

# CONNECT



## Mastering Best Practices in Electric Charging Test Development



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– Eastern USA & Canada

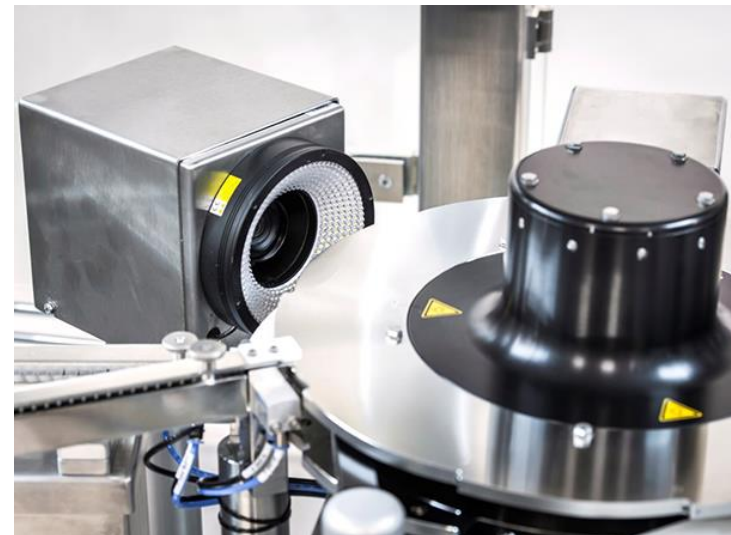
Explore and master best practices for optimal testing strategies in this deep dive into electric charging. We'll review what you need, what works, and the common mistakes made in the field.

From fast charging to home charging and bi-directional innovations, Averna covers every facet of test to help develop more sustainable solutions.

# Agenda

## Global Test & Quality Solutions Partner

- About Avera
- Test Challenges / Coverage
  - Fast Charging / Home Charging
  - V2X: Bi-Directional Charging
- Test Approach / Solutions
  - Sub-Assemblies
  - Regenerative Equipment / Microgrid
  - Protocol Simulation
  - Safety



# Averna's Mission

Be the world's leading Test & Quality Engineering Systems Integrator by delivering innovative solutions across the entire product lifecycle.



## Innovation

Staying ahead of technology while leveraging our experience to design & deliver efficient solutions.



## Teamwork

Combining worldwide expertise to provide our customers with a seamless experience.



## Client Commitment

Our solutions are fully synced with our goals, both technically and commercially.



