

# DER-VET Task Force

## ESIC Working Group 1: Grid Services and Analysis

Miles Evans | EPRI  
Halley Nathwani | EPRI  
Giovanni Damato | EPRI

May 7, 2020



# Antitrust Guidelines

Antitrust laws apply to EPRI, its members, funders, advisors, licensees, contractors, and vendors. Violations can lead to civil and criminal liability.

## DO NOT DISCUSS...

- Pricing, production capacity, or cost information which is not publicly available;
- Sales territories, market shares, future product offerings;
- Confidential market strategies or business plans;
- Other competitively sensitive information;
- Advise or try to influence others on their business decisions (except to the extent that they are already public);
- Complaints or disparaging remarks concerning customers/suppliers/competitors.

## DO NOT AGREE...

- To discriminate against or refuse to deal with a supplier (boycott);
- To only do business on certain terms and conditions;
- To set (or fix) prices;
- To divide markets or technologies;
- To allocate customers/suppliers/territories;
- To suppress a technology;
- To the use, promotion or endorsement of particular vendors, contractors, consultants or products.

# Webcast and Recording Notification

- The webcast is being recorded along with all Q&A. Your participation provides consent to that recording.
- As a result, please make sure your phone is on mute throughout the webcast unless speaking. Do not place your phone on hold.

# DER-VET Task Force

## ESIC Working Group 1: Grid Services and Analysis

Miles Evans | EPRI  
Halley Nathwani | EPRI  
Giovanni Damato | EPRI

May 7, 2020



# Agenda

- StorageVET 2.1 (updated with DER-VET development) Release Update
- DER-VET Beta Feedback Summary
- DER-VET Beta Feature Highlight

# StorageVET 2.1 Release

# Storage VET 2.1 Release

- Will announce date when we can get confirmation
- In the next couple of weeks

# Changelog

- New Inputs:
  - nsr\_max\_ramp\_rate
  - sr\_max\_ramp\_rate
  - fr\_response\_time
  - fr\_max\_ramp\_rate
  - Response time for all technologies (used for reliability and market services)
- Added check that requires energy market when including ancillary services
- Added self.startup\_time attributes for each Technology in technology class
- Added non-controllable load
- added data growth/removal helper function; removed separate\_constraints attribute from Scenario
- added fill\_and\_drop\_extra\_data, add/removes data for analys and creates optimization levels and initializes degradation iff battery is initialized
- added calc\_cba method that calculates all financial outputs
- added version to model parameter template name



# Changelog

- Changed:
  - Changed Model\_Parameters\_Template to allow for 0 min response time / startup\_time
  - Replaced 'Original Net Load' with 'Total Load' in Results post-opt calculations
  - Changed RA to find events per year, in addition to the mode set by the user
  - Changed technology to aggregate the state of energy of each ESS in the system
  - Derate based on 'usable' energy capacity instead of rated energy capacity
  - Replaced 'Original Net Load' with 'Total Load' in Results post-opt calculations
  - Collecting total SOE in results output
  - Changed Params to read in referenced data before case building

