Deliverable 2
Costs & Benefits

Vehicle-Grid Integration Communications Protocol Working Group

Noel Crisostomo, Air Pollution Specialist, Fuels & Transportation Division
California Energy Commission

California Public Utilities Commission - San Francisco

August 21, 2017

Deliverable 2 example and proposal (from 8/7 CEC PPT)

1. Evaluate use of [Comm. Protocol 1] to implement Use Case [1]

Stakeholder	Costs	Inc/Dec Factors	Benefits	Inc/Dec Factors
User				
Host				
PEV OEM				
EVSE OEM				
Operator				
VGI Aggregator				
DSO/LSE/CCA/ISO				
Ratepayer/Society				

2. Repeat for [Comm. Protocol 1-X], or alternative, for Use Cases [1 – X]

3. Juxtapose use case implementations, delineate opportunity costs

- Subgroups?
- Divide and Conquer:
  - Type of implementation: Comm. Protocol, alternative, or null *(Suggested)*
  - Use Cases
  - Costs
  - Benefits

Connection to Deliverable 1

- ***Use Cases*** → extracted ***Requirements***
- ***Standards*** → mapped to meet ***Requirements***
  - Standards or Alternatives
    1. IEEE 2030.5 (SEP 2.0)
    2. CHAdeMO (IEEE 2030-1-1)
    3. CNMP (IEEE P 2690)
    4. ISO 15118
    5. OpenADR *2.0b*
    6. OCPP v1.6
    7. SAE J3072 / SAE J2847 / SAE J2931 / SAE J1772
    8. Telematics
- Launch point for Deliverable 2, Question 1

