NC STATE UNIVERSITY

SUSTAINABLE FLEET TECHNOLOGY

WEBINAR SERIES 2023

Session #2: MD/HD Charging Infrastructure Challenges and Considerations

March 23, 2023

NC CLEAN ENERGY TECHNOLOGY CENTER

NAFA Fleet Management Association

VIATEC

Sourcewell

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

Format

- Q&A at the end
- Submit questions and comments to “Panelists”
- Scheduled for 2:00p-3:15p
- Handout
- Recording

MD/HD Charging Infrastructure Challenges and Considerations March 23, 2023

2:00-2:05 **Rick Sapienza, NCCETC**--Introduction and Welcome

2:05-2:25 **Round Table: Keith Dickerson--Black & Veatch, Jeremy Baksh—eTransEnergy and Geri Waack—Faith Technologies Inc.**

2:25-2:35 **Keith Dickerson, Black & Veatch**—Project Planning & Execution Considerations Overview

2:35-2:50 **Geri Waack, Faith Technologies Inc. and Jeremy Baksh, Black & Veatch**—Project Examples

2:50-3:15 **Q&A**

Today's Speakers

Keith Dickerson
Black & Veatch
Director, Clean Transportation
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Jeremy Baksh
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Project Director
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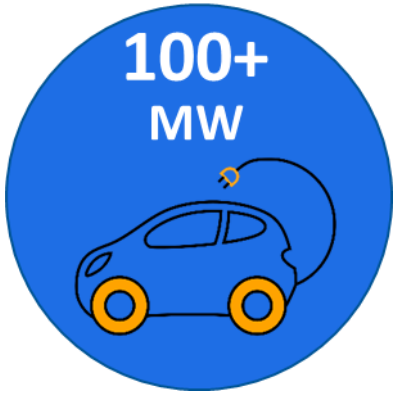
Geri Waack
EnTech Solutions
Director, eMobility Solutions
Geri.Waack@faithtechinc.com

Black & Veatch Today – 107 Years Of Innovation

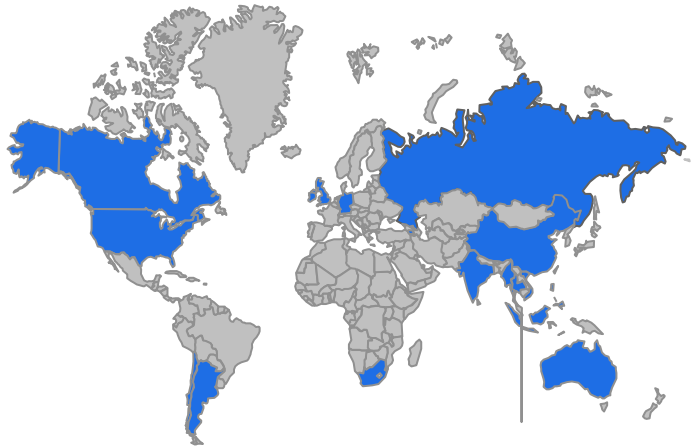
1,900+ Electric Vehicle Charging Sites Deployed



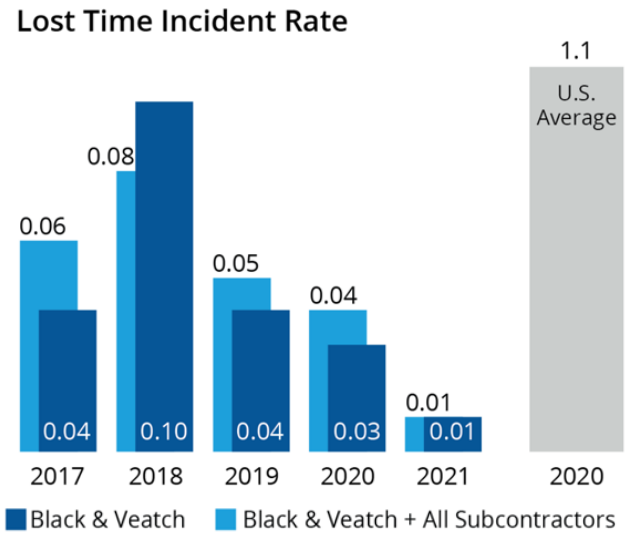
100+ MW of Transit and Fleet Charging Engaged

Backed by 3.5 GW Solar PV Experience

150+ Behind-the-Meter Battery Installations



- 9,200+ professionals
- $4 billion in 2022 revenue
- Work in 100+ countries on six continents
- Consistently high industry rankings in Solar, Power, Telecom, Water and more
- 100% Employee-owned company



Everybody returns home safely each day

About Us

- eTransEnergy is a wholly owned subsidiary of Duke Energy, providing end-to-end electric vehicle (EV) solutions for fleet owners/operators across North America
- We help organizations reduce operational risk, minimize the total cost of ownership (TCO), accelerate zero-emissions goals and ultimately realize the sustainability and cost benefits of electrifying their fleets

ACCELERATING ELETRIFICATION

1 Energy Infrastructure

Integrated energy infrastructure solutions that support specific EV fleet requirements through all phases of deployment –pilot, rollout and scale.

