GRIDWORKS

Joint Agencies Vehicle-Grid Integration (VGI) Working Group

WORKSHOP #4

JANUARY 22-23, 2020

10:00 AM – 5:00 PM AND 9:00 AM – 12:30 PM

SAN FRANCISCO, CA

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Agenda – Wednesday 1/22

10:00-10:20	Agenda, introductions, workshop objectives, Working Group status
10:20-11:45	Review of scoring results, methods of analysis, and ways of displaying scoring results
11:45-12:30	Discussion of scoring results, analyses, and displays
12:30-1:30	Lunch
1:30-3:15	Presentations of party proposals for answering PUC Question (a), "What VGI use cases can provide value now, and how can that value be captured?"
3:15-3:30	Break
3:30-5:00	Discussion of party proposals and formulating answers to PUC Question (a)

Agenda – Thursday 1/23

9:00-9:15	Address by Commissioner Rechtschaffen
9:15-10:45	Discussion to reach convergence and consensus on answers to PUC Question (a)
10:45-12:00	Policy implications from screening and scoring
12:00-12:30	Wrap up, next steps, next Working Group call, next Subgroup

Participant Introductions

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Workshop Objectives

1. Review use case scoring results, including divergences in scoring of individual use cases from multiple parties
2. Display and discuss a number of methods for analyzing, grouping, and/or ranking the scoring results
3. Develop answers to PUC Question (a), “What VGI use cases can provide value now, and how can that value be captured?”
4. Elicit and document consensus agreements and non-consensus disagreements on answers to PUC Question (a)

Working Group Status

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- Use case intake, screening, and scoring completed as of December 19
- Parties have had the past two weeks to develop methods of analyzing the scoring results and make proposals on how to answer PUC Question (a),), “What use cases can provide value now and how can that value be captured?”
- This workshop and following week to January 30 Working Group call: complete answers to PUC Question (a).
- Next stage, led by Subgroup C, starts January 30, to answer PUC Question (b), “What policies need to be changed or adopted to allow additional use cases to be deployed in the future?”
- Subgroup C leaders?

Updated Work Plan

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Stage	Content	Sub-Group Working Schedule	Workshop	Follow-up Working Group Call(s)	Draft Report for Review
1	Kick-off	---	8/19	8/26	---
2	Vet and finalize PG&E VGI Valuation Methodology	8/20-9/20 (3 weeks)	9/26	10/3	11/1
3a	PUC Question (a) (use cases)	9/26-11/12 (5 weeks)	11/14-11/15	11/21	11/26
3b	PUC Question (a) (continued)	11/15-1/17 (6 weeks)	1/22-1/23	1/30	2/4
4	Interim Report	---	---		12/10
5	PUC Question (b) (policy recommendations)	1/30-3/12 (6 weeks)	3/19-3/20	3/26 4/2	4/7
6	PUC Question (c) (compare to other DERS)	4/3-4/30 (4 weeks)	5/7	5/14	5/19
7	Final Report	---	6/4	6/11 6/18	5/19

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Subgroup B Report on Scoring Process

Scoring Compilation and Summary

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	LDV	MHDV
Use cases scored	232	176
Consensus pass	196	138
Disputed	36	38
Use cases with only partial scores	3	71
Use cases not scored	12	29

Scoring Compilation and Summary – Use Cases by Number of Parties Scoring

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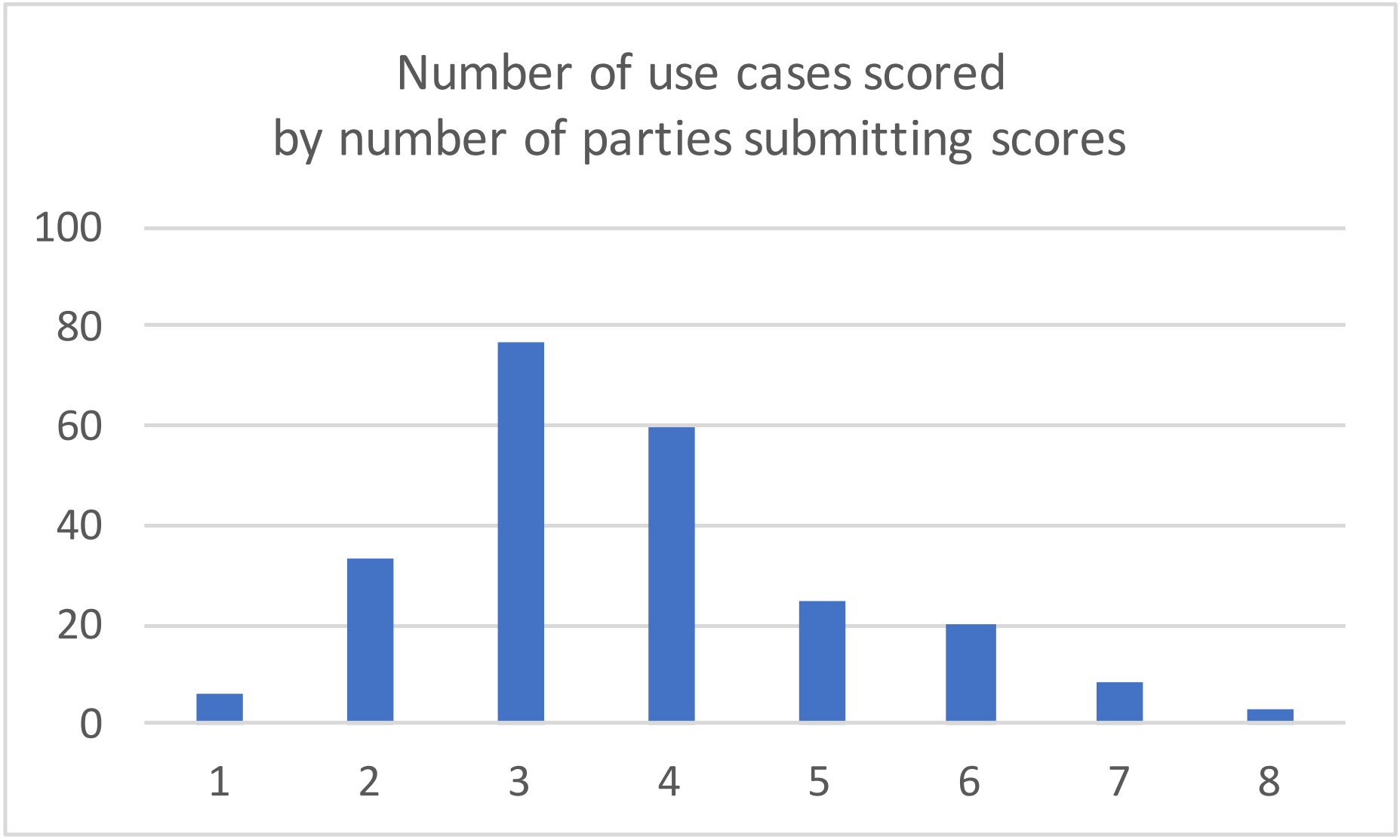
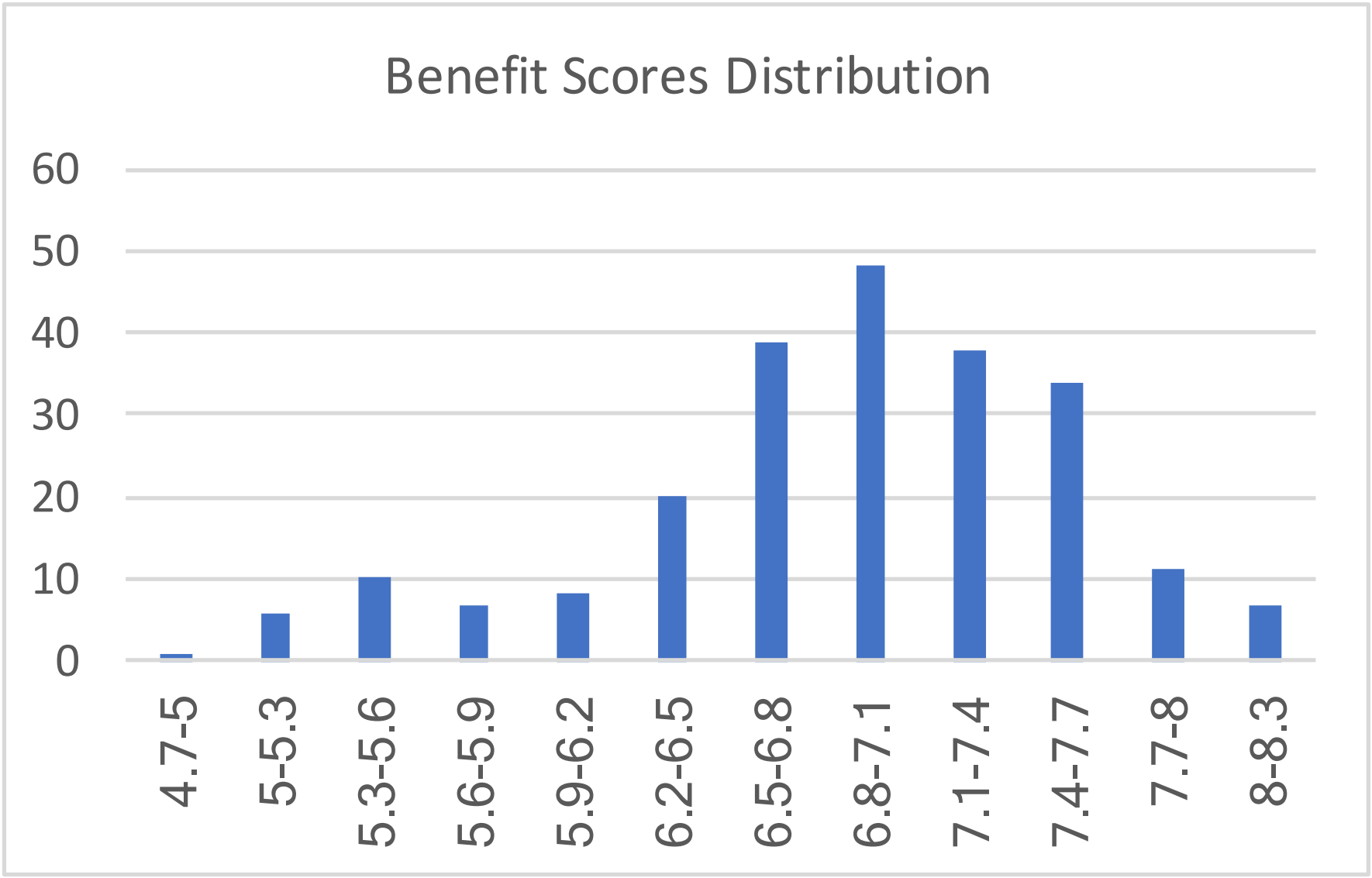
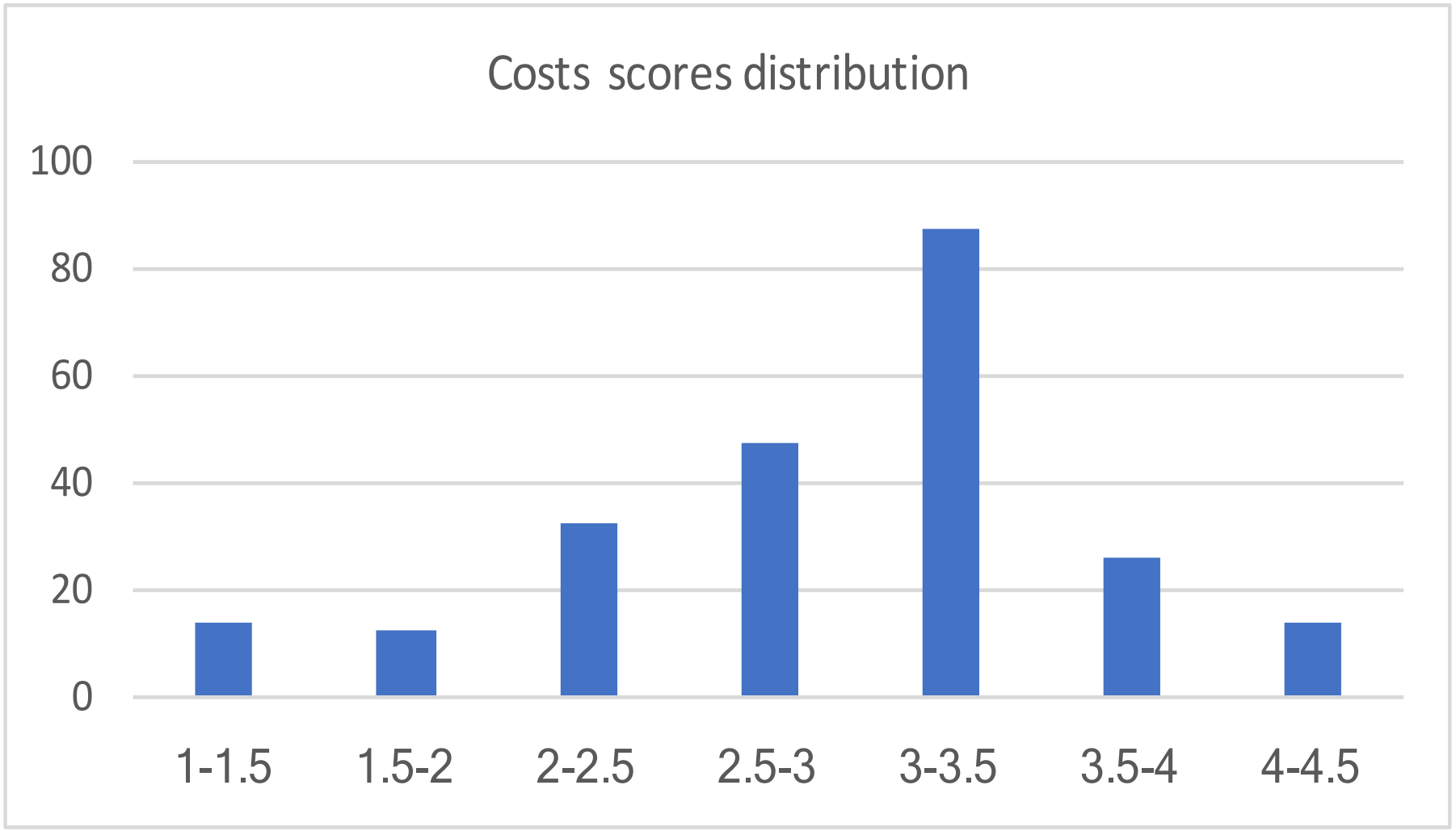


