
t&d

Logic Model EV-Grid

CEC EPC Project 14-086

Distribution System Aware Vehicle to Grid Services for Improved Grid Stability and Reliability

EPRI ELECTRIC POWER RESEARCH INSTITUTE

Project Overview

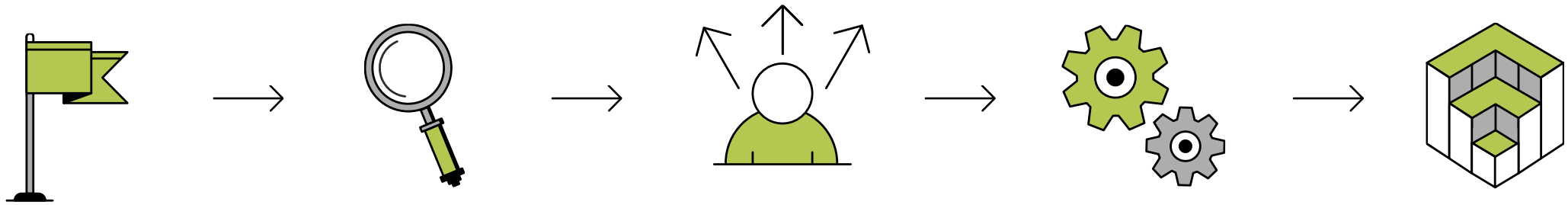
Plug-in electric vehicles (PEVs) are poised to become viable distributed energy resources, enabling improved grid stability and reliability through an integrated, two-way, vehicle-to-grid (V2G) system that demonstrates a capacity to be distribution-aware, self-regulating, interoperable, secure and open.

The “Distribution System Aware Vehicle to Grid Services for Improved Grid Stability and Reliability” project blends analysis, simulation, and implementation of an integrated vehicle-to-grid (V2G) system that is managed through a transformer management system. This integrated system uses open standards and interoperable protocols to provide connectivity and communications between the grid and the EV. This operates as flexible energy storage, to enhance grid reliability and stability.

This project tests protocols for verifying electric V2G interoperability and compatibility with CPUC interconnection requirements.

EV-Grid Logic Model Function

Updated: May 2019



PROJECT GOALS

Goals of this EPIC research and development project

KEY FINDINGS

Successes and challenges identified through research and development.

OPPORTUNITIES TO EXPLORE

Activities or circumstances that could fill in the gaps and leverage points to enable forward movement.

EXPECTED OUTCOMES

Most likely near term and longer term outcomes identified by the TA&D project team.

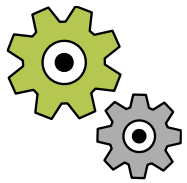
NEXT STEPS TO FOLLOW UP

Knowing what we know now, these are the suggested next steps.

RESEARCH QUESTIONS

1. Can the electric storage system (ESS) on board a plug-in electric vehicle allow for two-way power flow?

1. Can the ESS be distribution-aware, self-regulating, interoperable, secure and open as well as scalable and flexible?



PROJECT SUCCESSES

1. Validated end-to-end interoperability and application of desired standards.
2. TMS automated energy management supports grid service requests.
3. Simulated data verifies algorithmic functionality.
4. Positive value proposition for EV owners.
5. Grid-tied bi-directional charger & J3072 client control module integrated.
6. System integration revealed compatible & interconnected grid interaction.
7. Effective for residential Transformer energy monitoring – community aggregation application.

Our Opportunities

MISSING PIECES

- Defined SAE J3072 Interoperability, certification requirements & harmonized labeling.
- V2G incentive structures acceptable to customers.
- Clearer electrical integration standards.

LEVERAGE POINTS

- Battery costs declining.
- Competitive PEV market.
- Regulatory drivers pushing for electrification.
- CPUC identifies PEVs as part of reliable grid management solution.

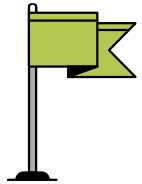
Our Challenges

NEXT STEPS

- Define SAE J3072 Interoperability, certification requirements & harmonized labeling.
- Develop V2G incentive structures acceptable to customers.
- Define clearer electrical integration standards.
- Develop next gen ‘edge of grid’ computing technology.
- Address adoption of J3072 by utilities for application to Rule 21 Interconnection requirements.
- Test capability of On-Vehicle V2G inverters to meet Rule 21 revisions.

DESIRED OUTCOMES

- Transformer Management System software can be integrated at any edge of the grid node.
- PEVs become an integrated resource for grid stabilization and reliability.
- Adoption of J3072 by utilities for application to Rule 21 Interconnection requirements.
- Capability of On-Vehicle V2G inverters to meet Rule 21 revisions.



PROJECT GOALS

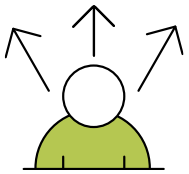
1. CAN THE ELECTRIC STORAGE SYSTEM (ESS) ON BOARD A PLUG-IN ELECTRIC VEHICLE ALLOW FOR COST-EFFECTIVE TWO- WAY POWER FLOW?

2. CAN THE ESS BE DISTRIBUTION-AWARE, SELF-REGULATING, INTEROPERABLE, SECURE AND OPEN AS WELL AS SCALABLE AND FLEXIBLE?

KEY FINDINGS

SUCCESSES

- Validated end-to-end interoperability & application standards.
- TMS automated energy management supports grid service requests.
- Simulated data verifies algorithmic functionality.
- Positive cost/ benefit value prop for EV owners, utility and societal perspectives.
- Grid-tied bidirectional charger & J3072 client control module integrated.
- System integration revealed compatible & interconnected grid interaction.
- Effective for residential Transformer energy monitoring – community aggregation application.



OPPORTUNITIES

MISSING PIECES

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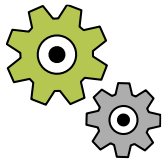

EXPECTED OUTCOMES

NEAR-TERM OUTCOMES

- Adoption of J3072 by Utilities for application to Rule 21 Interconnection requirements.
- Capability of On-Vehicle V2G inverters to meet Rule 21 revisions.

LONGER-TERM OUTCOMES

- Transformer Management System software can be integrated at any edge of the grid node.
- PEVs become an integrated resource for grid stabilization and reliability.

NEXT STEPS

NEXT STEPS

1. SAE J3072 Interoperability Certification and harmonized UL/SAE labeling defined.
2. Next gen ‘edge of grid’ computing technology.
3. Customer incentive mechanisms developed.
4. Electrical grid integration & compatibility requirements for on-vehicle inverters defined.
5. Large scale pilot testing.

ACTIVITY/ OWNERS

1. Secure project sponsor - EPRI
2. Develop scope for next round – EPRI/ Participating IOUs
3. Re-engage PEV and software manufacturers

Thank you for coming

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