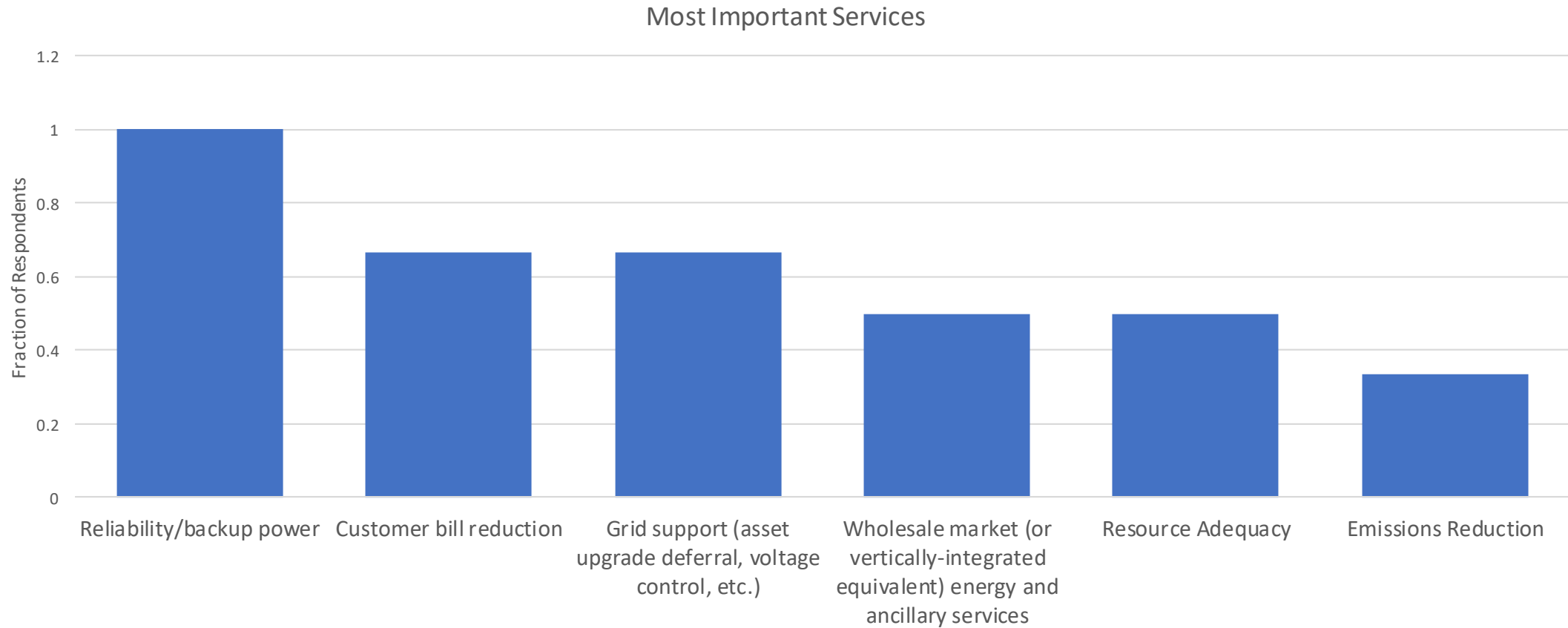
# Changelog

- Fixed

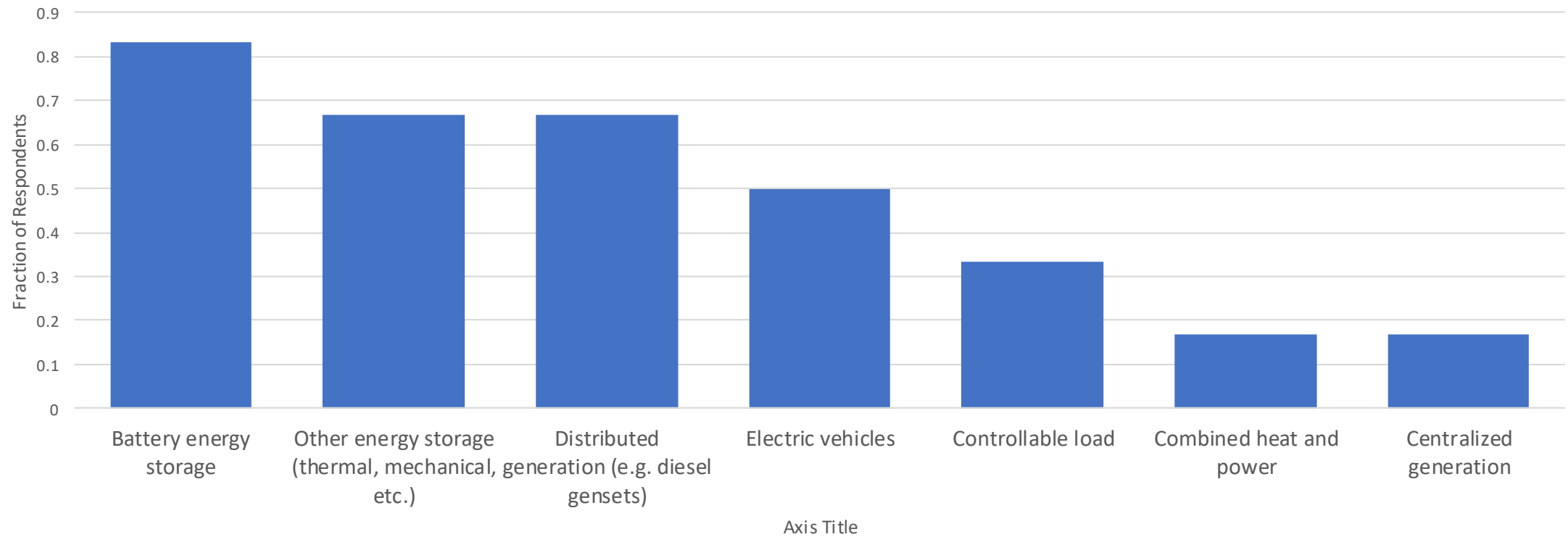
- Generalized children of DER classes to inherit the startup\_time attribute from the DER class
- Completed testing of controllable load
- Fixed RA validation check error and DR reporting error
- Fixed multi-year post optimization analysis bug

