Training Course on EV Charging Infrastructure and Standards

Professional Development Training Course Outline

Category	Engineering	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Introduction

This comprehensive training course on EV Charging Infrastructure and Standards provides an in-depth understanding of the critical ecosystem supporting the global transition to electric mobility. Participants will explore the diverse range of charging technologies (AC Level 1, 2, DC Fast Charging), communication protocols (OCPP, ISO 15118), and connector types (CCS, NACS, CHAdeMO, GB/T) that form the backbone of a robust EV charging network. Training Course on EV Charging Infrastructure and Standards covers essential aspects of site planning, grid integration, load management, and the economic models driving the deployment of public, private, and commercial charging solutions. This course is crucial for engineers, urban planners, energy professionals, and policymakers seeking to accelerate the widespread adoption of electric vehicles by building reliable, accessible, and future-proof charging infrastructure.

The program emphasizes practical considerations and addresses trending topics shaping the future of electromobility, including Vehicle-to-Grid (V2G) and Vehicle-to-Home (V2H) capabilities, smart charging and demand response, cybersecurity for charging stations, ultra-fast charging developments (350kW+), and the integration of renewable energy sources for sustainable charging. Participants will delve into the challenges of grid readiness, interoperability, and the evolving regulatory landscape across different regions. By the end of this course, attendees will possess the expertise to plan, design, deploy, and manage efficient, secure, and user-friendly EV charging solutions, contributing significantly to decarbonization efforts, energy independence, and the seamless integration of EVs into smart cities and smart grids. This training is indispensable for professionals at the forefront of sustainable transportation and energy innovation.

Programme Curriculum

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Course Objectives

1. Understand the global landscape of EV charging infrastructure and its projected growth.
2. Differentiate between various charging levels (AC Level 1, 2, DC Fast Charging) and their applications.
3. Identify and compare international charging standards and connector types (CCS, NACS, CHAdeMO, GB/T).
4. Master communication protocols for EV charging (OCPP, ISO 15118) and their functionalities.
5. Perform site assessment and planning for diverse charging station deployments (residential, commercial, public).
6. Analyze grid integration challenges and solutions including smart charging and load management.
7. Comprehend the principles and implications of Vehicle-to-Grid (V2G) and Vehicle-to-Home (V2H) technologies.
8. Evaluate business models and financing options for EV charging infrastructure development.
9. Address cybersecurity threats and implement mitigation strategies for charging stations.
10. Integrate renewable energy sources (solar, wind) with EV charging infrastructure for sustainability.
11. Understand regulatory frameworks, incentives, and policy trends affecting EV charging deployment.
12. Design for interoperability and user experience in charging network development.
13. Explore emerging charging technologies such as wireless charging and robotic charging.

Organizational Benefits

1. Strategic advantage in the rapidly expanding EV market by understanding the infrastructure landscape.
2. Optimized investment decisions in EV charging deployment, avoiding costly mistakes.
3. Faster and more efficient deployment of charging stations through informed planning.
4. Enhanced customer satisfaction by providing reliable and compatible charging services.
5. Reduced operational costs through smart charging and efficient energy management.
6. Improved grid stability and resilience by integrating EVs as flexible loads or distributed energy resources.
7. Compliance with evolving international and local standards and regulations.
8. Identification of new revenue streams from charging services and grid integration.
9. Strengthened cybersecurity posture of charging infrastructure.
10. Contribution to corporate sustainability goals through green charging solutions.

Target Participants

- Electrical Engineers
- Automotive Engineers
- Urban Planners
- Energy Grid Operators
- Utility Professionals
- Fleet Managers
- Real Estate Developers
- Government and Policy Makers
- EV Charging Solution Providers
- Sustainable Mobility Consultants

Course Outline

Module 1: Introduction to EV Ecosystem and Charging Fundamentals

- **Global EV Market Trends:** Growth drivers, adoption rates, future projections.
- **Role of Charging Infrastructure:** Enabling EV adoption, range anxiety.
- **Basic Electrical Concepts:** AC vs. DC, voltage, current, power.
- **Charging Levels Overview:** AC Level 1, AC Level 2, DC Fast Charging (DCFC).
- **Case Study:** Overview of the current EV charging landscape in a major global city (e.g., London, Oslo, or Shenzhen).

Module 2: AC Charging Infrastructure (Level 1 & 2)

- **AC Level 1 Charging:** Characteristics, typical applications (residential), limitations.
- **AC Level 2 Charging:** Power output, common uses (residential, workplace, public), installation considerations.
- **Charging Equipment (EVSE):** Wall connectors, pedestals, smart features.
- **Electrical Requirements for AC Charging:** Circuit breakers, wiring, safety devices.
- **Case Study:** Planning and cost estimation for installing AC Level 2 chargers at a multi-unit dwelling or workplace parking lot.

Module 3: DC Fast Charging (DCFC)

- **DCFC Principles:** High power direct current delivery, faster charging times.
- **Power Levels:** From 50kW to **ultra-fast charging (350kW+)**.
- **Components of a DCFC Station:** Rectifier, power modules, cooling systems.
- **Thermal Management in DCFC:** Importance of cooling for cables and components.
- **Case Study:** Designing a DCFC hub for a highway rest stop, considering power demands and grid connection.

