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DER-VET Task Force

ESIC Working Group 1: Grid Services and Analysis

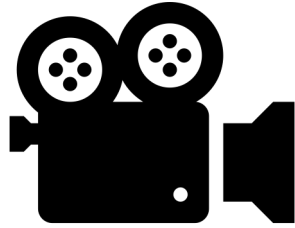
Miles Evans | EPRI

Andrew Etringer | EPRI

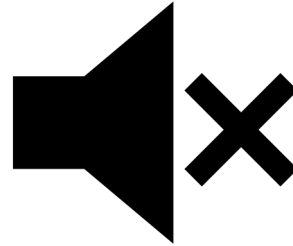
February 3, 2022



Webcast Reminders



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Please mute your phones when you are not speaking. To un-mute, press *6 or push the un-mute icon in WebEx.



Abide by Antitrust Guidelines



Chat to “Everyone” for maximum interaction



The slides and recordings will be posted to www.der-vet.com/esictf/



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Agenda:

- DER-VET Software Update
- Converting GUI Project .json files
- Polling & Task Force 2022 Priorities
- DER-VET Application: Vehicle to Building Backup Power



DER-VET Software Update

DER-VET: New Release is coming soon

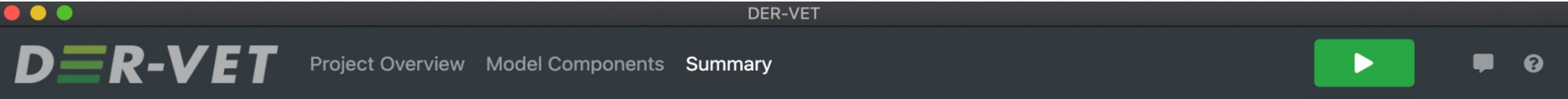
- Bug Fixes (*Python backend, GUI*)
- Improved fuel cost methods (*Python backend, GUI*)
- Support for Python 3.8
- New Thermal Load Technologies (*Python backend only*)
- User Experience Improvements (*GUI*)

Thank you for reporting bugs to us.

Please do send any new bug reports to us and we will address them.

DER-VET: New Release is coming soon

GUI User Experience Improvement: Imported Projects will undergo time series data validation



Errors in Services Components

- Day Ahead Pricing
 - **Invalid Data:** This data has **8787** entries. It must have **8784**.

Project Configuration

Project Name	CAISO Pre-Defined Case
Start Year	2020
Data year	2020
Grid Domain	Generation
Ownership	3rd Party

Technology Specifications

- Battery: 4-hr Li-ion

DER-VET: New Release is coming soon

The screenshot shows the DER-VET web application interface. The browser title is 'DER-VET'. The navigation bar includes 'DER-VET' logo, 'Project Overview', 'Model Components', and 'Summary'. A green play button and a help icon are also present. The left sidebar contains a menu with 'Overview', 'Technologies' (Battery: 4-hr Li-ion), 'Services' (Site Information, Frequency Regulation, Day Ahead Pricing), and 'Finances' (Miscellaneous Inputs, External Incentives). The main content area is titled 'Services: Day Ahead Energy Price'. It features a form for 'Growth Rate of Day Ahead Energy Prices' with a text input containing '2' and a label '% / year'. A note explains: 'A per year increase from the baseline year. This is the project start year.' Below this is an instruction: 'Upload the **day ahead price (\$/kWh)** as a **.csv** file that contains a reading for each timestep on a separate line. The selected data year is 2020 and selected data frequency is 60 minutes, so we require an input file with **8784** entries.' A link offers to 'Download a sample **DAPrice.csv** file with a 60-minute timestep for a leap year with 366 days (8,784 entries)'. The file upload area shows a 'Choose File' button and 'No file chosen'. A red 'Remove Data' button is on the right. A red error message states: 'Invalid Data: This data has 8787 entries. It must have 8784.' At the bottom, there are 'Save', 'There are errors on the page.', and 'Save and Continue >>' buttons.