2 Energy Management

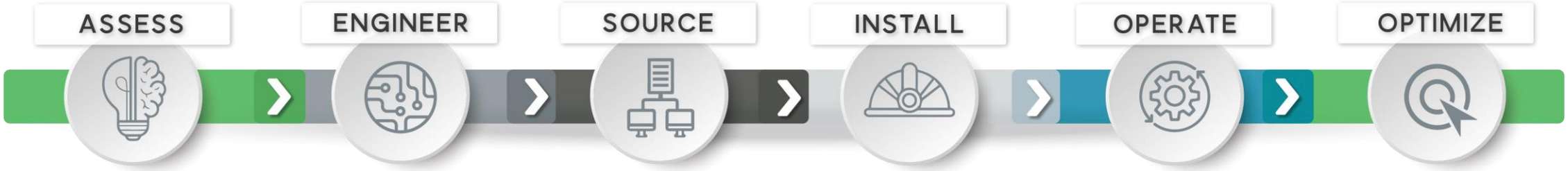
Dynamic charge management, energy management, tariff optimization and 24/7 support for continuous enhancement of electrification assets for maximum cost-effectiveness

3 Zero-Emission Energy

Cost-effective renewable energy generation to help improve operational economics, hedge against future electric rates and support sustainability objectives

OUR EMOBILITY CHARGING PROGRAM

DRIVING TOWARDS SMARTER ENERGY AT EVERY STEP



- Analyze current electrical usage/capacity
- Evaluate renewables
- Energy and cost modeling

- Detailed Engineering
- Project schedule
- Final project budget

- In-house manufacturing of modularized solutions
- Partner relationships

- Manage project from site prep to utility coordination to commissioning
- Offsite assembly

- Flexible operational solutions, including total ownership, leased infrastructure, or energy-as-a-service (EAAS)

- Ongoing services to optimize system and assess changing needs
- Preventative maintenance and remote monitoring by trained experts

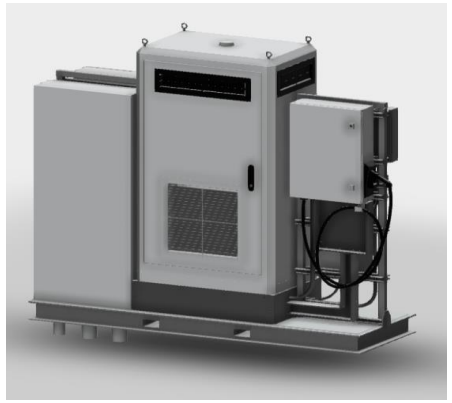
ENTECH™ SOLUTIONS
A DIVISION OF FTI.

MODULAR/SKIDDED SOLUTIONS

MODEL VS INSTALL

Kitted assemblies for rapid deployment

- Expandability
- Standard solutions
- Safer installation
- Higher-quality product

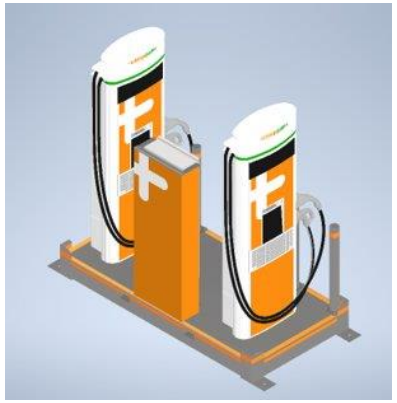


Skidded Model

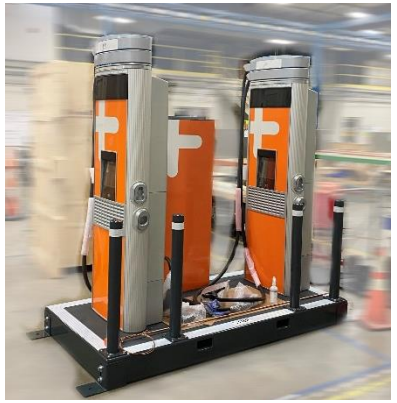
Physical Install

Skidded products

- Developed in manufacturing environment
- Lean processes
- Minimal installation time
- Ability to relocate charging equipment more easily