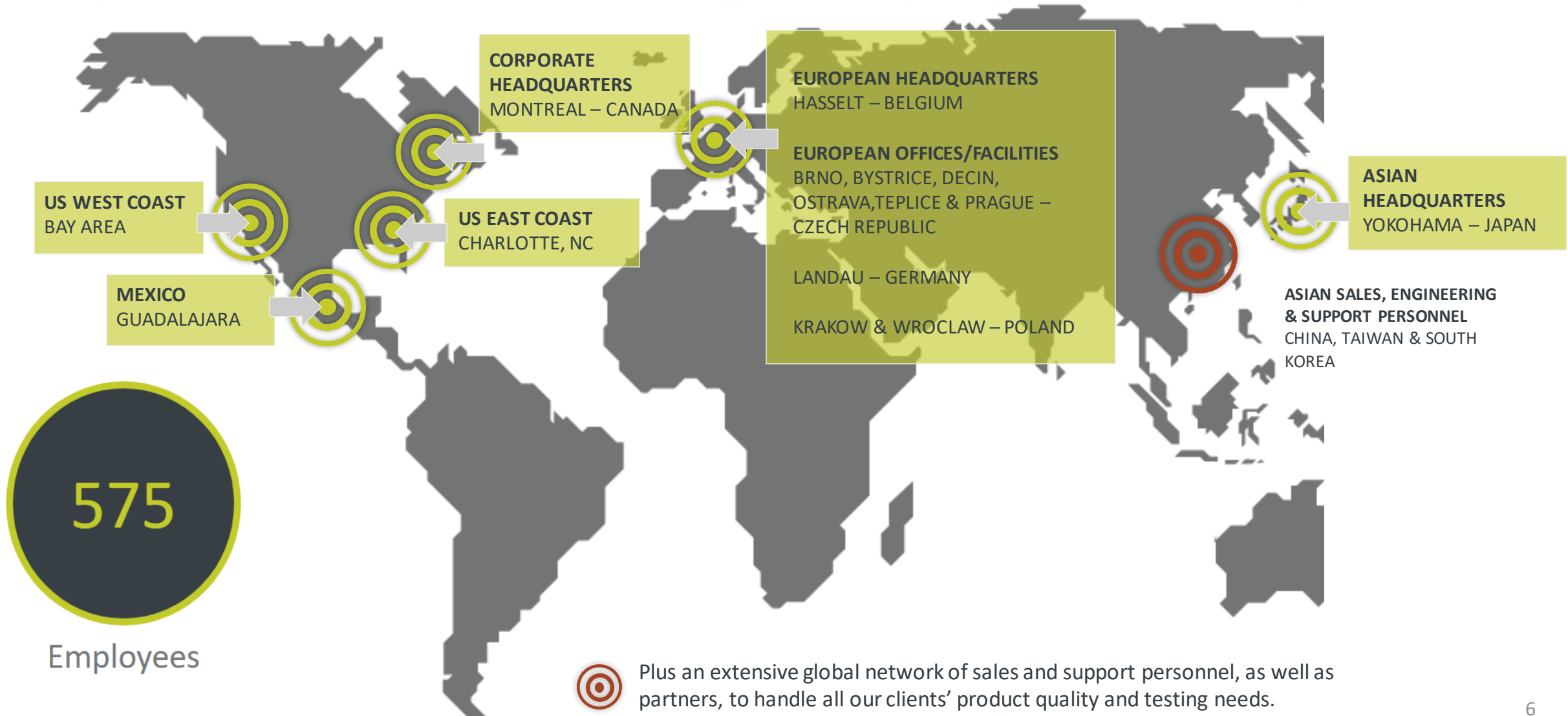
## Performance

Following industry best practices, we exceed expectations by relentlessly delivering on our objectives.

ACHIEVING OUR MISSION



# Our Global Design, Production & Support Locations



# Our Major Industries



Aerospace  
& Defense



Automotive, EV  
& Transportation



Consumer  
Electronics



Industrials



Life  
Sciences



Semi-  
conductors



Telecom  
Infrastructure



# High-power Testing Applications



DC Fast Chargers



Utility Grid



Smart Grid



V2X



Energy Storage

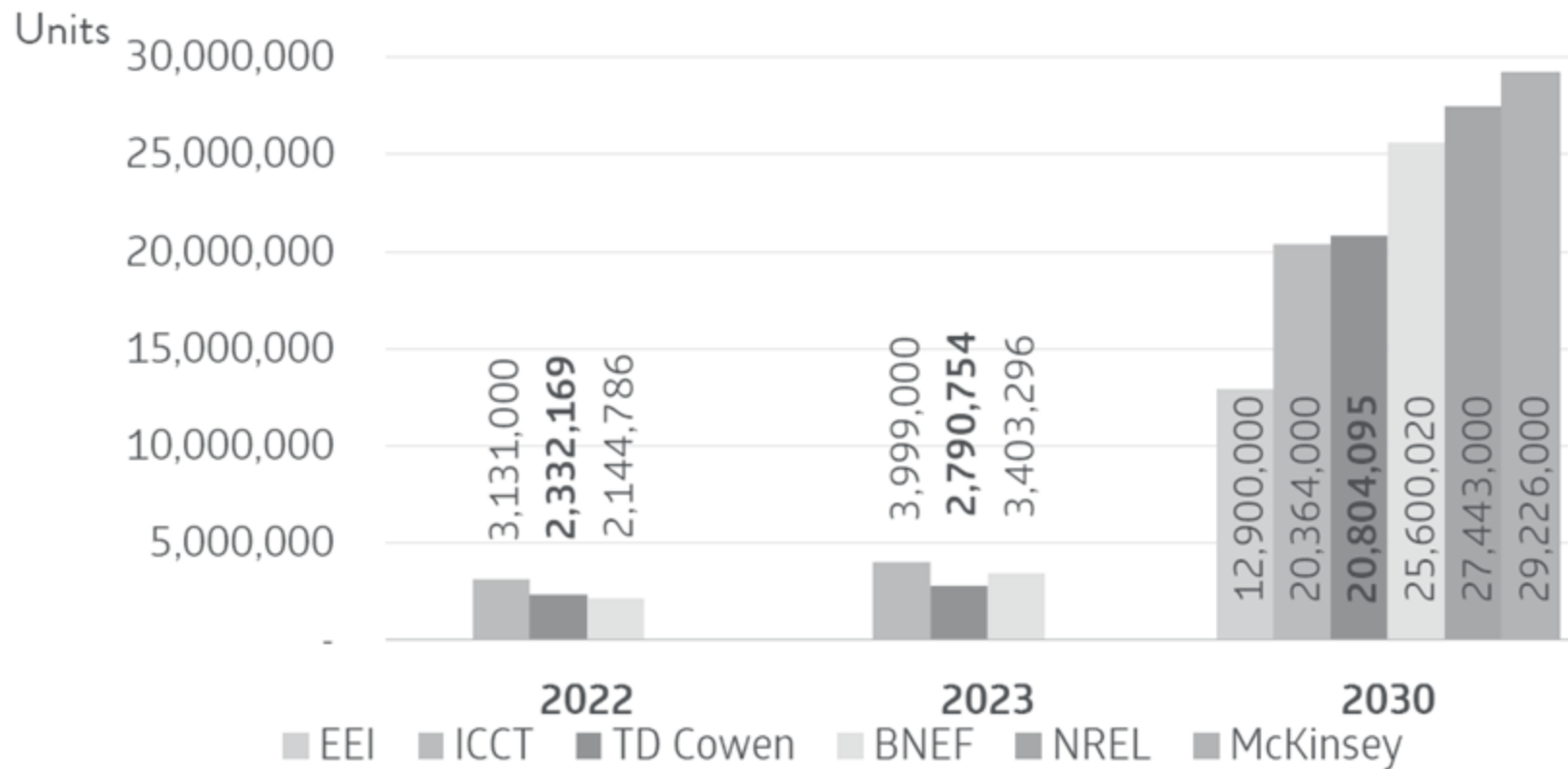


Solar PV Inverter

# Growth of Charging Ports

**7 – 10x  
by 2030**

Figure 8 Estimated Demand for EV Charging Ports in 2030





# Challenges in Testing



## DC Fast Charger

- Large amount of electricity in **15 minutes**.

