

I Grid

DER Valuation












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March 29, 2018

Grid Evolution

	MOBILE	VS	ELECTRIC GRID	Electric Grid Evolution
1G	 <p>Analog voice</p>		 <p>Traditional Nikola Tesla Model – Generation, Transmission, Distribution, Customer</p>	
2G	<p>Digital Voice & Simple Data</p> 		<p>Sustainability Renewable Integration, Remote Control, Automated Metering</p> 	
3G	 <p>Mobile Broadband</p>		 <p>Grid Modernization Battery Storage, Self-Healing, Electric Vehicles, Customer Technology Integration</p>	
4G	<p>Faster & Better (Rich Content)</p> 		<p>Self-Aware Grid Control all devices down to the customer Automated Systems to adjust real-time Integration of energy generation and storage systems</p> 	
5G	 <p>Full -Length HD Quality Video Connected World (wearables, smart appliances, connected cars)</p>			

Grid Evolution

POSSIBLE TRAJECTORIES FOR ELECTRICITY GRID EVOLUTION

PATH 1 INTEGRATED GRID

One path leads to grid-optimized smart solar, transactive solar-plus-battery systems, and ultimately, an integrated, optimized grid in which customer-sited DERs such as solar PV and batteries contribute value and services alongside traditional grid assets.

- Pricing & Rate Reform
- New Business Models
- New Regulatory Models

• EXPORT COMP. (NEW FT. WEST) • TOU PRICING • LOCATIONAL HOT SPOTS • ATTRIBUTE-BASED PRICING
 • NRG • E.ON • RWE • CO2'S BOOM
 • PERFORMANCE-BASED REGULATION • NYREV • CANNOT BE THAN SMART • ENERGIEWENDE



Solar PV and batteries play an important role in the future electricity grid, but decisions made today will encourage vastly different outcomes.

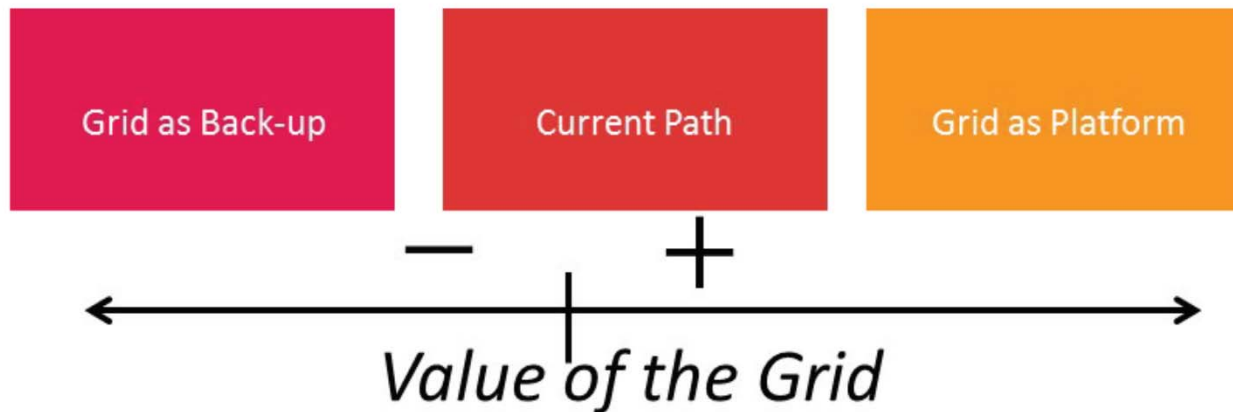


PATH 2 GRID DEFECTION

Another path favors non-exporting solar PV, behind-the-meter solar-plus-battery systems, and ultimately, actual grid defection resulting in an overbuilt system with excess sunk capital and stranded assets on both sides of the meter.

• NO EXPORT PRICING • FIXED CHARGES
 • CENTRAL GENERATION • VERTICALLY INTEGRATED UTILITIES
 • COST-OF-SERVICE REGULATION • STRANDED ASSETS

Potential End States



- Customers are largely self sufficient
- Micro-grids emerge
- Grid becomes break-fix
- Safety and Reliability are degraded and Customer/DER responsibilities

- Enhanced Safety and Reliability
- Optimized use of electric grid
- Adopting and maximizing advanced technology
 - DERMS/ADMS
 - Smart Inverter Control and Comm
- High level adoption and seamless integration of DER and EV's
- Utility is enabler