Converting GUI Project .json files

DER-VET GUI Project .json files

- a **project.json** file is created when you export a project from the GUI
- The next DER-VET GUI release (v1.2) has re-structured the format of this file
 - **project.json files created with the current DER-VET GUI (v1.1) will not be directly compatible in v1.2, and vice versa**
 - We have created a simple python script to translate a v1.1 **project.json** file so that it can be Imported in DER-VET GUI v1.2
 - The script will live in the DER-VET Backend Python repository (available on GitHub)
 - Run it on the command-line in the same manner as run_DERVET.py
- Example Usage (in a terminal window):

```
python migrate_project_DERVET_GUI.py <project-folder-path>
```

DER-VET GUI Project .json files

➤ `python migrate_project_DERVET_GUI.py -h`

usage: `migrate_project_dervet_GUI.py [-h] v1_directory_name`

This script converts an existing version 1.1 DER-VET GUI Project into a new 'project.json' file for import into version 1.2 of the DER-VET GUI. A single argument (a directory/path which contains a project.json file) is required. This directory will not be altered. A new directory is created (with '_v2' appended to the name) which will contain the new converted 'project.json' file. Should be used with Python 3.2 or greater

positional arguments:

`v1_directory_name` specify the directory name to work on

optional arguments:

`-h, --help` show this help message and exit

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DER-VET GUI Project .json files

Example Usage (in Terminal):

```
> python migrate_project_DERVET_GUI.py ~/Downloads/Bill-Reduction-Project/
```

Input v1 DER-VET GUI Project file:

```
/Users/paet001/Downloads/Bill-Reduction-Project/project.json
```

A v2 project.json was created:

```
/Users/paet001/Downloads/Bill-Reduction-Project_v2/project.json
```