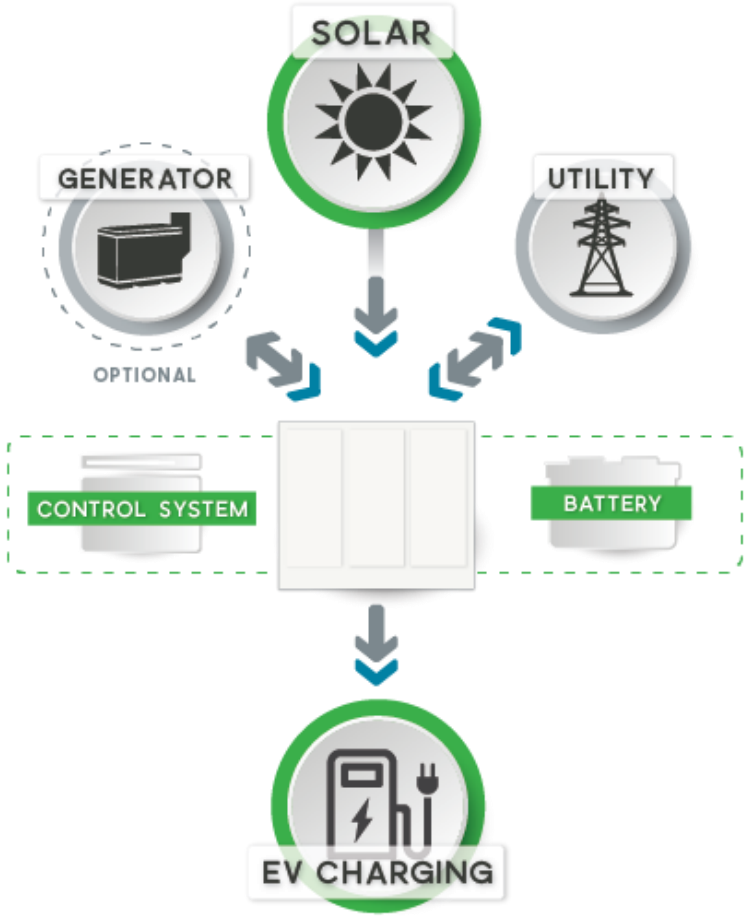
Skidded Model



Physical Install

ALTERNATIVE ENERGY SOLUTIONS

- Mitigate utility concerns
- Minimal site disruption
- Reduces operating costs and utility costs
- Lower carbon emissions
- Cleaner environment
- Rapidly deployable solutions (Skidded and assembled products)
- Temporary/Permanent installation
- Bridge gap until utility services are available



*Generator is used for resiliency in off grid configurations

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EXPLORING THE BUSINESS UNITS

EMOBILITY INFRASTRUCTURE

ENTECH™ SOLUTIONS

eMOBILITY INFRASTRUCTURE

- Electric vehicles (EVs) and other mobility devices offer countless benefits, from emissions reduction to energy efficiency
- We provide industry-leading, sustainable solutions to keep electric vehicles and other mobility devices powered
- Our clean eMobility charging solutions are safe, cost-effective and efficient
- Your project is planned, designed, built and managed to meet your specific needs

Charging Project: Areas of Focus

- EV Charging Equipment (EVSE)
- Facility Electrical Infrastructure
- Utility Service Infrastructure
- Distributed Energy Resources

EV Charging Equipment (EVSE)

Design Considerations

- Vehicle parameters (battery size, AC/DC capability)
- Dwell time for charging
- EVSE : Vehicle ratio
- Charge Management
- Physical configuration
  - Indoor/outdoor, pedestal/overhead
- Future optionality

Operational Flexibility can improve or restrict design options ($$)

Facility Infrastructure

Design Considerations

- Existing equipment capacity (amps, branch circuit availability, etc.)
- Thresholds for capacity upgrades
- Voltage requirements for charging
- Separate delivery for EV charging
- Utility rate tariff implications
- Building/Charge management options

Cost: Can be nominal or multiples higher than EVSE Cost

Utility Service Infrastructure

Considerations

- Existing utility capacity and thresholds
- Timeline for potential upgrades
  - On-site
  - Off-site
- Existing vs. new delivery
- Delivery voltage
- Rate Tariff options
- Potential for “CIAC”

Optional Utility Services ($)

- Alternate Feeder
- Dedicated Feeder
- Redundant Transformers

Distributed EnergyResources

Considerations

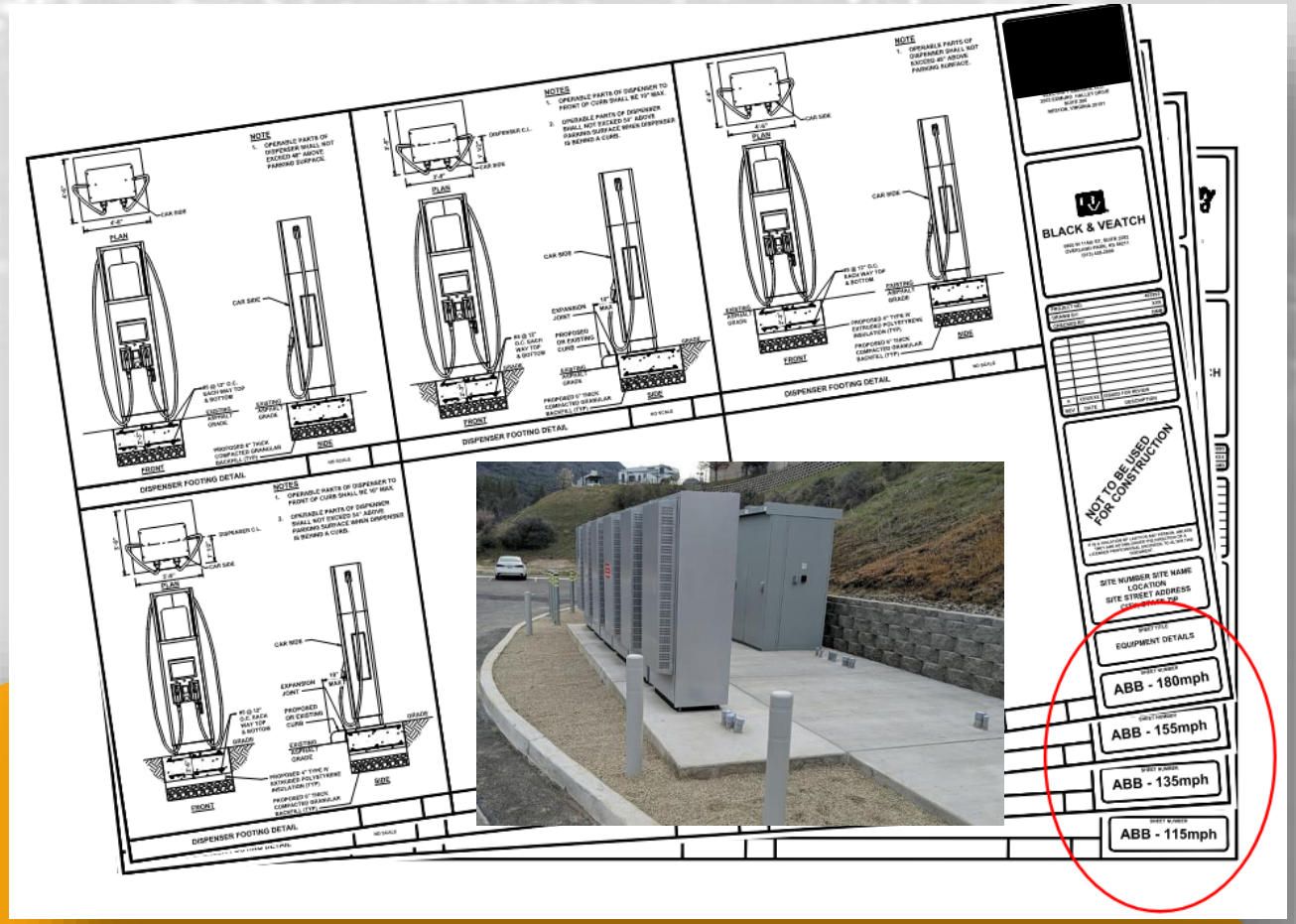
- Resiliency
- Sustainability
- Energy Cost
- Infrastructure Cost