Distribution Resource Plan

What it does...what it doesn't



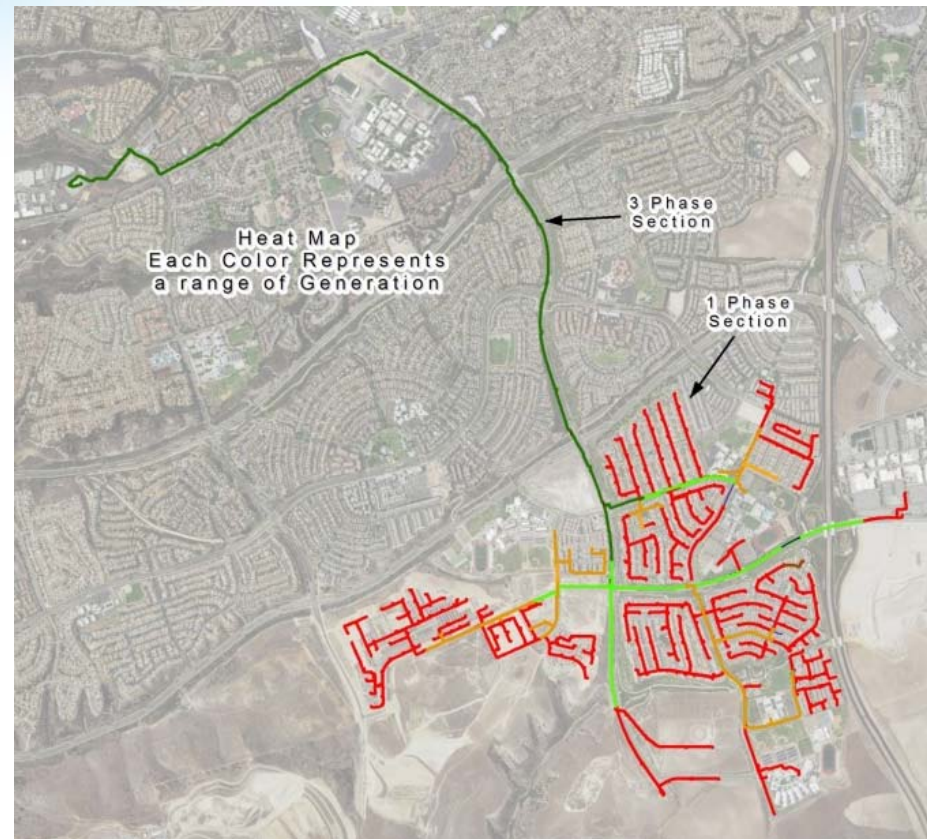
- Within Scope of DRP
 - Determine system capacity to integrate DERs
 - Determine methodology for locational values of DERs
 - Forecast growth of DERs and demonstrate projects
 - Identify issues surrounding safety, data, and tariffs that can help or hinder DER development

- Outside Scope of DRP
 - How to solicit DERs to provided identified benefits
 - Ownership of DERs; Operation of DERs
 - Mechanism to develop Rates and Incentives to attract DER where needed
 - IOU Cost Recovery
 - Addressing DER installations where no/negative benefits

<https://drpwg.org/sample-page/drp/>

Integrated Capacity Analysis, ICA, Map Updates

- IOUs to modify maps to promote consistent user experience
- Adopting a uniform heat map appearance may help usability
- Provide downloadable data
 - DER profiles
 - Load profiles
 - ICA results