**30 kW**  
24 hours

**100 kW**  
15 minutes

# Challenges in Testing for Residential V2X

Transfer and Optimization of Power Usage

Vehicle-to-Home / Vehicle-to-Grid

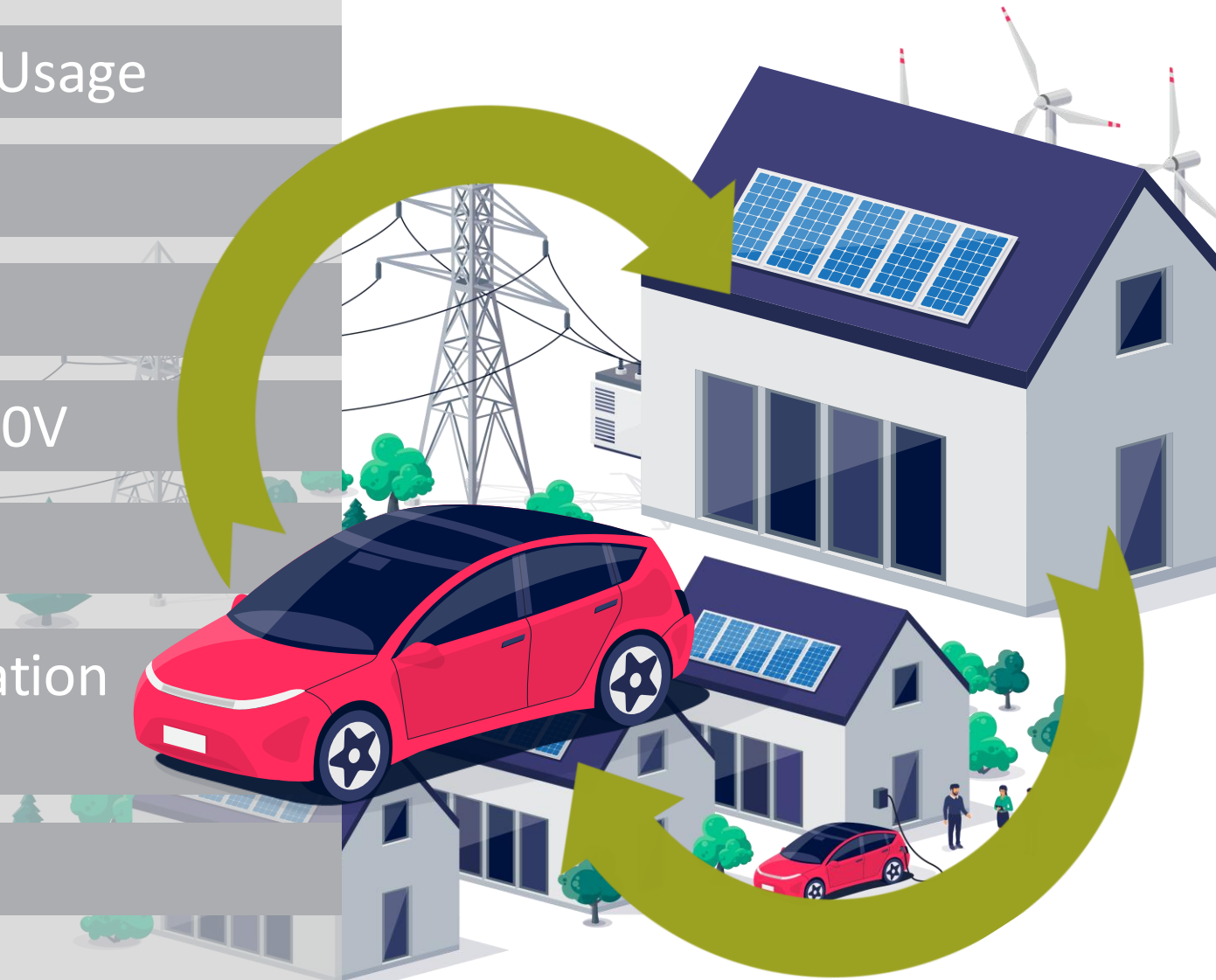
Safe, Smart & Sustainable

High Power → High Voltage 200-1000V

V2X Testing → Bi-Directional Power

**KEY:** Integrate Different Instrumentation  
into a Larger System

Compliance Varies by Country



# DC Fast Charger Test Coverage Summary



**Power** Power Input, Output Load Stress, Phase Monitoring, Outage Voltage And Calibration IO Under Load Efficiency, Power / Billing Calibration



**Safety**

DC safety tests  
Safety, GFI Trip Test, Emergency Buttons Testing  
Temperature Monitoring & Cooling System Testing



**Comms**



**Usability**

LCD Touch Test, Buttons  
Contact Less Payment & Chip & Mag Strip  
Power Cable Dynamic Weight Support Test



# V2X Test Coverage Summary



## Power

Power Input, Output Load Stress, Phase Monitoring, Outage  
Voltage And Calibration IO Under Load  
Efficiency, Power / Billing Calibration



## Safety

DC Safety Tests  
Safety, GFI Trip Test, Emergency Buttons Testing  
Temperature Monitoring



