Proposal Details

G Hendrix

Section 1: Summary Information

*** Project Title:**	Purchase and Installation of Electric Vehicle (EV) Charging Stations
*** Duration (months):**	2
*** Total Budget ($):**	$29,985.00
*** Requested SGEF Funds ($):**	$29,985.00
*** Matching Funds ($):**	$202,000.00
*** Proposed Starting Date:**	11/24/2014
PI Graduation Date (if applicable):	

Section 2: Applicant Information

	Full Name	Unit/Department	Phone	Email
*** Principal Investigator**	John Pilz	Honors College / Environmental Science	7274520603	johnpilz@mail.usf.edu
Investigator 1	Roger Stern	Honors College / Biomedical Sciences	8138179231	rogerstern@mail.usf.edu
Investigator 2	John Campbell	College of Engineering	5612548257	JJcampbell@mail.usf.edu
Investigator 3	Dr. Elias Stefanakos, Ph.D., P.E., Director of CERC	CERC / College of Engineering professor	8132308005	estefana@usf.edu
Investigator 4	Raymond Mensah, Director	Parking and Transportation	rmensah@usf.edu	8139740672

Section 3: Project Description

*** Project background and purpose (reasons motivating request) (Max 500 words)**

In 1995, USF was the first university to install an experimental 20 kW solar charging station. In 2011, USF made a groundbreaking decision to install Electric Vehicle (EV) charging stations in the parking lot by the Marshall Student Center. Today, the solar carport no longer functions as a charging station, and USF's 2 EV charging stations are insufficient for an increasing EV population of at least 27 (25 officially registered). As shown in the PDF attached to this proposal, the 2 charging stations are being used at 100% capacity at one point almost everyday, the stations are dispensing more electricity over time, and they have a total Greenhouse gas savings (GHG) accumulation of 2,358kg. EVs have an average GHG saving of 0.42kg/kWh, and USF has the opportunity to save an additional 4399kg*GHG through utilizing the existing solar carport's potential average of 6380.12 kWh/yr towards the electricity that EVs will utilize. As is described by the data, the purpose of this proposal can make some sense of all that's written thus far. On a 1,562 acre campus with many colleges, there are currently two 240-volt charging stations available for the 27 voluntarily registered EV owners that have listed their make and model. Of the four spaces available, only two actually can serve to charge cars with 240V while the other two can serve to charge at 120V. 120V chargers take an inordinate amount of time in comparison to the 240V ones. With increasing EV owners at USF, the demand for stations is exceeding the supply more and more. If this problem persists, a large portion of EV owners will not be able to charge their cars. We plan to propose the possible synergistic solar setup integrated with an EV charging station: A solar carport. The solar power is sent to the grid will in turn charge the EVs. The promise of solar energy as a means to offset the carbon footprint of electric cars enables USF to poise itself as a groundbreaking green institution, advertising such a structure on Beard drive with signs indicating "Solar EV Carport". The benefits to the Green Energy Fund's spreading of EV awareness spans well beyond a decade from now as a pioneer in the shift from internal combustion transportation to truly green transportation in which the very electricity produced can be said to be offset by solar energy. If the goal of this proposal is achieved, EV and future EV owners will have the opportunity to charge their cars at the USF Tampa campus without a significant carbon footprint (offset by solar energy). It is hoped that this synergy we are trying to establish will help catalyze future initiatives in this direction. In addition to the increased availability of EV parking

spaces, it will be less of an inconvenience to own an electric vehicle as a student or resident. This would enable EV drivers to have another place to park and would ease the commute of EV drivers to various areas on campus.

*** Project activities (Max 250 words)**

We have an existing infrastructure - the pre-existing conduits connect the transformer to outlets at every parking space available at the carport, all of which were used to charge electric vehicles when the structure functioned as such in the 1990s. The structure does not exist to charge electric vehicles because General Motors (the company funding the EV's to begin with) recalled all of the electric vehicles. The charging stations were subsequently removed as GM's property. This existing infrastructure will be utilized for electric vehicles once more in efforts to put the solar carport back to its intended use. The first step of our process requires us to purchase the EV charging stations and hire a contractor that provides the lowest of 3 estimates to install the system in the desired location (the solar carport). The green energy funding, complimented with the necessary permits must be obtained prior to installation. Since the bulk of the infrastructure is already in place, the installation will consist of station placement, and connection to the transformer through the existing solar carport conduits. The installation process will be relatively fast when all the necessary parts are present. To allow for time to get permits and the product to be installed, this project should be finished within 3 months time. As the solar energy is sent to the grid, the grid will be providing for the EV charging stations.

*** Project results (Max 500 words)**

With the solar panels generating an an estimated 29,200 kWh each year (according to SGEF booklet), this energy will go to offset the carbon footprint of EV charging at USF. An estimated total of 4399 kg GHG will be saved by this project through powering electric vehicles. Four spots will have been allocated for the two dual charging stations to effectively charge four cars at 240 volts, double the capacity of the existing two 24-volt chargers at the MSC. In addition, two extra spots will be allocated for EVs that cannot find a spot to charge. Electric vehicle spots will be properly labelled, and aesthetic signs will be used to advertise the efforts of SGEF. This will result in the reinstatement of the EV initiative that had been at the same location in the 1990's, under the supervision of Dr. Stefanakos from CERC. This project will be the cornerstone of future EV initiatives at USF because there are a total of 10 spots available for EV charging, according to Dr. Stefanakos. This project will nurture the growing EV market as the first solar EV charge port that still works. The stations can be programmed, updated and repurposed for the needs of the time. When the board of trustees decides, these charging stations can charge users to pay for maintenance and more EV stations. The information systems included will also provide USF with data to show how the stations are being used.

*** Outcomes of the project (Max 250 words)**

*** Annual Energy Savings**	0 kWh
Annual Cost Savings	$0.00
Return of Investment in %	0.00
Annual Green House Gas Reduction	0.00

*** Project Sustainability (Max 200 words)**

This project will be maintained like the two that already exist on campus, by the same company. Parking and Transportation will enforce the parking regulations - only electric vehicles with a USF permit can park. The stations can also generate funding to pay for themselves.

Section 4: Workplan and Budget Details

*** Detailed work plan/schedule of activities (Max 250 words)**

Notification will be given to the contractor that the funding has been received to begin work. In collaboration with USF Facilities Planning (Antonio Laurenco, project manager), the stations will be delivered and installed after the appropriate foundation has been laid with the extension of the conduits to their intended placement. Month 1 and 2 will consist of getting supplies and equipment ready for installation and the installation should commence and be finished within the same day before the end of the Fall semester (December 6).