Potential Solutions

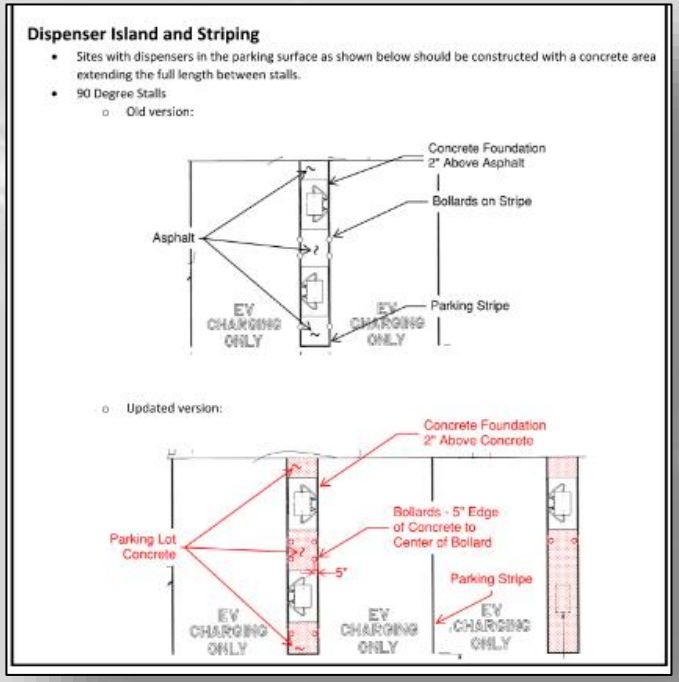
- On-Site “spinning” generation (or portable)
- Solar (on-site / off-site)
- Energy Storage

Cost Savings and Value Engineering

- Drawing Templates
  - Set up to streamline repeatable site conditions
    - Reduce time required in design
    - Reduce time required to prepare calculations for AHJ's



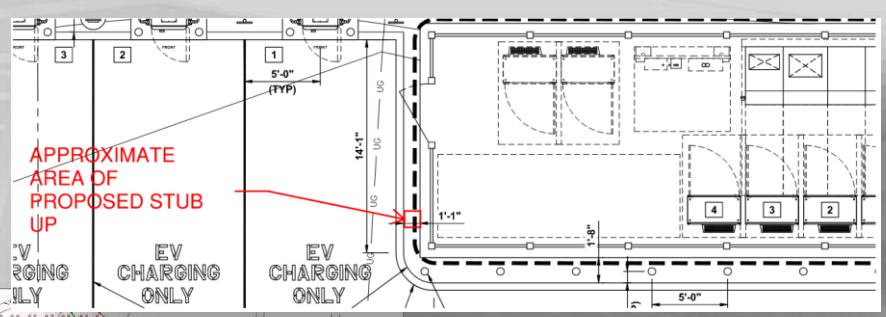
- Control & Communications
  - Streamline communication
    - Design team
    - Permitting team
    - Construction team
      - Issue construction bulletins
      - Responding to RFIs