## Comms

Ethernet, Wifi Test, Basic Connection, RSS  
EV CCS & CHAdeMO Comm Test And Response  
EV Communication



## Usability

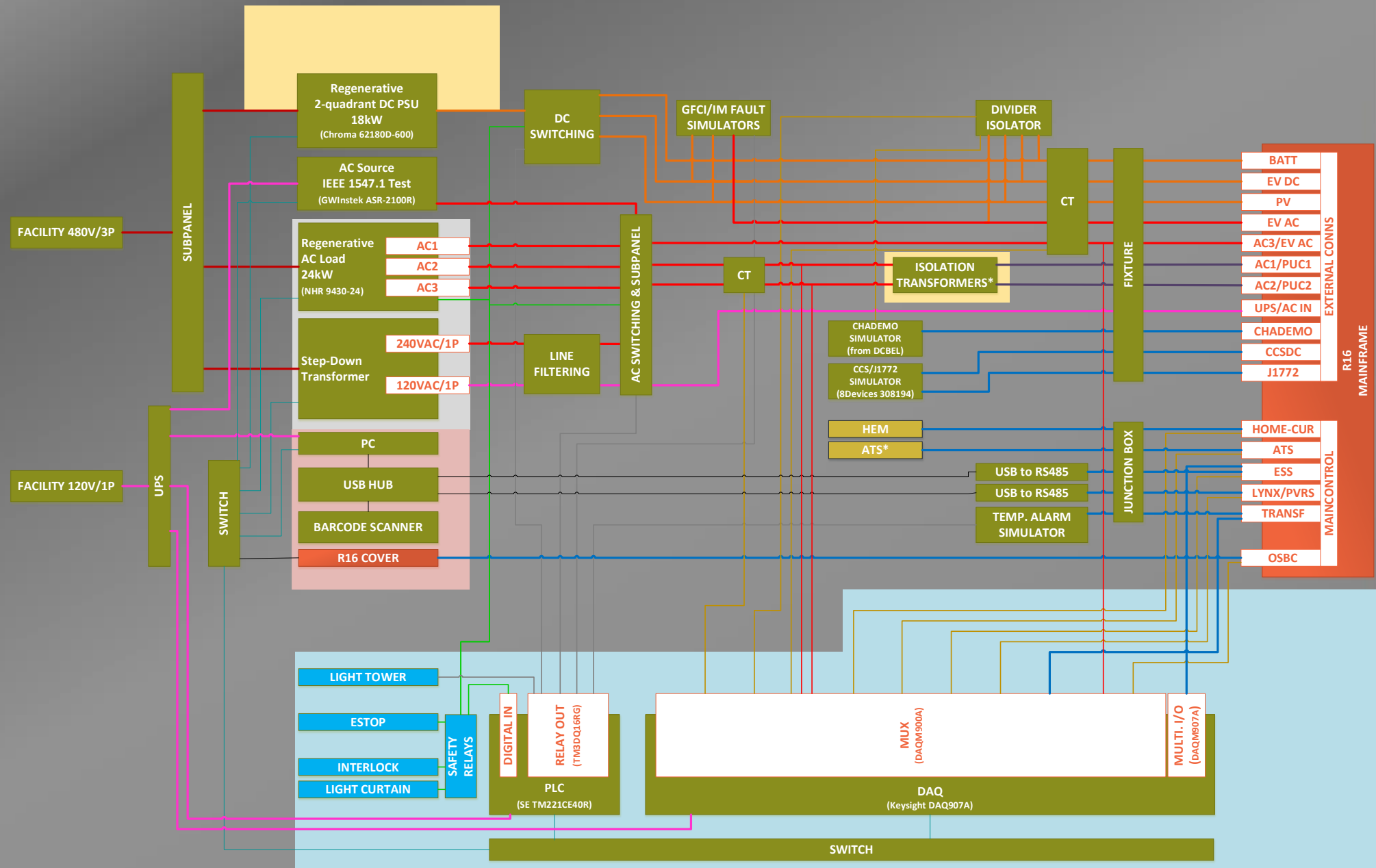
LCD Touch Test, Buttons

HOME BATTERY  
&  
VEHICLE  
&  
SOLAR POWER  
&  
GRID



# V2X

## Small but Complex



# Charger Testing

## What to Consider

Burn-In

GFI, Syncing,  
Sourcing Tests,  
Voltage, etc.