*** Budget breakdown**

Category	Request from SGEF	Applicant contribution	Total
Personnel (include all involved)	$3,600.00	$0.00	**$3,600.00**
Equipment	$13,905.00	$200,000.00	**$213,905.00**
Supplies/Materials	$1,020.00	$0.00	**$1,020.00**
Contractual	$625.00	$0.00	**$625.00**
Construction	$8,835.00	$0.00	**$8,835.00**
Other (specify in budget justification)	$2,000.00	$2,000.00	**$4,000.00**
Total Project Cost	**$29,985.00**	**$202,000.00**	**$231,985.00**

*** Budget justification (Max 250 words)**

The cost to build the existing solar carport is reported to be $200,000. This location is being provided by CERC for EV station installation, and illustrates support from the Engineering Department. Should the need rise, John Pilz (the PI) is willing to invest $2,000.00 to add additional matching funds. The Budget justification for the Personnel involves the commission for the contractor to install the system and provision of training support for the system. In addition, Facilities Planning requires a 6% commission. The Equipment budget consists of the 2 Dual Electric Vehicle charging stations. The Supplies and materials budget consists of the 2 years of commercial network service plan, which includes network operation and driver support, flex billing, station API use, a station manager login, and reservations. Each year is priced at $510.00. The Contractual budget includes the installation of the two charging stations. This involves the inspection and utilization of existing conduits from the existing electrical panel to existing junction box in concrete column, laying new conduits outside of the existing column, pouring new concrete footer, as well as other specifics included in the attached pdf. The "Other" section of the budget provides a 10% contingency.

Upload File:

Added By	Vote
Stanley M. Kroh	Yes
Stanley M. Kroh	Yes
Ken Christensen	Yes
Ken Christensen	Yes
Ken Christensen	Yes
Ken Christensen	Yes
Ken Christensen	Yes
Christian Wells	MayBe
Margaret Rush rush@epchc.org	Yes
Margaret Rush rush@epchc.org	MayBe

1 2 3

Added By	Comments
Stanley M. Kroh	I support the project but wonder why Annual Energy Savings, Annual Cost Savings, Return on Investment and Annual Greenhouse Gas Reductions are all shown as "0". The narrative states there will be annual greenhouse gas reductions of 4399kg. Please explain the statement "the stations can generate funding to pay for themselves". Also, in the Budget Breakdown, "Other Costs" of $4K are not fully described.
Ken Christensen	It is not entirely clear what is being proposed. As I understand it, $30K is being requested to build infrastructure for four EV charging stations and to connect existing (or to be purchased?) solar panels to the utility grid. The project will use the physical infrastructure of an existing 1990s EV charging station set-up behind the Engineering complex. The EV charging stations will be powered from the grid and not directly from the solar panels. It is unclear why the solar panels cannot directly connect to the EV charging stations and only return electricity to the grid when an excess of solar generated electricity exists (e.g., when no car is connected to the EV charging station). This approach would be more efficient. It is stated that the solar panels will generate an estimated 29,200 kWh per year. How was this estimate generated? At $0.10 per kWh the payback time for this project is then approximately 10 years. I would like to see more details on how the savings estimate was generated. The project has good potential for publicity – EV charging stations are “cool” (even the Greenwise Publix in SoHo has one). There are many details to be worked-out with respect to usage of EV charging stations. Who can park there and for how long? Will there be a prioritization for pure-EVs (e.g., Leaf) over hybrids (e.g., Volts)? Overall, I rate this project as competetive if more details are provided on the expected energy savings and a justification is given for why the solar generated electricity is not to be used directly
Lee Stefanakos	As the students' advisor it will not be appropriate for me to rate this proposal. I will add a couple of comments that posibly can clarify some comments made by other rebviewers. 1) The output of the PV modules is variable DC and, therefore, one would think it could directly charge the batteries of the EV. This is actually possible, however, because of the variability of the electrical output, it will require DC to DC conversion which would add to the cost of the proposed system. In addition it could possible bring in other issues, such as warranties, etc. from the manufacturer of the EV. 2.The PV system and car spaces are already in place as well as the conduits for bringing to the EV chargers the required power. The funds requested would only be for the chargers and their installation. 3. The eight spaces underthe carport are controlled by the USF Parking

	department and , therefore, cen be designated, as needed, for the sole use of the EVs. At one time (1994) six EVs were being charged under the carport as part of a project funded by the US Department of Energy.
Christian Wells	I don't understand what is being proposed (in other words, how exactly the SGEF funds will be expended). I think the project aims to use the existing solar panels to power the EVs or EV chargers. If this is the case, that would be novel and interesting, but might interfere with the warranties of the EVs and the EV chargers. I also wonder: if SGEF wishes to invest in additional EV chargers on campus, is this the best/most convenient place to do so? It seems a little out of the way of most traffic. Perhaps a survey of EV users on campus could evaluate if this is an ideal location. I think a bit more research (esp. into EV and EV charger warranties, etc.) is needed. Otherwise, it is a good idea and a good proposal.
Margaret Rush rush@epchc.org	I strongly support this type of project. From your electric vehicle numbers and station use,you are very much in need of expanding your charging infrastructure. The solar component adds to the cost, but as a University, this seems the right setting to be one step ahead of the curve and makes use of solar that students and citizens are looking for. Currently, using the solar panels to send energy to the grid is the best way to go, yet allows USF to investigate ways to make this system eventually go directly to the vehicles. The ability to use a credit card to charge for electricity sets up a way to recoup some costs, but I would keep the charge close to the actual energy use cost. I am not familiar with the location of the current solar carport, but it should be compatible for students to use for class or dorms. Having extra parking spaces is smart, but you will need to determine an incentive for these cars to move shortly after they charge, or you will have vehicles sitting there too long. Don't overlook opportunities to install low cost 120 overnight charging in garages near student living areas. Overnight charging is the MOST environmentally friendly and low cost way to promote electric vehicles.
Jochen Eckart	I would support the project. I think the EV numbers on the campus warrant an additional charging station on the campus.
Barbara S. Donerly	Agree with comments above. Need to have a mechanism to limit the amount of time a car can occupy the spaces to maximize utilization.

Proposal Addendum
Supporting Documents

Work has already been conducted with Facilities Planning and Construction. Three contractors were consulted, and the lowest bid was chosen after negotiations. The proposed bid is included in this document.