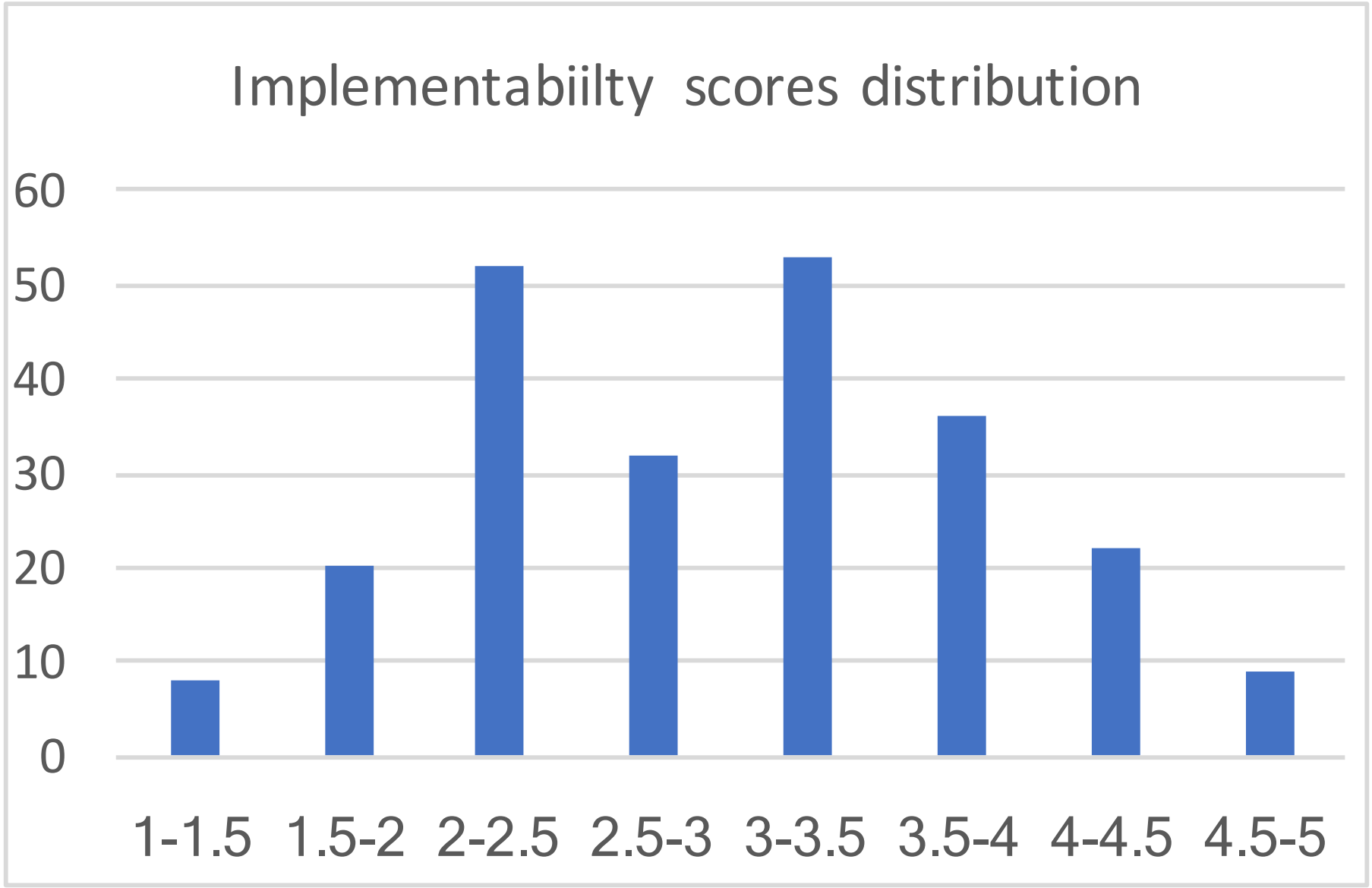
Scoring Compilation and Summary – LDV Benefit Scores Distribution



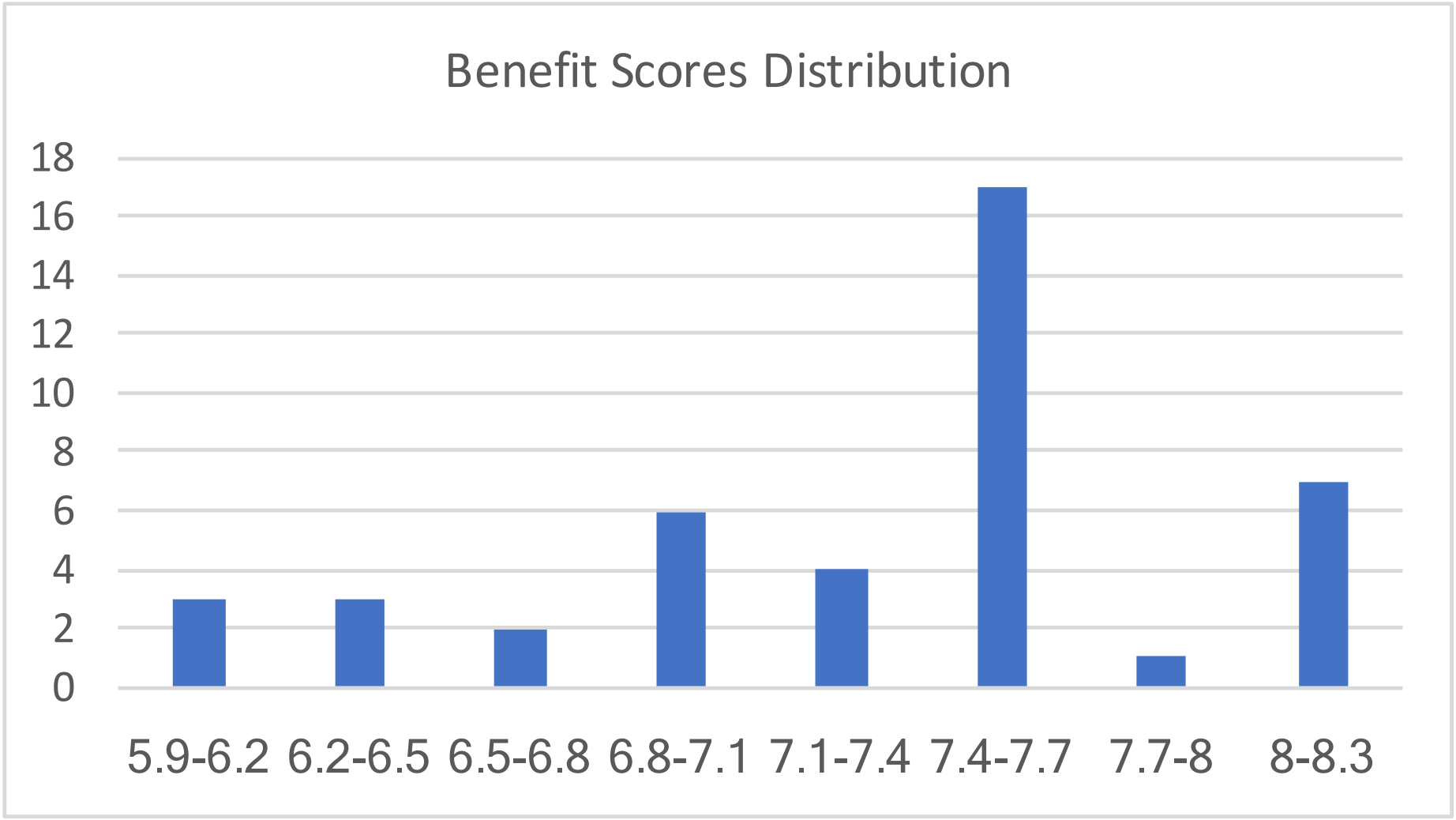
Scoring Compilation and Summary – LDV Cost Scores Distribution



Scoring Compilation and Summary – LDV Implementability Scores Distribution



Scoring Compilation and Summary – LDV Customer Bill Management Only



Scoring Compilation and Summary – Comments on Individual Use Cases

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Category	Typical comment
Assumptions made	Avoid $1,000 upgrade, 10 year life
References to outside studies	Value of transmission deferral about $25/kW-yr, per PNUCC, Jan 2017
Cost or benefit allocation	"Fragmented" use case differs from "unified" in that these are consumer owned EVs. Because savings need to be shared between 2 actors (building owner and EV owner) it may be considered to be more difficult to implement than "unified".
Rates	Assuming $0.20 difference between peak/off peak charging for 13 kWh (40 miles per day / 3 miles per kWh) for 5 days a week x 52 weeks per year
Technology	May require EV/EVSE provider to include additional software to offer direct control over charging timing.
Risk	Not risky because current programs account for this use-case and continue to develop operational experience on it. That said, there is still space for improvement to make it easy to scale up.
Customer adoption	Not all MUDs may want to go through the logistics to sign up for interconnection and coordinate with EV drivers.

Scoring Compilation and Summary – Notes by Parties

Three notes were received and are posted to OneDrive:

1. PG&E and Olivine – school bus scoring guidance
2. Sumitomo – basic assumptions used in scoring
3. VGI Council – ratepayer impact benefits

Presentations on Analysis and Display of Scoring Results

1. SCE – scoring display tool
2. Nissan – scatter-plots and thumbnail summaries
3. Honda – use case value metric
4. MHDV team – costs and benefits by application
5. E3 – benefit scoring review

Discussion of scoring results, analyses, and displays

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What about these graphical results really stands out?

Which aspects of the graphical results seem most clear and solid?

What might concern us about the graphical results?

What are our observations on the scoring?

NISSAN GROUP
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VGI Scoring Data Perspectives

VGI Working Group Workshop #4
January 22-23, 2020

Contents

Parsing the CPUC Question (a) Request*

What VGI use-cases now can provide value? and How can that value be captured?

Answered	Needs VGIWG Decision	Answered
The list of scored use-cases is already screened for the "now" time-frame to 2022 **List of use-cases is essentially complete**	Use-case needs scores to be identified as having potential to provide value VGIWG scoring is insufficient to identify that costs exceed benefits so all scored use-cases must be considered as having the potential to provide value **What VGIWG says about use-case value needs discussion**	Benefit is required first step to VGI value. Application was most frequently used during scoring to establish the benefit level captured Further, Application is the use-case element most influenced by CPUC policies **Application is the key element for how value is captured**

Approaches to Talking About Use-case Value

- **Strict Approach:** Use scores to identify which use-cases are better than others
  - Tends to generate arguments between providers of different solutions. Focuses attention on specific use-cases rather than larger policy affecting many use-cases
- **Loose Approach:** Value potential from all use-cases so all use-cases provide value
  - Easy, but doesn't really say much to support policy thinking about VGI use-cases
- **Interpretive Approach:** Use scores to understand landscape of all VGI use-cases
  - Looking at groups of use-cases using the scoring data has potential to provide more guidance to broad policy and direction thinking. Provides guidance for supporting groups of use-cases

Organizing Scoring Data for Interpretive Analysis

List of Scoring Data Fields:

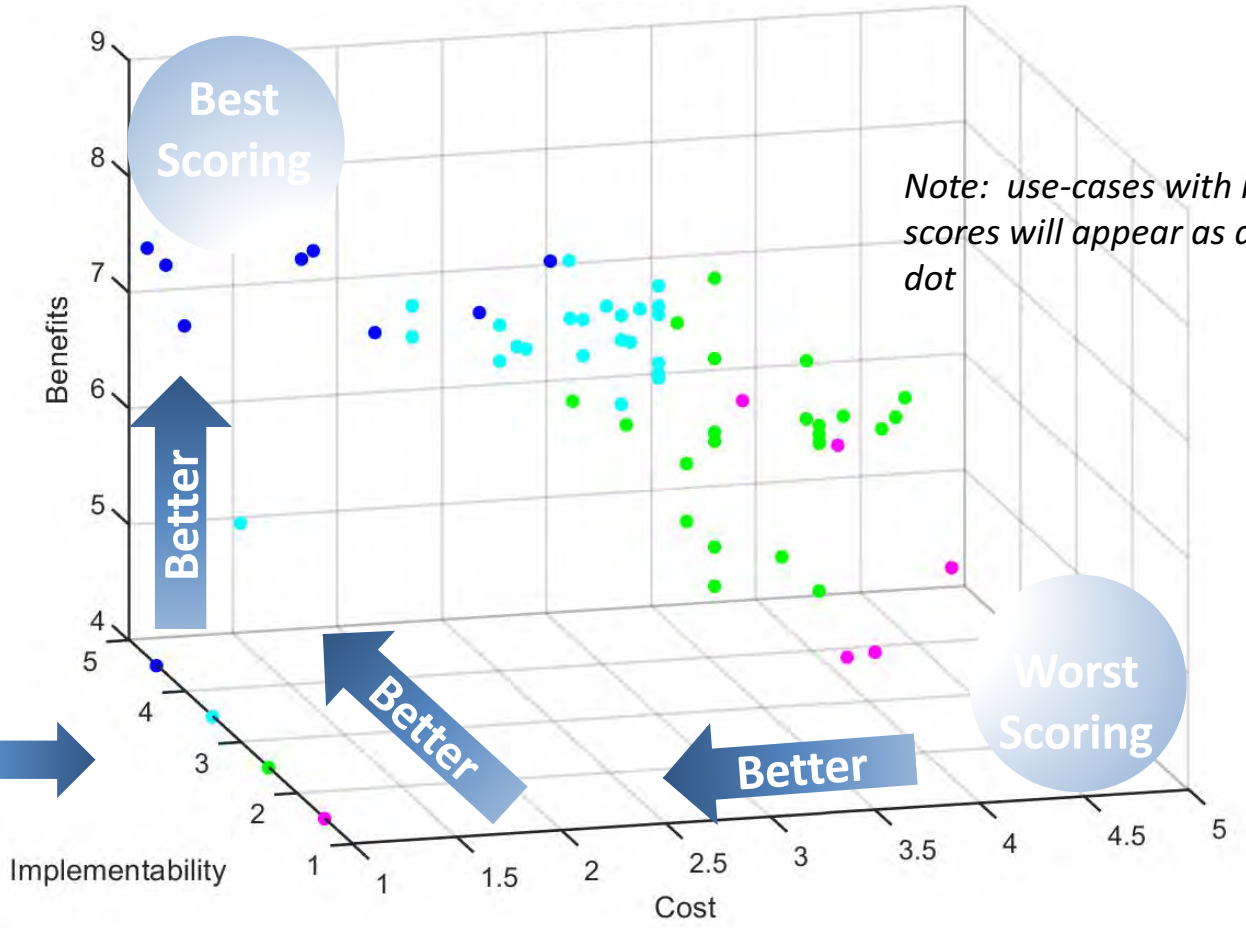
- Use-case ID
- Vehicle category
- Sector
- Application
- Type
- Approach
- Resource Alignment
- Technology notes
- Comment notes
- EV Population
- Screening Status
- Economic Benefit
- Benefits (combination of Economic Benefit & EV Population)
- Costs
- Implementability

- **Independent variables (categories):**
  - ***Primary category =*** Application
  - ***Sub-Categories & scoring influences =*** Vehicle category, Sector, Type, Approach, Resource Alignment, Technology notes, Comment notes
  - ***Magnitude qualifier =*** EV Population
  - ***Tracking Reference =*** Use-case ID
- **Dependent variables (results):**
  - **Data Results =** Benefits, Costs, Implementability, Economic Benefit
  - ***Scoring confidence qualifiers =*** Screening Status, number of scores/scorers per use-case

Scatter Plot Visualization / Interpretation

Benefits Score = Combined $/EV/yr & vehicle population

Depth-perception assistance color coding



Note: use-cases with identical scores will appear as a single dot

“Thumbnail” Summary of Category

- Provides an overview of the characteristics of all the use-cases within a Category or sub-category

VGI Application	Scores						Type		Approach	
	Benefit Score Avg	Cost Score Avg	Implementability Score Avg	Use-case Count	Cmplt Score?	Disputed Count	V1G Count	V2G Count	Indirect Count	Direct Count
Commercial - Workplace	6.9	2.9	2.9	76	72	15	40	36	20	56

Average Scores

Use-case Counts

Sub-category characteristics

LDV Application "Thumbnail" Summary

VGI Application	Scores						Type		Approach	
	Benefit Score Avg	Cost Score Avg	Implementability Score Avg	Use-case Count	Cmplt Score?	Disputed Count	V1G Count	V2G Count	Indirect Count	Direct Count
Customer - Bill Management	7.3	2.6	3.1	43	43	12	29	14	17	26
System - Renewable Integration	6.7	2.8	2.7	34	28	9	26	8	14	20
System - Day-Ahead Energy	7.1	2.8	2.6	25	25	3	23	2	9	16
System - RA, System Capacity	6.7	2.8	3.1	24	24	9	21	3	9	15
System - GHG Reduction	6.9	2.8	3.0	21	21	0	17	4	6	15
System - Grid Upgrade Deferral	7.0	3.0	3.0	19	19	0	16	3	7	12
Customer - Upgrade Deferral	6.7	2.3	3.0	18	18	0	15	3	8	10
Customer - Renewable Self-Cons	6.7	2.0	2.7	16	15	1	11	5	8	8
Customer - Backup, Resiliency	6.6	3.1	2.5	9	9	0	0	9	3	6
System - Backup, Resiliency	6.6	3.4	2.0	9	9	0	0	9	5	4
System - Real-Time Energy	7.3	2.9	2.5	6	6	0	6	0	0	6
System - RA, Local Capacity	6.7	3.0	3.1	6	6	2	5	1	0	6
System - RA, Flex Capacity	5.8	3.2	1.9	6	6	4	3	3	0	6
System - Frequency Regulation	#DIV/0!	3.0	2.0	4	0	4	2	2	0	4
System - Voltage Support	#DIV/0!	3.0	2.0	4	0	4	2	2	0	4

Green = Max; Red = Min; Yellow = missing scores; Purple = interesting outcomes

MHDV Application "Thumbnail" Summary

VGI Application	Scores						Type		Approach	
	Benefit Score Avg	Cost Score Avg	Implementability Score Avg	Use-case Count	Cmplt Score?	Disputed Count	V1G Count	V2G Count	Indirect Count	Direct Count
Customer - Bill Management	6.2	2.1	4.1	38	30	7	28	10	22	16
System - Day-Ahead Energy	5.4	2.9	3.5	34	21	9	29	5	12	22
System - RA, System Capacity	5.5	2.7	3.0	22	15	10	20	2	12	10
Customer - Renewable Self-Cons	5.5	2.1	3.8	16	8	0	12	4	7	9
System - Renewable Integration	5.1	1.7	2.9	27	7	10	23	4	14	13
System - GHG Reduction	5.2	2.2	3.5	20	6	0	16	4	8	12
System - Real-Time Energy	5.2	3.8	3.0	11	5	3	11	0	0	11
System - Grid Upgrade Deferral	5.4	2.0	1.8	14	2	0	14	0	7	7
System - RA, Local Capacity	5.2	4.0	2.0	2	2	1	2	0	0	2
System - RA, Flex Capacity	5.4	4.0	1.0	1	1	0	1	0	0	1
Customer - Upgrade Deferral	#DIV/0!	1.0	#DIV/0!	10	0	0	9	1	4	6
Customer - Backup, Resiliency	5.4	#DIV/0!	3.0	5	0	1	0	5	3	2
System - Voltage Support	#DIV/0!	#DIV/0!	#DIV/0!	4	0	4	2	2	0	4
System - Non-Spinning Reserve	#DIV/0!	#DIV/0!	#DIV/0!	1	0	1	1	0	0	1

Green = Max; **Red** = Min; **Yellow** = missing scores; Purple = interesting outcomes

LDV Sector "Thumbnail" Summary

VGI Application	Scores						Type		Approach	
	Benefit Score Avg	Cost Score Avg	Implementability Score Avg	Use-case Count	Cmplt Score?	Disputed Count	V1G Count	V2G Count	Indirect Count	Direct Count
Residential - Single Family Home	7.5	2.4	3.1	34	32	4	21	13	15	19
Residential - Single Family Home - Rs	7.4	2.0	3.7	11	11	0	11	0	5	6
Commercial - Public, Commute	7.0	3.1	2.1	16	15	5	14	2	8	8
Commercial - Workplace	6.9	2.9	2.9	76	72	15	40	36	20	56
Commercial - Public, Destination - Rs	6.8	2.8	2.5	14	12	5	13	1	4	10
Commercial - Public, Destination	6.8	3.0	2.6	24	20	7	22	2	8	16
Residential - Multi-Unit Dwelling	6.6	2.5	2.7	32	31	5	21	11	9	23
Residential - Multi-Unit Dwelling - Rs	6.6	2.2	3.3	11	11	3	11	0	6	5
Commercial - Public, Commute - Rs	6.5	3.0	2.6	26	25	4	23	3	11	15

Green = Max; Red = Min; Yellow = missing scores; Purple = interesting outcomes

Observations & Possible Next Steps

- Observations:
  - Be cautious with use-case counts.
    e.g. VGI tends to out number V2G because of how indirect/direct and fragmented/aligned are commonly viewed.
  - Consider perception bias in selecting the use-cases.
    e.g. LDV real-time energy includes no V2G; yet the hardware could serve that purpose.
- Possible VGIWG Next Steps:
  - What collections of use-cases are useful to understand?
  - What meanings can be identified from the data?

Scoring Plots Appendix

BLUE SKIES FOR
OUR CHILDREN

Inputs to CPUC DRIVE VGI Working Group Question 1

VGI Workshop

January 22-23, 2019

HONDA
The Power of Dreams

CPUC Question 1: What VGI Use Cases Provide Value Now…

- **Influences on this Question**
  - VGI Use Case scoring
  - Interpretation of Comments
  - Legislative Drivers
    - SB327 (IoT Security Act)
    - SB350 (Clean Energy & Pollution Act), SB 350 TE – Transportation Electrification Activities
    - SB454 (Forthcoming: EVSE Open Access Act)
- **Methodology**
  - Analysis of Use Case scoring: ranking, prioritization, recommendations
  - Consolidation of Comments into categories, how to capture context
  - Cross check of Legislative Drivers including Utility Planning and Infrastructure Investment Programs
- **Report Preparation**

Methodology, Oversight and Inputs to Use Case Analysis

- How are we, the Working Group stakeholders, to agree on methodology and processing of recommendations regarding the scoring results to create contributive insights into answering CPUC's Question 1?

- What does CPUC anticipate using the results of this process to accomplish? How shall the analysis be framed to produce valuable information supporting market mechanisms?

- Does CPUC intend for there to be a new category of dispatchable resources under VGI, and if so, how would these resources be enabled to assure support in achieving the shared value of these resources. How will this be treated from a rate-making perspective?

Methodology, Use Case Value = Ranking of Combined Data

- How might we bring the resulting data together to effectively represent the cost, benefit, and implementability scores in a "Value Metric?"
- Suppose:

  Use Case Value Metric = (5.01-Cost) * Benefit * Implementability (avg scores)

  - For this method, we must arithmetically treat cost values because they range from *low to high* on a 1 – 5 scale, versus benefits and implementability, which range *high to low*. This is accomplished by treating [cost score] = [5.01 – raw cost score].
  - Other ways of calculating a Value Metric can/could have been chosen
- Top 95 LDV Use Cases by Value Metric are V1G
  - Highest value LDV Use Cases are single family residential and commercial workplace
  - The lowest value/non-scored LDV Use Cases are disputed
  - V2G Use Cases fall mostly in the lower half of the Value Metric sort