Calibrating  
DUT's  
On-Board  
Measurements

Accuracy

Safety  
Testing

THD

Hipot  
Tests





TEST APPROACH

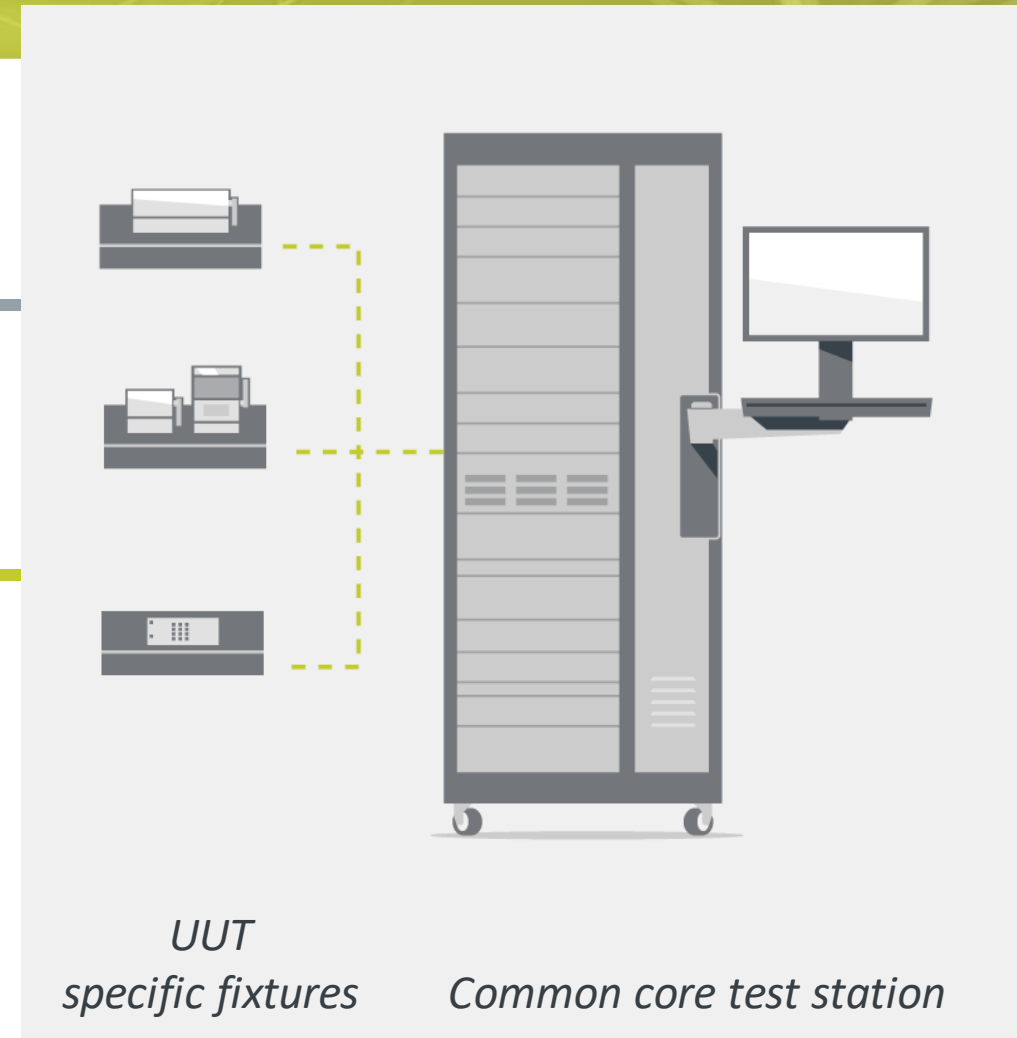
# Optimized Approach for Sub-Assembly Test

## Advice

Expensive, Highly Reusable  
Hardware

Modify Product Fixtures  
In between items that require  
Investigation and Analysis

Lower Priced and More Specialized  
Items



# Considerations for Success – Sub-Assemblies



## Large, Complex, Powerful DUT

- Test strategy should include testing sub-assemblies prior to final test.
- Standard test platform with custom fixtures for each sub-assembly.