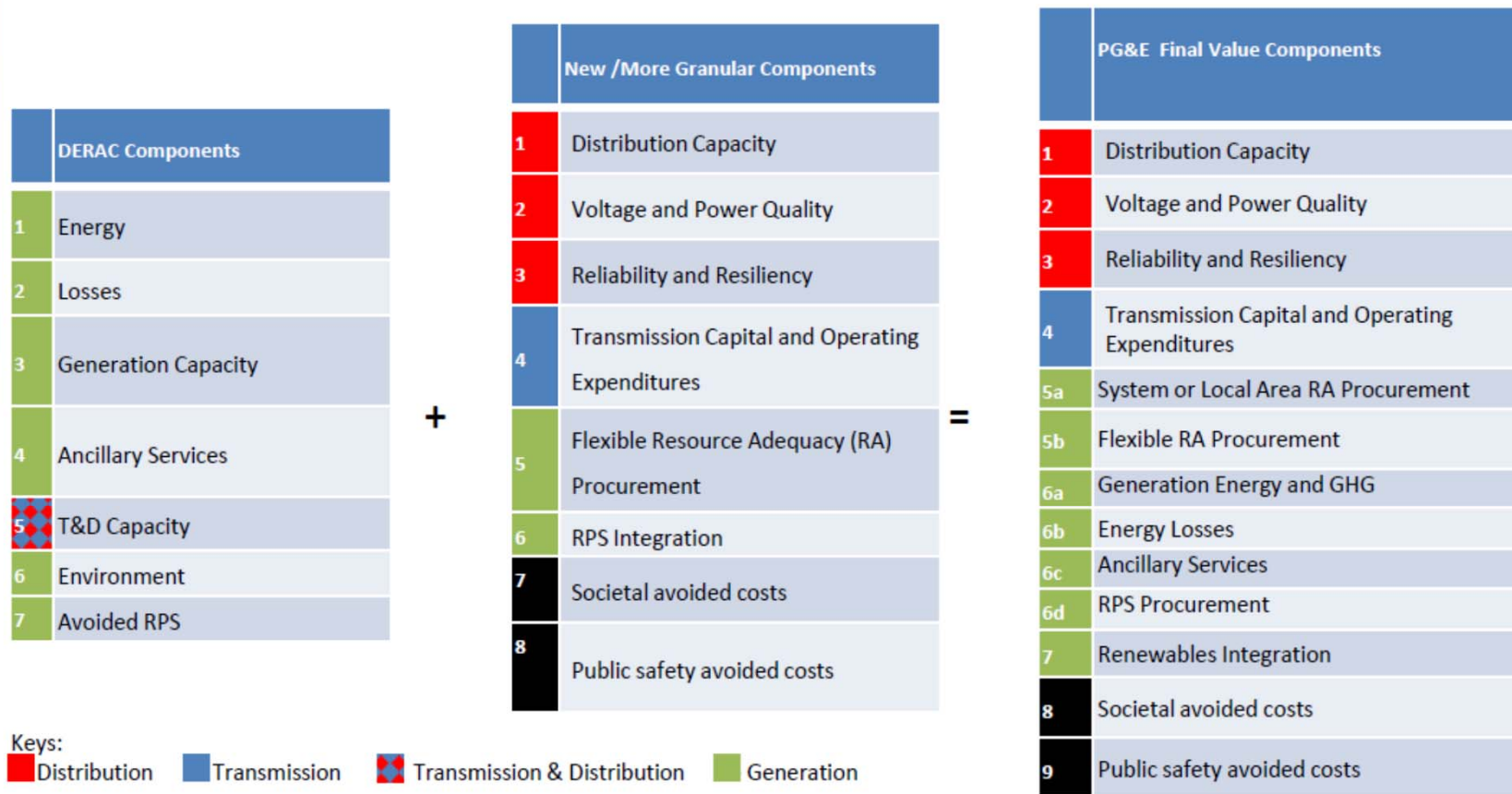


DER Value Calculations



Guidance on Locational Value Components

Start with DERAC*, add new and more granular components

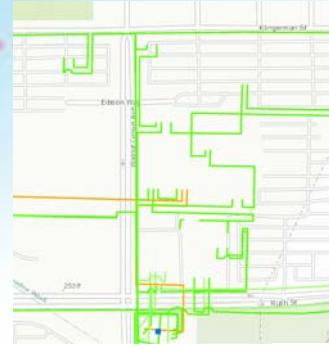


* E3's Distributed Energy Resources Avoided Cost Calculator (DERAC) provides system-wide avoided costs.

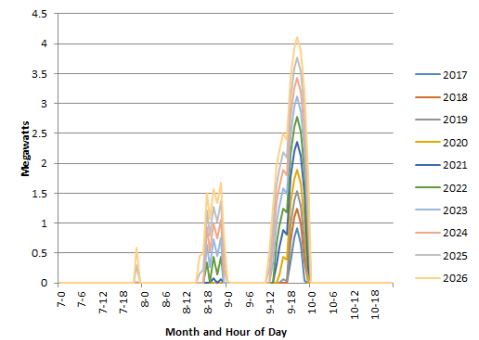
High-Level User Flow for Locational Net Benefit Analysis, LNBA, Deliverables



1. Access the LNBA mapping layer that identifies deferral opportunity locations
2. Select a section with a deferral opportunity to view project description
3. Download distribution deferral datasets for project
4. Construct a DER profile that meets the required electric characteristics, considering deferral requirements and ICA results
5. Upload DER profile in LNBA Tool to estimate system-level avoided costs