Methodology, Sample Use Case Ranking

J3 =(5.01-D3)*A3*G3

	A	B	C	D	G	H	K	M	N	0	P	Q	R	
1		Benefits		Costs	Implementability			Yellow= no scorin& received for that use case						
	enefits	Benefit	Benefi	Costs	Costs	Costs	Impl.	Impl.	Impl.	Cost•	Benef	screenin	Use case	Use					Battery Capacity	Charger Power
2	Ave	s Min	ts. Max	Ave	Min	Max	Ave	Min	Max	it•Imp	g status	D	Sedor	Application	Type	pproacl	Re-source Alignment		(kWhl	(kWl
3	8.0	5.4	8	10	1	1	50	5	5	16140	Passed	205	Residenta Sngle Family Home R	Customer· Bill Managerr	V1G	Indirect	EV·EVSE UnfedAgned		2Q-40kWh	7kW
4	83	7.3	8	10	1	1	4.9	4	5	161.10	Passed	1.1	Residential - Single Family Home	Customer Bill Managerr	V1G	Indirect	EV·EVSE UnfedAgned		240+mles;1D-2	5kW
5	8.1	7.3	8.7	10	1	1	4.9	4	5	58.05	Passed	2	Residenta Sngle Family Home	Customer • Bl Managerr	V1G	Indirect	EV·EVSE UnifedAgned		240+mles;1D-2	If
6	7.5	6.2	8	0	1	1	4.7	4	5	14085	Passed	863	Commercial -Workplace	Customer - Renewable Se	V1G	Indirect	EV·EVSE UnfiedAgned			
7	7.8	7.2	8.1	0	1	1	43	3	5	34.67	Passed	13	Residenta- Sng Family Home	Customer • Upgrade Defe	V1G	Indirect	EV·EVSE UnfedAgned			3.3kW
a	7.6	7.2	8	1.0	1	1	4.3	3	5	3161	Passed	12	Residential - Single Family Home	Customer • Upgrade Defe	V1G	Indirect	EV·EVSE UnfedAgned			If
9	7.5	6.2	8	0	1	1	4.3	4	5	30.79	Passed	854	Commerci l -Workplace	Customer - Renewable Se	V1G	Indirect	EV·EVSE FragmentedAgned			
10	6.1	5.4	6.3	10	1	1	50	5	5	12133	Disputed	614	Residenta- MuUnt Dwelling - R	Customer • Bll Managerr	V1G	Indirect	EV·EVSE FragmentedAgned			
11	7.1	6.2	7	10	1	1	40	3	5	11468	Passed	830	Commercial -Workplace	Customer • Upgrade Defe	V1G	Indirect	EV·EVSE FragmentedAgned			
12	7.0	6.2	8	15	1	2	4.5	4	5	111.06	Passed	313	Residenta Sngle Family Home -R	System - Renewatenteg	V1G	Indirect	EV·EVSE UnfedAgned			
13	7.5	4.8	8	17	1	3	44	4	5	09990	Disputed	818	Commercial -Workplace	Customer- Bll Managerr	V1G	Indirect	EV EVSE FragmentedAgned			
14	7.5	4.8	8	18	1	4	4.5	3	5	10988	Passed	817	Commercial ·Workplace	Customer - Bill Managerr	V1G	Indirect	EV-EVSE UnfedAgned		0-20kWh	7kW
15	7.6	5.6	8.4	16	1	3	4.2	2	5	08.21	Passed	410	Residenta- MuUnt Dwelling	Customer- Bll Managerr	V1G	Indirect	EV·EVSE FragmentedAgned			12
16	6.8	6.2	7	15	1	2	4.5	4	5	10768	Passed	58	Residenta MuUnt Dwelling	System- Renewable Integ	V1G	Indirect	EV·EVSE FragmentedAgned			
17	7.3	6.2	8	15	1	2	4.0	2	5	102.54	Passed	109	Residential - Single Family Home	System - Renewable Integ	V1G	Indirect	EV·EVSE UnfedAgned		240+mles;25kV	6kW
18	7.9	6.7	8	8	1	3	40	3	5	00.89	Passed	133	Residenta- Single Family Home	System - RA, System Capa	V1G	Indirect	EV EVSE UnifedAgned			
19	6.6	6.2	6	20	2	2	50	5	5	99.56	Passed	1753	Commercial ·Puttc,Commute· Rd	System- GHG Reduction	V1G	Indirect	EV·EVSE UnfedAgned		Vans	12 ChargeP
20	7.0	4.8	7.7	0	1	1	3.5	2	5	9826	Passed	241	Residenta- Sng Family Home-R	Customer Renewable Se	V1G	Indirect	EV·EVSE UnfedAgned			
21	7.5	6.8	8	1.0	1	1	3.3	2	5	9720	Passed	37	Residential - Single Family Home	Customer·Renewable Se	V1G	Indirect	EV EVSE UnfedAgned		240+mles	
22	7.4	4.8	8	1.5	1	2	3.8	2	5	9707	Passed	337	Residenta Sngle Family Home· R	System • RA, System Capa	V1G	Indirect	EV·EVSE UnfedAgned			
23	7.2	7.2	7	1.7	1	3	40	2	5	9597	Passed	121	Residential - Single Family Home	System - GHG Reduction	V1G	Indirect	EV·EVSE UnifiedAgned		25kWh	6kW
24	7.3	4.8	8	1.8	1	3	40	3	5	9461	Passed	458	Residenta- MuUnt Dwelling	System -Grd Upgrade D	V1G	Indirect	EV·EVSE FragmentedAgned			
25	7.9	4.8	8.4	2.D	1	3	4.0	2	5	94.57	Passed	49	Residenta- Sngle Family Home	System -Grd Upgrade D	V1G	Indirect	EV·EVSE UnfedAgned		240+mles;25kV	6kW 12
26	7.8	6.2	8.7	2.0	1	3	40	3	5	9406	Passed	160	Residential ·Single Family Home	System- RA, ocal Capaci	V1G	Direct	EV EVSE UnfedAgned		25kWh	6kW
27	7.6	6.7	8	20	2	2	4.0	3	5	919	Passed	16	Residenta- Sngle Family Home	Customer - Upgrade Defe	V1G	Direct	EV-EVSE UnfedAgned		240+mles;25kV	6kW
28	7.5	4.8	8	2.0	1	3	40	3	5	90.59	Passed	148	Residenta·Sngle Family Home	System· RA, Rex Capacl	V1G	Direct	EV·EVSE UnfedAgned		25kWh	6kW
29	6.8	5.6	7	20	1	3	4.3	4	5	8905	Passed	866	Commercial ·Workplace	System - Grd UpgradeD	V1G	Indirect	EV·EVSE FragmentedAgned 25kWh			6kW 12
30	8.2	7.3	8	2	1	3	3.9	3	5	8880	Passed	4	Residential - Single Family Home	Customer Bill Managerr	V1G	Direct	EV·EVSE UnfedAgned		240+mles;1D-2	6-7kW
31	7.5	5.6	8	20	1	3	38	3	5	8539	Passed	412	Residenta- Multi UnDwelling	Customer • Bl Managerr	V1G	Direct	EV EVSE FragmentedAgned			If
32	8.1	5.4	8	20	1	3	3.5	2	5	8567	Passed	1226	Commercial ·Public, Destination ·F	Customer • Bill Managerr	V1G	Indirect	EV·EVSE FragmentedAgned SQ-80kWh			50 kW,3
33	7.4	5.6	8.1	20	1	4	38	3	5	8562	Passed	542	Residenta- MuUnt Dwelling	System - RA, Systemtapa	V1G	Indirect	EV·EVSE FragmentedAgned			
34	7.5	5.4	8	2.0	1	3	38	3	4	8505	Passed	208	Residential - Single Family Home-R	Customer· Bill Managerr	V1G	Direct	EV EVSE UnfedAgned		2Q-40kWh	7kW
35	7.9	6.8	8	20	1	3	3.5	2	5	83.57	Passed	1130	Commercial ·Public, Commute	Customer·Bill Managerr	V1G	Indirect	EV·EVSE FragmentedAgned 20kWh			DCFC,150

Methodology – Grouping, Analyzing, Ranking, Processing

Gridworks Question 1: How you are grouping, analyzing, ranking, and/or processing the scoring results to create insight(s) into answering CPUC Question (a)? Please provide the Working Group with specific details and displays of your groupings, analysis, rankings, or processing.

- Use the "Value Metric" for the Initial Processing and Ranking
- The Groupings are established by the Framework "dimensions":
- Analysis of Use Case according to "Value Metric" Score
  - Choose a threshold, say top 20 use cases by "Value Metric" ranking
  - Analyze these Use Cases by Groupings and the three VGI scores
  - Analyze the Comments for these Use Cases
  - Analyze Comments for other Use Cases to see if they pertain to the top 20

Methodology – Non-Scored Use Cases

Gridworks Question 2: How you are treating use cases for which no scores were received?

- What are the observable trends of Non-Scored Use Cases?
  - 15 Use cases were not scored – all of them disputed
  - 12 of the Use Cases were Commercial, 3 were Single Family Residential
- Note Non-scored Use Cases for future discussion
  - Scored and Non-scored use cases of similar sector and application both show low ranking
  - All Non-scored Use Cases were disputed, suggesting that future treatment may be necessary to build their viability

Methodology – Widely Diverging Use-Case Scores

Gridworks Question 3: How you are considering widely-diverging scores of the same use case from multiple parties (i.e., how you are handling any wide divergences in minimum and maximum scores)?

- Use Average Scores
  - Can the average cost, benefit and implementabilty values be used? Yes, using the "Value Metric" approach, the top 100 Use Cases don't show significant divergence.
  - Note which Use Cases show widely diverging scores, along with potential reasons – e.g., type of scorer (utility, OEM, etc. – without attribution).
- No significant impacts from widely diverging Use Case scores
  - Does divergence represent a problem? No.
  - Would more consensus and adjustment change the "Value Metric" scores? Not significantly, at least for the highly ranked Use Cases.

Methodology – Comments

- Group and Consolidate Comments
  - Analysis of Use Case scoring: consolidation, trending, sorting, prioritization
  - Capture context of consolidated comments
  - Frame the comments under impacts from Legislative Drivers including Utility planning and Infrastructure Programs
- Example of duplicative comment
  - "Benefit: $/EV based on internal analysis using RA prices from PUC reports" occurs 16 times.
- Example of multiple comments on one Use Case
  - Use Case 133 has comments from 5 parties
- Summarize
  - Capture context for the highest value Use Cases for recommendation to CPUC
  - Capture notable comments from other Use Cases that reflect on the high value Use Cases

MHDV Team Presentation

Four* Medium/Heavy Duty Vehicle "Sectors"

(*for this analysis)

1. Small Truck
   - Small Truck A (delivery)
   - Small Truck B (delivery)
2. Large Truck
   - Large Truck A (class 6 delivery)
   - Large Truck B (class 6/7 regional)
   - Large Truck C (class 6/7 regional)
3. Transit Bus
   - Long Range Bus A
   - Long Range Bus B
   - Long Range Bus C
   - Short Range Bus A
   - Short Range Bus B
   - Airport Shuttle
   - Transit Shuttle Van
4. School Bus
   - School Bus A
   - School Bus B
   - School Bus C

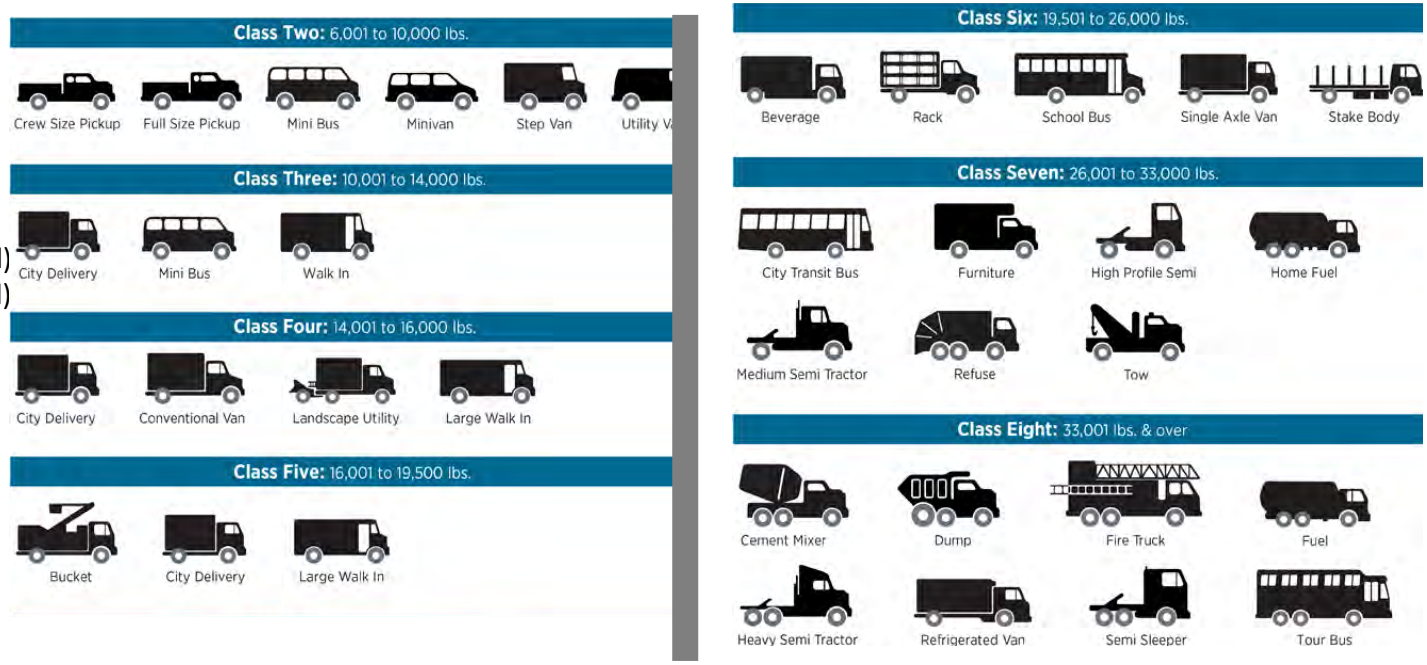
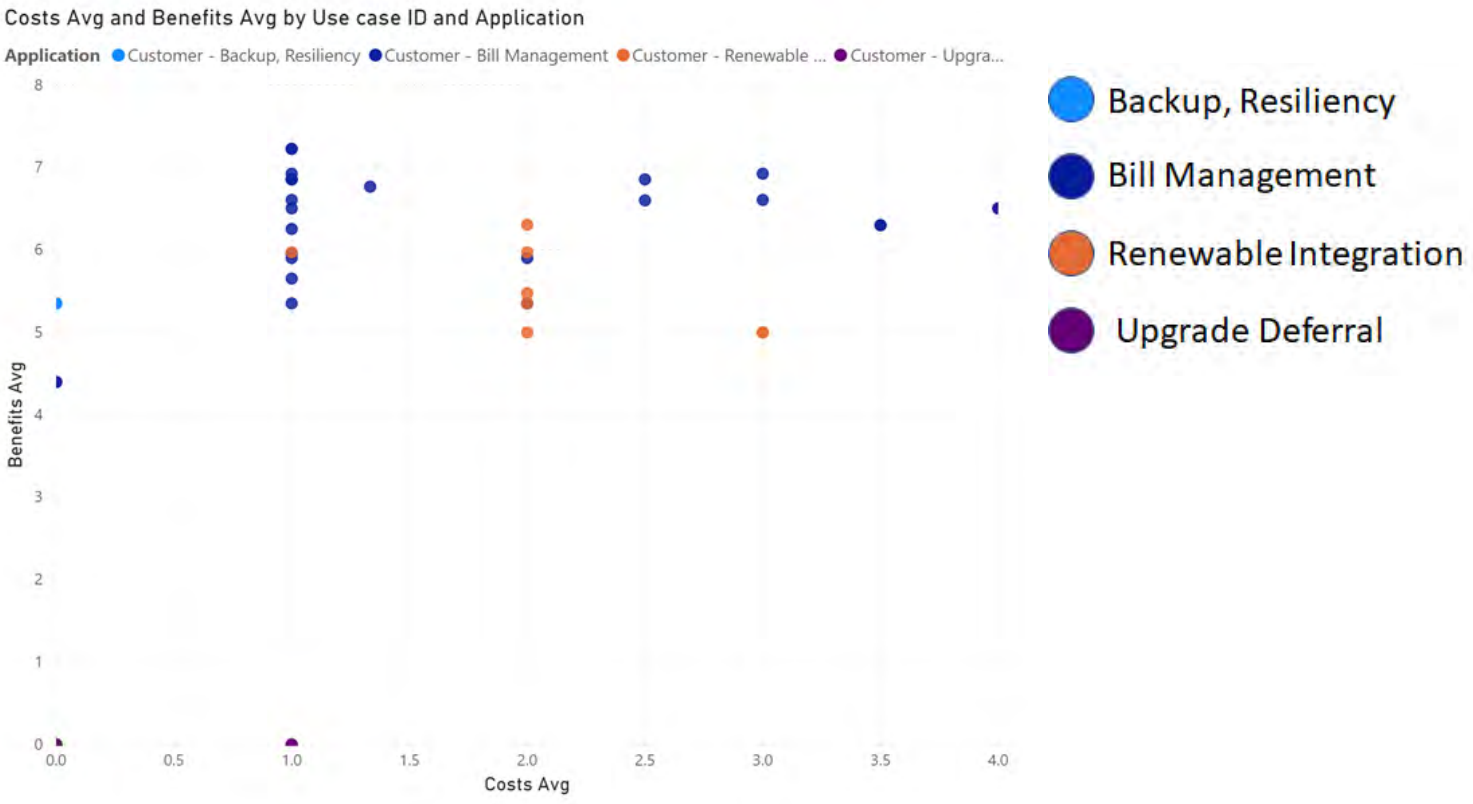
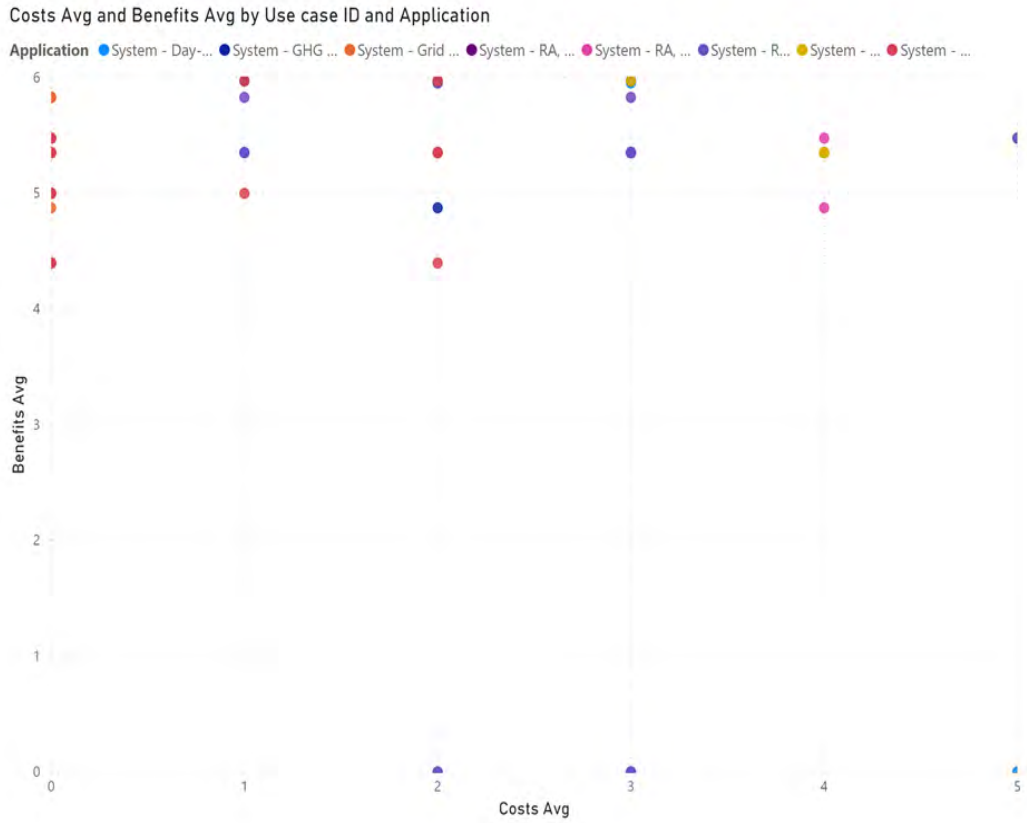


