



ADVANCING FEDERAL
INFRASTRUCTURE
THROUGH INNOVATION



CINCINNATI, OHIO
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National Renewable Energy Laboratory
Center for Integrated Mobility Sciences

PLANNING



Building & Training Your Team

EV Champion
Training Series

Federal Fleet EV
Training Materials

EV U-Finder



Identifying ZEV & EVSE Opportunities

ZEV Planning and
Charging (ZPAC) Tool

FleetDASH AFV
Screening Tool

Alternative Fuels Data
Center

DESIGN



Design EVSE; Complete EVSE Site Assessments

Federal Fleet EVSE
Planning Form

EVSE Site Assessment
Findings at Army Facilities

EVI-Locate EVSE Cost
Estimator Tool Pilot

FEMP Managed EV
Charging Webpage

Bidirectional Charging and
EVs for Mobile Storage

Federal Workplace
Charging Program

EXECUTE



Deploying and Operating ZEVs

FEMP Procuring EV
Infrastructure Webpage

GSA Fleet Electrification
Website

federal_fleets@ee.doe.gov

ZEV Planning and Charging (ZPAC)

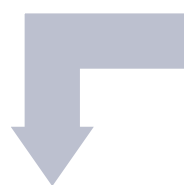
Garage	Zip	Vehicles	Recommended EVs
NREL Bldg. 16	01234	25	17
NREL STM Lot	01234	65	44
NREL Wind	56789	10	9



Recommended EV?

- (1) Model availability
- (2) Fuel quantity [GHGs+\$\$]
- (3) Public recharging frequency

EV Selection?
(1) Mission decision



Garage	Zip	Vehicles	Recommended EVs	Selected EVs
NREL Bldg. 16	01234	25	17	12
NREL STM Lot	01234	65	44	36
NREL Wind	56789	10	9	4

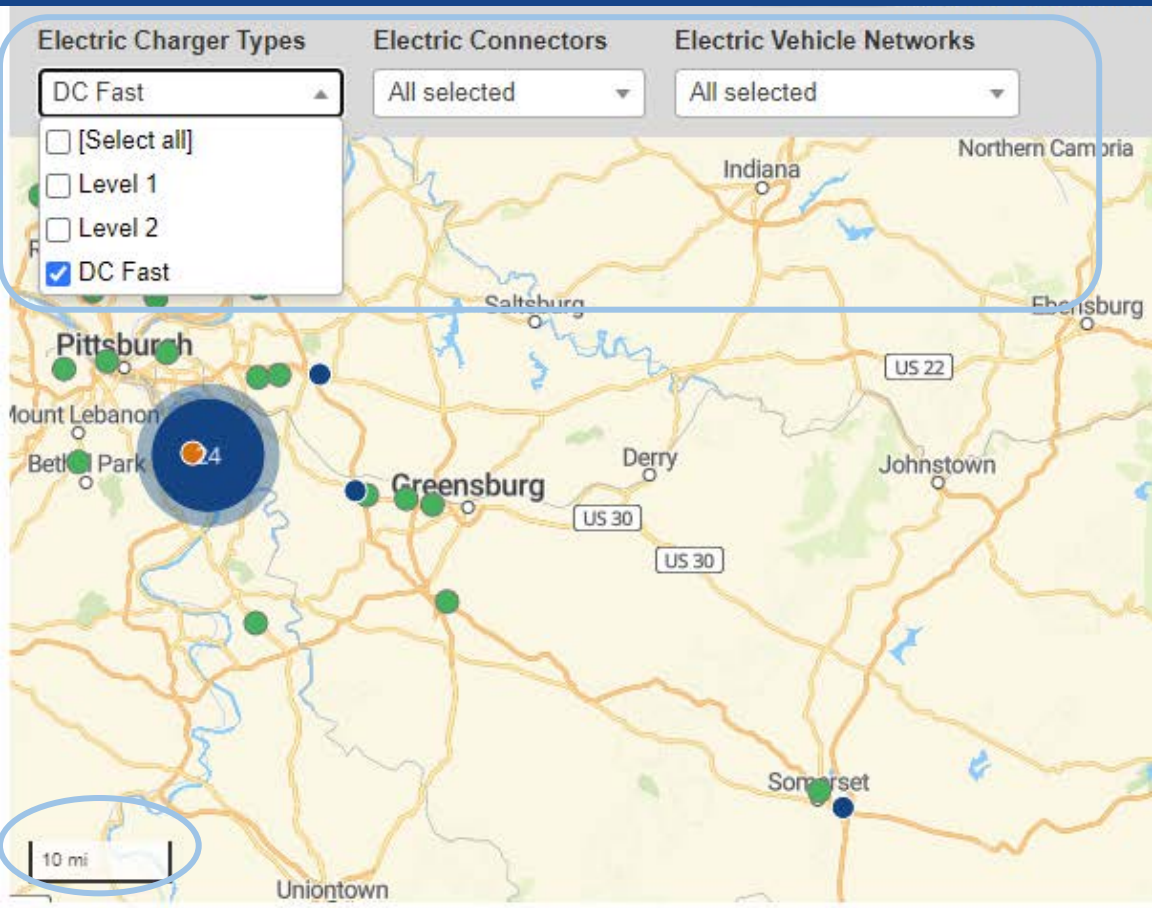
Garage	Zip	Vehicles	Recommended EVs	Selected EVs	Priority Site?
NREL Bldg. 16	01234	25	17	12	Yes
NREL STM Lot	01234	65	44	36	Yes
NREL Wind	56789	10	9	4	No