Control



Safety





# Unique Considerations for Charger Test



Managing the Microgrid

Regenerative Equipment

Protocol Simulation

Safety

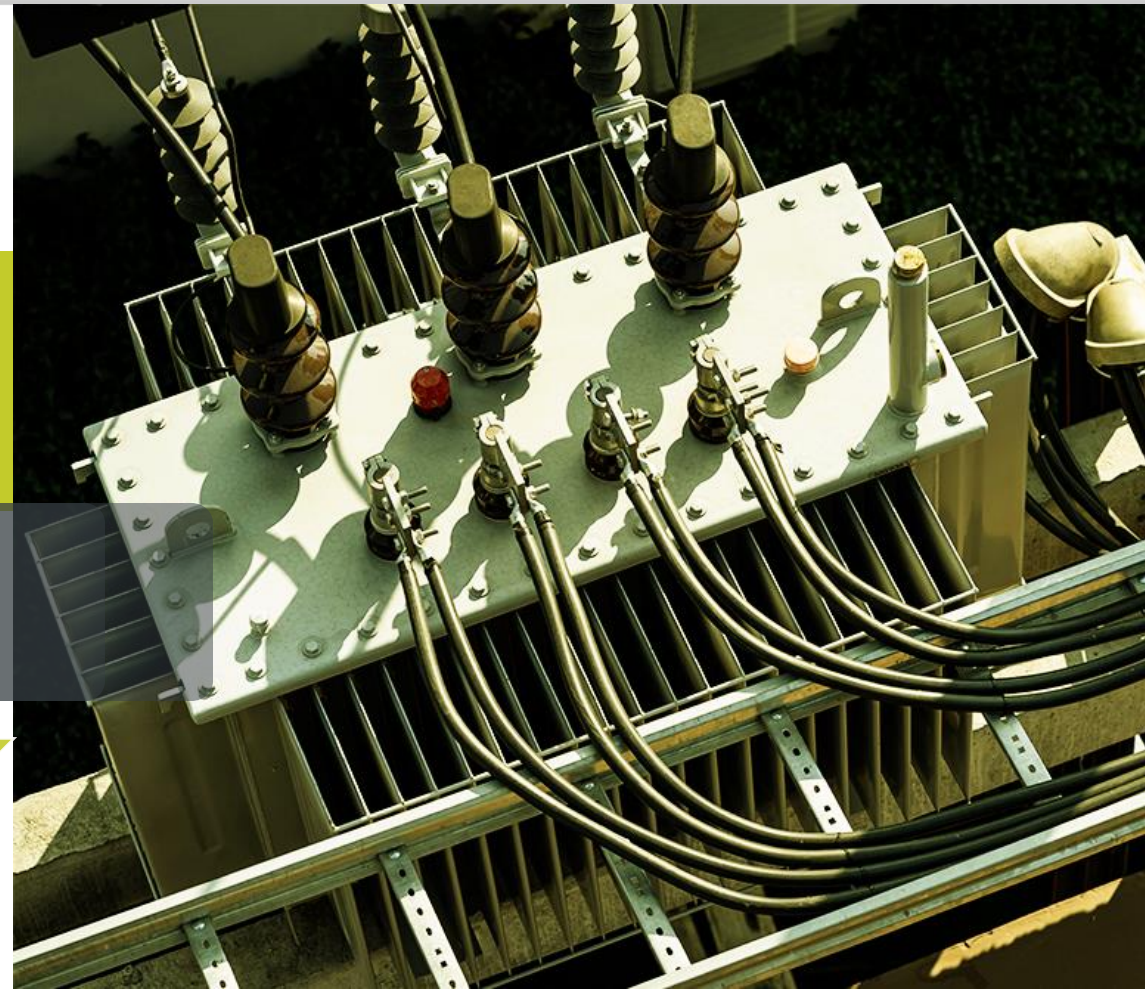
# High Power Test Consideration

## Designing a Sustainable High-Power Solution

STEP 0:  
Spec Phase

STEP 1:  
Consider the Application,  
Power Rating,  
DO1, Volume, etc.

STEP 2:  
What Does it Need to?