# DER-VET Beta

# Initial Feedback



### Most Important Technologies



# Issues

- Installation
  - Reasoning for “Happy Path” GUI installation
  - Difficulty of full install
- Degradation
- Time step validation and handling
- Meaningful error handling and reporting
- Tariff file construction guidance and cleaning
- Modern Windows version required

# DER-VET Beta Will Stay Up

- [www.der-vet.com](http://www.der-vet.com)
- Fill out beta tester's survey (embedded in website)

EXIT

**EPRI** | ELECTRIC POWER RESEARCH INSTITUTE

### DER-VET Beta Tester Sign Up

\* 1. Email Address (We will send you the feedback form here)

\* 2. Name

powered by SurveyMonkey



## Distributed Energy Resources Value Estimation Tool (DER-VET™)



You Are Here: Home

### DER-VET

A publicly available, open-source, optimization-based energy valuation and planning tool for distributed energy resources (DER) and larger, centralized energy resources. DER-VET was developed by expanding on the framework developed in EPRI's Storage Value Estimation Tool (StorageVET).

Made possible through funding support from the California Energy Commission.

### DER-VET Resources

- [DER-VET User Guide](#)
- [DER-VET User Feedback Form](#)

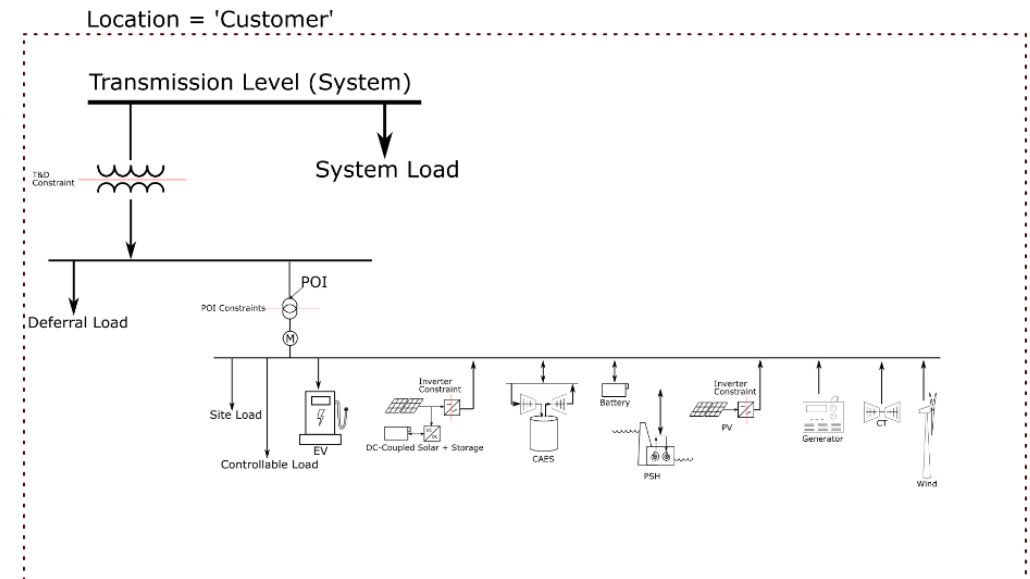
### Download DER-VET

- [DER-VET Standalone Environment](#)

(use the form below)

- [License](#)

Requirements for running DER-VET Community Edition:



# Accessing DER-VET Beta

- Please click 'Done' at the end of the survey!
- This helps us with tracking.