Image source: https://afdc.energy.gov/data/10381

Customer Applications Cost vs. Benefit Scores



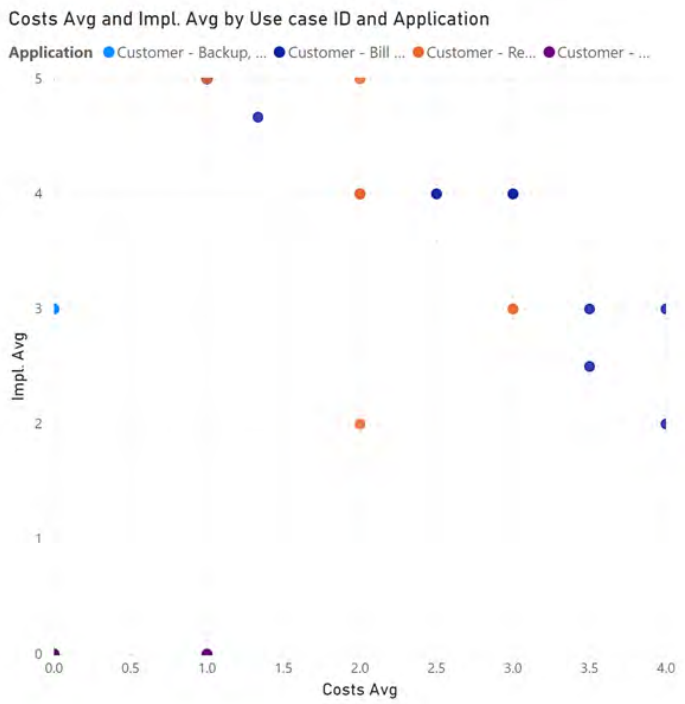
System Applications Cost vs. Benefit Scores



- Day-Ahead Energy
- GHG Reduction
- Grid Upgrade Deferral
- RA Flex Capacity
- RA Local Capacity
- RA System Capacity
- Real-Time Energy
- Renewable Integration