Subject Matter Expert Teams Designing Implementations

- Automaker

- EVSE Manufacturer

- VGI Aggregators

- Grid Operator

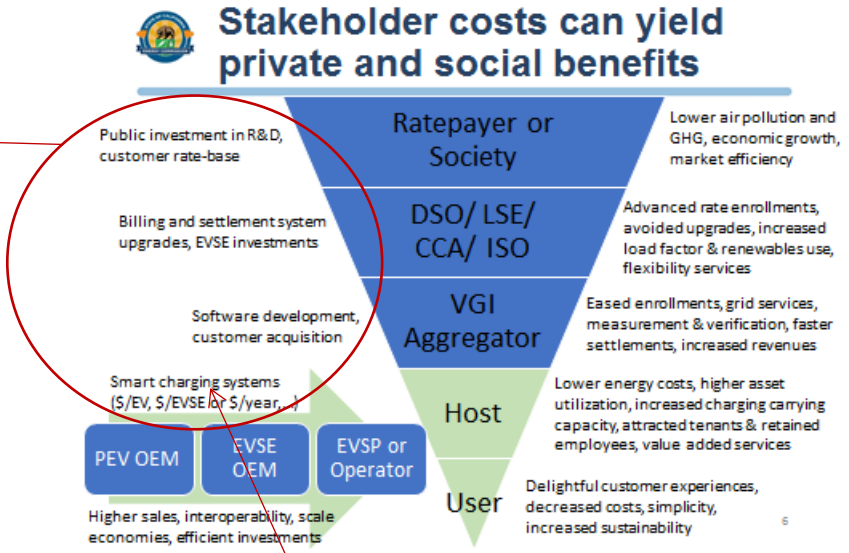
Standard 1

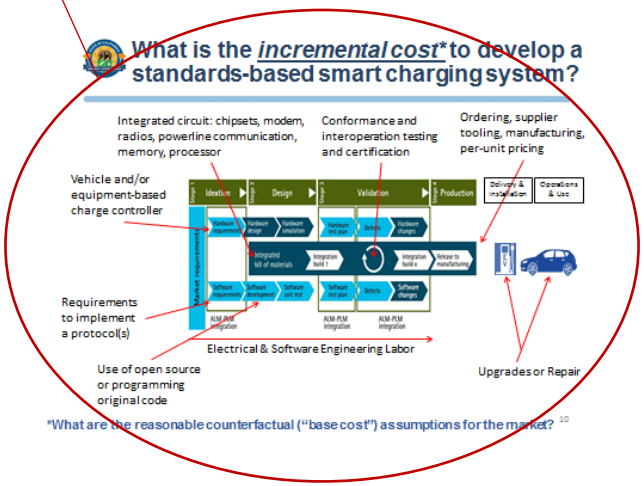
…

Alternative

List Cost Categories necessary to implement one use case

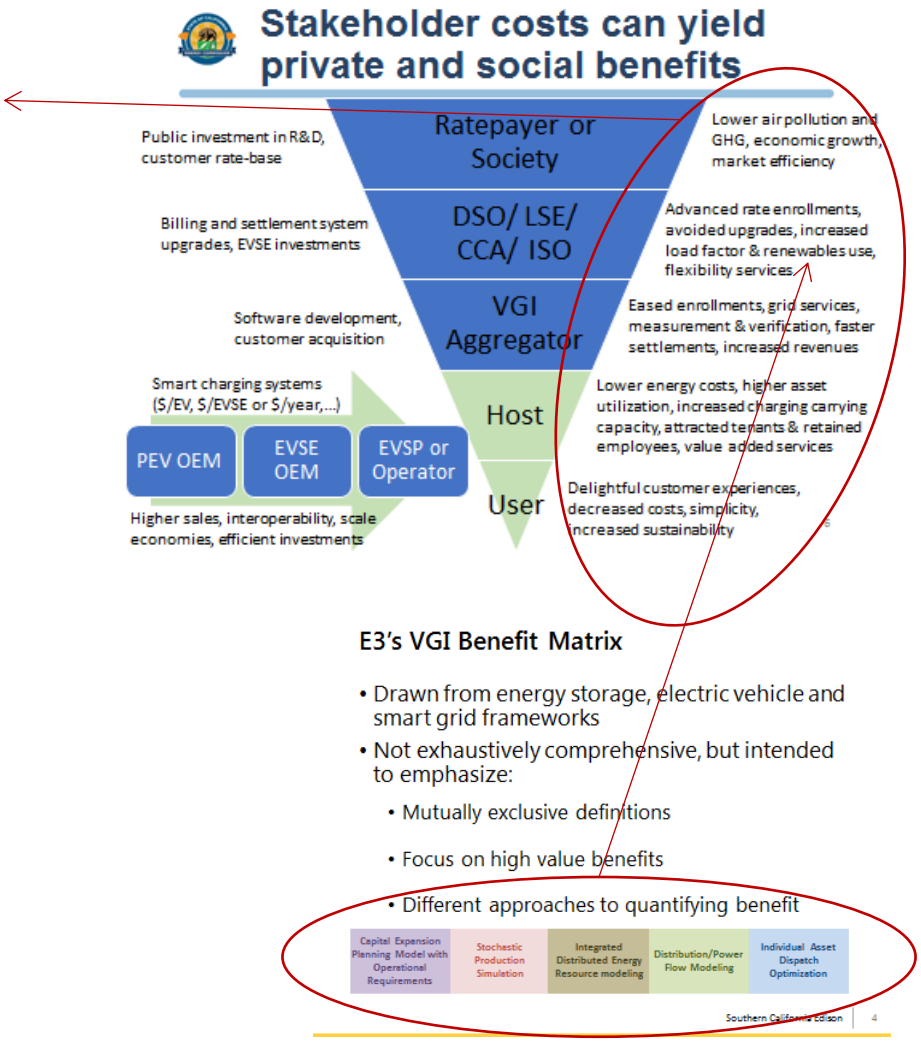
1. Standard 1
    1. EV charge controller
        1. Quant. if available
    2. EVSE charge controller
        1. Quant. if available
    3. …
2. Categorize costs given other stakeholders needed to complete use case.
3. How does adoption or absence of standard affect cost? List factors increasing or decreasing costs.
4. Repeat for other use cases. Indicate costs added or saved when implementing other use cases
    1. If applicable. If subsequent implementations do not change cost structure, do not list.





List Benefit Categories achievable from implementing one use case

1. Standard 1
    1. Demand charge management
        1. Quant. if available
    2. Frequency regulation
        1. Quant. if available
    3. …
2. Categorize benefits accrued to stakeholders.
3. How does adoption or absence of standard affect benefits? List factors increasing or decreasing benefits.
4. Repeat for other use cases. Indicate benefits added or lost when implementing other use cases
    1. If applicable. If subsequent implementations do not change cost structure, do not list.