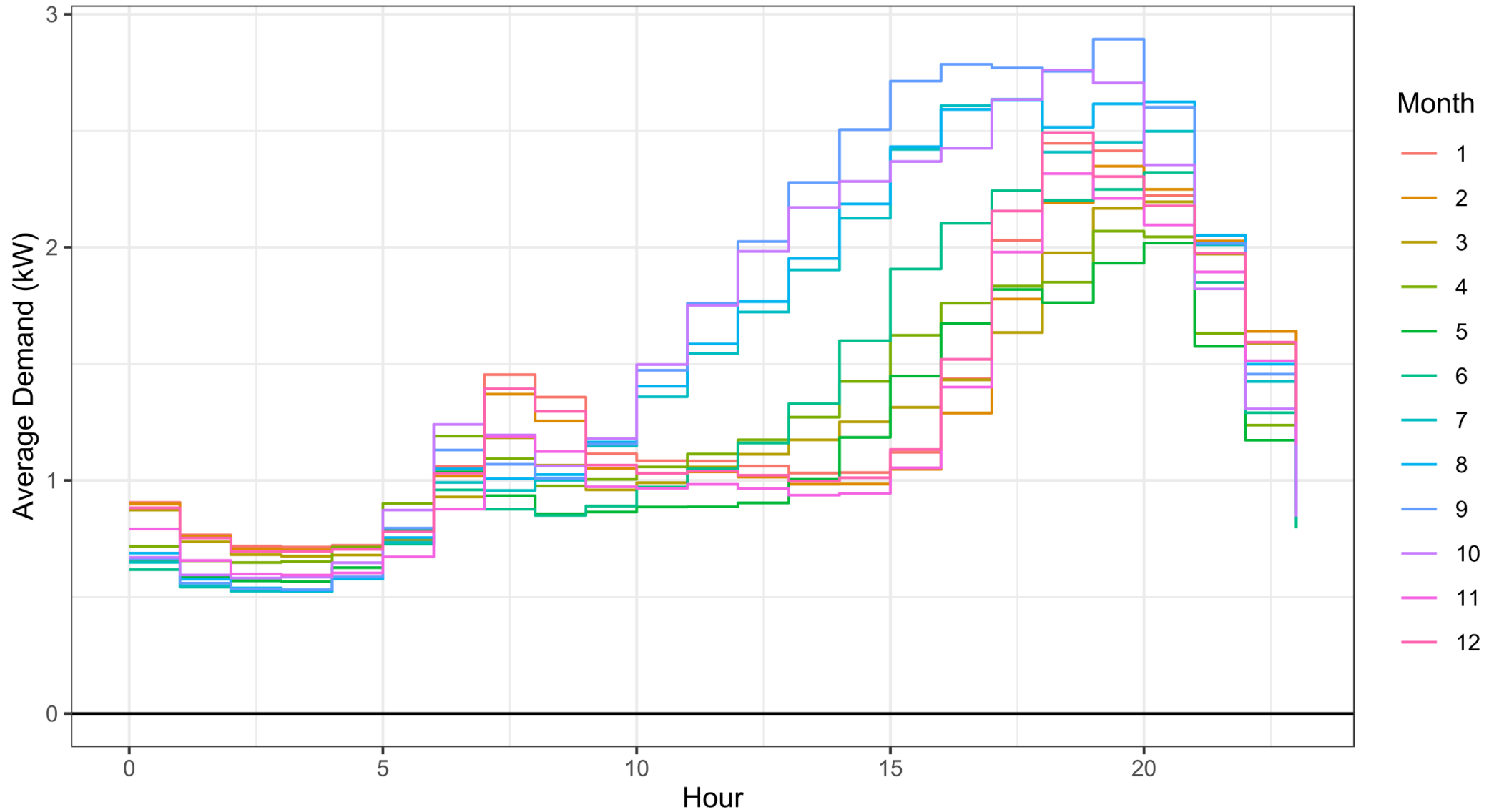


DER-VET Application: Vehicle to Building Backup Power

V2B Case Setup

- EV technology in DER-VET is only capable of managed charging
- Two options for V2B backup power
 - For foreseen outages (e.g. PSPS, hurricanes, etc.), use a battery with 100% SOC to model the vehicle
 - For unforeseen outages, we can model different starting SOC's to understand the likelihood of surviving an outage

