Distribution System Planning in the 21st Century©

Robert Sherick - July 26,2020

With states like Oregon[1] and Colorado[2] embarking on Distribution System Planning improvements, the first step is investigating what some of the early adopter states like California, New York, and Hawaii are doing. Both Oregon and Colorado have conducted fact-finding, background investigations, and discussions on current practices to develop the groundwork for a roadmap that will work for their individual state. This process has consisted in a variety of stakeholders getting together (virtually) to discuss, share, learn, and contest. I have written on the difficulty of this process in California[3] and expect the journey in Oregon and Colorado to have similar features while also heading down unique paths.

At a high-level, improving distribution system planning is an excellent idea. The complexities and opportunities associated with Distributed Energy Resources including advanced demand response and transportation electrification are significant. The industry needs to manage, leverage, and optimize this dynamic environment. At the same time, the industry has a history of slow and steady and many aspects of the utility business have great opportunities to catch-up to the 21st century. This is certainly a derivative of the monopoly nature of the business, the often contentious and sub-optimal relationship between the industry and regulators, and the inherent conservativeness of a critical public service. Theoretically, if the industry really needs to change to further societal goals, it will change. But the change often looks like fits and starts and a tremendous amount of talk and little movement.

Embarking on a Distribution System Planning initiative can quickly become an exercise in inflating expectations and delivering slowly, small improvements. This is the Gartner hype-cycle in practice within the industry-regulatory framework. Lots of hope, hard work, maybe something good comes of it, after a good long while. Is there a way to make this better and at what cost?

Xcel points out in their Distribution System Planning comments on hosting capacity updates that "(SCE) invested $40 million in software and process development in order to have the ability to update their maps on a monthly basis."[4] This is referencing SCE's report to the California Public Utilities Commission on their Integrated Capacity Analysis (ICA) implementation costs.[5] While this $40M does more than update hosting capacity on a monthly basis, it is less than a quarter of expenditures for overall Engineering and Planning tools SCE has spent and plans to spend to revamp their distribution planning processes. As outlined in their General Rate Case filing expenditures to date (as of 2018) and requested expenditures include the following[6]:

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[1] Oregon Public Utility Commission, "Investigation into Distribution System Planning", https://apps.puc.state.or.us/edockets/docket.asp?DocketID=21850

[2] Colorado Department of Regulatory Agencies, "Distribution System Planning", https://www.dora.state.co.us/pls/efi/EFI.Show_Docket?p_session_id=&p_docket_id=19M-0670E

[3] Energy Research Cooperative, "C is for California", https://erco-op.com/wp-content/uploads/2019/02/C-is-for-California.pdf

[4] Public Service Company of Colorado, "Reply Comments", March 13, 2020.

[5] Southern California Edison, "Report on ICA Implementation", December 28, 2018.

[6] SCE, "2021 GRC Grid Modernization, Grid Technology, and Energy Storage", August 30, 2019, p. 31.

Software Tool	Expenditures (2015-2018)	Anticipated (2019-2023)
Grid Connectivity Model	$11.4M	$34.3M
Grid Analytics Application	$17.8M	$28.7M
Long Term Planning Tool and System Modeling Tool	$31.8M	$24.4M
Grid Interconnection Processing Tool	$6.2M	$23.0M
Distribution Resources Plan External Portal	$4.5	$10M
Total	$71.8M	$120.3M

SCE is one of the largest electric utilities in the United States and in an aggressive regulatory climate for decarbonizing electricity production that includes utilizing and optimizing distributed energy resources. Therefore, this is not the expenditure level of every utility to manage the emerging complexity of distribution planning. Yet, even this level of expenditure does not guarantee all solutions and requirements as SCE has pointed out in recent filings on the External Portal upgrades: "adding transmission-level projects to the DRP External Portal ("DRPEP") as described in reform No. 9 is a significant technical undertaking and poses challenges to integrate these attributes into the existing portal."[7]

Is this level of expenditure necessary and is it effective? On the first point, SCE's requested capital program is $5B.[8] And much of this work is on the distribution grid to manage and optimize distributed energy resources, encourage transportation electrification, and mitigate fire hazards throughout SCE's 50,000 square mile service area. To do this well, software tools are absolutely necessary and there is significant need to upgrade the existing tools that have traditionally been used in distribution planning analysis. On the effectiveness front, judging from the concerns about adding a transmission overlay on the DRPEP, the expenditures seem like they would support more flexibility in the tools. One of the issues may be that these are all capitalized software efforts with a corresponding rate of return on these expenditures. This along with many utilities buildout of data centers may not be the most effective use of utility dollars. A cloud provider like AWS, Microsoft, and Google is likely to build 20-30 datacenters per year. A utility is likely to build two every decade. This begs the question whether utilities should be in the business of building datacenters. Is this their core competency? But there are built-in incentives to build datacenters running capitalized software as both these expenditures are rate-based.

One way to do this more economically is described by John Kochavatr, Portland General Electric's CIO, at a talk on cloud computing at the 2020 Distributech: "To build for max case, it is a lot of what we do in the utility industry, it just costs a lot of money. And the reality is those dollars that go into service that infrastructure is borne ultimately by our customers and we need to be sensitive to that…We want to do what is most economically efficient so that we can ensure that customer rates are as low as they can be so we can compete…It makes sense to deploy capital into longer life assets than into a 5-year short lived asset." This is not to say that cloud-computing will solve everything, but the expertise embedded in the major cloud providers is something that can be leveraged and will be an important component for utilities to significant improve distribution planning in the 21st century. Utilities focusing on building long life assets that are core to their function to deliver clean, safe, reliable, and affordable electricity service is likely to be a determining factor in who is successful in this century.

[7] SCE, "Motion for Extension of Time," July 10, 2020, p. 4.
[8] SCE, "2021 GRC Policy," August 30, 2019, p. 16.