Charging 101: Planning & Buildout

May 4, 2021









More info at www.runonless.com

ELECTRIC

Welcome, DHL!



DHL will be participating in Run on Less – Electric this September, operating a Lightning eMotors truck in NYC









Join us for the 10th anniversary of the leading clean transportation event!

August 30 to September 2, 2021

Bootcamp Attendees Discount Code: BOOTCAMP50

Register at <u>www.actexpo.com/register</u>

Last Training



Last month we covered What's Driving Electric Trucks?



Video recording now available at: www.RunOnLess.com







Coming Up



Our next training is May 18 on Charging 201: Power Management and Resilience



To test your knowledge and earn your Electric Truck Expert badge, please visit: www.RunOnLess.com





Today



Charging 101: Planning & Buildout







Thank you to today's sponsor!



Before we get started:

Q&A

Submit your questions to the host using the Q&A box in the upper right-hand corner.

Presentations

A recording of today's webinar will be available on the ACT News website, and you will be emailed a link by early next week.

Survey

There will be a 30-second survey shown at the end. We appreciate your feedback!

Technical Issues

Contact Benjamin Chan at: benjamin.chan@gladstein.org or call 310-573-8545 for assistance.







Guidance on Charging Infrastructure



AMPING UP: CHARGING INFRASTRUCTURE FOR ELECTRIC TRUCKS

Wedepresent Innovation and Individual Jack Jack Proamp roducing judges and particular budges and an affect decides, revolutions, and polaritiely damptine opportunities access the transporticion lockage. Jack newsi concepts, new spplications, and object modes of balandor much the market, fixeds and manufactures need information on the balantita, challenges, and fails so that everyons can profit in this existing landscapes. The Marth American Causard to rehight Thiosony (MCCT) topose that by their managers, manufactures, and drines using the Guddesca Reports in the months and years leading to launch, the that generation of production inchronologies will perform stude balance and dire hight prefamily and non-time tomes and their studence. Reports and other hight reliables of parties much about and dire hight reliables of theirs much about and their hight reliables of theirs much about the students and their hight reliables of theirs much about the students and their hight reliables of theirs much about the students and their hight reliables of theirs much about the students and their hight reliables of theirs their balance and their hight reliables of theirs much about their about their studence about their This report locases on charging intrastructure considerations for North Anteriors commencial behavy aductive vehicles (EEMA). Its provides Guidance Reports, Electric Trucio — When They Make Sama and Medium Dury Priceits: Trucio — Card O Construction, INC/FC found that while the benefits of alacritic vehicles can be huge, or an the power regulatements to trutinging them. In fact, the provides regorts identified changing infrantructure as one of the imped unknown and courses of anoing for fiscal candidating one herm adoption of this lactorology. MC/FC created the Guidance Report to provide unbiased information detailing the multiple factors to accound in the infrastructures private prior to gravity unbiased information detailing the multiple factors to consider in the starts of private private gravity (CHEV). While there

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Source: NACFE



HARDWARE

The physical charging stations, ports, panels, transformers, etc., including wiring/conduit, transformer upgrades, and installation

Does not vary dramatically from company to company. Main differentiators are connector types, speed, and price

Utility programs may cover some hardware costs

SOFTWARE/NETWORKING

Can be built-in to chargers or purchased from third-party vendors to complement chargers' built-in software

Enables cost-effective charging management, along with integration of distributed energy resources (DERs) and grid services

Provides data and analytics to fleet managers to inform charging decisions

Main differentiator between Electric Vehicle Supply Equipment (EVSE) provider companies

MAINTENANCE

Timely repair of charging equipment is essential for ensuring vehicle uptime

Service packages available to monitor and repair equipment

Necessary for proactively identifying and addressing issues







Charging Procurement Roadmap





Source: NACFE



Different Power Levels & Connectors

Type of EVSE	Voltage	Power (kW)	Price	Installation Requirements	
Level 1	120 V	1.9 kW	Usually included with vehicle purchase (for passenger EVs)	Most plug-in electric light-duty vehicles come with a cord set capable of plugging into a standard home wall outlet, so no additional charging equipment is required	
Level 2	208 - 240 V	7.2 - 19.2 kW	A few thousand dollars per charger	Requires installation of charging equipment and a dedicated circuit of 20 to 100 amps	
DC Fast Charge (sometimes called Level 3)	Typically 480 V AC Input	72 kW+ 1 MW (in discussion)	\$15,000-\$90,000 per charger	Requires installation of charging equipment and dedicated circuit	

Truck	Battery Size	Range	Charge Time with Level 2* **		Charging Time with DCFC****	
			To 80%	To 100%	To 80%	To 100%
Chanje V8100	100 kWh	150 miles	3-4 nours	4-6 hours	30-40 minutes	I-2 hours
Freightliner eCascadia	550 kWh	250 milles	17-18 hours	23-26 hours	2.5-3.5 hours	4-6 hours