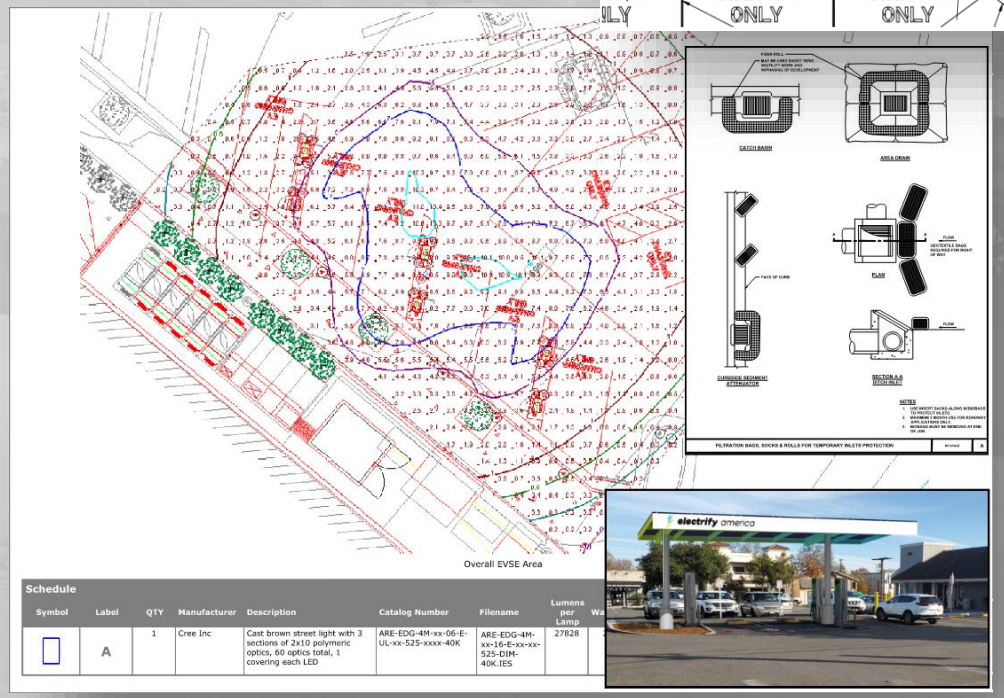


Cost Savings and Value Engineering

- Structural calculations
- Photo-simulations
- Photometric studies
- Erosion control plans
- Parking analysis
- Traffic control plans
- Traffic control permits
- Title 24
- ADA compliancy
- Special Inspections
- Fault current calculations

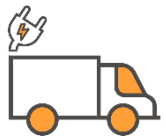
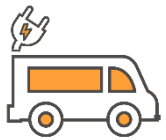
- Proactive Approach
  - Forward looking at future expansion





Grid Connection Lead Times

Understanding the complexities and timing for fleet infrastructure can inform your investment and scale up roadmap

SAMPLE FLEET	CAPACITY REQ'D	GRID UPGRADE	EXAMPLE TIMELINE REQUIRED
 20 overnight charging medium-duty delivery trucks	1MW Charging Site	Service Transformer	~3 MONTHS
 500 overnight charging light-duty delivery vans	5MW Charging Site	Feeder Upgrade	12 - 26 MONTHS
 200 daytime fast charging heavy-duty trucks	20MW Charging Site	Substation Upgrade	24 - 48 MONTHS OR MORE

Black & Veatch

Generic Utility Upgrade Estimates

- Utility infrastructure upgrades would be required to serve the new charging stations
- Upgrades are site specific and are dependent upon upstream network and electrical loading
- Upfront estimates costs vary to site specific situations and utility design guidelines

ESTIMATED BUDGET PRICING SUMMARY	DESCRIPTION
$100,000	Service supply extension; up to 1 MW (up to 3 chargers)
$264,000 - $1,300,000 per mile	New conductor/ reconductor; up to 5 MW (up to 8 chargers)
$3,000,000 to $11,000,000	New transformer bank; over 10 MW (over 15 chargers)
$40,000,000 to $80,000,000	New substation bank; over 20 MW (over 30 chargers)

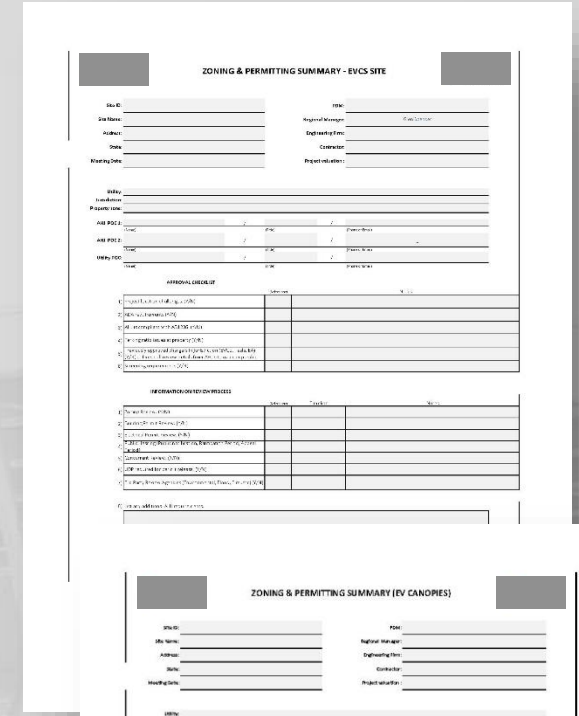
Pricing is budgetary based on a generic utility sites. Each site will require engineering investigation to determine the specific site upgrades required.