After speaking with Mr. Lourenco and Mrs. Gahagan (contacts below), we were told all that is needed to start construction is the chart fields information for the account to generate a Purchase Order (P.O.) from which to draw funding.

Contacts

Antonio J. Lourenco – Project Manager
alourenc@admin.usf.edu
(813) 966-2496

Jackie Gahagan – Project Coordinator
jhahagan@admin.usf.edu
(813) 974-0332

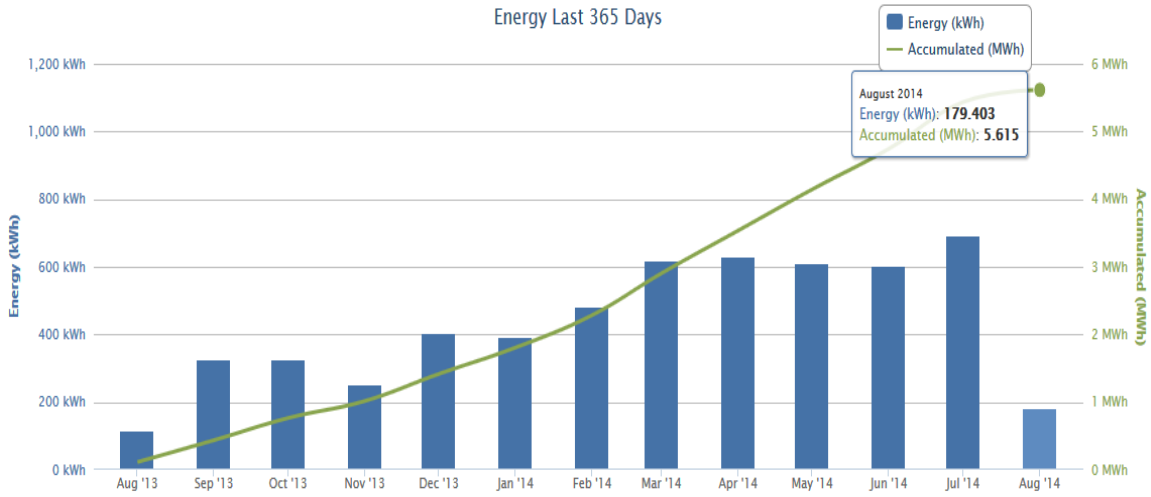
Table of Contents

We have received this data on registered electric vehicles campuswide in Spring 2014 from Chargepoint through Frank Granda.

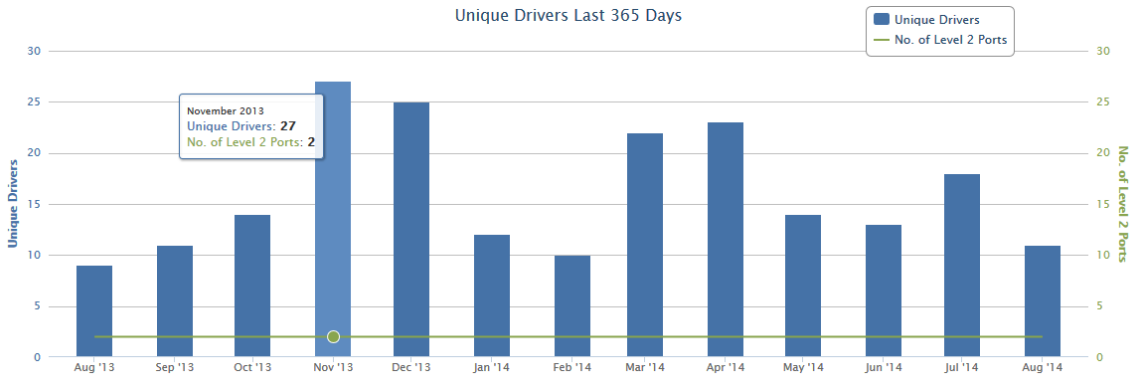
Nissan Leaf – 3
Mercedes Smart Car – 7
Chevrolet Volt - 15

Here are the graphs to show the necessity for electric car chargers at USF. Please notice the second and third graphs - the second shows a total of 27 unique drivers and the third shows an average of 100% peak daily occupancy. The last graph shows the total greenhouse gas savings over time, so this is something very notable for this campus' carbon footprint, to say the very least.

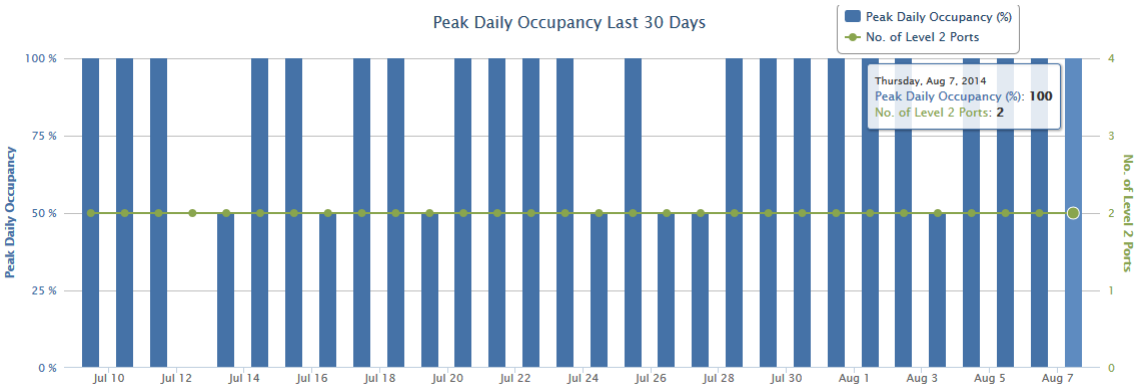
Electricity being dispensed (Notice it's increasing as the year progresses)



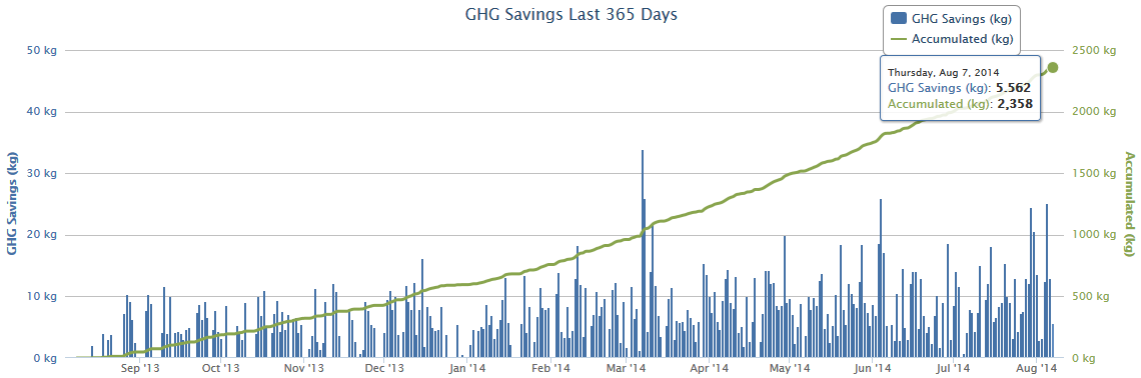
Unique Drivers (EV's on campus)



