DER-VET Task Force

ESIC Working Group 1: Grid Services and Analysis

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June 2, 2022

in



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Agenda

Software Update
Cases under 1 year
Complex Tariffs

Software Update

DER-VET Software Update

Latest Version: v1.2.1 (updated May 4th, 2022)

Known Bugs (v1.2.1):

– When setting up a Battery with a 'Known size', an error will appear in the Summary Page:

Set the max duration of the size? Is required.

But there is not an obvious way to set it on the Battery Page.

WORK-AROUND:

click to 'Have DER-VET size the capacity' (energy and/or power)

set the max duration to 'No'

click save

click back to 'Known size'

click save

- 'No Export' Constraint feature may have a bug.
 - This is under investigation now.

DER-VET Software Update

- Features being worked on:
 - Better error handling in the project.json Migration script.
 - Disallow negative DA energy prices when sizing any technology.
 - Automate the build of the application (Windows and Mac)
- We expect to release an update later in June 2022

Cases < 1 year

Best Practices for Running Cases < One Year

- Ensure that all the data correspond to the correct timestamps for accurate results
- Populate missing data with zeros (based on timestamp) to avoid inaccuracies
- Since most data have seasonal variation, avoid linear extrapolation of results. For instance, bill savings tend to be higher in the summer than winter due to higher demand charges
- While presenting results, consider adding a note that the results were generated for a truncated period of time. For example, the customer saved \$100 over three summer months with the 2 kW, 4 kWh BESS.
- Alternatively, missing data can be made up by borrowing data from a previous year (similar month) instead of running with zeros

Complex Tariffs

DER-VET Tariff Format

Infinite number of charges

- Flexibly combine demand and energy charges
 - Start time, end time, "excluding" times
 - Month of the year
 - Weekend vs weekday
- No limit on number of TOD periods
- Up to 12 seasons per year 1 for each month

Retail Tariff

Build a retail tariff definition by entering each billing period one at a time, by importing a tariff from an export file, or by selecting one from OpenEl's utility rate database.

Start Month	End Month	Start Time	End Time	Excluding Start Time	Excluding End Time	Weekday?	Value	Charge	Name	Ť
1	5	1	8			1	0.054152	Energy	Winter Offpeak	Edit 👕
1	5	9	21			1	0.062392	Energy	Winter Mid- peak	Edit 👕
1	5	22	24			1	0.054152	Energy	Winter Offpeak	Edit 👕
1	5	1	24			0	0.054152	Energy	Winter Weekend	Edit Т

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DER-VET Tariff Format

Timeseries Results

K	L	M	
Critical Load (kW)	Demand Charge Billing Periods	Energy Price (\$/kWh)	
1297.31585	['15']	0.054152	
1487.16695	['15']	0.054152	
1275.07275	['15']	0.054152	
1281.494925	['15']	0.054152	
1316.336	['15']	0.054152	
1284.1722	['15']	A 05 (152)	
1430.2525	['15']	1 Billing Per Start	N
1396.7601	['15']	2 1	
1296.2026	['15']	3 2	
1613.08465	['15']	4 3	
1587.2682	['15']	5 4	
1552.491	['15']	6 5	
1562.346	['15']	7 6	
1568 0181	['15']	8 7	
1300.0101		9 8	
		10 9	

	Billing Per	Start Mon ⁻ End Mo	ntl	Start Time	End Time	Excluding	Excluding	Weekday?	Value	Charge	Name	
	1	1	5	1	8			1	0.054152	Energy	Winter Of	fpeak
	2	1	5	9	21			1	0.062392	Energy	Winter Mi	d-peak
	3	1	5	22	24			1	0.054152	Energy	Winter Of	fpeak
	4	1	5	1	24			0	0.054152	Energy	Winter We	eekend
	5	6	9	1	8			1	0.049672	Energy	Summer C	Offpeak
	6	6	9	9	12			1	0.086152	Energy	Summer N	∕lid-peak
	7	6	9	13	18			1	0.262392	Energy	Summer P	eak
	8	6	9	19	23			1	0.086152	Energy	Summer N	∕lid-peak
)	9	6	9	24	24			1	0.049672	Energy	Summer C	Offpeak
1	10	6	9	1	24			0	0.049672	Energy	Summer V	Veekend
2	11	10 1	12	1	8			1	0.054152	Energy	Winter Of	fpeak
3	12	10 1	12	9	21			1	0.062392	Energy	Winter Pe	ak
4	13	10 1	12	22	24			1	0.054152	Energy	Winter Of	fpeak
5	14	10 1	12	1	24			0	0.054152	Energy	Winter We	eekend
5	15	1 1	12	1	24			2	7.016	Demand	Demand C	Charge
7	• •											

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DER-VET Tariff Format Limitations (abridged...)

- No tiers
 - Nonlinear optimization
- No ratcheting
 - Interrelated years of optimization
- Calculates bills starting on the 1st of the month only
 - Format limitation
- No power factor adjustments
 - Services limitation
- No minimum or non-bypassable charges
- No complex billing kW calculations

Objectives for Workarounds

- Support decision making
- Produce optimal DER operation
 - Marginal costs and benefits are represented
 - If a demand or energy charge isn't fully represented, the operation may still be correct

Complex tariff workarounds usually require some calculation outside of DER-VET

Tiered Billing in DER-VET

 Objective is to calculate savings relative to base case

- Separate calculations for base case vs. change case bills
- The tiers for the base case are known
 - 1. Calculate "effective" rate based on known baseline usage (total bill/amount used)
 - 2. Construct tariff based on "effective" rate to calculate baseline electricity costs



https://www.sce.com/residential/rates/Standard-Residential-Rate-Plan

Ebbi

Tiered Billing in DER-VET

- The tiers for the change case are not known
 - 1. Make an assumption about what tier the DER will result in for each month
 - 2. Construct a tariff based on the marginal rate in the expected tier
 - 3. Run optimization
 - 4. Evaluate assumptions made in step 1 and repeat if necessary
 - 5. Calculate change case bills
 - 6. Calculate difference between base case and change case bills
- Notes
 - OpenEl integration does not work for tiered tariffs
 - Size optimization may not produce optimal results

Ratcheting Tariffs in DER-VET

- DER operation in year 1 impact minimum billing in year 2
 - E.g. the minimum billing demand in year 2 is 75% of the maximum demand in year 1.
- Simplest solution assume the ratcheting is non-binding (e.g. the billing kW doesn't change much between years)
 - Evaluate this assumption with data if possible
 - Can make an exception for DER year 1 and calculate this in a separate case
 - Potentially results in more DER operation than is optimal
 - Will never result in higher bills than the best case

Ratcheting Tariffs in DER-VET

 Complicated solution – run 1 year at a time and update bill calculations for each year

Billing Periods Not Aligned with Months in DER-VET

- What if a facility is billed starting on some other day than the 1st of the month?
 - DER-VET exclusively calculates bills based on the period starting with the 1st of the month and ending at the end of the month.
- Option 1 accept the inaccuracy
 - Is there a meaningful long-term pattern in the demand data that would make this assumption invalid?
- Option 2 shift all the data such that the demand data is mostly aligned with months in DER-VET
 - E.g. if billing starts on the 15th of the month, move the first 14 days of data from the beginning of the data set to the end.
 - Now, DER-VET will calculate January's bill based on the data from Jan 15 through March 14 and so on.

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