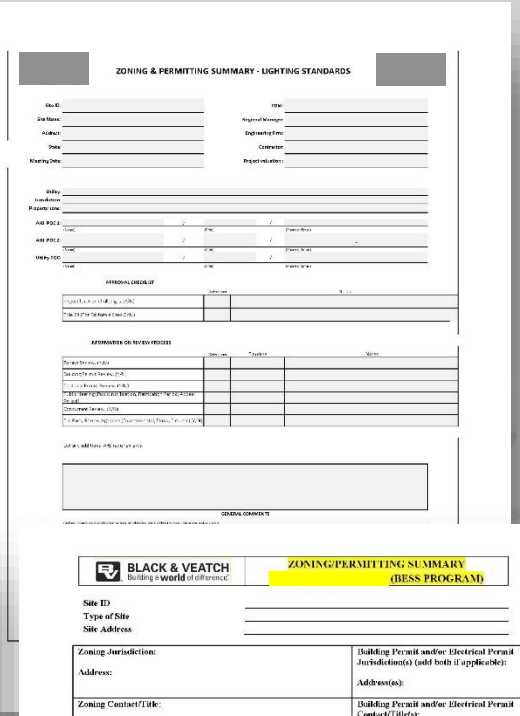
Utility Scheduling

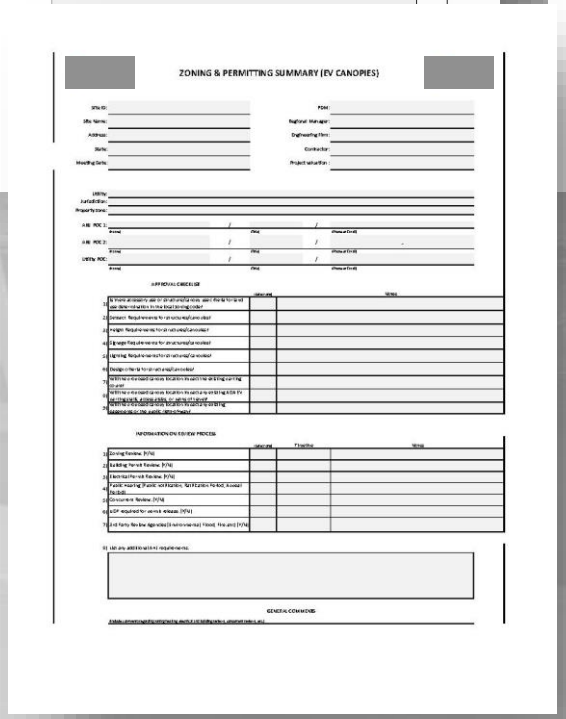
- Involve utility preconstruction, and early in the construction process
- Confirm all agreements are executed and fees paid
- Confirm account set up
- Installation of primary conduit/structures
- Final electrical inspection
- Lead times for utilities to set meter and energize service

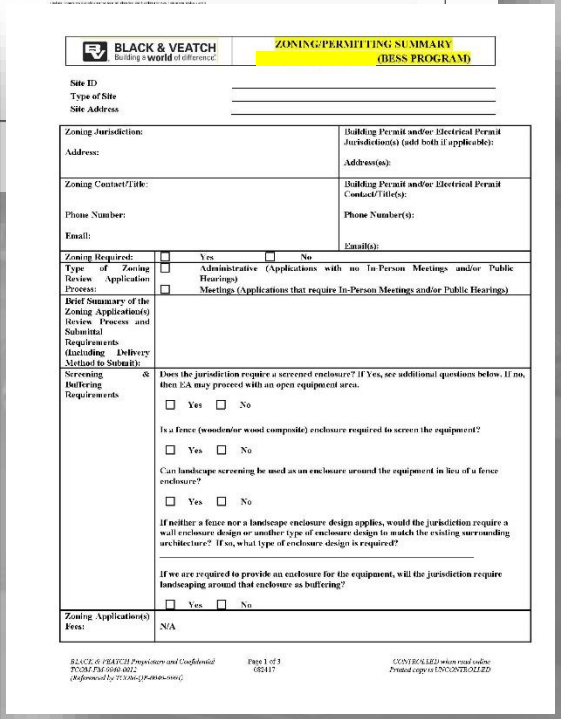
Zoning / Permitting: Due Diligence

- Understanding site design/ scope of work
- Municipal Outreach – relationship building & maintaining and product education
- Identifying zoning & permitting processes, timelines and costs
- Reduce requirements
- Expedite timelines


ZONING & PERMITTING SUMMARY - EVCS SITE


ZONING & PERMITTING SUMMARY - LIGHTING STANDARDS


ZONING & PERMITTING SUMMARY (EV CANOPIES)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Building a world of difference

ZONING/PERMITTING SUMMARY
(BESS PROGRAM)

Site ID
Type of Site
Site Address

Zoning Jurisdiction: Address:	Building Permit and/or Electrical Permit Jurisdiction(s) (add both if applicable): Address(es):
Zoning Contact/Title: Phone Number: Email:	Building Permit and/or Electrical Permit Contact/Title(s): Phone Number(s): Email(s):
Zoning Required:	☐ Yes ☐ No
Type of Zoning Review Application Process:	☐ Administrative (Applications with no In-Person Meetings and/or Public Hearings) ☐ Meetings (Applications that require In-Person Meetings and/or Public Hearings)
Brief Summary of the Zoning Application(s) Review Process and Submittal Requirements (Including Delivery Method to Submit):	
Screening & Buffering Requirements	Does the jurisdiction require a screened enclosure? If Yes, see additional questions below. If no, then EA may proceed with an open equipment area. ☐ Yes ☐ No Is a fence (wooden/or wood composite) enclosure required to screen the equipment? ☐ Yes ☐ No Can landscape screening be used as an enclosure around the equipment in lieu of a fence enclosure? ☐ Yes ☐ No If neither a fence nor a landscape enclosure design applies, would the jurisdiction require a wall enclosure design or another type of enclosure design to match the existing surrounding architecture? If so, what type of enclosure design is required? If we are required to provide an enclosure for the equipment, will the jurisdiction require landscaping around that enclosure as buffering? ☐ Yes ☐ No
Zoning Application(s) Fees:	N/A

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(Referenced by TCOM-QP-0000-xxxx)

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PROJECT HISTORY

CAMPING WORLD

Camping World's location in Draper, Utah, had a need for temporary electrical vehicle (EV) charging power prior to when utility interconnection was available. Because of the lack of grid availability, they needed an off-grid power solution that would provide resilient energy for charging of new electric RVs and campers.

EnTech Solutions designed and installed an Xcape microgrid controller with ground mount solar to provide resilient, zero-emission power for Camping World's temporary power needs.