Priority Site?

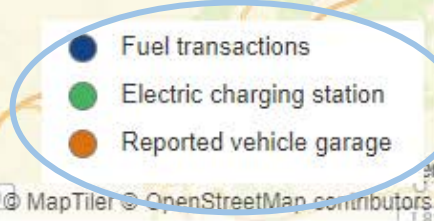
- (1) Number of potential EVs
- (2) Electrical capacity
- (3) Site challenges

FleetDASH Screening Tool

<https://federalfleets.energy.gov/FleetDASH/>



Screen EV candidates
individually based
on operational
geography, costs,
and fueling patterns



EVI-LOCATE

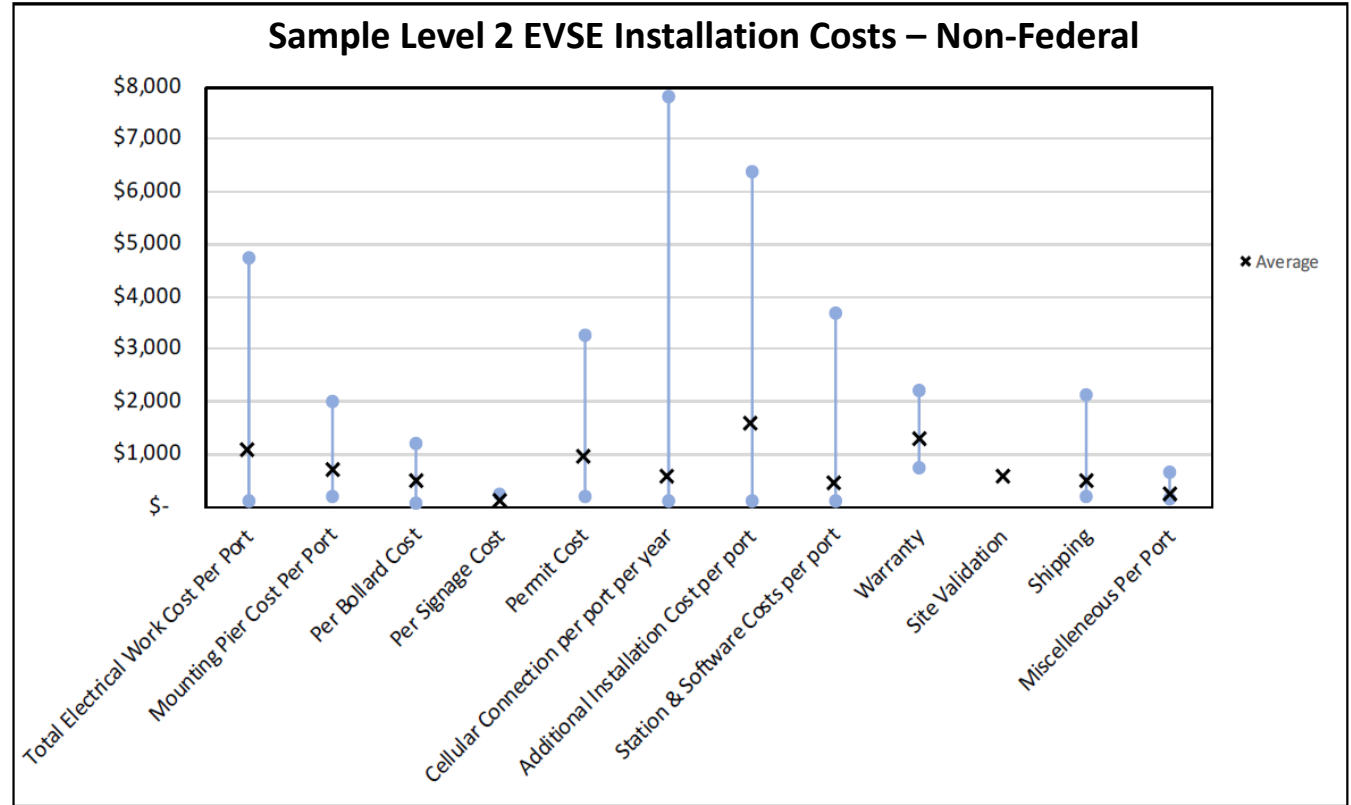
1. Design EVSE installations
2. Estimate project costs
3. Manage projects across agency



