



Power Systems Engineering Research Center

PSERC Background Paper

The New Electric Power Business: An Information-Based Revolution

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The electric power industry is undergoing radical restructuring in several countries throughout the world, including our own. Participants in the new electric power business,¹ like most modern industries, have determined that information is the key to eventually producing a finely-tuned, economically efficient, and technically-reliable electric power system.

The creation of new information and the flow of that information among the various players is at the heart of restructuring. The power generation and delivery technology will be essentially the same, modulo some growth, after restructuring takes place as it was before restructuring started. Restructuring is essentially an IT revolution that is causing new institutions to form and new institutional arrangements to be crafted. It is causing new and existing players to interact in different ways than in the past, and new economies to occur. The once dominant idea of scale economies is being questioned in favor of distributed economies that can only work if timely and appropriate information is provided on a wide scale. The flow of market information is facilitating trading. The ability to sense and react to new technical data is changing the way the system is to be operated and protected. New billing and settlement systems are being built to respect the fast-paced world of finance that honors the real-time value of money and other assets.

Information is not raw data. It is the intelligence that comes from the raw data after processing it that provides value to each user (such as a person, computer system or control system). Value arises from having the processed data in time to make the next decision. In the electric power business, information ranges in timeliness from

¹ Participants are no longer vertically integrated companies who own and operate assets from generation to load. They are a diverse group that include companies that own one or more generators, transmission companies, marketers whose job is to buy and sell electricity for customers, Independent Operators whose job is to operate the system while owning no assets, and so on.

milliseconds to years. It also varies in importance and sensitivity, and therefore warrants different forms of security. It varies in type and traffic volume. It also varies in the need for reliability (that is, vulnerability to communication path failure) and flexibility (since information can become either become critical or obsolete quickly).

The industry's information system is outmoded and unprepared for the challenges of the new electric power business. A result of not addressing information issues will be problems such as dealing with emergency situations. We already know that failure of elements of the protection system, and problems in real-time monitoring and operating control systems, communications systems and operations during power system restoration contribute to our inability to react properly to a high percentage of disturbances. For example, there are a number of key bottlenecks in the communication and information systems reported in the literature² that have led to operation and restoration problems in many disturbances in the past. Reported bottlenecks include:

- Inadequate exchange of real-time operating information and real-time coordination among control centers
- Lack of automated communication systems to receive time-sensitive information from sensing and control devices
- Lags in communicating critical data and failure to use available communication systems
- Overloads on computer facilities when there are a large number of alarms and information
- Inadequate transmission system operational reliability and communication facilities
- Inadequate and improper communication or transmission circuits
- Power supply failures to communication facilities and circuits
- Lack of standard procedure and protocols used to exchange real-time operating data
- Lack of advanced communication equipment and emergency communication equipment
- Lack of real-time operational reliability analysis and coordinated operation under adverse conditions, including the effects of simultaneous transfers across transmission interfaces.

While many of the characteristics of power system information needs are individually common to other users of information, the complexity and variance in information type and needs is uncommon. Today there are severe needs in the electric power business for new tools to create relevant information. There is a need for an integrated set of

² Z. Xie, G. Manimaran, V. Vittal, A.G. Phadke, V. Centeno, "An Information Architecture for Future Power Systems and Its Reliability Analysis", personal communication.

communication protocols and protocol architectures that permit new information to flow easily and flexibly through different nodes on its way from source to user. And there is a need for tools to help make difficult decisions based on as yet unknown information requirements that can have profound effects on the economy and reliability of the power system, and the value of that system to its service providers and users.

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