\* 1. Email Address (We will send you the feedback form here)

mevans@epri.com

\* 2. Name

Miles Evans

\* 3. Organization

EPRI

Next

powered by SurveyMonkey

EPRI | ELECTRIC POWER RESEARCH INSTITUTE

## DER-VET Beta Tester Sign Up

### Download DER-VET

Please click 'Done' below after downloading DER-VET for your survey to be recorded!

Download DER-VET at the link [here](#)

Prev Done

powered by SurveyMonkey



# Accessing DER-VET Beta

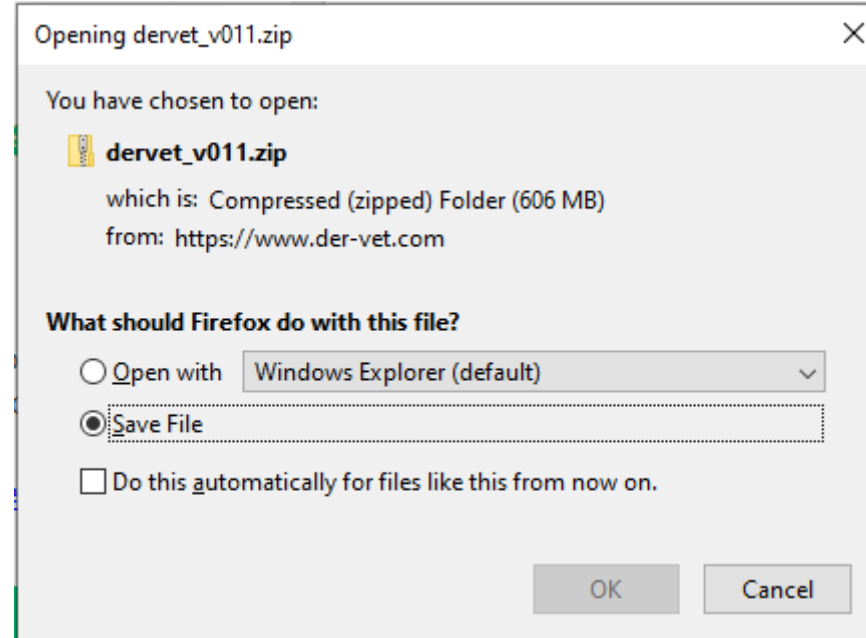
- Click the [here](#) button and save the file when prompted.
- That's it!
- DER-VET Beta lives in the downloaded file.

## DER-VET Beta Tester Sign Up

Download DER-VET

Please click 'Done' below after downloading DER-VET for your survey to be recorded!

Download DER-VET at the link [here](#)