# High-Power Testing for Chargers

## The Risks of High-Power Output

Massive Amounts of Heat

Instability

High Cost

## SOLUTION

Leverage Regeneration Equipment

Fast ROI

Every Situation is Unique

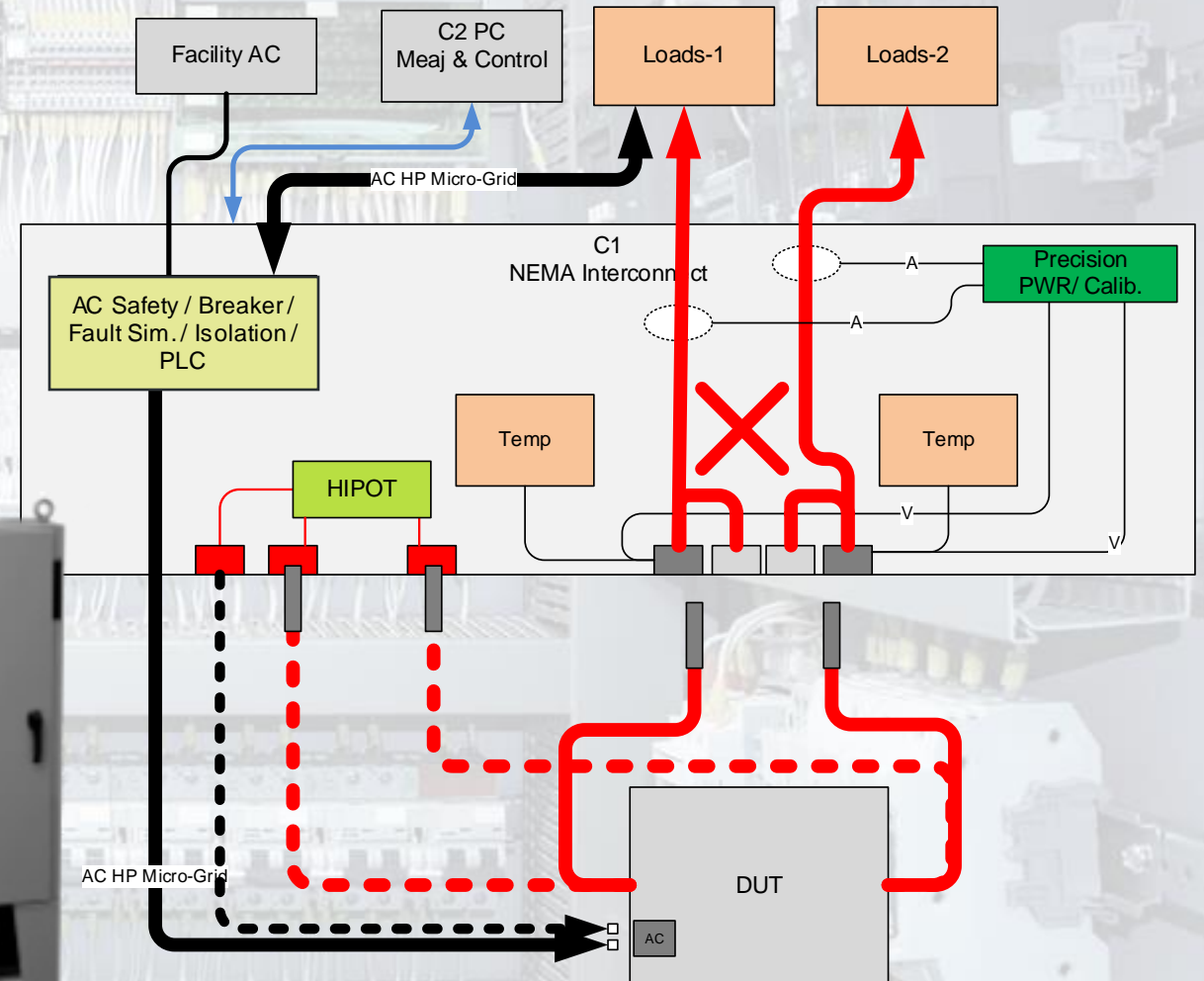
Use a Sustainable Solution



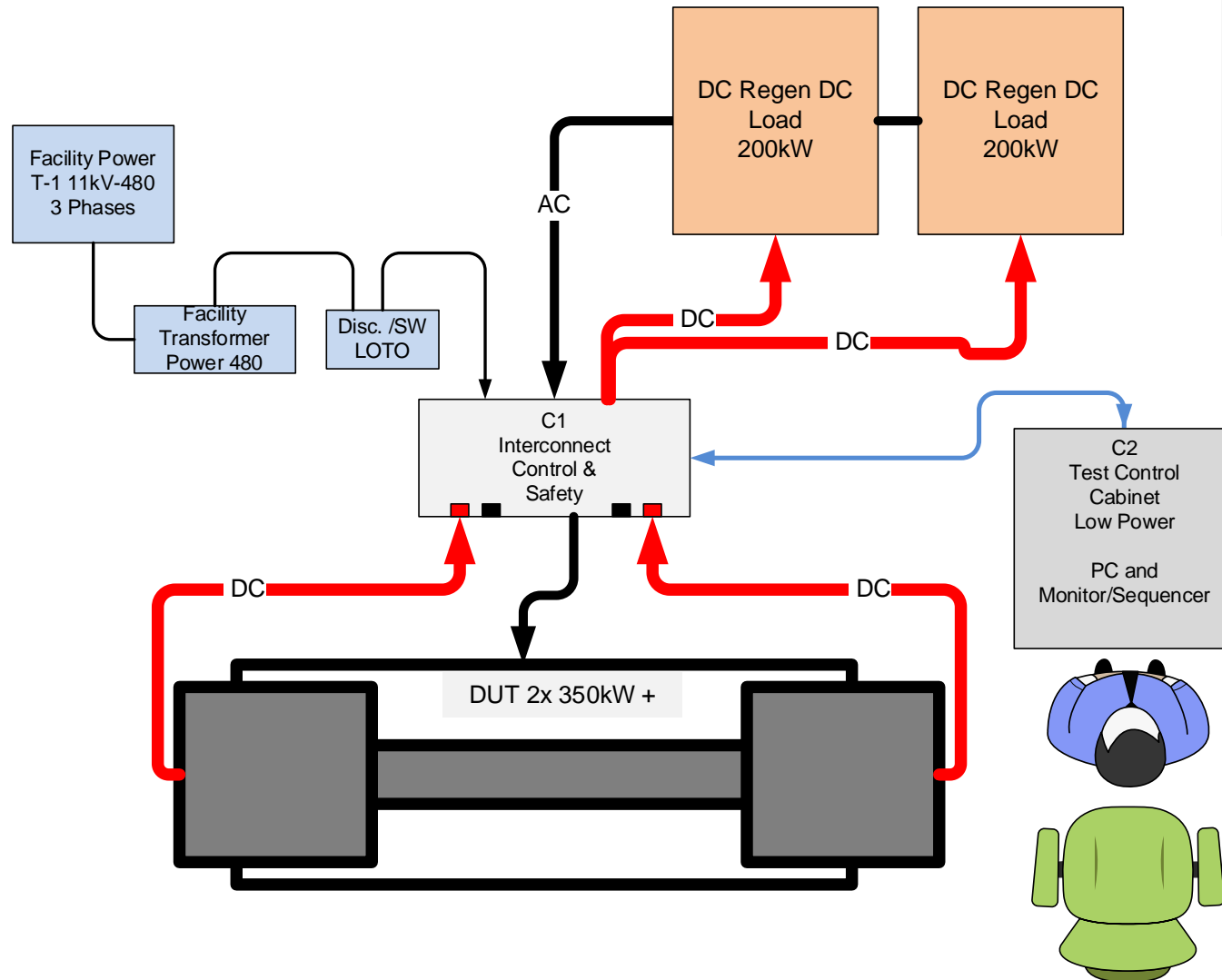
# Managing the Microgrid

## Considerations

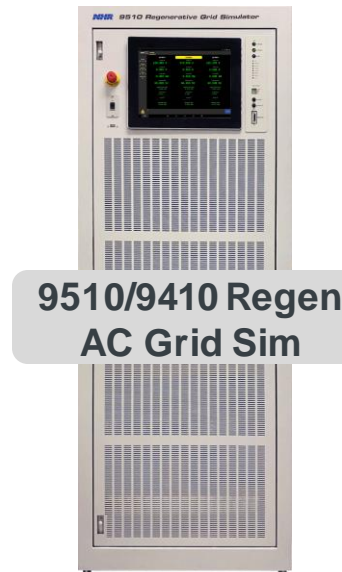
- Regenerative Equipment
- Safety
  - NFPA Regulations
- Defined Requirements
  - Cable Size
  - Connectors
  - Etc.