V2B Case Setup

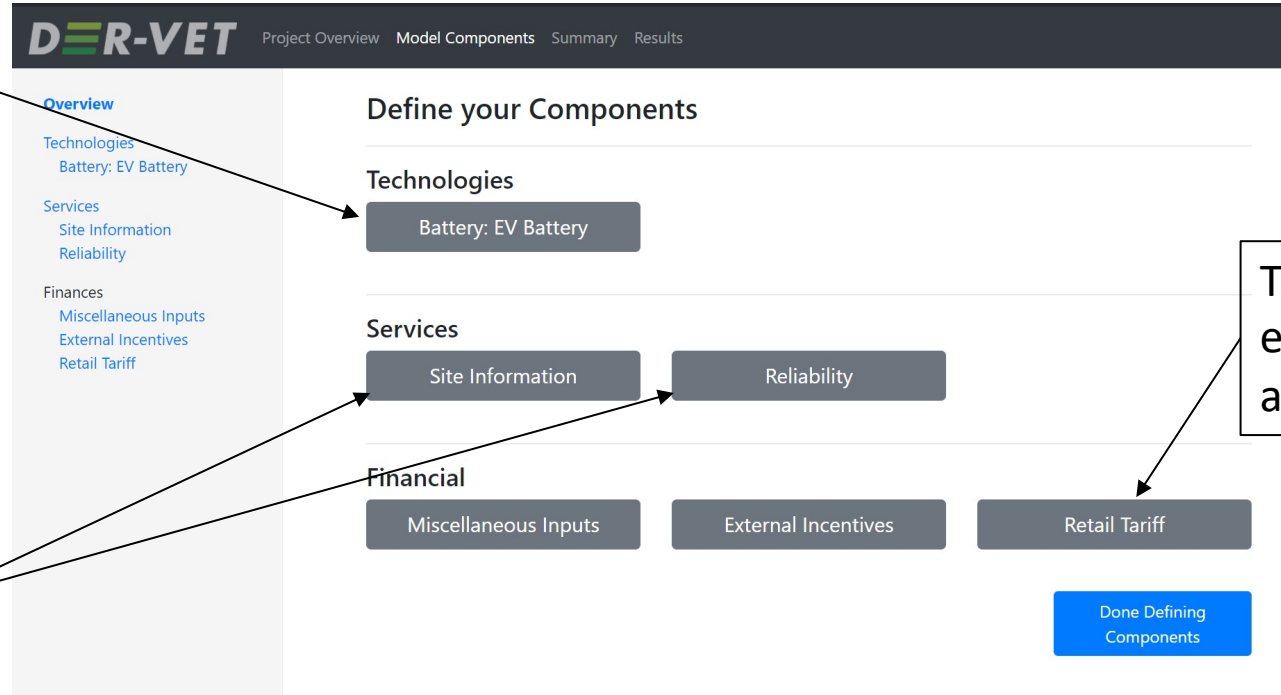


V2B Case Setup

150 kW/60 kWh simple battery

Maximum SOC and target SOC are based on EV SOC at beginning of outage

Site Load and Critical Load are the single family home

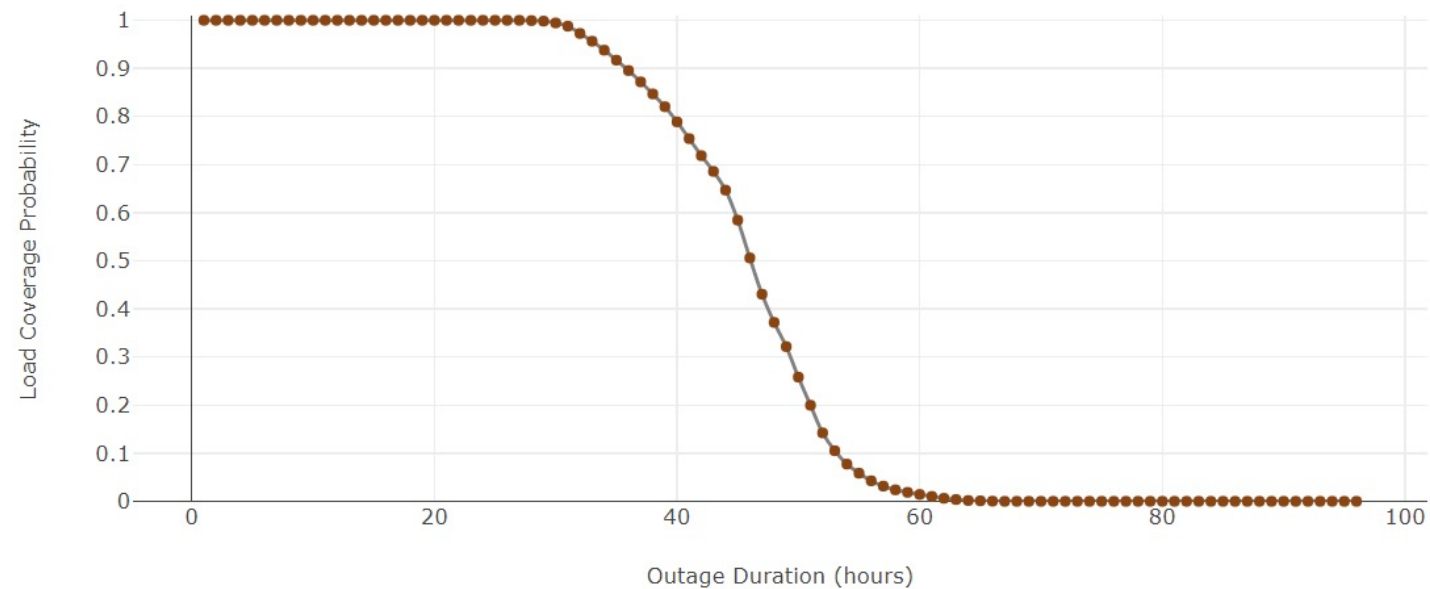