Done

powered by SurveyMonkey

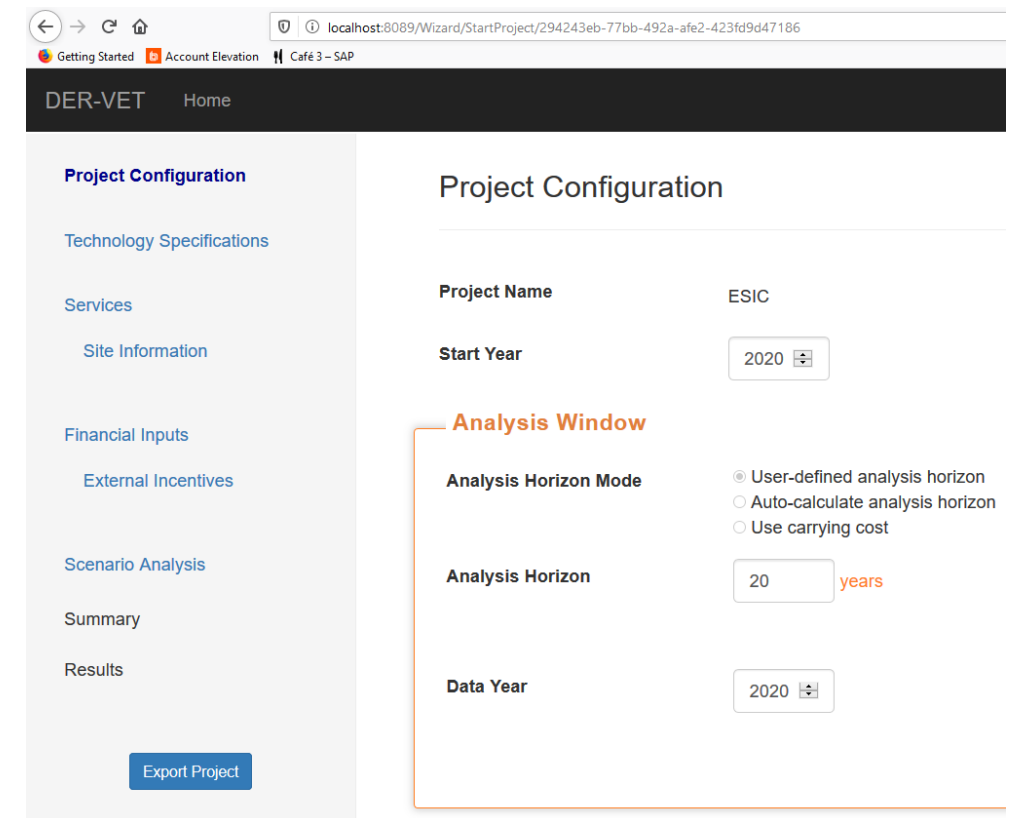
# Installing DER-VET Beta

- 2 Options

- Command Line (Just like StorageVET 2.0)
- Graphic User Interface (More involved installation, more validation)

```
Command Prompt
02/21/2020 04:27 PM 12,540 Model_Parameters_Template_305.cs
v
02/21/2020 05:47 PM 23,425 Model_Parameters_Template_305.xml
l
03/18/2020 12:10 PM 13,979 Model_Parameters_Template_DER.cs
v
03/18/2020 12:10 PM 25,322 Model_Parameters_Template_DER.xml
l
03/18/2020 12:14 PM 13,762 Oakmont_mp.csv
03/18/2020 12:16 PM 26,666 Oakmont_mp.xml
03/18/2020 12:10 PM 21,662 ParamsDER.py
02/25/2020 09:26 AM 29,897 ReOpt_Comparison.xml
03/18/2020 12:10 PM 9,154 ResultDER.py
03/18/2020 12:27 PM <DIR> Results
03/18/2020 12:10 PM 4,871 run_DERVET.py
03/18/2020 12:10 PM 5,636 ScenarioSizing.py
03/18/2020 12:10 PM 7,491 SchemaDER.xml
03/18/2020 12:10 PM <DIR> storagevet
03/18/2020 12:10 PM <DIR> TechnologiesDER
03/18/2020 12:10 PM <DIR> ValueStreamsDER
03/18/2020 12:10 PM 409 __init__.py
03/18/2020 12:14 PM <DIR> __pycache__
22 File(s) 300,488 bytes
8 Dir(s) 321,843,470,336 bytes free

C:\Users\pmev001\storagevet2v101\dervet>"C:\Users\pmev001\storagevet2v101\python.exe" "C:\Users\pmev001\storagevet2v101\dervet\run_DERVET.py" "C:\Users\pmev001\storagevet2v101\dervet\Model_Parameters_Template_DER.csv"
```



# DER-VET Beta Feedback

- “As a beta tester, you agree to provide feedback as a condition of obtaining the preproduction software”
- We will send feedback form (<https://www.surveymonkey.com/r/XV6XKZB>) to your email



DER-VET Beta Version 0.1.1  
Electric Power Research Institute (EPRI)  
3420 Hillview Ave.  
Palo Alto, CA 94304

Copyright © 2020 Electric Power Research Institute, Inc. All rights reserved.