# Regenerative Equipment



- Majority of Energy **Recovered** and **Reused**



# Protocol Simulation

Communication

Testing & Validation  
Procedures

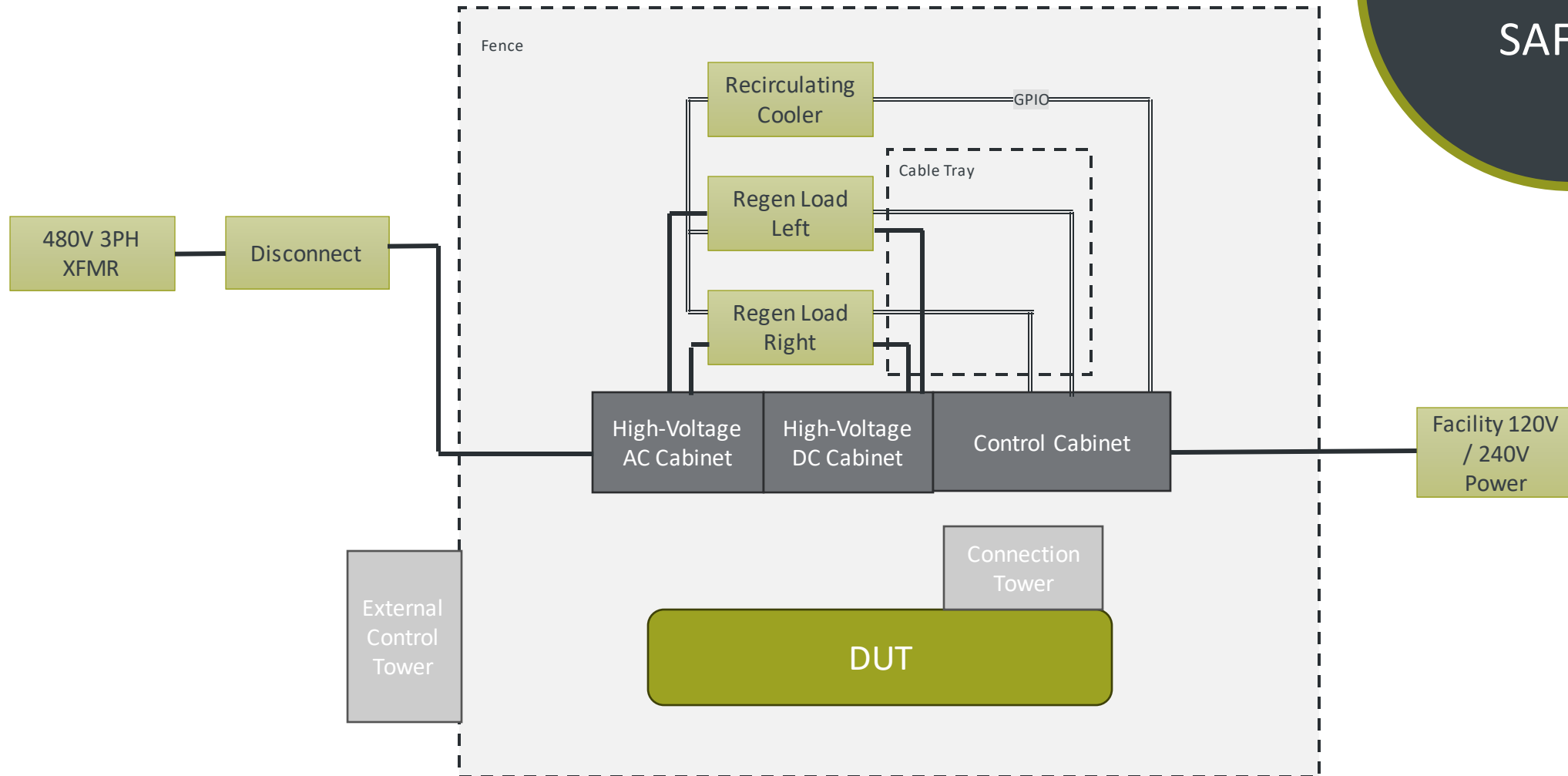
- Open Charge Point Protocol
- ISO 15118
- CHAdeMO
- Combined Charging System (CCS)
- NACS



Protocol simulation creates an environment that mimics EV behavior.

# Safety – It's in the Design

DUT & TEST  
STATION  
SAFETY





A glowing yellow electrical plug is the central focus, emitting a bright light from its base. The plug has a lightning bolt icon on its side. The background is dark with faint, glowing yellow lines that resemble circuitry or data paths. The text "PUTTING IT TOGETHER" is written in a bold, yellow, sans-serif font in the lower-left quadrant.

PUTTING IT  
TOGETHER



# Conclusion

- Test Sub-Assemblies
  - Apply Hardware Reuse Strategies
- Use Regenerative Loads To Create an Efficient Microgrid
- Consider Electrical Safety Parameters in the Test System Design

