Shell + NREL: A Global Energy GameChanger

GCxN Cohort 5 Theme: E-Mobility Future Charging Solutions

Shell's target is to become a net-zero emissions energy business by 2050, in step with society's progress in achieving the UN Paris Agreement's goal on climate change. Our current business plans won't get us there, so we are transforming our business and working cross-sector to achieve our targets. This cohort topic will support Shell's Powering Progress strategy by facilitating the effective growth of electric vehicle charging infrastructure, in turn, meeting the rapidly increasing global transport demand for electrical power.

What are we looking for?

We seek safe, easy to scale, and affordable solutions for electrically powering transport vehicles, including, e.g., personal transport, public transport, road transport.

- Efficient charging on charger level: improved electronics, charging algorithms, systems, and thermal designs
- Charger system integration: solutions for multiple connected chargers, e.g., with grid, power storage, solar
- Data based customer solutions: the generation and use of charging data in the broadest sense to improve the offering of power products to customers in all relevant power charging segments.

In scope

Any novel, scalable automotive charging technology, system, architecture, or data algorithm allowing to improve efficiency, effectiveness, and products and services offered by future charging infrastructure for all transport markets.

- System-level EV simulations of charging behavior as inputs to network/station financial models, site-specific storage/generation/control, and geographically resolved electrical demand forecasts.

The Shell GameChanger Accelerator™, powered by NREL (GCxN), is a multi-million-dollar, multi-year program developed in collaboration between Shell GameChanger and the U.S. Department of Energy's National Renewable Energy Laboratory to discover and advance emerging clean technologies with the potential to dramatically alter the future global energy landscape.

- Miniaturization of D.C. Electric Vehicle Supply Equipment (EVSE), including novel power topologies, system architectures, and thermal solutions on 10-20kW D.C. vehicle-level, resulting in lower cost and smaller footprint.

- Innovations for efficient, low-cost thermal management of high current charging connectors and power conversion equipment or other E.V. charging components.

- Vehicle to X (V2X) solutions such as smart charge management (V1G), vehicle to grid (V2G) & vehicle to building (V2B). For grid applications, this includes monetizing E.V. loads as distributed energy resource (DER) for small and mid-size use cases, e.g., municipal, residential, bus fleets.

- Behind-the-Meter storage for DCFC – designing for low-cost system solutions, high discharge power, e.g., hybrid power storage systems and integration technologies (inverters, controls, etc.).

- E.V. charging hub site design and operational innovations as a function of # charging bays (e.g., 5, 25, 100), charger power (150, 350 kW), use of energy resources, potentially including system-level solutions >1 M.W. Use cases in order of interest:
    - For local delivery vehicles (LDV) depots
    - For medium and heavy-duty depots
    - For passenger cars, including ride-hailing services
    - For high penetration of Autonomous E.V.s

Out of Scope

- In-vehicle power systems
- Conventional fuel options or hybrid approaches