

Iceman, Eli T. – Power Grid Operations

Dog Ear Publishing, 2012, [Surrounding Knowledge] Grade ★★★★★

In the public discussion about electrical utilities power generation gets most of the attention and the power grid gets very little – apart from some vague remarks about “smart grids”. This is a shame as the grid is a very complex and interesting machine in itself. In *Power Grid Operations* the author teaches the basics of how the power grid works and what power grid operators do to the non-engineer general public. The name of the author is a pun as it is a pseudonym alluding to the mnemonic ELI the ICE-man that electrical engineers use to keep track between voltage and current in an AC circuit. The book largely seems to have been a teamwork effort among several anonymous persons working in the power grid industry – with one person being the main author.

The book has two parts of significance. The first presents the power grid by discussing its parts. The first parts are physical: the power generators (nuclear power plants, wind farms etc.), the transmission line system, the substations and the distribution line system. The other parts are more intangible: legislation, governance and regulation plus the process of real-time operations. The operations are given the leading role of the second part of the book.

If I would have to guess I'd say that the authors occupations predominantly are as power grid operators. There is more effort made to explain and make sense of operations the “largest man-made machines ever built” (a title that by the way also communications networks often claim the right to) than in explaining the tangible physical parts of the network. Despite the briefness of the text of say the transmission network the authors do a good job of explaining things in plain English. The text in part one could have benefitted from a few more “how does it work”-pictures of for example the power

plant, what an electric circuit is, what electric equipment actually sits up in the telephone pole, what happens in a substation etc. As it is now the explanations are largely verbal.

The novice reader certainly gains an appreciation of the complexity of operating the power grids. The basic property of a power grid is that, since electricity cannot be stored, it in every instant has to balance supply (generation) with demand (load). The operator has to handle all the unexpected variations in both supply and demand in his area plus - since areas are interconnected - the unexpected variations in supply and demand in other areas that ripple through the transmission network. The ramp up time of various generators puts up constraints in how they can be used to fend off network imbalances. There is also a jungle of regulations putting up constraints in the handling, often for energy security reasons and to top things off the operations have to manage the bidding process of the electricity market where different suppliers compete for business on a derivatives market.

The book is a very easy read (there isn't an equation in sight) and still as someone new to the area I learnt quite a bit. A network with 100 percent renewable energy will for example be a tough task. At times the authors wander off from the story to try to make it more appealing. Most of the time this is unnecessary and distracts more than anything. Also, they throw up a kind of jokey “trigger warning” every time a subject becomes slightly technical. After a while this feels tiresome and almost a bit depreciatory – just concentrate on making the difficult subject understandable and this will be quite enough.

If you want insight into and an overview of the complex workings of the power grid this is a very good first book.

Mats Larsson, January 13, 2016