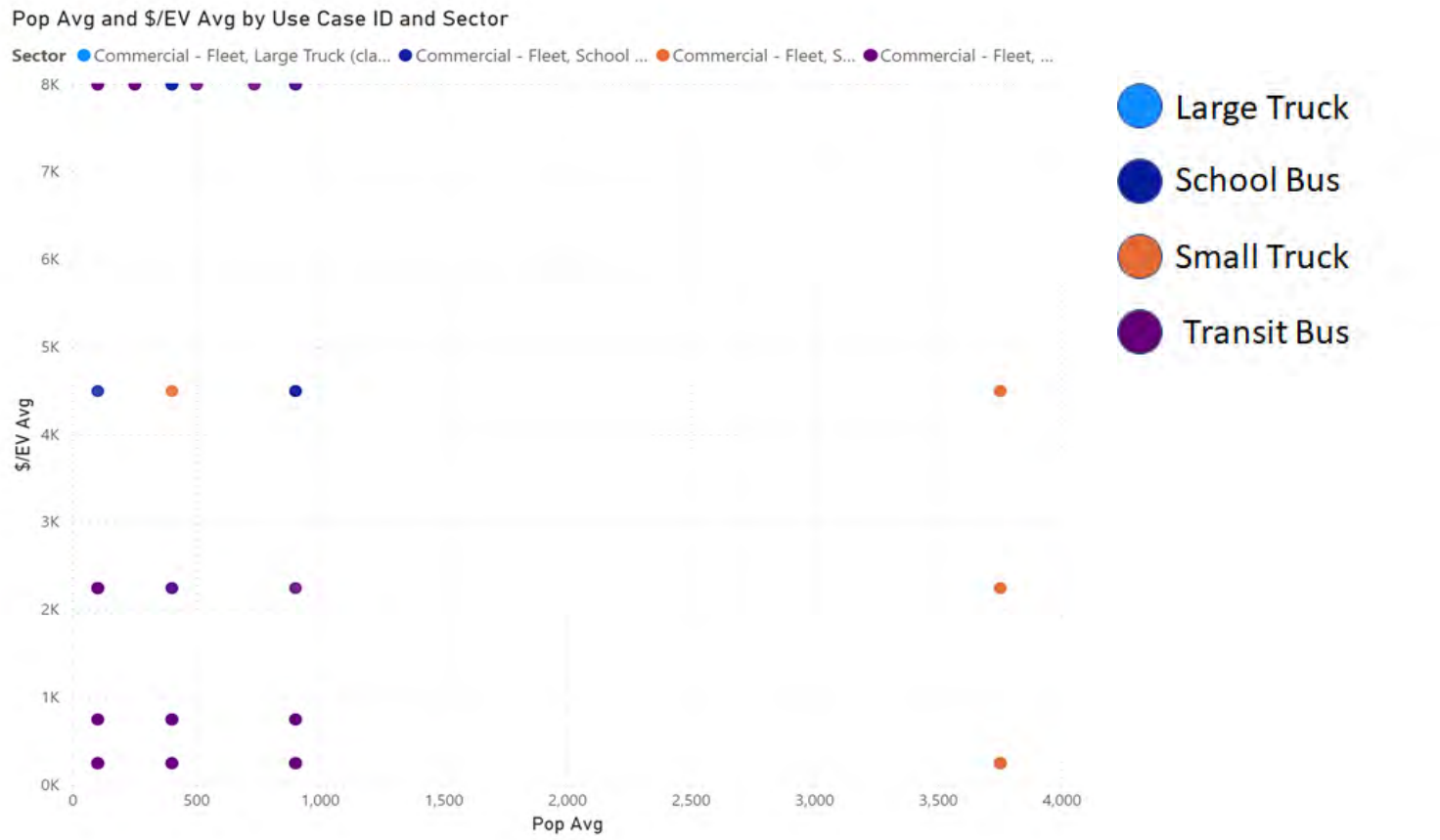
Costs vs. Implementability

Customer Applications

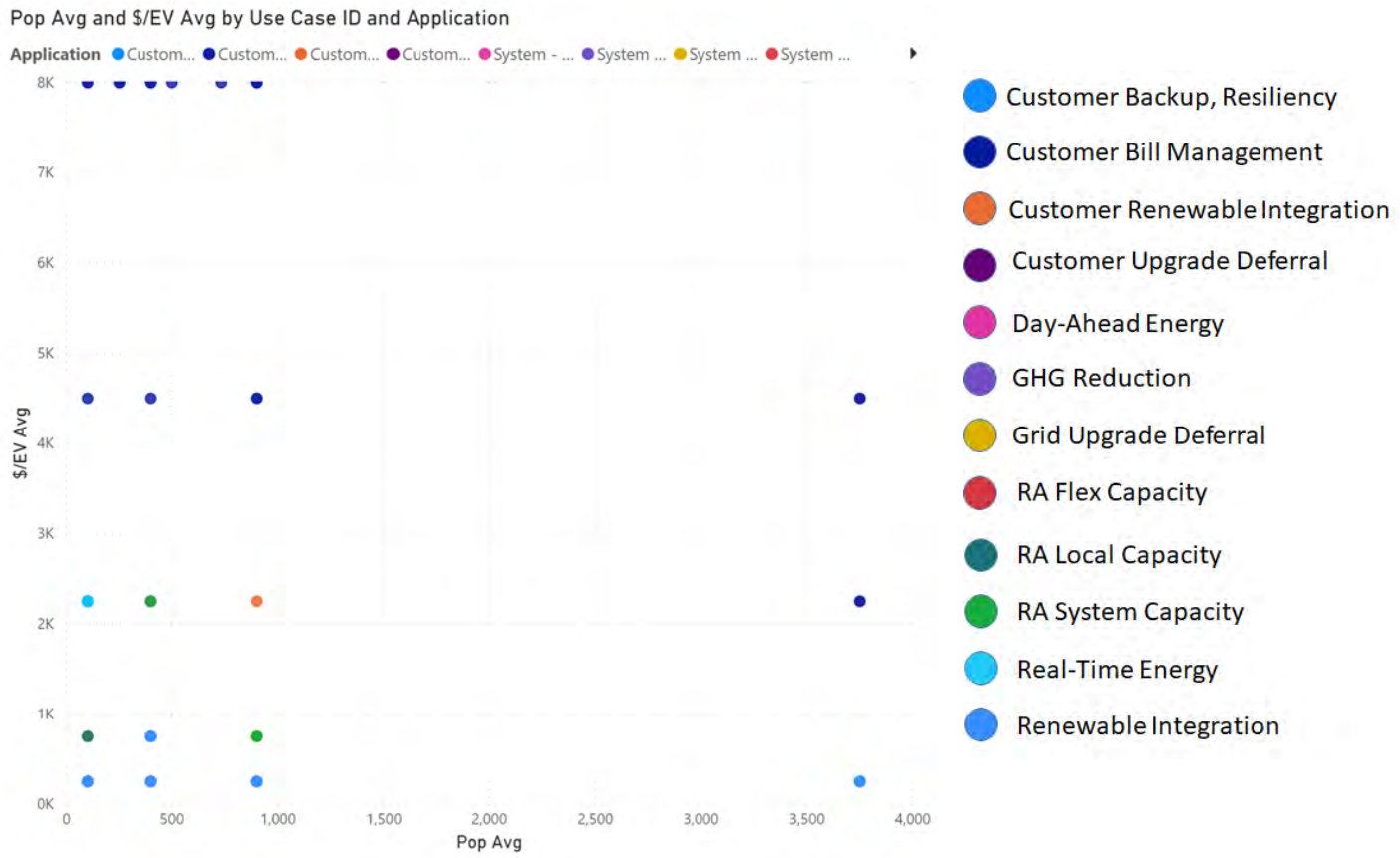


System Applications

Population vs $/EV by Sector



Population vs $/EV by Application



Energy+Environmental Economics

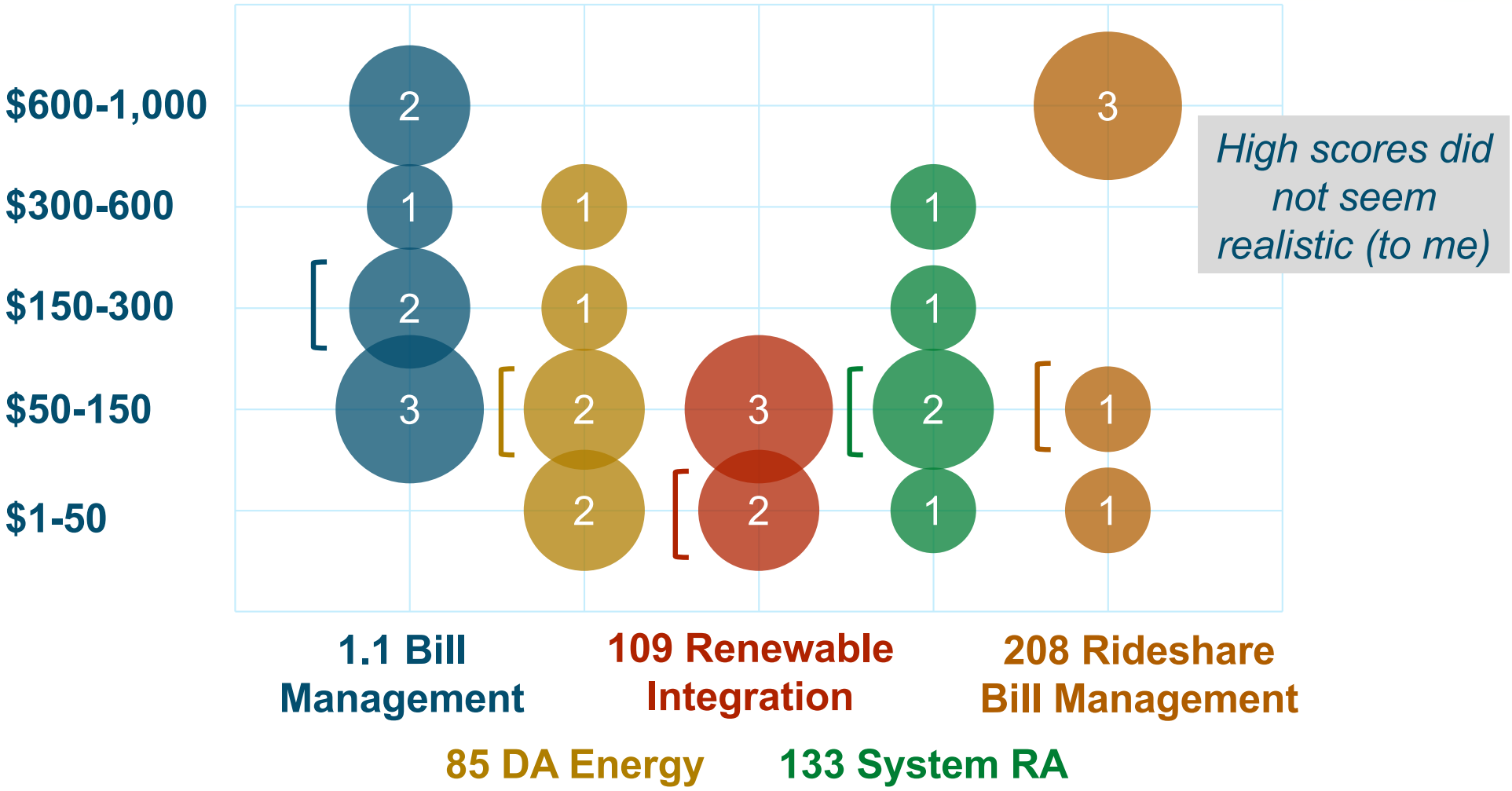
E3 Benefit Scoring Review

CPUC VGI Working Group

01/23/2020

Eric Cutter

Residential Benefit Scores



[*If I had to pick after reviewing the scores*

Summary conclusions on benefit differences

- **Performed brief survey of 5 residential use cases**
- **Largest differences due to baseline assumptions**
  - Different specificity on baseline charging assumptions
  - Amount of charging that is occurring during on-peak period in baseline
- **Lesser differences due to assumed price differentials**
- **Larger values:**
  - Assume all charging was shifted
  - All shifting from highest cost to lowest cost period
  - Several high values not documented
- **Lower values:**
  - Assume only some percentage of baseline charging occurring during peak TOU
  - Assuming shift from evening to nighttime (not from evening to daytime)
- **Benefit scores provide useful information, but averaging is not likely to be meaningful**

1.1 Residential SF Home Bill Management

#	Benefit	Comments
	1-50	
3	50-150	Blended domestic and TOU rates Move charging from evening to overnight ($0.06/kWh differential
2	150-300	Per Joint IOU Guidance
1	300-600	
2	600-1000	Assume $0.20/kWh on/off peak differential for all charging

85 Residential System DA Energy

#	Benefit	Comments
2	1-50	Home charging only, shifting from evening to overnight
2	50-150	CEC – EPRI V2G study Report (includes capacity value) Joint IOU Resource Documents
1	150-300	
1	300-600	
	600-1000	

109 Residential System Renewable Integration

#	Benefit	Comments
2	1-50	Home charging only, shifting from evening to overnight
3	50-150	CEC – EPRI V2G study Report (includes capacity value) Joint IOU Resource Documents
	150-300	
	300-600	
	600-1000	

133 System RA Capacity

#	Benefit	Comments
1	1-50	Assumes 15% of EVs charging on-peak (IOU load research data)
2	50-150	Based on CPUC RA prices Blended shifting of L1 and L2 charging
1	150-300	
1	300-600	
	600-1000	

208 Rideshare Bill Management

#	Benefit	Comments
1	1-50	40% of charging on peak – shifted to off-peak $0.25/kWh rate differential from Joint IOU reference documents
1	50-150	
	150-300	
	300-600	
3	600-1000	60 kWh/day, $0.10/kWh rate differential from Joint IOU reference documents

Discussion of scoring results, analyses, and displays

GRIDWORKS

How has this exercise contributed to our understanding of use case value?

Lunch

GRIDWORKS

Presentations of Party Proposals

- Our goal is to interpret the scoring results we have seen this morning, in ways that allow us to answer PUC Question (a), “What VGI use cases can provide value now, and how can that value be captured?”
- After each presentation, we will take questions and clarifications. We will have a chance to discuss in depth later this afternoon after the break.
- We will also do some additional brainstorming after the proposals, including real-time interactive views of scoring results

Presentations of Party Proposals

1. Honda
2. Ford
3. MHDV Team
4. Sumitomo
5. Fermata
6. VGI Council

BLUE SKIES FOR
OUR CHILDREN

Inputs to CPUC DRIVE VGI Working Group Question 1

VGI Workshop

January 22-23, 2019

HONDA
The Power of Dreams

CPUC Question 1: What VGI Use Cases Provide Value Now…

- **Influences on this Question**
  - VGI Use Case scoring
  - Interpretation of Comments
  - Legislative Drivers
    - SB327 (IoT Security Act)
    - SB350 (Clean Energy & Pollution Act), SB 350 TE – Transportation Electrification Activities
    - SB454 (Forthcoming: EVSE Open Access Act)
- **Methodology**
  - Analysis of Use Case scoring: ranking, prioritization, recommendations
  - Consolidation of Comments into categories, how to capture context
  - Cross check of Legislative Drivers including Utility Planning and Infrastructure Investment Programs
- **Report Preparation**

Working Principles: Approaching ALL of CPUC's Questions

As directed in the CPUC Rulemaking, the 2019 VGI Working Group will answer at a minimum:

- What VGI use cases can provide value now, and how can that value be captured?
- What policies need to be changed or adopted to allow additional use cases to be deployed in the future?
- How does the value of VGI use cases compare to other storage or DER?

Additional questions for consideration:

- What else can be gleaned from the process and the data produced by the WG inputs?
- Do the results of the ranking and scoring exercises fully exploit opportunities created by CA's planned investments in the deployment of ET Infrastructure?
- Do the scoring results corroborate CA's Infrastructure Roadmap or are there differences which point to other utility/industry/OEM objectives?
- How is the "Voice of the Customer" preserved or undermined in this process?

Influences on Working Group's Inputs Question #1

- **VGI Use Case scoring – Subgroup worked to consolidate abstractions for Cost, Benefit, and Implementation Potential ("Implementabilty")**
  - Framework presumes Use Cases defined by 6 "dimensions" for VGI
    - Sector, application, type, approach, resource alignment and technology
  - Scoring objectives: ranking, prioritization, recommendations
- **Comments – provide excellent qualitative context for Use Cases**
  - Suggest consolidation of Comments into trend categories
  - Distill comment trends across use cases to provide insights
- **Legislative & Program Drivers – Impacts on Use Case scoring?**
  - SB350, SB327, SB454, EOs, ADA, CALGreen, others
  - IOU Charging Infrastructure Programs

Honda comments pertain to Light Duty Vehicles Only

Methodology – Key Legislative Drivers

Analyze Impact on the Use Case Environment as Impacted by Legislative Drivers

- **SB 327 –** Cybersecurity directives covering "smart" devices for the Internet of Things
- **SB 350 TE –** CPUC has approved the three IOUs to implement major EV charging infrastructure programs for light duty and medium/heavy duty vehicles that totals on the order of $1B
- **SB 454 –** The primary requirement is to install credit card readers at public EV charging stations. This requirement has the potential to negatively impact the value and implementation of all VGI use cases that include public charging
- **Many Others** – LCFS, ADA, Governor Brown's EV and Charger mandates, CALGreen (buildings), etc.

Objectives for WG Report Preparation

- **Inputs to Question 1**
  - Recommend VGI use cases – How will we defensibly state which Use Cases show the highest value and should be promoted to capture that value?
  - Characterize how answering Question 1 will inform the approaches to be undertaken in answering Questions 2 and 3?
  - Summarize Work Group B Scoring comments to provide meaningful context.
  - Provide legislation and programs analysis to clarify WG perspectives on impacts to Use Case value.
- **Present Backup**
  - Working group work product from participants, meetings, workshops
  - Use Case scoring methodology, use cases which are disputed
  - Comments: interim and final interpretations
- **Present Additional Takeaways**
  - What else might mining of the scoring & ranking data reveal?
  - What foundational tenets apply to VGI implementations?

Tenets of Intelligent Charging from a VOC Perspective

Preserve the Voice of the Customer (VOC)

As with the Utility's Charter: *We Must Abide By The Obligation to Serve*

- Maintain Vehicle-User Centric VGI
  - The car must be charged when the driver needs the car.
  - VGI activity (V1G and V2G) needs to be governed by the vehicle, under the control of the user
    - SOC depth of usage, minimum SOC, departure time SOC, etc
  - VGI activity (V1G and V2G) needs to be clearly communicated to the user.
- There must be a VGI participation upside: enhanced value proposition
  - LCFS credit awards to the customer, in one way or another.
  - Visibility: Utility rate structures should provide for some form of on-bill credits or rewards.
  - CCAs must appropriately carry weight of VGI capacity procurement.
  - Aggregators should be required to share proceeds under an equitable mechanism.

Ford VGI WG Assessment Process Approach

1. Filter “Compiled” use cases for easy-to-implement (4 or 5 rating)
2. Filter easy-to-implement use cases (filter #1 above) to those that have high value ($150 or more)
3. With the shorter list developed from filters #1 and 2 above, VGIWG team needs to commit to reviewing each use case to brainstorm the actions (policy, economic, etc) required to catalyze implementation and how value is captured

Additionally,

- Conduct deeper dive on widely divergent items to better understand “why” on ratings to assess if there are divergent assumptions that should be considered
- Ignore use cases that have no ratings (interpret these to be apparent edge cases that are not highest priority)

MHDV Presentation

What Use Cases Provide Value Now?