As a user of this EPRI preproduction software, you accept and acknowledge that:

- This software is a beta version which may have problems that could potentially harm your system
- EPRI will evaluate all tester suggestions and recommendations, but does not guarantee they will be incorporated into the final production product
- As a beta tester, you agree to provide feedback as a condition of obtaining the preproduction software

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer
- Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution
- Neither the name of EPRI nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission

# DER-VET Beta Feature Highlight

# Optimization vs Evaluation Inputs

	A	B	C	L	M	N
1	Tag	Key	Optimization Value	Evaluation Value	Evaluation Active	Options/Notes
2	Scenario	monthly_data_filename	.\dervet\storagevet\Data\Monthly_Data.csv	.\dervet\storagevet\Data\Monthly_Data.csv	n	
3	Scenario	time_series_filename	.\dervet\storagevet\Data\hourly_optimization.csv	.\dervet\storagevet\Data\hourly_evaluation.csv	y	
4	Scenario	dt				

- Give the optimization different data than is used to calculate financial performance
- Include forecast error in time-series prices
- What happens if the system doesn't last as long as expected?
  - Life is a key input to size optimization
- What happens if variable costs are higher than expected?

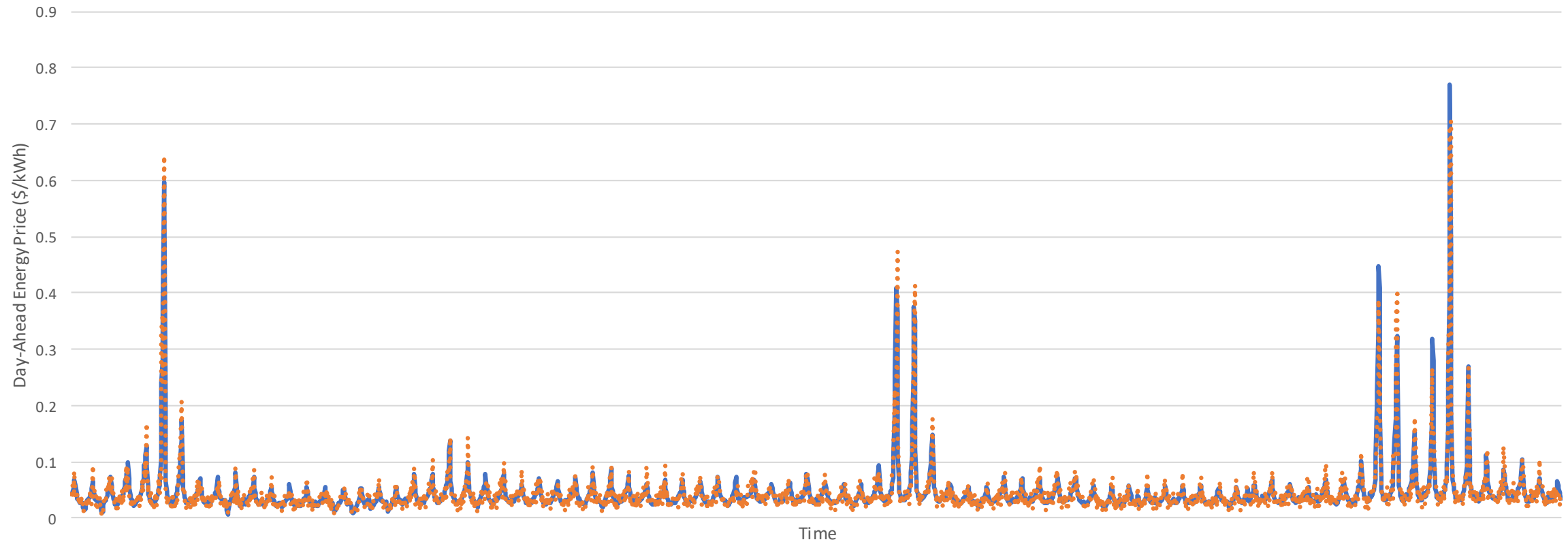
# Optimization vs Evaluation Inputs

- For file inputs:
  - Create two versions of the file. One will be used to optimize the problem, the other will be used for financial evaluation.
- For all inputs (including files):
  - Turn on 'Evaluation Active' column.
  - Set 'Optimization value' and 'Evaluation value' columns separately.
  - Financial results will be calculated with the evaluation value