XCAPE TYPE	XCAPE 2.0
Technical summary	
Customer Load	Level 2 EV Charger
Design Output kW	18 kW
Design Storage kWh	88 kWh
Design Solar PV Input	14.4 kW
Supplemental Power Generation	
Grid Connection	No grid connection
Generator Application	No generator back-up

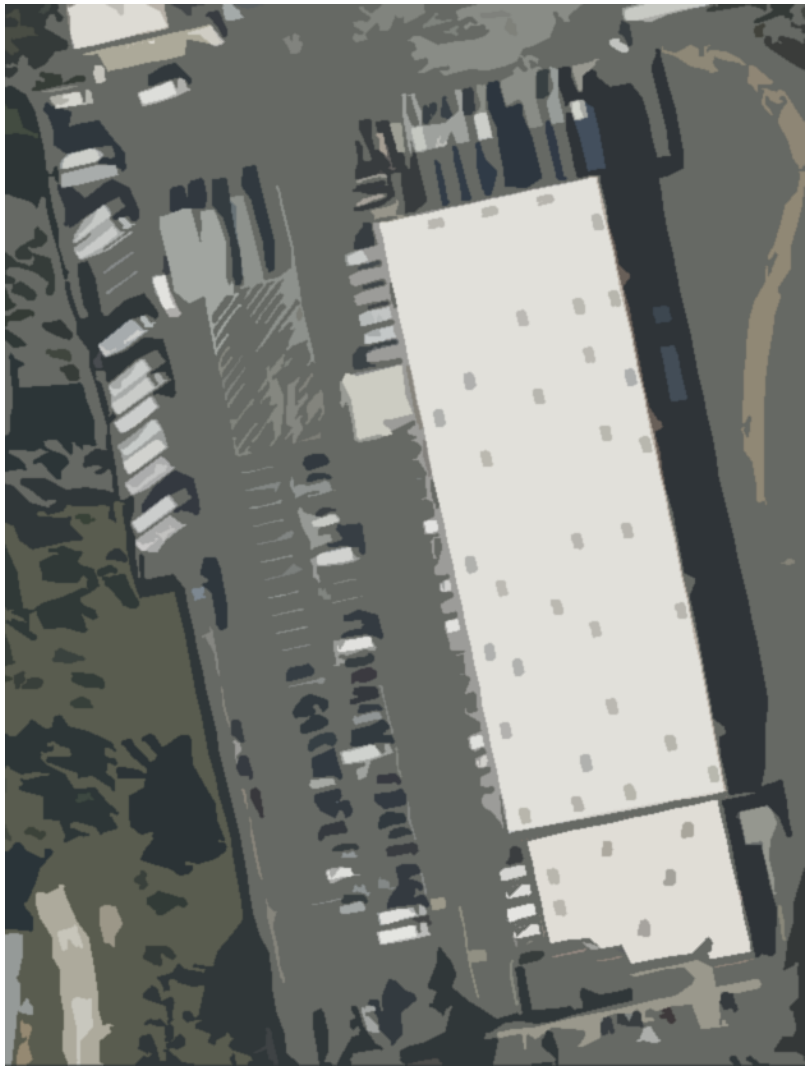
PROJECT HISTORY

LAKESIDE

The Lakeside Vision Center is powered by clean energy Xcape™ and DCentrIQ™ microgrids which consist of ground-mount and roof-top solar, battery storage, a natural gas generator and DCentrIQ power controls. All power is managed by EnTech Energy Center™ proprietary software. It is an educational facility where FTI is able to demonstrate energy resilience, building confidence in its energy products and solutions with quantifiable metrics. Within the facility itself, customers and visitors are able to view live energy data feeds and analytics of the systems powering the facility and learn how these systems can be applied to their own energy challenges.