- Customer Bill management-almost all use cases
- V2G: only in cases where battery is oversized for vehicle duty cycle, or duty cycle ends midday
  - School buses
  - Possibly commuters
  - Some transit buses
  - Delivery trucks (if returns to depot during low-priced/high solar hours)
- System use cases that are easily implementable- vehicle vocations with daytime charging ability
  - DA energy and Resource Adequacy-avoiding peak charging
    - TOU rates generally provide good arbitrage incentive, but subscription charges can still provide some perverse incentives from a system perspective
    - CAISO PDR resource does not incentivize optimal charging behavior, only high-cost curtailment
  - Renewable integration for vehicle vocations that have ability to charge in day/ discharge or delay charging in evening

School Buses and Commuter Buses

- Vehicles idle through most of day (unless repurposed for other routes); high value in many applications, potential in V2G
- Commuter buses: ability to charge *most of the* day, opportunity for shared charging
  - Significant uptake possible for private shuttles (large orders for silicon valley employers)
  - Partnership opportunities for transit agencies, companies that would allow for midday charging
- School buses
  - Most, if not all charging can be shifted to midday
  - Half or more of battery can provide V2G, allowing for high value compared to other sectors
  - IOUs running pilots so we will learn more soon

Transit Sector

- Bill Management is the application that has the most value
  - Depot charging duty cycle aligns with time-of-use periods and requires minimal changes in behavior to capture
- Renewable Integration is an application that could have value now with en-route charging but has cost and implementation issues
  - Siting issues
  - Cost of equipment and infrastructure
  - Labor and equipment need to be idle during charging
  - Demand and subscription charges
- Customer – Backup/Resiliency has potential value but did not pass screening
  - V2B hardware exists and software will be available in 2021
  - Tradeoff between mobility requirements and power needs

Delivery Sector

- Highest expected population # by 2022 of all MHDV (~3,000)
- Similar to transit, vehicles are primarily driven during daytime, except that routes typically end in the early afternoon (2-3pm)
  - These cases are **well suited** for daytime charging, and particularly renewables integration (just not super-off-peak charging)
- These vehicles will be used as return-to-base or point-to-point and can utilize level 2 charging. So, charging costs are low and infra build-out is fairly simple.
  - Manufacturers not planning V2G capability at this time. Waiting for demonstration of value to customer.

Who has access to VGI value?

- DR/directly market-integrated programs split VGI value of (e.g., real-time energy)
  - Customer saves money, likely split with aggregator
  - LSE gets some benefit if program is designed for RA
- Retail Rates – captures some value for day-ahead, RA, and other applications
  - Customers have access to value
  - Little value for aggregators "now"

FERMATA ENERGY

VGI WORKING GROUP

WHAT VGI USE CASES CAN PROVIDE VALUE NOW, AND HOW CAN THAT VALUE BE CAPTURED?

V2G

1. More than just “2 x V1G”. It is dispatchable, distributed, mobile energy supply.
2. Can produce value to more than cover the optimized cost of EV charging.
3. Can lower the total $ cost of energy produced for the grid, not just the average $/kWh paid. This means the that the grid is better off with an EV than without – i.e. the EV is a true resource, not just an optimized cost.
4. Determining V2G contribution is straightforward and can be directly metered – no baselines or guess work.
5. Constraint is KWh SoC – which is growing per EV.
6. EVs qualify for CA storage mandate
7. When EV owners are compensated for an energy storage service from V2G (and to a lesser extent V1G), demand for EVs increases, which increases EV adoption while directly benefiting utility customers.

COMPARING V1G + V2G CAPACITY

1. Average V2G energy capacity available to discharge vs. V1G charge is 2x to 10x.

2. This does not include V2G's ability to charge and discharge throughout the hour, day, or week. This means V2G has far more potential uptake capacity than V1G as well as greater discharge capacity if an EV can charge between peak events.

V1G / V2G CAPACITY COMPARISON	Charge at Home + Work	Charge at Work Only
EV Driving Efficiency (miles/kWh)	4.00	4.00
Average Commute (miles)	13.00	13.00
kWh used for Commute	3.25	3.25
Max SoC (kWh)	60.00	60.00
Optimized SoC %	80.00%	80.00%
Optimized SoC (kWh)	48.00	48.00
Minimum Reserve SoC %	20%	20%
Minimum Reserve SoC (kWh)	12.00	12.00
Minimum Reserve SoC (miles)	48.00	48.00
Morning Starting SoC (kWh)	48.00	44.75
kWh used for Commute	3.25	3.25
Starting SoC at Work	44.75	41.50
V1G Uptake Capacity to Optimal SoC	3.25	6.50
V1G Uptake Capacity to Max SoC	15.25	18.50
V2G Dcharge Capacity from Optimal SoC	32.75	29.5
V2G Dcharge Capacity from Max SoC	44.75	41.5
V2G Capacity vs. V1G Capacity	10.1x	4.5x
V2G Capacity vs. V1G Capacity	2.9x	2.2x

V2G USE CASES TODAY

- Deploying V2G in the marketplace needs to start with a few “anchor” use cases.
- These anchor use cases act like “killer apps” to produce significant value for customers without the need for major policy shifts, new markets mechanisms, or new utility system control technology.
- Once V2G units have been deployed with anchor use cases, new use cases can be added to the service “stack” since prohibitive fixed costs have been covered by an anchor use case.

Some of these use cases today include:

1. Home backup
    1. Straightforward value proposition for anyone with an EV and a home.
    2. Homeowners routinely pay $5,000 or more to install generators and well over twice that for a home battery storage system.
    3. Cost for a bidirectional home unit is estimated at about $5,500 with installation. An inexpensive level 2 unidirectional is about $2,000 with installation. So, a homeowner, who is going to get a home charger anyway, would pay $3,500 more for the backup. This is $1,500 savings right away, before any incentives.
    4. Main constraint is the lack of a cost-effective hardware product. New cost-effective products are planned for 2020/2021 release.
2. Customer Bill Management
    1. Managing commercial and industrial electricity bills with site located stationary batteries is an established service and industry. This same practice can be done with an EV and bidirectional charger.
    2. To capture this value, chargers must be behind-the-meter and integrated with building load.
    3. Expected customer bill savings in California range from $1,700 – $5,800 per year per EV , with an average of ~$3,500.
    4. Over 200,000 estimated customer sites where V2G customer bill management is applicable.

V1G vs V2G USE CASE SCORING

V1G + V2G should be assessed separately and independently.

1. V1G scores are driven predominantly by an installed base of unidirectional chargers.

2. V2G scores depend on a change in the status quo and the introduction of new technology.

3. V1G is a like a “value” investment for a stock. Like large companies that are undervalued, the large existing base of unidirectional infrastructure is undervalued in the absence of V1G.

4. V2G is a like a “growth” stock. There is a not a large existing base of infrastructure, but the potential value of growing a new technology is significant.

5. While V1G score value is high today because many unidirectional chargers exist, the V2G opportunity will be missed if decisions are solely based on optimizing a status quo.

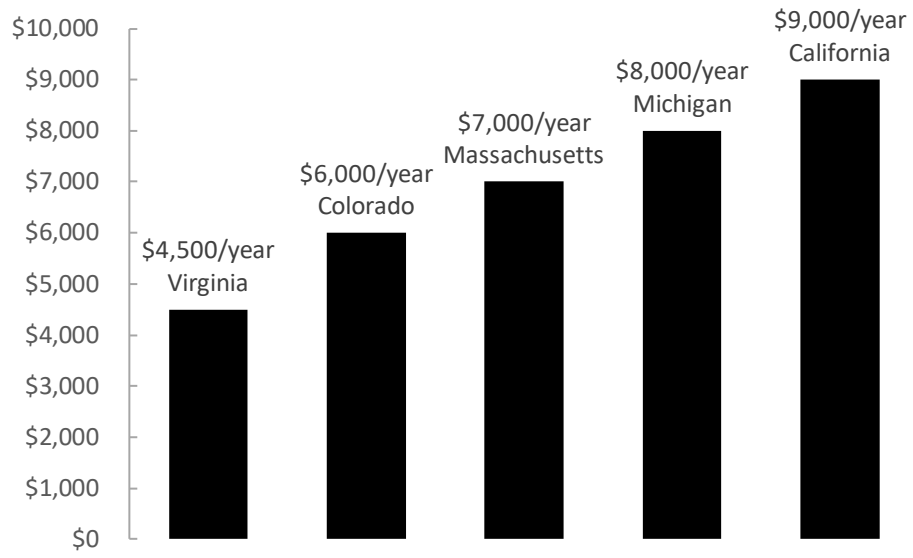
CUSTOMER BILL MANAGEMENT USE CASE

Fermata Operations - EIT Manufacturing Facility, VA

CUSTOMER BILL MANAGEMENT USE CASE

FERMATA OPERATING RESULTS – 5 Months

- In June 2019, Fermata deployed our prototype FE-15 charger and 2018 40kWh Nissan LEAF at EIT manufacturing facility in Danville, VA.
- Utilizing our cloud software's demand charge management application, the system was able to successfully monetize $187.50 by discharging a Nissan LEAF to reduce the peak kW demand portion of EIT's monthly electricity bill.
- This was the maximum dollar amount achievable under the local retail tariff as the full 12.5kW capacity of the charger was successfully applied to reduce the peak event by 12.5 kW, resulting in a 100% performance score. All savings have been verified by comparing EIT's June electricity bill to meter and charger data.
- Demand charge management was performed three times during month, each event lasting approximately 45 minutes with the state of charge of the LEAF battery never falling below 75% in any event.
- Since then, the system continues to function 24/7. As of November 2019, the system has produced $776.51 in savings over five months.
- These results are analyzed pro-forma for different markets using our planned 25kW FE-25 in the chart below. *Note: these are based on average price ranges for specific tariffs. Fermata is currently performing a utility specific proforma for the California and will post this soon.*

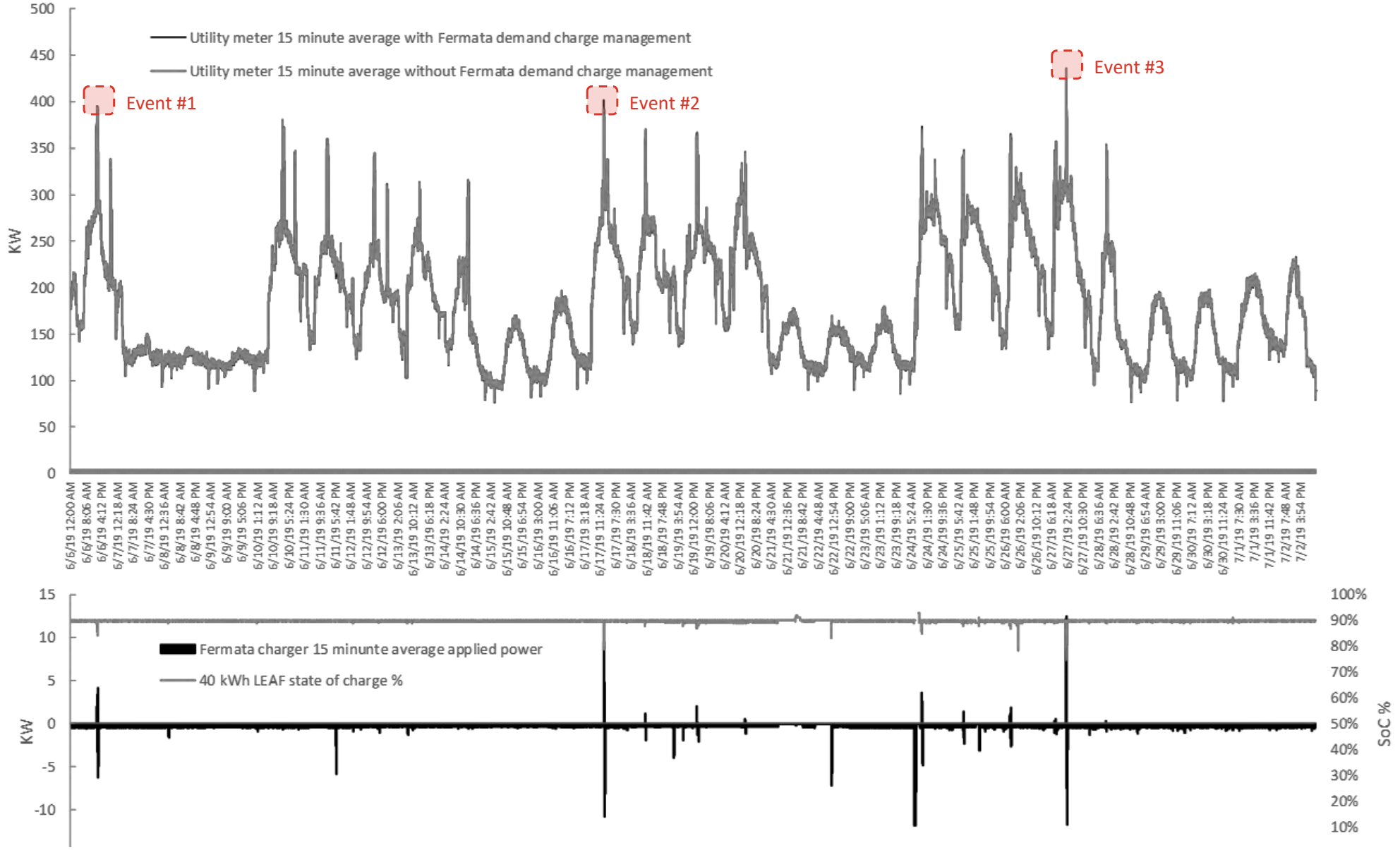


CUSTOMER BILL MANAGEMENT USE CASE

Fermata Operations - EIT Manufacturing Facility, VA

CUSTOMER BILL MANAGEMENT USE CASE

Fermata Operations - EIT Manufacturing Facility, VA



CUSTOMER BILL MANAGEMENT USE CASE

DEMAND CHARGE MANAGEMENT EVENT 3
1:59pm June 27th, 2019

Total time spent discharging:

- 15 minutes

Total time spent charging:

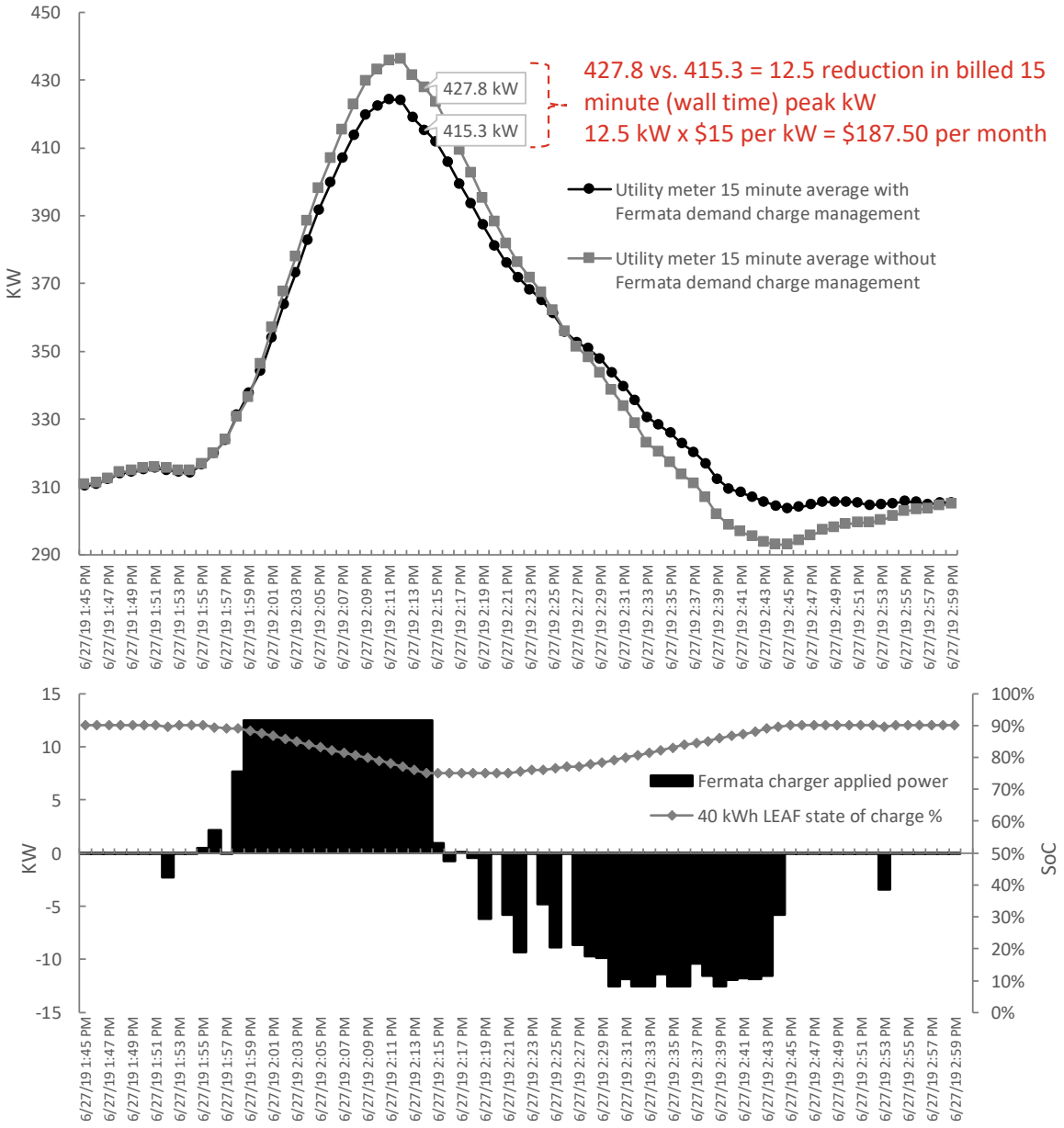
- 30 minutes

Total event peak kW reduced:

- 12.5 kW

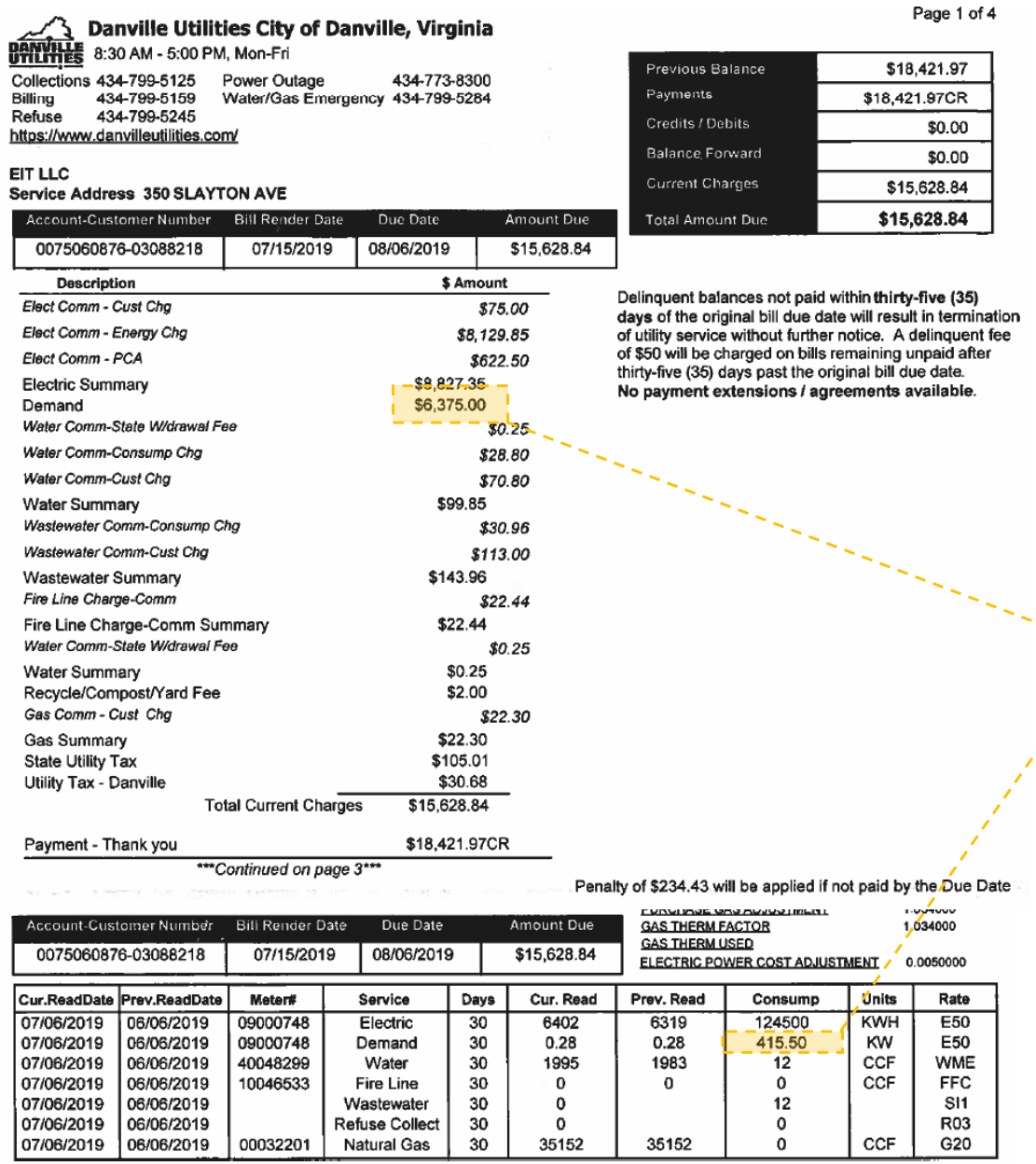
Minimum LEAF state of charge

- 75%



CUSTOMER BILL MANAGEMENT USE CASE

FERMATA OPERATING RESULTS | VERIFIED BY BILL



Page 1 of 4

Danville Utilities City of Danville, Virginia
8:30 AM - 5:00 PM, Mon-Fri

Collections 434-799-5125 Power Outage 434-773-8300
Billing 434-799-5159 Water/Gas Emergency 434-799-5284
Refuse 434-799-5245
https://www.danvilleutilities.com/

EIT LLC
Service Address 350 SLAYTON AVE

Account-Customer Number	Bill Render Date	Due Date	Amount Due
0075060876-03088218	07/15/2019	08/06/2019	$15,628.84

Previous Balance	$18,421.97
Payments	$18,421.97CR
Credits / Debits	$0.00
Balance Forward	$0.00
Current Charges	$15,628.84
Total Amount Due	**$15,628.84**

Description	$ Amount
Elect Comm - Cust Chg	*$75.00*
Elect Comm - Energy Chg	*$8,129.85*
Elect Comm - PCA	*$622.50*
Electric Summary	~~$8,827.35~~
Demand	$6,375.00
Water Comm-State Wdrawal Fee	*$0.25*
Water Comm-Consump Chg	*$28.80*
Water Comm-Cust Chg	*$70.80*
Water Summary	$99.85
Wastewater Comm-Consump Chg	*$30.96*
Wastewater Comm-Cust Chg	*$113.00*
Wastewater Summary	$143.96
Fire Line Charge-Comm	*$22.44*
Fire Line Charge-Comm Summary	$22.44
Water Comm-State Wdrawal Fee	*$0.25*
Water Summary	$0.25
Recycle/Compost/Yard Fee	$2.00
Gas Comm - Cust Chg	*$22.30*
Gas Summary	$22.30
State Utility Tax	$105.01
Utility Tax - Danville	$30.68
Total Current Charges	$15,628.84
Payment - Thank you	$18,421.97CR

Continued on page 3

Delinquent balances not paid within **thirty-five (35) days** of the original bill due date will result in termination of utility service without further notice. A delinquent fee of $50 will be charged on bills remaining unpaid after thirty-five (35) days past the original bill due date.
No payment extensions / agreements available.

Penalty of $234.43 will be applied if not paid by the Due Date

Account-Customer Number	Bill Render Date	Due Date	Amount Due
0075060876-03088218	07/15/2019	08/06/2019	$15,628.84

GAS THERM FACTOR 1.034000
GAS THERM USED
ELECTRIC POWER COST ADJUSTMENT 0.0050000

Cur.ReadDate	Prev.ReadDate	Meter#	Service	Days	Cur. Read	Prev. Read	Consump	Units	Rate
07/06/2019	06/06/2019	09000748	Electric	30	6402	6319	124500	KWH	E50
07/06/2019	06/06/2019	09000748	Demand	30	0.28	0.28	415.50	KW	E50
07/06/2019	06/06/2019	40048299	Water	30	1995	1983	12	CCF	WME
07/06/2019	06/06/2019	10046533	Fire Line	30	0	0	0	CCF	FFC
07/06/2019	06/06/2019		Wastewater	30	0		12		SI1
07/06/2019	06/06/2019		Refuse Collect	30	0		0		R03
07/06/2019	06/06/2019	00032201	Natural Gas	30	35152	35152	0	CCF	G20

Billed kW peak demand reduced 12.5 kW by discharging Nissan LEAF into the building to reduce metered peak load.

415.5 kW (billed from grid)
\+ 12.5 kW from LEAF (“behind the meter”, unbilled)
= 427.0 kW actual building demand during peak.

12.5 kW x $~15 per kW = $187.50 per month savings

FERMATA OPERATING PRO FORMA ANALYSIS

Current Operations in Danville, VA

12.5	x	$15	=	$188	x	12	=	$2,250
Charger kW		*$ per kW price*		*Monthly Savings per charger*		*months*		*Annual Savings per Charger*

Same system above in California

12.5	x	$30	=	$375	x	12	=	$4,500
Charger kW		*$ per kW price*		*Monthly Savings per charger*		*months*		*Annual Savings per Charger*

25 kW system in California

25	x	$30	=	$750	x	12	=	$9,000
Charger kW		*$ per kW price*		*Monthly Savings per charger*		*months*		*Annual Savings per Charger*

Additional Brainstorming for Answering PUC Question (a)

- What other ideas are sitting in the room right now?
- What are some other views of the Excel scoring results we could display?
- Turn to your partner for 5-7 minutes and see if you can come up with any new ways of looking at the scoring results or providing answers to the PUC Question

Break

GRIDWORKS

Discussion of Party Proposals

1. What was one idea or answer presented?

2. What ideas or answers were most interesting?

3. What about these ideas or answers sound like good news for your organization?

4. Which ideas or answers seem clear and can be readily agreed upon by the Working Group?

5. Which ideas or answers need further consideration and discussion?

6. What further work may be needed beyond this workshop?

Address by Commissioner Rechtschaffen

Discussion to reach convergence and consensus on answers to PUC Question

What VGI use cases can provide value now, and how can that value be captured?

- Where do we have consensus on answers to this question?
- Where do we have other answers not agreed by all?
- How do we complete convergence and consensus during the following week?
- Let's put all our existing answers to this question into three buckets:

  Bucket 1: Consensus / easy / straightforward

  Bucket 2: Clear answer, but we don't all agree, so non-consensus

  Bucket 3: Not clear what the answer is, needs more work to define

- What are the key differences between answers to the PUC Question that we currently have? If there are key differences, how can they be resolved?

Policy Implications from Scoring and Screening

- Past stakeholder comments on policy from screening, scoring, and Subgroup discussions
- Policy-relevant items from yesterday's and this morning's discussions
- Looking ahead to next stage of Working Group on policy recommendations

Wrap Up

General

- Recap action items
- Other items?
- Next Workshop: 3/19-3/20 in San Francisco or Oakland

Subgroup "C"

- Sub-group work schedule: 1/30 to 3/12
- Proposals due to Subgroup by: TBD
- First sub-group planning call: TBD
- Sub-group progress calls: TBD