Connectors Level Asian Makes US / EU Makes Tesla Wall outlets (Nema With With adapter With adapter 1 515, Nema 520) (° þ adapter With 64) Port J1772 2 Yes Yes adapter Nema 1450 (RV (i) With 2 With adapter With adapter plug) adapter 6\$9 With CHAdeMO 3 Yes No adapter 9 SAE Combo CCS 3 No Yes No R Tesla HPWC 2 No No Yes R No Tesla supercharger 3 No Yes





* Assuming 20% state of charge

** Assuming t9.2 kW

*** Assuming 120 kW from charger and that vehicle capable of receiving 120 kW

Electric Truck Charging Pathways



1) Fleet Depot Based

2) Opportunity Charging Stores, Ports, Warehouses... 3) Shared Card Lock Locations



4) Truck Stops



6) Interstate Rest Areas



7) Mobile Roadside Charging (emergencies & service calls)8) In Motion Charging

Source: NACFE

Today's Speakers:



Paul Stith Director, Global Transportation Initiatives Black & Veatch



Peter Thomas Commercial Business Development Manager Electrify Commercial



Steve Bloch Western Regional Vice President, EV Charging Infrastructure ABB



Joe Colett Technical Manager of Charging Services Portland General Electric



Alycia Gilde Senior Director Initiative Lead, Clean Fuels and Infrastructure CALSTART







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Building the Foundation for Zero Emission Trucking

NACFE Bootcamp #2 Charging 101: Planning & Buildout

May 4, 2021

Paul Stith

Director, Global Transportation Initiatives StithP@bv.com





Black & Veatch: Innovating for Over 100 Years

Our work in Transportation Decarbonization

Renewable Energy





Hydrogen Refueling

Battery Energy Storage





High-Powered Charging

- Strategy, planning, design, engineering, permitting through construction of EV charging and H2 fueling at scale
- Communications, renewables, energy storage integration and resilient microgrids
- Clients: Public & Private Fleets, Utilities, Vehicle OEMs, Charging Networks, Developers
- Focus on safety, speed, and quality



First of a Kind Projects and National Programs Supporting clients in all phases – from planning through deployment

- Regional & Nationwide charging networks
- Medium/Heavy Duty Truck OEMs and Logistics Clients, multiple sites and technologies with integrated resilience
- Transit: Depot, on-route charging, NYC, DC, Rochester, Reno, LA DOT and several others
- Utility programs for AC and DC Charging Infrastructure with over 10,000 charging stations under contract





Image source: Black & Veatch New York Metropolitan Transit Authority

Photo Sim: Daimler Trucks North America

Black & Veatch works with clients such as Daimler Trucks North America (above), Proterra and New Flyer and supporting Washington DC DOT (above left) and New York City Transit Authority (left)

Black &



Black & Veatch Program Innovation & Execution

Collaboration required throughout entire development cycle



Electricity Usage Comparison

Long Haul 220,000 kWh per Year





 Long-term energy price • Better use of capital than Optimize use of energy

Black &

CharIN Task Force Update: Megawatt Charging System



Task Force formed in 2018:

- Charge 200-600 kWh batteries in 20-30 minutes
- The plug name is now "MCS", short for Megawatt Charging System™
- Growing list of use cases: Truck, Bus, Aviation, Marine
- <u>IEC standards</u> submission underway in parallel to industry testing and validation phase



Designed to be safe up to 1500V DC and 3000A DC (testing setup at NREL)

Black &

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Available at: **bv.com/eBooks**





Thank You

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Electric Bootcamp – Charging 101

- Electrify Commercial
- May 2021

The largest open ultra-fast network



NUMBER OF STATIONS



NUMBER OF CHARGERS

May 2018



For ultra-fast charging deployments, experience and scale are essential



Program Level Planning



Design and Permitting/Utility Coordination



Construction & Commissioning



Vehicle Testing



Service Operations & Maintenance



Pre-deployment and Ongoing Testing is Critical

Vehicle software must be successfully integrated with the charging hardware and network backend

Communications across systems must work flawlessly, with edge cases tested

Software updates require ongoing testing prior to field deployment



Effective Charger Maintenance Ensures Successful Ongoing Operations

Getting the infrastructure installed can be challenging, but is not the end of the journey

Most fleet operators would rather not dedicate internal resources to charger maintenance

24/7 engineering and diagnostic support, parts inventory, warranty management, and experience maintaining DCFC are critical





Contact: Peter Thomas – Peter.Thomas@electrifyamerica.com

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MAY 4, 2021

Best Practices for Depot Charging

Steve Bloch – Western Regional Vice President, EV Infrastructure steve.bloch@us.abb.com



ABB: An electrification leader in power and automation technologies

Leading market positions in utility, industry, transportation and infrastructure businesses



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Slide 2

Over 20,000 DC fast chargers installed globally in >85+ countries



Selecting the Right kW Size and Number of Stations



Slide 3

- How many vehicles?
- Battery size of the vehicles (kWh)?
- How many miles of driving per day?
- How many hours available to charge the vehicles?
- Charging at night only to save electricity costs?
- Station redundancy needed?
- Need to charge fast during day and slow at night?
- Availability of power at site?
- Need/want to minimize electricity costs?



