DER Planning Framework: SMUD iDER

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Thinking about the “Future” for Electric Utilities

Unidirectional power distribution from centralized bulk generation

Self-managing, demand responsive smart buildings

Distributed, variable, sustainable resources

Secure, self-healing, self-optimizing grid

Clean transportation, leveraging clean generation and storage of energy

Energy-efficient, self-managing homes driven by consumer choice

Consumers/businesses are both users and creators of energy (bi-directional power distribution)
# Black & Veatch Approach to Distributed Resource Planning

## DRP Framework
- Benchmarking of DRP in other states
- DRP strategic objectives
- Overall DRP process design and alignment
- Gap analysis of existing DER processes
- Stakeholder workshops
- Regulatory filing support

## Distribution Planning
- Hosting capacity and future scenario analysis
- Customer DER potential & adoption forecasting
- T&D upgrade deferral opportunities with DERs

## Benefit/Cost Analysis
- Methodology for locational costs/benefits
- Analysis of locational costs/benefits

## Grid Investment
- Business case for DER technology investments (hardware and software)

## Tariffs/Contracts/Programs
- Align existing/new DER programs with DRP objectives
- (Re)Design of DER tariffs/rates

## Implementation/Demonstrations
- Design of pilot program for grid benefits
- EPC of integrated DER pilot project
- Mitigation strategies for DER grid impacts
- Procurement process & contract development for grid services from DERs
- RFP & vendor selection support for DER-related technologies
- Customer engagement plan

## Other Services
- Identify/discuss DER growth barriers
- Implementation of IT/OT platforms for DER, and AMI data analytics
- Maps of hosting capacity, locational value
- Stakeholder workshops on data sharing
One Approach to Developing a DRP framework

Black & Veatch generally uses the following tasks to support utility clients in developing the DRP Framework, leveraging our team’s unique combination of expertise:

Task 1 • DRP Processes in Other States

Task 2 • Identify Barriers to DER Deployment

Task 3 • Refine DRP Strategic Objectives for Utility

Task 4 • Advise on DRP Process Design and Alignment

• Summarize the findings from Tasks 1-4, and provide a list of next steps in the DRP process.

• Key Assumptions for completing this deliverable on schedule:
  • Utility staff are available for meetings as needed to provide input and review preliminary findings. This will be particularly important for Tasks 3-4.
  • The deliverable will focus on figures, tables, charts, and text in bullet format, and will not be a full written report with complete paragraphs.
DRP Process Design and Alignment

1. Document a proposed DRP process
2. Align DRP with existing planning and regulatory processes in the future
SMUD iDER Planning: Project Background

- SMUD engaged Black & Veatch to assist in assessing integrated Distributed Energy Resources (iDER)

- Major tasks
  a) Review of existing work and processes; tie together approaches
  b) Rooftop PV potential modeling
  c) New, detailed assessments of potential through dispersion modeling (customer DER potential and adoption forecast)
  d) Distribution system impact modeling (GRIDiant)
  e) Bulk system impact modeling (PLEXOS)
  f) Economic valuation (net value of each DER, and combined)

- First of a kind study
CONSIDER DER IMPACTS FROM MULTIPLE ANGLES

**DER Potential By Circuit**
- Summary-level information
- Total change in load (MWh) on a circuit due to DER (+ or -)
- All parcels served by circuit shaded same

**Individual Customer DER Adoption**
- Customer-level information
- Different symbol and color for each DER. Size proportional to DER output.
- Concentric circles for multi-DER

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**Change in Load (GWh/yr)**

-5  |  +5

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[SMUD](https://www.smu.org)
ALL RESIDENTIAL DER
ALL COMMERCIAL DER
DG SOLAR PV POTENTIAL APPROACH

| Technical Potential | • What is technically practical  
|                     | • LiDAR-based assessment of available rooftop space by building  
|                     | • Aerial Imagery analysis of commercial parking lot space |
| Economic Potential  | • What makes financial sense  
|                     | • Tied technical potential to SMUD customer database  
|                     | • Cloud-based computing to assess payback of solar for individual customers, under 4 scenarios |
| Achievable Potential| • What might actually happen  
|                     | • Application of Market Penetration Potential and Customer Adoption Curves  
|                     | • Adoption modeling of individual customers |
51 SUBSTATIONS (26%), COULD HAVE VOLTAGE VIOLATIONS AT SERVICE TRANSFORMERS DUE TO PV
OVER 12,000 TRANSFORMERS MAY NEED TO BE UPGRADED DUE TO EVS, 17% OF TOTAL

PERCENT OF TRANSFORMERS STRESSED DUE TO EVS
- under 5%
- 5% to 10%
- 10% to 20%
- over 20%

REPRESENTS A HIGH EV, UNOPTIMIZED CHARGING SCENARIO
The combined DER portfolio was found to decrease ramping requirements and to actually flatten SMUD’s net load profile.
Preparing for the Inevitable Arrival of DERs

- Different drivers will push different technology mixes
  - What are your goals? How do they meld with other stakeholders’ goals?
  - What are the main drivers that will help you meet your goals? Others’ goals?

- Most utilities are concerned about DERs
  - But they don’t have the tools to be flexible, nimble, and responsive
  - Slow to change planning activities to be prepared, instead of reactive

- SMUD is asking forward-looking questions to be ready for the predicted onslaught of DERs
  - “But we don’t have SMUD’s level of penetration, do we need to act now?” YES
  - Identify activities that can be done now, to be prepared (e.g., least regrets)
All Hands on Deck

1. Critical pathway: DATA
   - More detailed data needs to be gathered (e.g., net load is inadequate)
   - We are finding data for the same location can be inconsistent and not in the same format – data validation and data formatting is a heavy, and necessary lift

2. Planning and Operations Analysis: New Insights
   - Link DRP and bulk system/integrated resource planning (IRP)
   - Understand the impact on the utility system and economics
   - Don’t try to analyze all of the data: focus on key issues in problem locations

3. Identify win-win-win pathways forward
   - Key stakeholders need to be on board from the start; roadblocks could mean
   - Requires investments in analytics, modeling tools, communications systems and IT infrastructure. (DOE to fund? Utilities having trouble getting capital internally)