Module 4: EV Charging Connectors and Inlets

- **North American Standards:** J1772 (Type 1), NACS (North American Charging Standard - Tesla connector).
- **European Standards:** Type 2 (Mennekes), CCS Combo 2.
- **Asian Standards:** CHAdeMO (Japan), GB/T (China).
- **Adapter Usage and Interoperability:** Bridging different standards.
- **Case Study:** Analyzing the prevalence of different connector types in a specific regional market and its implications for charger deployment.

Module 5: Communication Protocols for EV Charging

- **OCPP (Open Charge Point Protocol):** Management of charging stations, billing, remote control.
- **ISO 15118 (Plug & Charge):** Secure vehicle-to-charger communication, automated payment.
- **Modbus, DLMS/COSEM:** Data exchange with utilities and energy management systems.
- **Cybersecurity Implications of Protocols:** Securing data and control signals.
- **Case Study:** Implementing a basic OCPP communication flow for a smart charging station to a central management system.

Module 6: Site Planning and Deployment

- **Site Selection Criteria:** Accessibility, visibility, electrical infrastructure, amenities.
- **Permitting and Regulations:** Local, regional, and national requirements.
- **Civil Works and Installation:** Trenching, conduit, foundations.
- **Safety Standards (e.g., NEC, IEC):** Electrical codes, fire safety.
- **Case Study:** Developing a site plan for a public charging station in an urban retail area, accounting for space constraints and pedestrian flow.

Module 7: Grid Integration and Load Management

- **Impact of EV Charging on the Grid:** Peak demand, grid strain, voltage fluctuations.
- **Smart Charging:** Optimizing charging times based on grid conditions and electricity prices.
- **Load Balancing and Demand Response:** Preventing overloads, utilizing off-peak energy.
- **Battery Storage Integration:** Using local storage to buffer grid demand and supply.
- **Case Study:** Designing a smart charging strategy for an EV fleet depot to minimize electricity costs and grid impact.

Module 8: Vehicle-to-Grid (V2G) and Vehicle-to-Home (V2H)

- **V2G Concepts:** EV as a distributed energy resource (DER), grid services (frequency regulation, peak shaving).
- **Bidirectional Charging Technology:** Inverters, power flow control.
- **V2H and V2B:** Powering homes/buildings during outages or for self-consumption.

- **Challenges and Opportunities for V2X:** Policy, battery degradation, market models.
- **Case Study:** Evaluating the potential for a V2G-enabled EV fleet to provide ancillary services to the local utility grid.

Module 9: Business Models and Economics of EV Charging

- **Ownership Models:** Publicly owned, privately owned, CPO (Charge Point Operator) models.
- **Revenue Streams:** Usage fees, subscriptions, advertising, grid services.
- **Total Cost of Ownership (TCO) for Charging Stations:** CAPEX, OPEX, maintenance.
- **Government Incentives and Subsidies:** Grants, tax credits, carbon credits.
- **Case Study:** Developing a financial model for a commercial EV charging station investment, including payback period analysis.

Module 10: Cybersecurity for EV Charging Infrastructure

- **Threat Landscape:** Data breaches, remote control, denial of service, firmware attacks.
- **Secure Communication:** Encryption, authentication (ISO 15118).
- **Physical Security:** Preventing tampering and vandalism.
- **Supply Chain Security:** Ensuring integrity of hardware and software components.
- **Case Study:** Identifying potential cybersecurity vulnerabilities in an OCPP-based charging network and proposing mitigation strategies.

Module 11: Integration with Renewable Energy Sources

- **Solar PV and Wind Integration:** Direct charging, battery storage buffer.
- **Renewable Energy Forecasting:** Predicting generation for optimal charging.
- **Energy Management Systems (EMS):** Optimizing power flow from renewables to EVs.
- **Off-Grid and Microgrid Charging Solutions:** Resilience and sustainability.
- **Case Study:** Designing a solar-powered EV charging station with integrated battery storage for a remote location.

Module 12: Regulatory Frameworks and Policy

- **National and International Charging Policies:** Mandates, targets, incentives.
- **Interoperability Regulations:** Ensuring seamless charging across networks.
- **Building Codes and EV Readiness:** Pre-wiring requirements for new constructions.
- **Accessibility and Equity:** Ensuring fair access to charging for all users.
- **Case Study:** Analyzing the impact of a new government policy promoting public fast charging on a regional EV market.

Module 13: User Experience and Accessibility

- **Payment Systems:** RFID, credit card, mobile apps, Plug & Charge.
- **Wayfinding and Navigation:** Integrating charging stations into mapping services.
- **Reliability and Uptime:** Importance of maintenance and network monitoring.
- **Accessibility for Disabled Users:** ADA compliance, universal design principles.
- **Case Study:** Evaluating the user experience of existing public charging stations and proposing improvements for ease of use and reliability.

Module 14: Maintenance, Operations, and Diagnostics

- **Remote Monitoring and Diagnostics:** Identifying issues proactively.
- **Preventative Maintenance Strategies:** Scheduling, routine checks.
- **Upcoming Scheduled Sessions**

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Online	$2,000
23 Nov 2026	04 Dec 2026	Physical	$3,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

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