Tariff imposes a flat energy price to keep SOC at target for all hours

V2B Case Setup

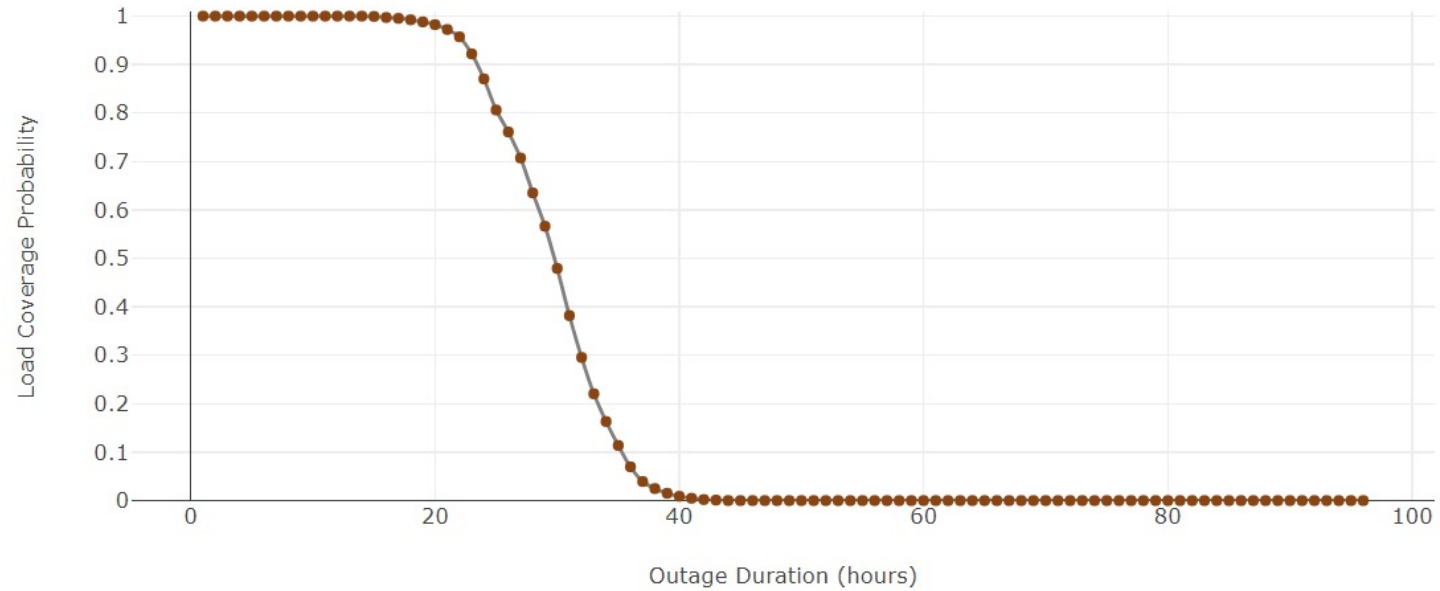
- Hypothetical 60 kWh usable EV battery
- Whole home backup, no load shedding
- Planned outage – 100% SOC

