and lack of resources to repairs and maintenance is a very big issue. In this paper, we focus primarily on revenue management by the use of SMART GRIDS, and also suggest a plan for SMART GRID implementation. We also give few propositions for addressing issues of interoperability and security.

Keywords
Autonomic Power System (APS), Smart Grid

1. Introduction and Literature Review

In [1] the authors raise the issue of self-correcting or Autonomic Power Systems. In [2] authors have claimed that with APS, we will be able to improve significantly the efficiency of power generation and usage. In [3],[4] authors raise the issue of interoperability when new power using nodes are added and deleted (especially during power failure). When there is power failure, APS must have the capability to refigure quickly. In [5] authors reported a study, which noted that power users would adopt to APS if they see some benefit for them.

In the section given below we give few interesting propositions.

2. Developing Few Propositions

It has been proposed in literature that multi agent system (storage agent, generation agent, distribution agent, power consumption and an integrator agent) be used for managing power grid. It has been argued (see references below) that putting smart meter (that communicates with computer system for managing power grids by supplying data on quality and quantity of power being used (over internet)) in every American home is economically not feasible due to cost considerations. It appears to be reasonable to assume that large power is consumed by a smaller number of power users. Also for higher quality of power, the users must be asked to contribute to build appropriate infrastructure. This high end segment of the power users will be profitable, and the surplus be used to prepare infrastructure for the lower end segment. Hence we have the proposition given below.

Proposition 1: Smart meters to be put up first only in the affluent class (Users consuming large power). And complete details of power factor be communicated to centrally located

computer systems. And on a complete range of power factor, the large power users to be charged (instead of only two rates; one rate for house hold sector and other for commercial users). The large users should contribute capital for building necessary power infrastructure.

Complexity of power networks is very high and also cost of having smart meter to be installed is prohibitive. Hence we have the following. Also changes in one section of the country affects the whole power network, we have the following proposition.

Proposition 2: Smart Grid should be implemented in an 'incremental' manner and NOT in a big-bang fashion.

In the high end segment of the power users, the complexity of APS will be much higher, and hence we propose the following.

Proposition 3: For achieving interoperability more efforts will be required in high end power users.

The high end power user's information will be more sensitive, and hence we propose the following,

Proposition 4: Security will be a much bigger issue in the case of high end power users, and hence their information will be kept on a private and dedicated cloud.

3. Conclusions:

It may be noted that current understanding is that the implementation of Smart Meters appears to be economically infeasible, but in the long run when system comes to substantial size, the information made available (that is like knowing the state of heart and pulse of the economy), is useful to policy makers and members of industry (just like credit card information is used by marketers for developing strategy) and it will generate huge revenue. This revenue stream may also be considered while deciding to go for SMART GRIDS; and it may change the balance in favor of SMART GRIDS (from economic perspective).

4. References

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Biography

Dr. RRK Sharma received his B.E. degree in mechanical engineering from Visvesvaraiyya Regional College of Engineering, Nagpur, India. He has received his FPM (Fellow Program in Management) degree (equivalent to Ph.D.) from IIM, Ahmedabad, India. He has Industrial Experience of 33 months.
He has joined Department of Industrial and Management Engineering (IME) at IIT Kanpur, as a Lecturer in 1989 and currently he is a Professor in the same. He is also been awarded from 'Professor, HAG Scale' (01 Aug 2012), and 'Sanjay Mittal Chair Professor', (15 Sept 2015- 14 Sept 2018) in the IME Department, at IIT Kanpur. He has served as Head, Department of IME at IIT Kanpur (2005-07). He has won several awards at national and international level.
He has taught more than twenty subjects by now at under-graduate and post-graduate level. More than 152 publication, he is having, incorporating (Book Chapters; International Conference and Journal research Articles) in his research area. He too has published books (MRP System and on Management Control System of organizations). Apart from these publications, he has guided 129 special studies projects for management students. His major interest areas are production and operation research management.

Kamini Singh is currently pursuing her Ph.D. from Department of Industrial and Management Engineering at IIT Kanpur, India. Her current research interest is working on algorithm to manage the customer relationship in smart grid and power engineering. She has received her B.tech degree in mechanical engineering from Kamla Nehru Institute of Technology, Uttar-Pradesh, India in 2012 and M.tech degree in manufacturing system and engineering from Sant Longowal Institute of Engineering and Technology, Punjab, India in 2015.