EV Charging Basics – Power and Energy

- Power = Volts x Amps = 400 VDC x 200 Amps = 80 kW
 800 VDC x 200 Amps = 160 kW
- Energy = Power x Time = 80 kW x 1 hour = 80 kWh (40 miles range/hour)
- 1 kWh of Energy = 0.5 miles of range for a truck



Non-liquid cooled cables provide up to 200 amps Liquid cooled cables provide up to 500 amps

Slide 4

Cellular Connectivity



- Major carriers: Verizon, AT&T, T-Mobile
- Ethernet option?
- Will a cell booster help?

May 4, 2021 Slide 5

CABB

Used for usage data, smart charging and remote diagnostics



Authorization and Usage Data

Open Access, RFID, Mobile App, or AutoCharge



- Open Access: Anyone can use station
- <u>RFID</u>: Identify the driver
- Mobile App: Identify the driver (driver gets real-time usage data via app)
- <u>AutoCharge</u>: "plug-and-charge" (no need for driver to do anything)



Thank You

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Electric Island

PGE











Let's meet the future together.



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Electrifying Corridors for Trucks

Alycia Gilde

Senior Director, Clean Fuels and Infrastructure CALSTART agilde@calstart.org

Availability, Costs of MHD Charging Solutions

Tech is beginning to support MHD Corridor Charging

From: Moving Zero Emission Freight Toward Commercialization

U.S. EPA Diesel Collaboratives Advancing Alternative Fuels Corridors

IDAHO

astructure Corridor Coalition (AFIC)

NORTHEAST DIESEL COLLABORATIVE

Northeast Diesel and West Coast Collaboratives are promoting corridors for Medium – and Heavy-Duty Alternative Fuel Vehicles

- Regional Multistate Public and Private Partnerships
- Discuss Regional Air Quality & Transportation Priorities
- Facilitate Educational Webinars on Advanced Techs
- Evaluate Opportunities for Infrastructure Development
- Explore State, Federal and Private Funding Sources
- Develop Roadmaps to "Fill in the Infrastructure Gap"
- Regularly Convene Partners to Evaluate Progress

Northeast Clean Freight Corridors

Workgroup Roadmap

egional partnership to plan and promote ernative fuel & idle fre

2017

FHWA Designated EV Corridors

COAST COLLABORATIVE

A public-private partnership to reduce diesel emission

US EPA West Coast Collaborative Alternative Fuel Infrastructure Corridor Coalition (Multi-Stakeholder Partnership)

West Coast Clean Transit Corridor Initiative (SCE & 8 West Coast Utilities)

MHD Infrastructure Corridor Planning 2 Similar Studies, *Different* Methods

EPA WCC-AFICC

- Stakeholder-led (Public/Private)
- Evaluated for EV, H2, LPG, & NG
- Identified 62 sites for charging/147 sites for all fuels
- Needs based on user-input
- Sites rated on readiness criteria
- Incentives and partners needed
- Cost for EV Charging = \$124,000,000/\$373,600,000 (altfuel stations)

9 Utility-Led WCCTCI

- Data-driven
- Evaluated grid capacity along I-5
- Identified 27 sites for MD Charging (50 mi) 14 HD (100mi)
- Needs based throughput, market projections, & truck stops, etc.
- Project commitment needed
- Cost for Electric Corridor = \$332,920,000 (27 MD + 14 HD)

California MHD Vehicle Infrastructure Heatmap Hybrid & Zero-Emission Truck and Bus Voucher Incentive Project (HVIP)

New York Metropolitan Transportation Council Infrastructure Heatmap Clean Freight Corridor Analysis

MHD Infrastructure Heatmaps

Evaluating industry demand and economic and environmental indicators to inform corridor planning.

CA Infrastructure Heatmap

- Planned MHD EV deployments
- Maximum kW demand per site
- Utility territories
- Visualize growing demand on grid
- Identify Tribes and impacted communities
- CALENVIROSCREEN 3.0

NYMTC Clean Corridor Heatmap

- Freight throughput
- Existing alternative fuel stations
- FHWA corridor designation
- Existing infrastructure gaps
- US EPA EJSCREEN

Electrifying Corridors for Trucks Key Takeaways

PUBLIC CHARGING WILL INCREASE ELECTRIC TRUCK ADOPTION

PLAN FOR ELECTRIC CORRIDORS NOW!

PLANNING REQUIRES DIVERSE STAKEHOLDER INVOLVEMENT AND DATA

- Build upon existing EV programs
- Need smart policies, utility rates, and incentives
- Need standardization and interoperability
- Integrate DER, such as VGI, energy storage, and microgrids to support power demand
- Build workforce to advance technology transformation

8% of MHD vehicles will be electric by 2030 [WCCTCI Report]

Electrifying Corridors for Trucks

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