Note: Listing Costs & Benefits

- In the absence of knowing what existing (billing, metrology, communication) supporting systems or grid service markets or available or needed to complete service, list them.
  - Can be removed later if determined to be available.
  - Unavailable items can be noted as policy issues.
- Costs
  - Note assumed counterfactual charging system.
- Benefits
  - Working Group will be gathering Business Practice Manual and utility contract terms required for deliverability.
  - Can include qualitative, non-grid service benefits.

Deliverable 2 Questions 1 & 2

- Answers to Question 2 flow from analysis and synthesis of Question 1.
  - Juxtapose costs & benefits of implementations
    - Distinguish for use cases ***only with material changes*** in equipment structure or stakeholders involved
  - Combine and eliminate duplications in categories
  - Identify commonalities and options for net benefits

- Next Steps
  - Today: Identify SME teams designing implementations of standards and alternatives
  - Build upon cost/benefit presentations from 8/7 and more detailed instructions and outline
  - 9/5: Present on progress

Questions or Feedback?

Noel Crisostomo | CEC
noel.crisostomo@energy.ca.gov

Questions to keep in mind…

- What benefits are accrued with certain information and what is foregone without it?
  - How is adoption enabled or hindered?
  - What will encourage private investment?
  - What future use cases are stifled without intelligence?
- What are the implementation costs if levelized over “widespread” scale?
  - Sensitivity to thousands of units? Millions?
- How can the efficiencies of a international automotive market be leveraged?
- What advanced technologies are concerning? How do risk tolerances differ among stakeholders?

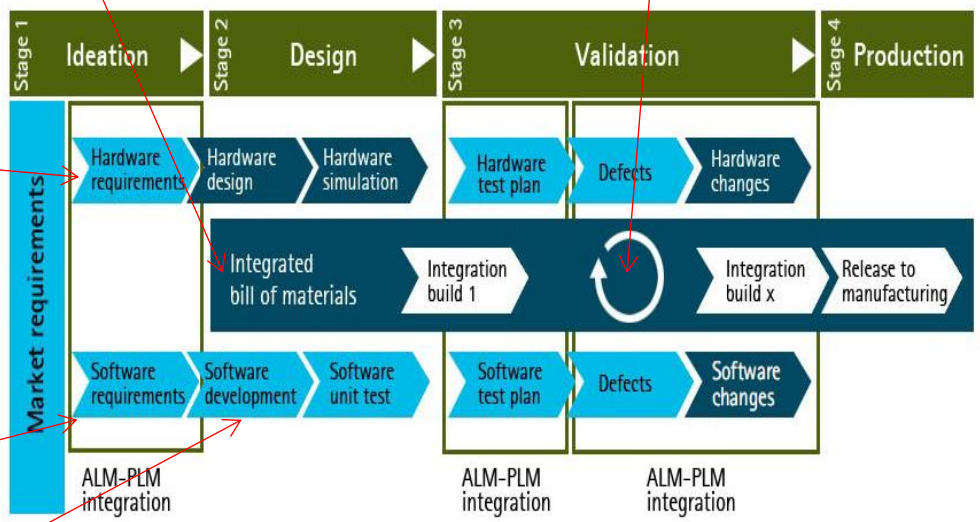
What is the *incremental cost** to develop a standards-based smart charging system?

Integrated circuit: chipsets, modem, radios, powerline communication, memory, processor