Load Coverage Probability

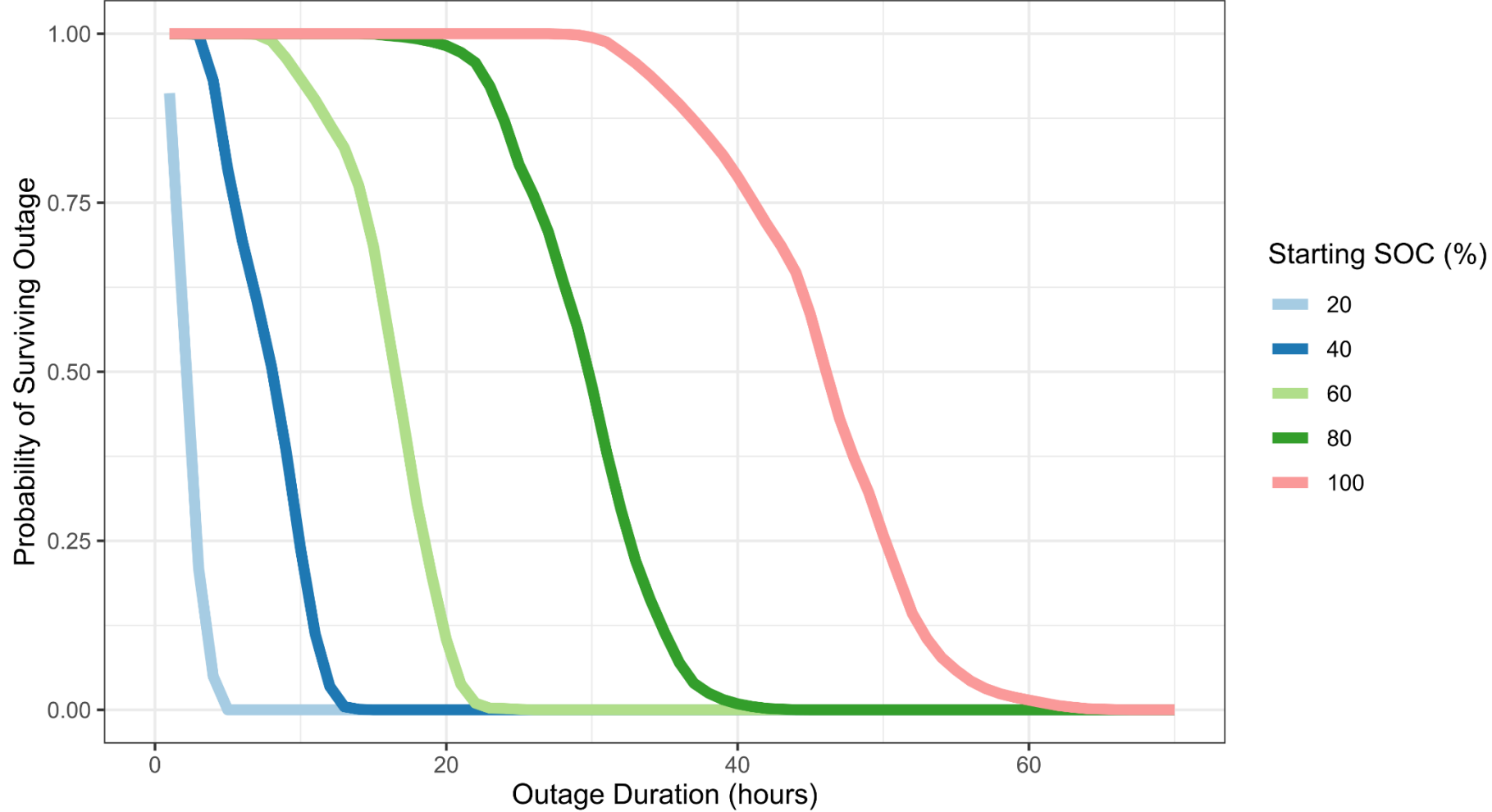


What if the vehicle only has 80% SOC?