User-driven tool with design considerations and cost estimates calculated automatically

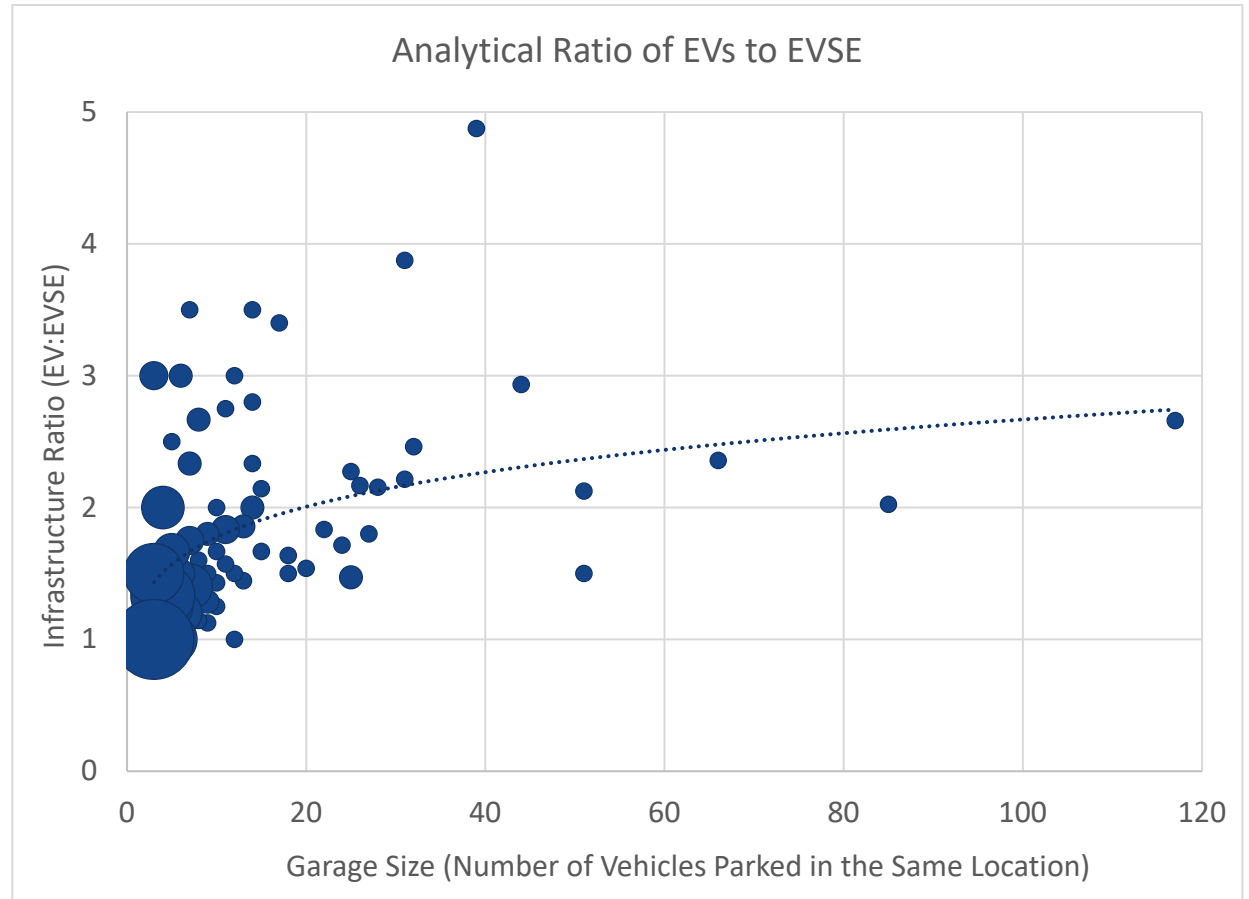
EVSE Costs

- AC Level 2 unit costs on GSA BPA vary between \$450 and \$68,500
- Significant variance in installation costs based on location, electrical upgrades, permit requirements, construction, and unit costs
- EVI-LOCATE cost estimator is site specific and geared toward federal sites