Here's the graph to show how often the chargers are used (peak is 100%)



Here's a snap shot for the sustainability office interested in saving greenhouse gases (look at the greenhouse gases saved)



Why Electric Vehicles Beat Unsustainable Gasoline

This chart compares the financial and environmental costs of gasoline vehicles to those of all-electric and partially electric vehicles.

Vehicle type	Gas cost for 50 miles/day	kWh for 50 miles/day	Annual cost for 50 miles/day	Gas gallons/year for 50 miles/day	Tons of tailpipe CO_2/year	Total CO_2/year, including upstream*
10 mpg gas	$17.50	200	$6,400	1,829	21	27.3
20 mpg gas	$8.75	100	$3,200	915	10.5	13.6
30 mpg gas	$5.85	67	$2,130	609	7	9.1
40 mpg hybrid	$4.40	50	$1,600	457	5.2	6.8
50 mpg hybrid	$3.50	40	$1,275	365	4.2	5.5
Plug-in hybrid with 25 mile all-electric range	$1.75	10	$820	182	2.5	3
Plug-in hybrid with 50 mile all-electric range	$0	22	$396	0	0	0.4
All-electric vehicle	$0	12	$216	0	0	0.2

The main assumptions used to produce the values in the chart are: 1. The average cost of gasoline over the next year will be approximately $3.50/gallon. 2. The Time of Use (TOU) rate for nighttime charging is approximately $0.05/kWh. 3. There are about 40 kWh of energy in a gallon of gasoline. 4. Burning 1 gallon of gasoline produces approximately 23 pounds of CO_2.

*This column includes "upstream" CO_2 emissions for process to find, extract, refine and transport gasoline, as well as CO_2 emissions from the California mix of power plants that produce electricity to charge EVs.

4142 Mariner Blvd. # 106
Spring Hill, Florida 34609
352.414.5334 Office
813.354.4658 Fax
Accounting@GoSpaceGo.com

Proposal

Date	Proposal No.
10/03/2014	76548

Project Submitted to:

University of South Florida
4202 E. Fowler Avenue
Tampa, Florida 33620
Attn: John Pilz

Project Location:

University of South Florida - Solar Canopy
4202 E. Fowler Avenue
Tampa, Florida 33620

Project Name: Solar Canopy (USF)

Activity	Quantity	Rate	Amount
• ChargePoint Electric Vehicle Charging Station CT4021 Bollard Dual Level II Commercial (Gateway) - Self Retracting Cords - 5.7 Display Monitor 04.03.1-CT4021-GPRS-LOCK-CCR	1	7,210.00	7,210.00
• ChargePoint Electric Vehicle Charging Station CT4021 Bollard Dual Level II Commercial (Non-Gateway) - Self Retracting Cords - 5.7 Display Monitor 04.03.2-CT4021-LOCK-CCR	1	6,695.00	6,695.00
• 1 Yr Commercial ChargePoint Network Service Plan Dual EV Charging Station - 24/7/365 Network Operation & Driver Support - Station Manager Login - Flex Billing - Reservations - Station API use	2	510.00	1,020.00
• Provision and Commission ChargePoint EVSE Network Connection and Training Support	2	300.00	600.00
• Installation Details: - Install required breakers in existing panel located in adjacent building of Solar Canopy for two (2) Level II Electric Vehicle Service Equipment (EVSE) units. - Inspect and utilize existing conduits from existing electrical panel to existing junction box in concrete column. - Run new conduit outside of existing column, across concrete footer, 90 degrees into existing ground. - From existing concrete footer, continue new underground conduit to each new Level II EVSE locations.	1	8,585.00	8,585.00

Continue to the next page

_____ initials _____ initials(GS)

Activity	Quantity	Rate	Amount
• Installation Details (cont) - Form & Pour new concrete footers for two (2) new Level II EVSE locations. - Assemble two (2) new Level II EVSE units & fasten to new concrete footer per manufacturer specs. - Pull new wire through from existing electrical panel to the two (2) new Level II EVSE locations and connect. - Complete Diagnostic Testing of system from the two (2) new Level II EVSE units to existing electrical panel. - Power up the EVSE units. - Install (2) bollards in front of each new Level II EVSE units. - Provision System.			
• Permit Fees and Coordination	1	350.00	350.00
• Freight	1	275.00	275.00
OPTIONAL Line Item: $675.00 • Striping and Stenciling • Four (4) Parking Spaces • Stencil (GoSpace Custom) (Installation Included)			
OPTIONAL Line Item: $589.00 • Custom four (4) Electric Vehicle Charging Station Signage and four (4) 100% Recyclable Composite Post			
		Total	$24,735.00

We are looking forward to working alongside your company in your efforts to go GREEN.
We are proud to be your GoSpace Equipment and Installation Provider.

Accepted By: _____ Accepted Date: _____ Authorized Signature 10/10/2014 Date

Standard Terms and Conditions

GENERAL

All contracts are valid for a period of 30 days, unless otherwise noted, and must be accepted in writing by the Customer and with an executed copy furnished to GoSpace, LLC (GS) within that time period. After this period, the Contract can be withdrawn without notice.

This contract, upon acceptance, constitutes the entire Agreement between the Customer and GS and supersedes any and all prior representations, discussions, agreements or understandings, whether verbal or in writing, No changes, modification or revisions to these Terms and Conditions shall be binding unless accepted in writing by GS.

SCOPE OF WORK

The scope of work is as noted on page 1 of this Contract and describes the work to be performed under the Contract (the "Work"). No changes in the scope of work will be authorized or performed without the prior written permission of GS and Customer's agreement as to the cost of same.

PAYMENT TERMS

All invoices shall be paid as follows: 50% due upon execution of this agreement; remaining balance due project is completed. All payments due under this Agreement or any written modification thereto, shall be due upon receipt of an invoice from GS, unless other advance written arrangements are made with GS. Any invoice not paid within 30 days of receipt of invoice from GS, shall incur a finance charge of one and a half percent (1.5%) per month (annual rate of 18%) that shall be added to the unpaid balance each month until paid in full.