Load Coverage Probability



EV may start an unplanned outage at any SOC

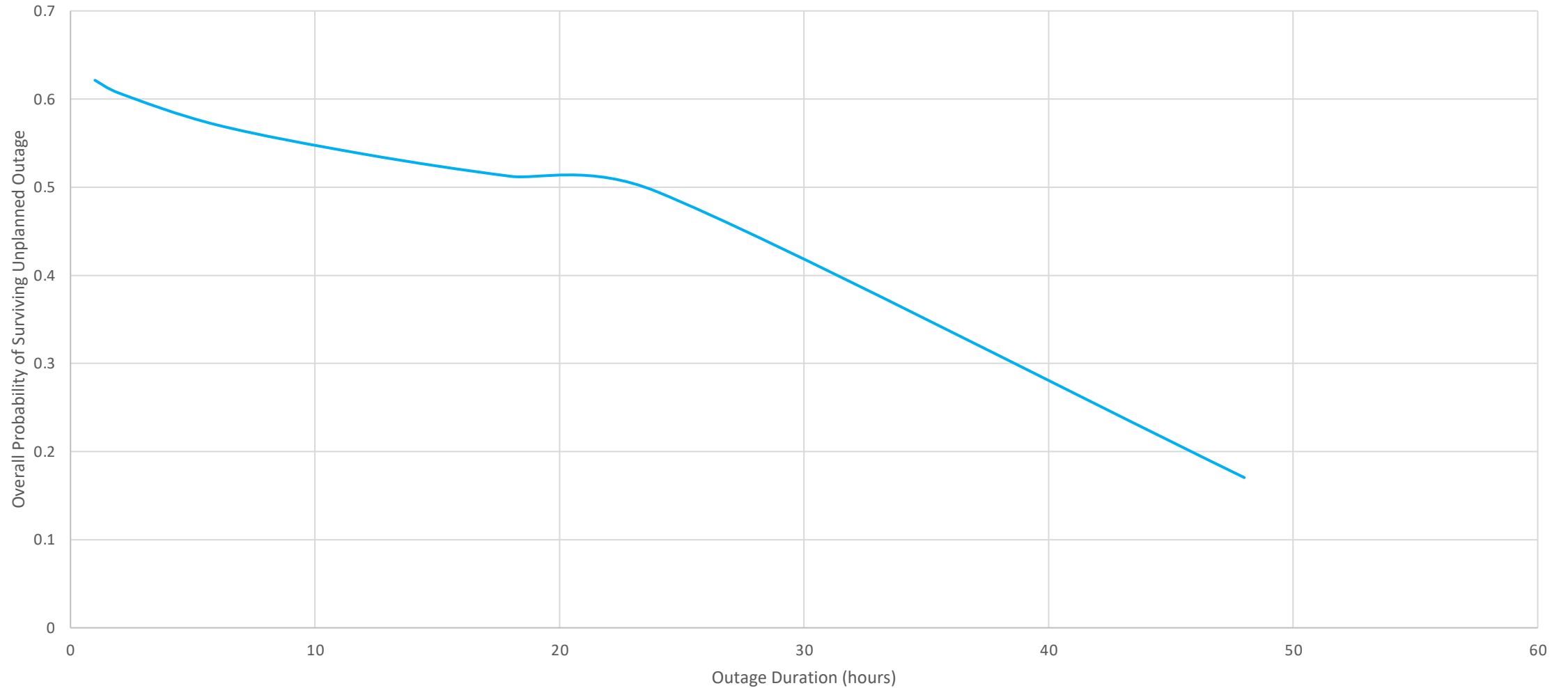


EV Schedule

- 9 hours per day away
- Returns at 20% SOC
- Charges for 4 hours to 100% SOC
 - 1 hr at 40%, 1 hr at 60%, etc.

Hour	Available SOC (%)	Probability of Covering 24-hr Outage	Probability of Covering 4-hr Outage
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	20	0	0.049560352
11	40	0	0.930912413
12	60	0.001945748	1
13	80	0.870436076	1
14	100	1	1
15	100	1	1
16	100	1	1
17	100	1	1
18	100	1	1
19	100	1	1
20	100	1	1
21	100	1	1
22	100	1	1
23	100	1	1
24	100	1	1
Overall Probability		0.494682576	0.582519699

Overall Probability of Covering Unplanned Outages





Polling & Task Force 2022 Priorities



**Next Meeting March 3, 2022
11 AM Pacific Time**

A blue-tinted photograph of four people standing in a row. From left to right: a woman with curly hair and glasses wearing a white lab coat with the EPRI logo; a man with glasses wearing a white lab coat with the EPRI logo; a woman wearing a white hard hat and a dark polo shirt with the EPRI logo; and a man with glasses and a beard wearing a light-colored button-down shirt. They are all smiling and looking towards the right. The background is a solid blue color.

Together...Shaping the Future of Energy™