Conformance and interoperation testing and certification

Ordering, supplier tooling, manufacturing, per-unit pricing

Vehicle and/or equipment-based charge controller



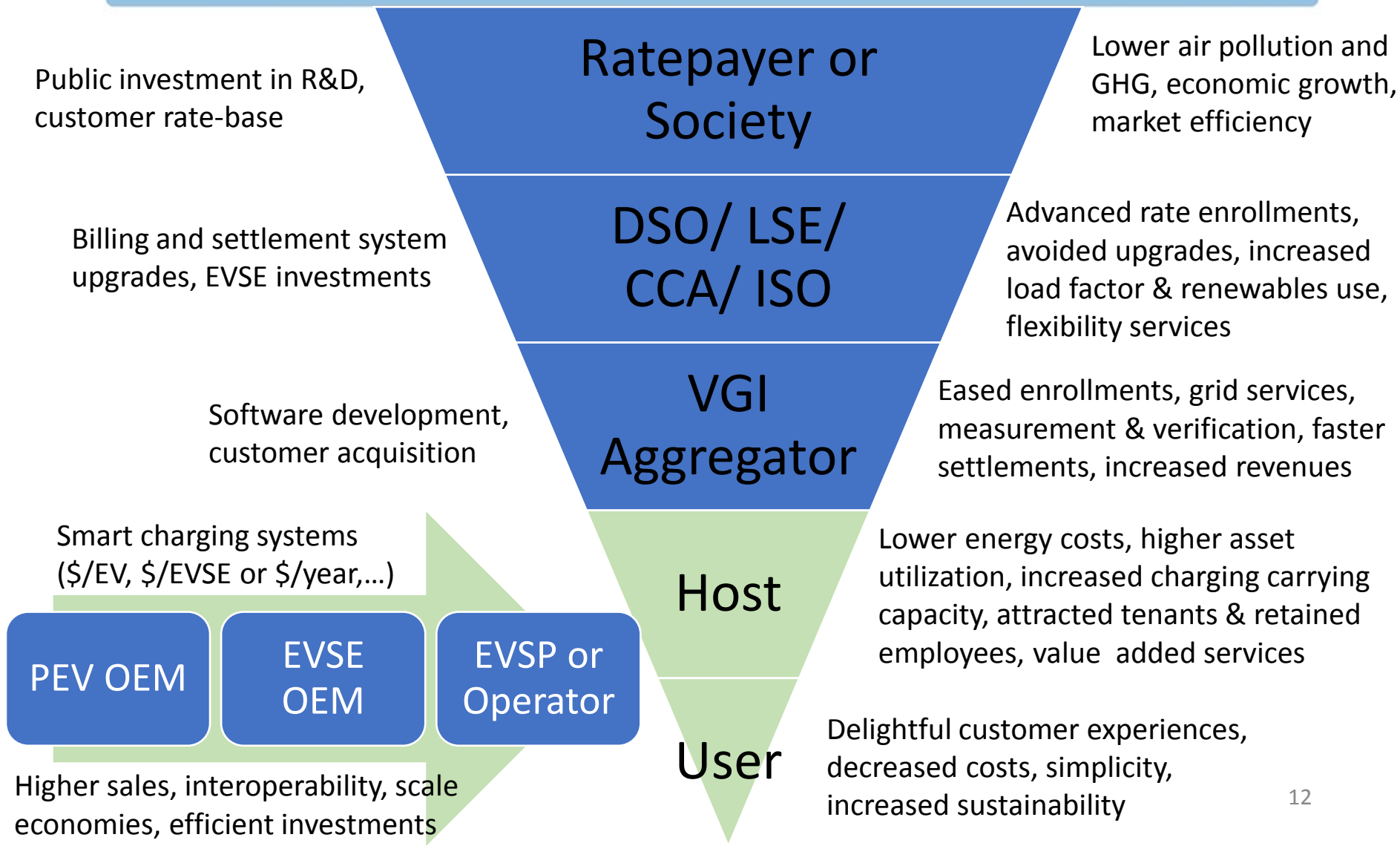
Requirements to implement a protocol(s)

Use of open source or programming original code

Upgrades or Repair

***What are the reasonable counterfactual ("base cost") assumptions for the market?**

Stakeholder costs can yield private and social benefits



Achieving benefits for California relies on PEV charging data

Data should be

- Accountable
- Specific
- Verifiable
- Fungible
- Secure

Other non-policy uses for this data will exist!

Select Agency ZEV Activities
Reliable operation of the grid by **scheduling PEV demand**
Locating electric vehicle **charging stations**
Open, **authenticated access** to public charging sessions
Charge control per Time-Of-Use or Dynamic rates
Provision and settlement of **grid ancillary services** as DERs
Accurate **receipt of commercial sale** of electric fuel
Monitoring traffic flows/congestion, road capacity, and tolling
Validating **Credit Generation** for Low Carbon Fuel Standard
Analyzing utilization and maintenance of deployed networks
Improving load and generation **forecasting and grid planning**
Allocating construction costs to drivers proportionate to use
Target future **strategic investments** in charging networks
Track **deployment, petroleum & emissions** reduction goals
Meet energy efficiency and **fleet procurement** targets

Revised per CEC/CPUC December 7, 2016 Vehicle-Grid Integration Communications Standards Workshop