INSURANCE

GS will secure and maintain comprehensive general liability insurance, including coverage for independent contractors, contractual liability, personal or bodily injury, products liability, premises/operations, completed operations and broad form property damage with combined single limits of not less than one million dollars ($1,000,000.00) per occurrence. GS shall also maintain such insurance as will protect against claims in connection with the performance of the Work by GS's employees, subcontractors or agents under applicable Workers' Compensation Statutes. GS shall cause its carrier to waive its right of subrogation against Customer and the Indemnities. All such insurance policies shall name Customer, Customer's management company and their respective parent companies, affiliates, officers, directors, employees and agents as additional insured's. The insurance afforded to Customer's management company shall be primary for all purposes. Upon request from time to time by Customer, GS shall furnish evidence of all insurance coverages to Customer.

INDEMNIFICATION

GS agrees to protect, defend, indemnify and hold Customer, its management company and their respective parent companies, affiliates, officers, directors, employees and agents (collectively the "Indemnities"), harmless from and against any and all liabilities, claims, expenses, losses and damages (including reasonable attorney fees and costs) that may at any time be asserted against the Indemnities by reason of (i) the Work provided by GS, (ii) GS's presence at Customer's premises, (iii) any negligence, carelessness, or misconduct of GS or its employees, subcontractors or agents, and/or (iv) GS's breach or default of any of the covenants, agreements, terms, provisions, representations or warranties contained in this Contract. Additionally, GS shall, at its own cost and expense, not subject to reimbursement, defend all actions, suits or proceedings, and satisfy all judgments, orders or decrees with respect to the foregoing. In the event Customer determines, in its sole discretion, that GS is not providing an adequate defense, Customer may take all actions to defend itself, and GS shall promptly reimburse Customer for all costs of such defense.

GS'S EMPLOYEES: GS acknowledges that it is solely responsible for all withholding, social security, self-employment, worker's compensation, unemployment compensation, benefits, employment taxes and any and all other considerations generally paid by an employer or an employee. Further, all employees and other persons employed or engaged by GS in furtherance of its obligations under this Contract shall for all purposes solely be and remain the employees, agents or independent contractors of GS, and GS shall assume all and every responsibility for such employees, agents or independent contractors. GS expressly acknowledges and agrees that all personnel providing services under the Agreement shall do so on behalf of GS, and shall be, for all intents and purposes, employees of GS, under the direction and exclusive control of GS, and that GS alone shall be responsible for all employment determinations, including, but not limited to, hiring, termination and salary considerations.

WARRANTY TERMS

GS will warrant all of its labor for a period of One Year from the date of the original installation against any defect in workmanship. GS will not warrant any products as said warranties are solely those of the manufacturer of the product. GS will, however, work in conjunction with the manufacturer to resolve any and all warranty claims.

SAFETY

GS will carry out to the best of its ability a safe work environment. All parties agree to notify each other immediately upon becoming aware of any alleged violation of the Occupational Health and Safety Act.

DELAYS

GS shall not be liable for any delay in the performance of the work resulting from or attributed to acts or circumstances beyond their control, including but not limited, to acts of God (force majeure), fire, riots, labor disputes, terrorism, acts or omissions of the Customer, Owner of the property, or delays in supply of any materials

_____ Initials _____ Initials (GS)

to be provided under this Contract by the manufacturer or their distributor. Customer agrees to extend the time for GS's performance hereunder for a reasonable period of time to complete GS's work hereunder, including extensions of time required by revisions to this Contract as requested by Customer.

COMPLIANCE WITH LAWS

GS will perform its Work in substantial compliance with the plans and specifications provided for the Work. GS shall not be responsible for errors or omissions on the plans or specifications and does not warrant that the system, designed by others, will function as desired by the Owner or the Contractor.

DIRECTIONAL BORING

GS will take reasonable and necessary precautions to identify underground obstructions. GS will arrange for underground utility locations within public right-of-way easements. The Owner/General Contractor will provide utility location information including elevations of all underground utilities on private property or areas not covered by the state one call service. If an unknown or improperly marked underground obstruction is encountered or damaged, cost of the repair, if any, will be the responsibility of the Customer or Owner/General Contractor.

HAZARDOUS MATERIAL

Unless specifically noted in our scope of work, GS expressly excludes any work associated with identification, abatement, clean up, control, removal, or disposal of hazardous materials.

MATERIALS

If material or equipment included in this Contract becomes delayed for reasons beyond our control and without fault to GS, the installation schedule shall be adjusted accordingly. If materials included within this Contract become permanently unavailable due to no fault of GS, alternate materials shall be authorized and approved in writing. An appropriate price adjustment will be approved in writing prior to proceeding.

ASSIGNMENT

The Contract shall not be assignable by Customer without the expressed written consent of GS, which may be withheld at GS's sole direction.

This Agreement shall be binding upon GS's and Customer's respective heirs, successors and assigns.

GOVERNING LAW AND VENUE

Both parties acknowledge that this Agreement shall be governed exclusively by the laws of the State of Florida without remedy to the principal of conflicts of laws. Venue for any and all legal proceedings arising out of or related to this Contract shall be in Orange County, Florida. If any part of this Agreement is held to be invalid or unenforceable for any reason, the remaining terms and conditions of this Agreement shall remain in full force and effect.

The parties executing this Agreement on behalf of Customer and GS, respectively, acknowledge and agree that they have authority on behalf of said party to execute this Agreement. Neither party shall be required to inquire further with the Customer as to said authority. The person executing this Agreement shall be GS's primary contact with Customer and the party to execute any other Agreement provisions or changes to this Contract unless GS is notified by writing of Customer of a change in authority.