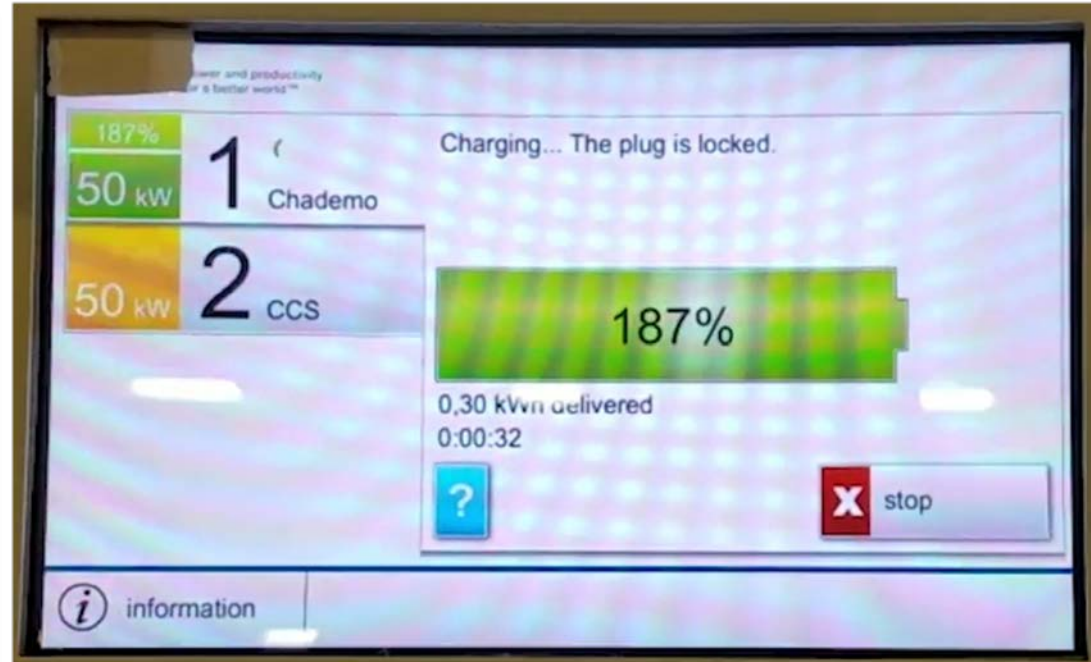
EVI-Ratio

- EVs do not always require a 1:1 ratio of EV:EVSE
- Federal fleet vehicles are not always operated daily, and they may only drive a few miles in a day
- Optimized ratio that accounts for variance in individual vehicle operations garaged at specific sites could save 29% on charging infrastructure costs
- Consider parking logistics and conservative assumptions