# Optimization vs Evaluation Inputs Example

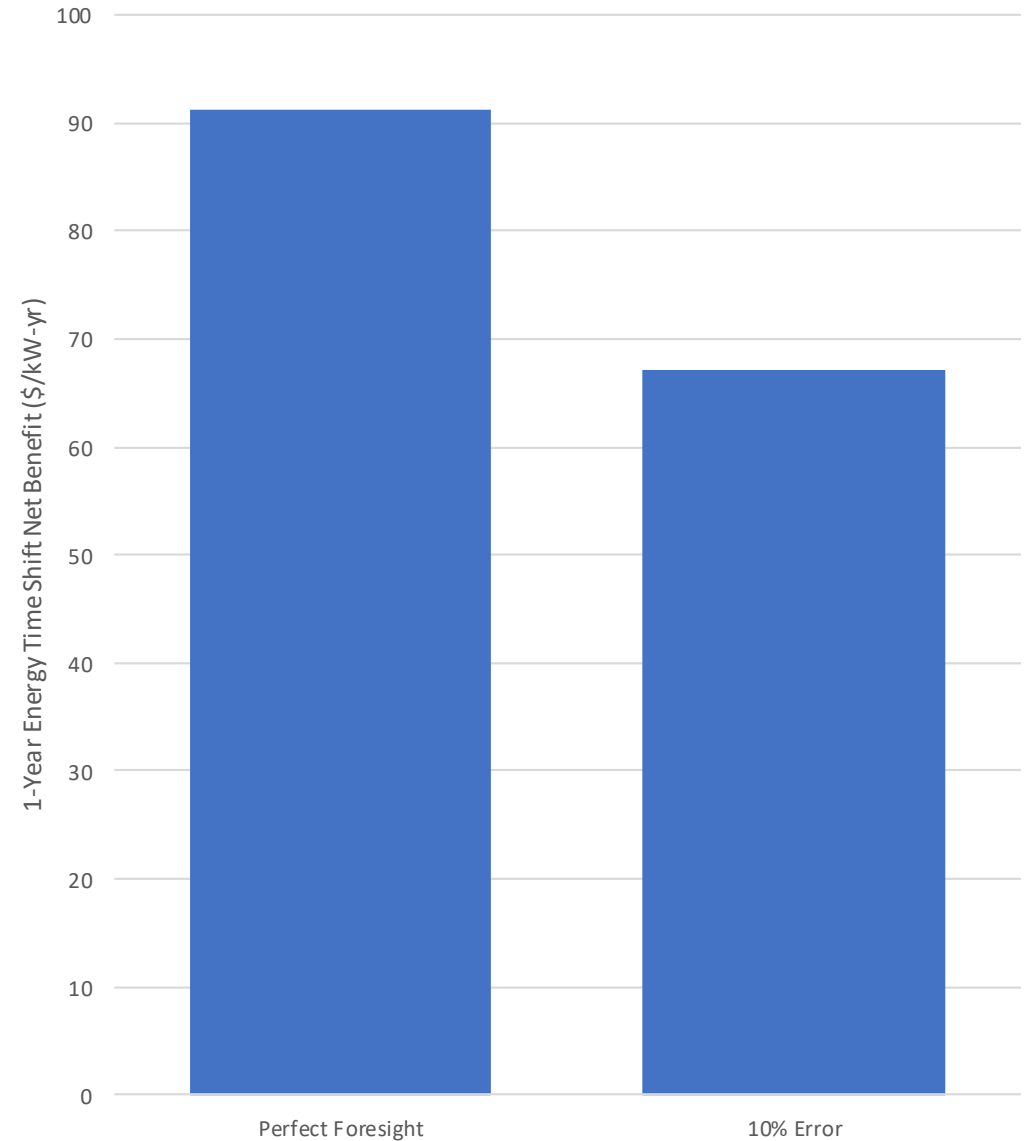
- Fixed-size battery performing day-ahead energy time shift
- 20 MW, 4hr

10% Random Uniform Error



# Financial Results

- Perfect Foresight Results are 36% higher than when the 10% error was included.
- Could layer in stacked services, each with their own error.





# Optimization vs Evaluation

- Everything else works the same.

# Next Meeting

# Regularly-Scheduled Meetings

- **Next Meeting – Thursday June 4, 11:00 am Pacific Time**

# Together...Shaping the Future of Electricity