DISCLAIMER

COMPANY DISCLAIMS ALL OTHER WARRANTIES WHETHER EXPRESSED OR IMPLIED, INCLUDING STATUTORY WARRANTIES AND SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS OR PARTICULAR PURPOSE, OR WARRANTY OR COMPETENT SERVICE. FURTHER, THE COMPANY HAS MADE NO AFFIRMATION OF FACT OR PROMISE RELATING TO THE PRODUCT FOR SERVICE PROVIDED HEREUNDER THAT HAS CREATED OR AMOUNTED TO AN EXPRESS WARRANTY. CUSTOMER EXPRESSLY WAIVES AND RELEASES ANY CLAIMS IN ANY LAWSUIT, ARBITRATION OR OTHER LEGAL PROCEEDING AGAINST GS FOR NEGLIGENCE, TORTS, PERSONAL INJURY, DEATH, VIOLATION OF ANY STATUE, RULE OR REGULATION, LOSS OF USE, DIMINUTION OF VALUE, ECONOMIC, COMPENSATORY, INCIDENTAL, CONSEQUENTIAL, EXEMPLARY, PUNITIVE, LIQUIDATED, TREBLE OR SPECIAL DAMAGES IF ANY AND IN NO EVENT SHALL GS BE LIABLE FOR ANY AMOUNT GREATER THAN THE AMOUNT PAID BY THE CUSTOMER TO GS FOR THE SERVICES PROVIDED UNDER THIS CONTRACT.

NOTICE OF CLAIM

CHAPTER 558, FLORIDA STATUES CONTAINS IMPORTANT REQUIREMENTS YOU MUST FOLLOW BEFORE YOU MAY BRING ANY LEGAL ACTION FOR AN ALLEGED CONSTRUCTION DEFECT AT YOUR LOCATION. SIXTY DAYS BEFORE YOU BRING ANY LEGAL ACTION, YOU MUST DELIVER TO THE OTHER PARTY OF THIS CONTRACT A WRITTEN NOTICE REFERRING TO CHAPTER 558 OF ANY CONSTRUCTION CONDITIONS YOU ALLEGE ARE DEFECTIVE AND PROVIDE SUCH PERSON THE OPPORTUNITY TO INSPECT THE ALLEGED CONSTRUCTION DEFECTS AND CONSIDER MAKING AN OFFER TO REPAIR OR PAY FOR THE ALLEGED CONSTRUCTION DEFECTS. YOU ARE NOT OBLIGATED TO ACCEPT ANY OFFER, WHICH MAY BE MADE. THERE ARE STRICT DEADLINES AND PROCEDURES UNDER THIS FLORIDA LAW, WHICH MUST BE MET AND FOLLOWED TO PROTECT YOUR INTERESTS.

_____ Initials _____ Initials (GS)

CT4000 Family

ChargePoint® Charging Stations

The CT4000 is the latest generation of ChargePoint charging stations. Refined yet rugged, the CT4000 family sets the industry standard for functionality and aesthetics. A robust cord retraction system comes standard on all CT4000 models to eliminate unsightly cords on the ground, and to keep your drivers from having to touch charging cables.

The CT4000 full motion color LCD display instructs drivers while supporting dynamic updates of custom branded videos and advertisements.

The intelligent power sharing feature of the CT4000 doubles the number of parking spaces served by allowing two charging ports to share a single circuit. Sites with single port EV stations can upgrade to dual port stations without requiring additional electrical services.

All CT4000 models offer one or two standard SAE J1772™ Level 2 charging ports with locking holsters, each port supplying up to 7.2kW.

Available in bollard and wall mount configurations, the CT4000 supports easy installation anywhere. To future proof your investment, all stations are fully software upgradeable over the air.

Corporate Branding and Video Advertising

- Download full motion color videos to your stations[1]
- Custom replaceable signage to project your brand
- Custom "helmet" printing available[2]

Intelligent Power Sharing (patent pending)

- Reduced installation and operating costs
- Dynamically share one 40A circuit between two parking spaces
- Double the number of parking spaces for a given site's power capacity
- Upgrade a single port station to dual port with no electrical upgrade

Cord Management

- Keep charging cords off the ground and out of drivers hands
- Standard on all models
- Ultra-reliable second-generation gravity operated mechanism
- Flexible over entire -22°F to +122°F product temperature range

Driver Friendly User interface

- Instructional video shows how to use the station
- Multi-language: English, French, Spanish
- Touch button interface; works in rain, ice and with gloves
- Backed by ChargePoint's world class 24/7/365 driver phone support

Energy Measurement and Management

- Real-time energy measurement
- 15 minute interval recording
- Time of Day (TOD) pricing
- Load shed by % of running average or to fixed power output

The standard *EV Charging Only* sign is easily replaceable with your branding.

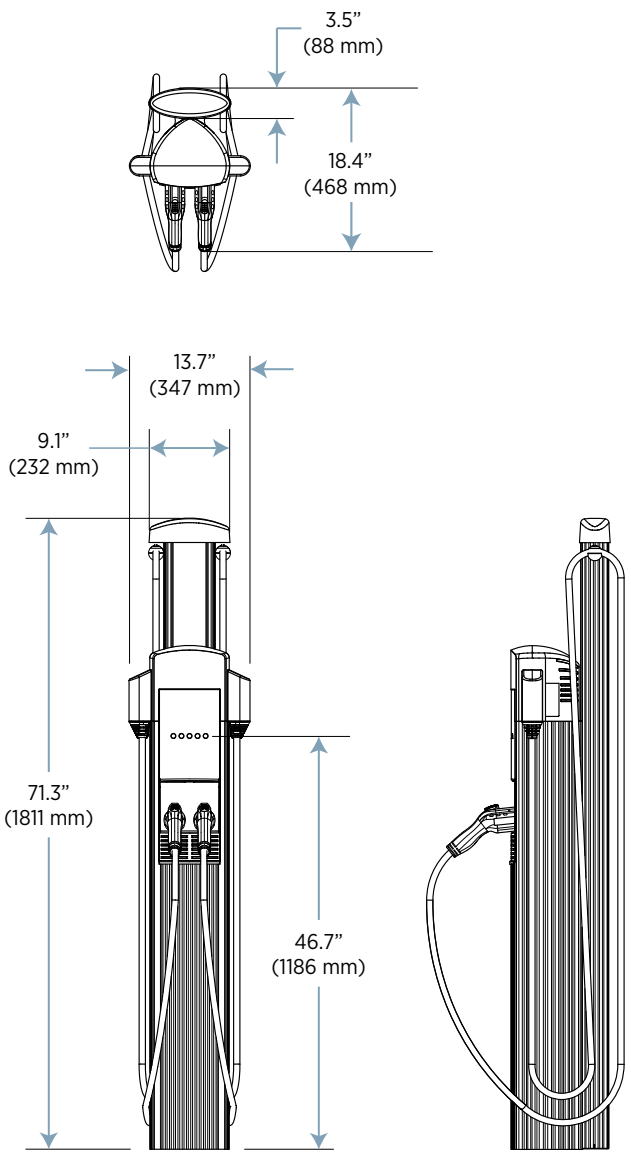
The cap of the CT4000 family is also available for custom branding.