EVSE Cybersecurity Considerations

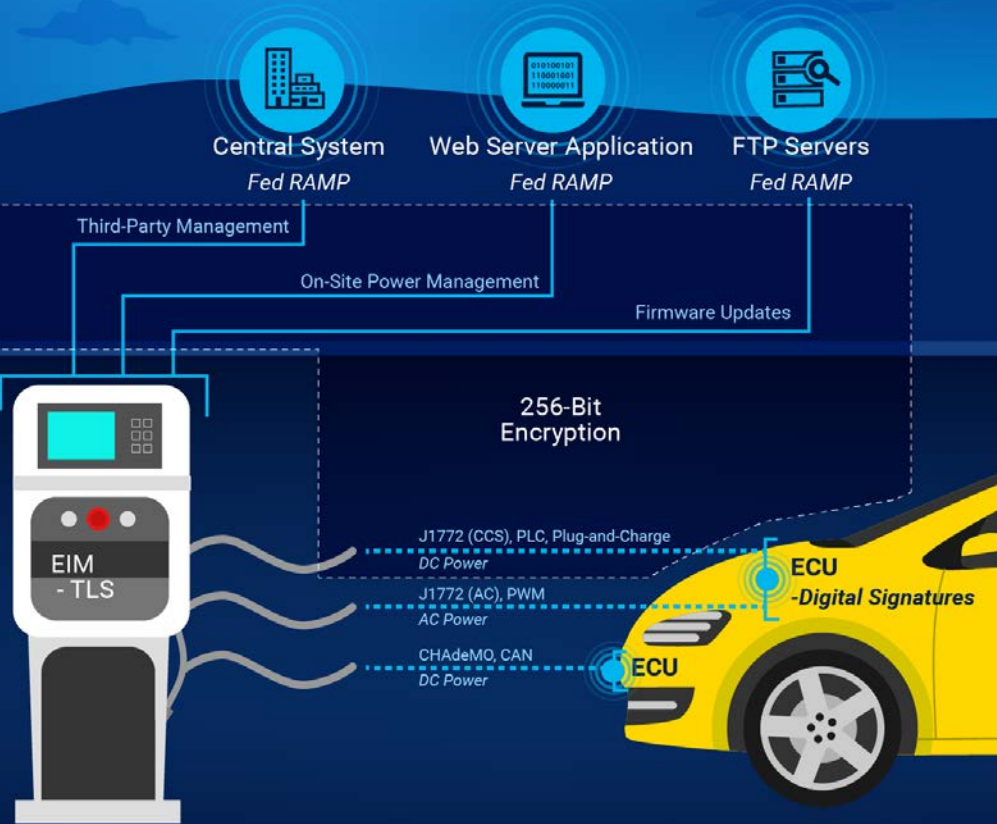
- Network Hacks
 - Free access to EVSE
 - Credit cards
 - Personal information
- Power Delivery
 - Turn EVSE on and off
 - Damage battery
- Vehicle Intrusion
 - Requires compromising EV and EVSE
 - Only possible with DCFC
 - Limited list of approved commands