Required DER Electrical Characteristics



	Heatmap of DER shape																							
	Hour of the Year (hour starting PST)																							
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Jan	0	0	0	0	0	0	0	0.08	3.02	7.17	9.19	11.4	12	12.4	11.4	8.78	2.2	0	0	0	0	0	0	0
Feb	0	0	0	0	0	0	0	0.81	4.21	7.61	9.77	11.7	11.6	11.6	8.37	6.8	5.17	0.39	0	0	0	0	0	0
Mar	0	0	0	0	0	0	0.21	3.83	9.57	15	17.7	19.5	20.1	19.6	16.9	14	8.73	1.91	0	0	0	0	0	0
Apr	0	0	0	0	0	0.01	1.67	5.99	11.3	15.1	17.9	19.7	20.9	20.1	17.9	13.6	9.02	4.45	0.13	0	0	0	0	0
May	0	0	0	0	0	0.4	3.19	8.45	13.5	17.8	21.3	22.5	22.2	22	19.3	15.3	9.9	5.47	0.82	0	0	0	0	0
Jun	0	0	0	0	0	0.51	2.89	7.05	11.5	15.7	18.8	21	22.2	21.9	19.9	16.2	11.1	6.03	2.35	0	0	0	0	0
Jul	0	0	0	0	0	0.29	2.3	6.11	11.8	17.1	21.6	23.8	24.2	23.5	20.6	17.1	12	6.54	2.44	0	0	0	0	0
Aug	0	0	0	0	0	0.02	1.61	5.71	10.3	16.1	20.6	23.2	23.9	23.4	20.7	16.3	10.9	4.99	0.21	0	0	0	0	0
Sep	0	0	0	0	0	0	0.91	4.94	9.72	13.5	18.3	21.3	22	21	18.1	13.7	8.22	1.88	0	0	0	0	0	0
Oct	0	0	0	0	0	0.19	3.84	9.13	14	17.9	19.5	19.6	18.8	15.3	10.6	4.17	0.14	0	0	0	0	0	0	0
Nov	0	0	0	0	0	0	1.62	5.93	9.41	11.4	13.5	13.3	12.2	9.71	6.47	0.7	0	0	0	0	0	0	0	0
Dec	0	0	0	0	0	0	0.26	3.85	7	9.5	11.2	12	11.4	8.04	5.67	0.86	0	0	0	0	0	0	0	0

LNBA Tool Guide

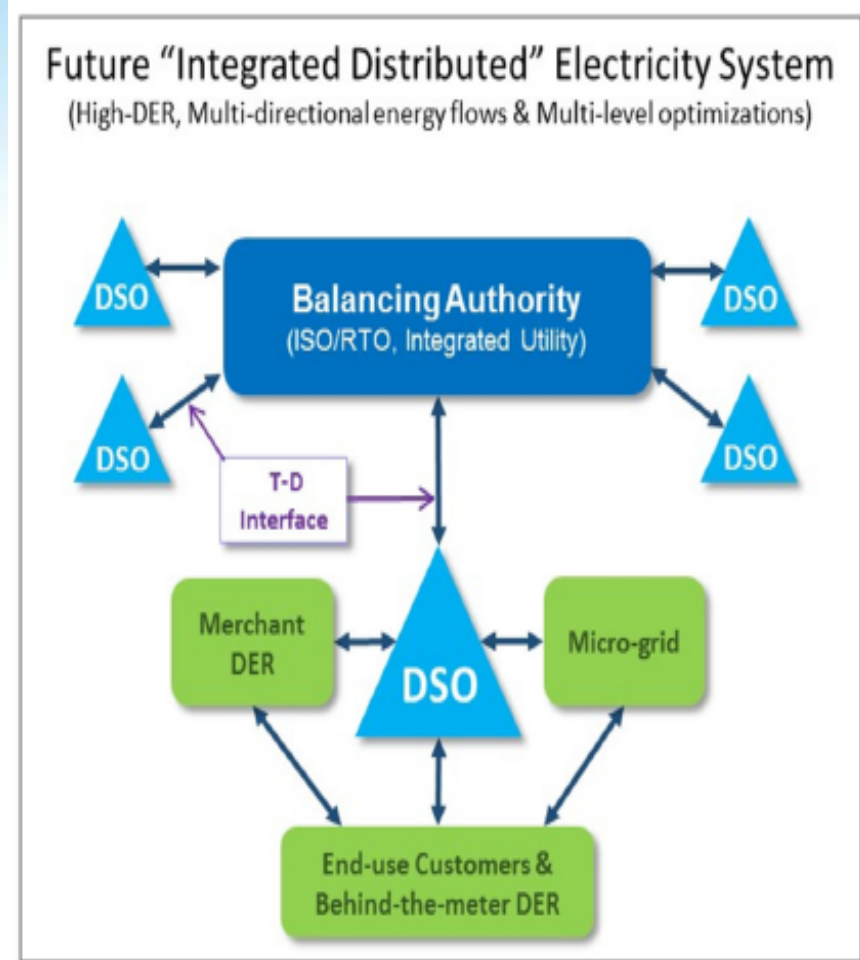


LNBA Tool User Guide
Version 2.11, December 22, 2016

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Future Distribution Model

- SDG&E is the DSO and performs the following tasks
 - Reliable Operation of the Distribution Grid
 - Long Term Planning
 - Control and Monitoring of DER
 - Solicitation of Distribution Services
 - Distribution Capacity related DER solutions
- Energy Markets Remain at CAISO
 - DER resources are aggregated by third party or DSO and participate in CAISO wholesale markets for energy related services



Questions?



Thank You