The 5.7" LCD display provides full motion charging instructions in a clear and simple format. It also allows station owners to deliver advertising messaging.

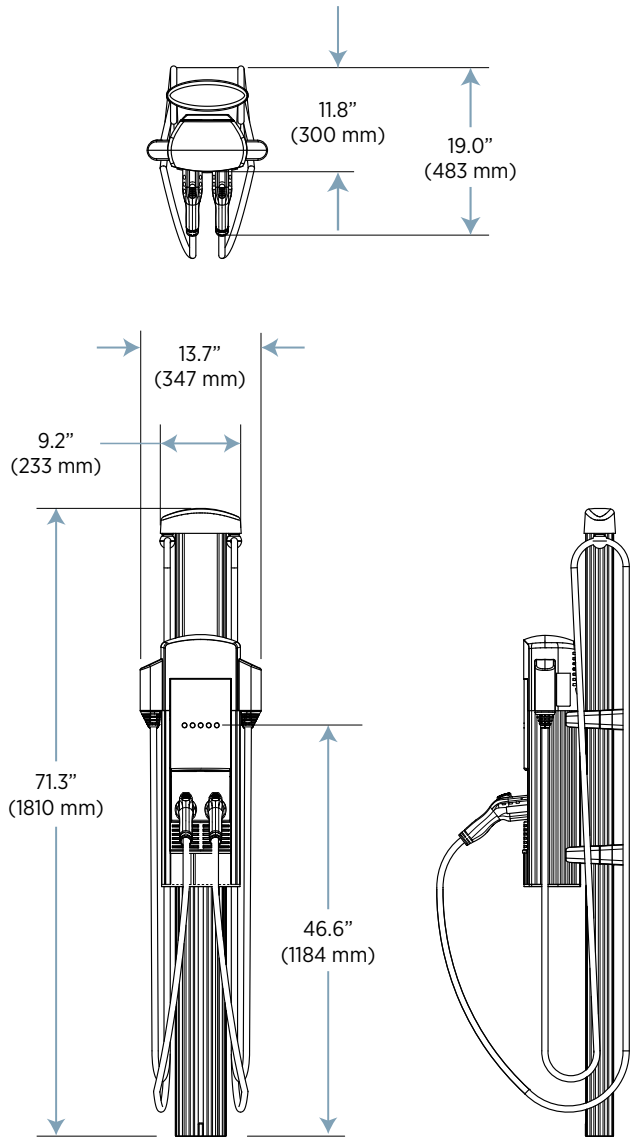
Driver interaction is supported in any weather by five rugged, back-lit buttons with audio feedback.

[1] Download fees apply
[2] Minimum order quantities apply

CT4021 Bollard



CT4023 Wall Mount



CT4000 Family Specifications

Electrical Input	Single Port	Dual Port
AC Power Input Rating – Standard	208/240VAC 60Hz single phase @ 32A	208/240VAC 60Hz single phase @ 32A x 2
AC Power Input Rating – Power Sharing	n/a	208/240 VAC 60Hz single phase @ 32A
Input Power Connections – Standard	One 40A branch circuit	Two independent 40A branch circuits
Input Power Connections – Power Sharing	n/a	One 40A branch circuit
Required Service Panel Breaker – Standard	40A dual pole (non-GFCI type)	40A dual pole (non-GFCI type) x 2
Required Service Panel Breaker – Power Sharing	n/a	40A dual pole (non-GFCI type)
Service Panel GFCI	Do not provide external GFCI as it may conflict with internal GFCI (CCID)	
Wiring – Standard	3-wire (L1, L2, Earth)	5-wire (L1, L1, L2, L2, Earth)
Wiring – Power Sharing	n/a	3-wire (L1, L2, Earth)
Station Power	8W typical (standby), 15W maximum (operation)	

Electrical Output		
AC - Standard	7.2kW (240VAC @ 30A)	7.2kW (240VAC @ 30A) x 2
AC - Power Sharing	n/a	7.2kW (240VAC @ 30A) x 1 OR 3.8kW (240VAC @ 16A) x 2

Functional Interfaces		
Connector(s) Type	SAE J1772™	SAE J1772™ x 2
Charging Cable Length	18’ (5.5 meters)	18’ (5.5 meters) x 2
Overhead Cable Management System	Yes	
LCD Display	5.7” full color, 640x480, 30fps full motion video, active matrix, UV protected	
Card Reader	ISO 15693, 14443, NFC	
Locking Holster	Yes	Yes x 2

Safety and Connectivity Features	
Ground Fault Detection	20mA CCID with auto retry
Open Safety Ground Detection	Continuously monitors presence of safety (green wire) ground connection
Plug-Out Detection	Power terminated per SAE J1772™ specifications
Power Measurement Accuracy	+/- 2% from 2% to full scale (32A)
Power Report/Store Interval	15 minute, aligned to hour
Local Area Network	2.4 GHz Wi-Fi (802.11 b/g/n)
Wide Area Network	3G GSM, 3G CDMA

Safety and Operational Ratings	
Enclosure Rating	Type 3R per UL 50E
Safety Compliance	UL listed for USA and cUL certified for Canada; complies with UL 2594, UL 2231-1, UL 2231-2, and NEC Article 625
Surge Protection	6kV @ 3000A. In geographic areas subject to frequent thunder storms, supplemental surge protection at the service panel is recommended.
EMC Compliance	FCC Part 15 Class A
Operating Temperature	-22°F to 122°F (-30°C to +50°C)
Operating Humidity	up to 85% @ +50°C (122°F) non-condensing
Non-Operating Humidity	up to 95% @ +50°C (122°F) non-condensing
Terminal Block Temperature Rating	221°F (105°C)
Maximum Charging Stations per 802.11 Radio Group	10. Each station must be located within 150 feet “line of sight” of a gateway station.

CT4021 Bollard charging station

CT4023 Wall Mount charging station

Ordering Information

Specify model number followed by the applicable code(s). The order code sequence is:

Model-Options-Warranty

Option		Order Code
Model	Single Port Bollard Mount Dual Port Bollard Mount Single Port Wall Mount Dual Port Wall Mount	CT4011 CT4021 CT4013 CT4023
Options	Integral Gateway Modem - USA Integral Gateway Modem - Canada	-GW1 -GW2
Warranty	Parts Only Extended Warranty – 2, 3, 4, or 5 year	CT4000-EWn*

* Substitute *n* for the duration of the warranty (2, 3, 4, or 5 year)

Order Code Examples

If ordering this	the order code is
Dual Port Bollard Mount USA Gateway Station	CT4021-GW1
Single Port Wall Mount Station with 5 Year Warranty	CT4013 CT4000-EW5
Dual Port Wall Mount Canada Gateway Station with 2 Year Warranty	CT4023-GW2 CT4000-EW2

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University of South Florida
Student Government Senate

SB [R] 55-0XX
Support for Increase of
Electric Vehicle Charging Stations
55th Term
Fall 2014

A SENATE RESOLUTION

Be it resolved by the Senate of the University of South Florida Student Government assembled,

Whereas, 1,068 student signatures have been made in favor of expanding the existing system of USF Electric Vehicle (EV) charging stations.