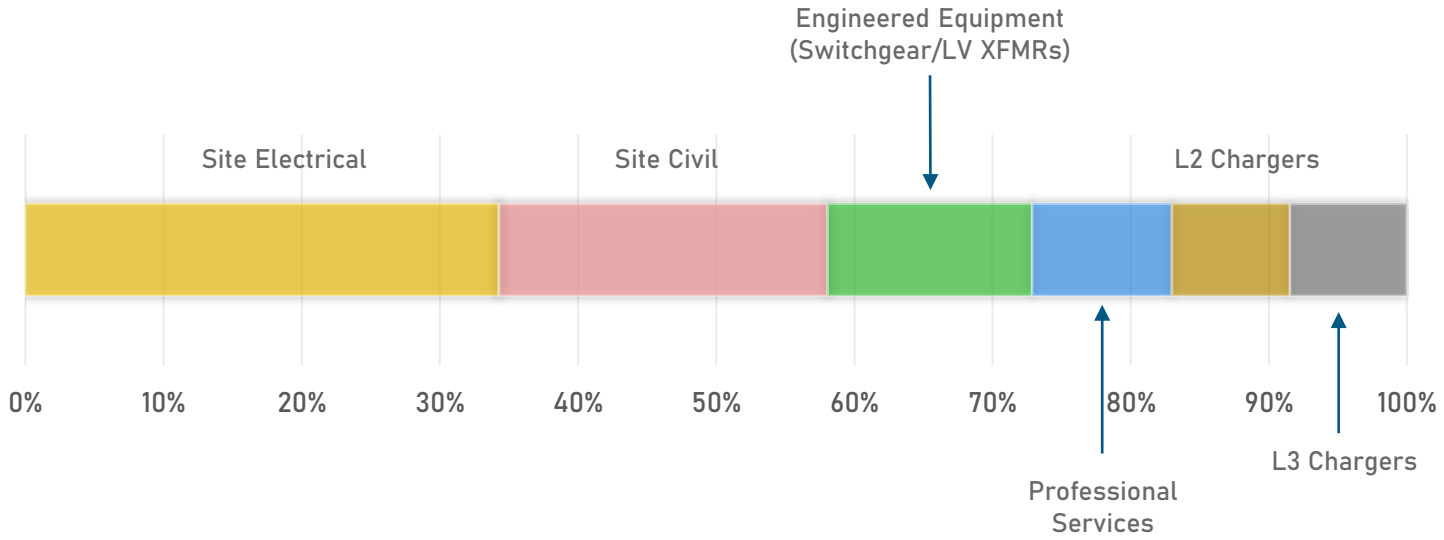
DEPOT CASE STUDY



IN CONSTRUCTION – TARGETING EOY 2023 COMPLETION

SCOPE OF EVSE:

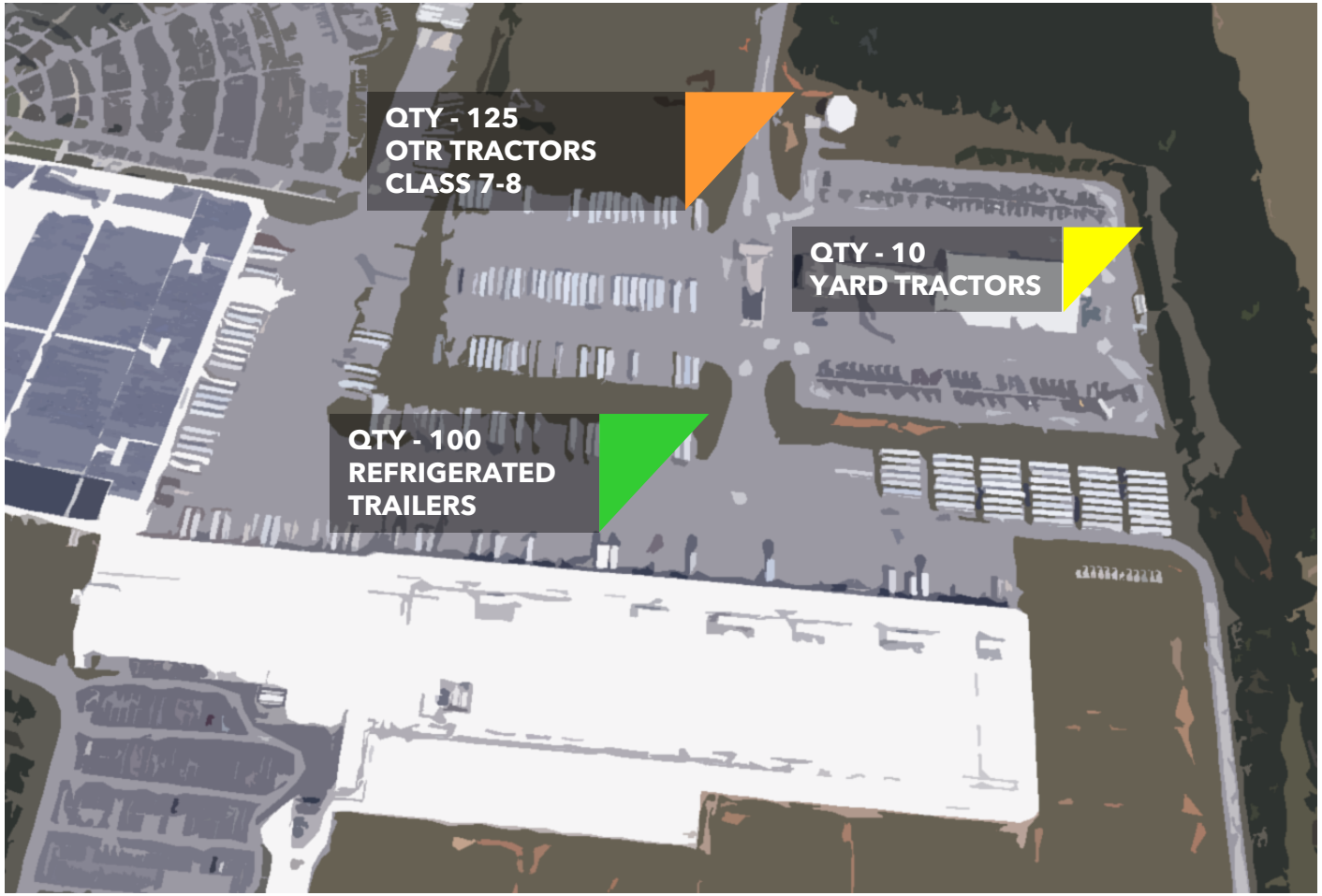
- Quantity - 48, 80A L2 CHARGERS
- Quantity – 2, 120kW DCFC



TAKEAWAYS

- Construction (labor/minor materials) > 50% of total project
- Chargers (L2 & L3) < 20%

CASE STUDY – SITE ASSESSMENT



ASSESSMENT ASSUMPTIONS

1. Assume 80% of fleet electrified
2. Design Load 1:1 Asset to Dispenser ration required
3. L3 Chargers
    1. 120kW Yard Tractors
    2. 350kW OTR Tractors (Future Proofing)
4. Refrigeration Trailers are electrified
    1. Dock Charging – L2
    2. % of Trailers staged for pre-cooling
5. Site to be electrified in phases; utilizing available site capacity ~ 3MVA to begin

SITE LOAD ESTIMATED

15-20MVA @ COMPLETION