Ken Rohde, Idaho National Laboratory

<https://www.youtube.com/watch?v=TH7ccwGH4rw>

EVSE Cybersecurity Measures



Vehicle Cybersecurity Threats and Mitigation Approaches



Physical Access



Network Monitoring



Encryption



Certifications

<https://www.energy.gov/eere/femp/federal-fleet-cybersecurity>

Components

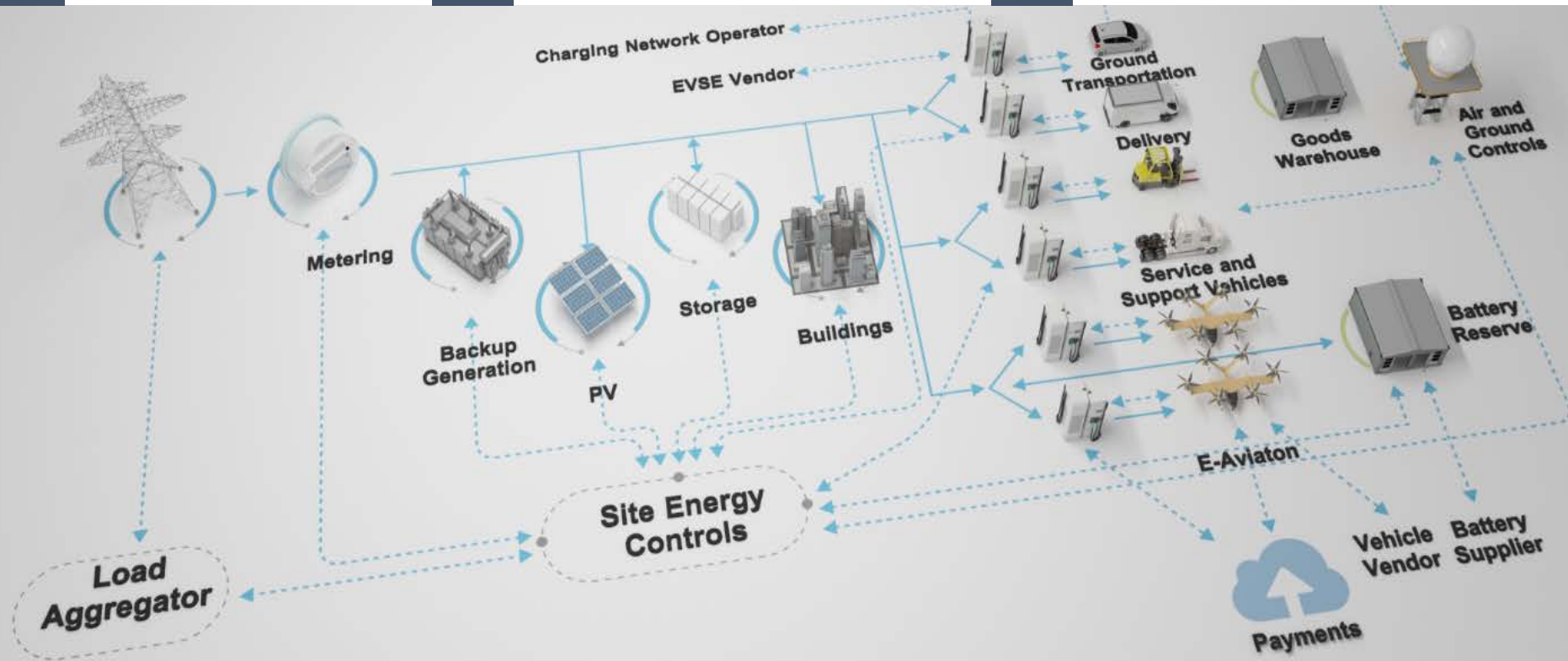
- EVSE
- Vehicle
- Charge Network Operations Center

Stakeholders

Charge Network Operator
EVSE Manufacturer
User/Driver
Vehicle Manufacturer
Fleet and Facility Managers

Interfaces

User to EVSE
User to Charge Network Operations
Vehicle to EVSE
EVSE to Charge Network Operations
Fleet Operator to Network



Overview of EVSE Cybersecurity Concerns

- EVSE cybersecurity is evolving
- Prior vulnerabilities have been identified and others are likely to be identified in the future
- Risk reduction/mitigation
 - Leverage procurement guidance
 - Assess risk level of data exchanges and site-specific handling requirements
 - Use defense in depth design and engineering approaches
 - Consider cyber monitoring solutions that can provide awareness of unexpected operations
 - Prepare a response strategy for cyber events

NREL/PR-5400-84217