Whereas, the students ask for representation in USF Tampa with regards to the initiative to support clean and renewable energy.

Whereas, the students support the Student Green Energy Fund and relevant institutions in an investment in Electric Vehicle charging stations for their future.

Therefore, be it resolved by the Senate of the University of South Florida Student Government Assembled, that on behalf of the student body, Electric Vehicle Charging stations should be expanded at the University of South Florida to meet the demands set by registered Electric Vehicles on the Tampa campus.

ATTEST:

Andy Rodriguez
Senate President

Abdool Aziz
Senate President Pro-Tempore

This is a true and correct copy of Senate Resolution 55-0XX, adopted by the Senate on October 14th 2014.

USF
UNIVERSITY OF SOUTH FLORIDA
COLLEGE OF ENGINEERING

CERC
Clean Energy Research Center
College of Engineering
University of South Florida
4202 East Fowler Avenue, ENB 118
Tampa FL 33620-5350
813-974-7322

October 10, 2014

RE: Letter of Support for retrofitting the existing CERC photovoltaic carport to add electric car charging stations

Dear Student Green Energy Fund Council,

As the Co-Director of CERC (Clean Energy Research Center) at USF, it has been my heartfelt mission to support any and all practical applications that have been brought to my attention by enthusiastic students. When John Pilz informed me of the need for additional EV charging stations, I thought it would a very good idea to utilize the existing Solar Charging Station for this purpose. I had actually received word from Mr. Major Alston that a Tesla supporter group might actually offer a Tesla supercharger to be installed at the carport. As an avid supporter of clean solar energy, I initiated the development of the first solar charging station in the world. As the system is already set up to potentially charge up to eight electric vehicles, this project is a very practical application for utilizing the existing infrastructure. With the wiring already set up to provide electricity through conduits in each of the pilings shouldering the weight of the solar panels, the charging station(s) installation can be a simple procedure. The EV charging stations draw electricity directly from the grid, electricity that is provided by the solar panels.

The cost for the installation of solar car charging station(s) will be an excellent use of the students' green energy fund. We strongly support this proposal and hope it will meet with the approval of the council.

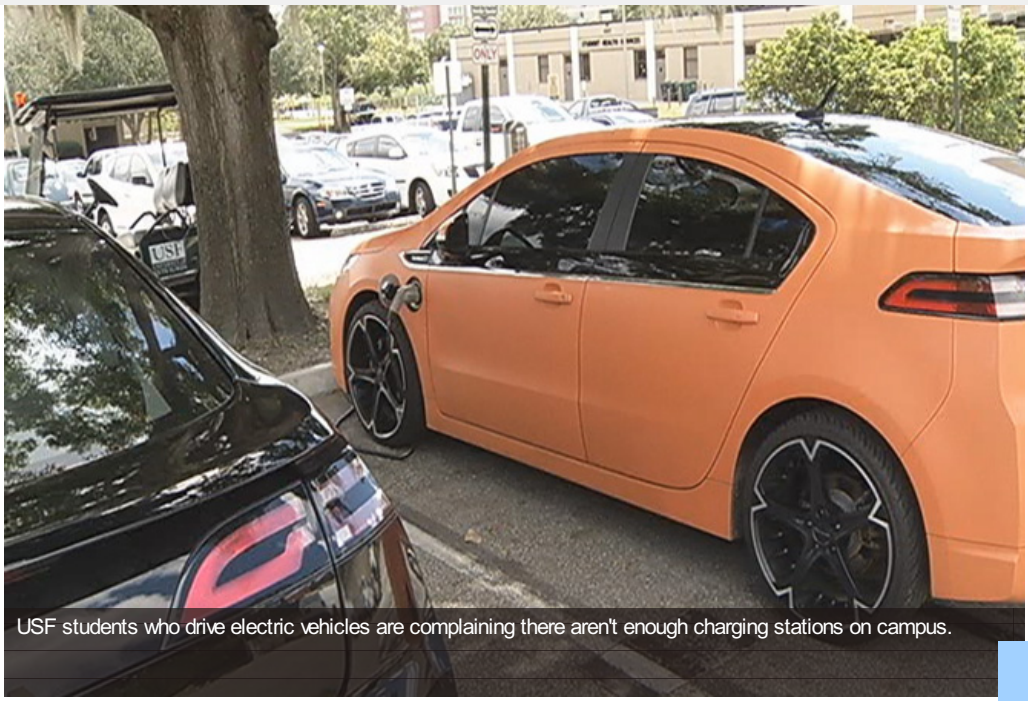
Sincerely,

Elias K. Stefanakos, Ph.D., P.E.
Director and Professor
Clean Energy Research Center
estefana@usf.edu
Telephone: 813-974-4413 Fax: 813-974-2050
Email: estefana@usf.edu Website: http://cerc.eng.usf.edu/

With approval of:

José L. Zayas-Castro, Ph.D.
Professor and Associate Dean of Research
College of Engineering josezaya@eng.usf.edu

Students: Not enough charging stations at USF



USF students who drive electric vehicles are complaining there aren't enough charging stations on campus.


By Erin Maloney, Reporter
Last Updated: Monday, September 29, 2014, 5:39 PM

17

TAMPA -- USF students who drive electric vehicles are complaining there aren't enough charging stations on campus.

Out of 25 registered electric cars, there are only two chargers on campus. Students like Jimmy Abbiati get to school two hours early to ensure a charger.

Without the chargers, some students wouldn't be able to make the trip back home.

To add to the problem, electric car owner and USF student John Pilz said gas powered cars are stealing electric powered spots too.

He's even seen a USF police officer parked in a spot reserved for electric vehicles.

Instead of complaining to the administration, Pilz came up with a plan. He's working with a USF professor on a proposal that will breathe new life into an old research project: USF's solar carport.

It was the nation's first 20,000 watt solar carport. Installed in 1993, it used to have the capability of charging electric vehicles using solar power. But in the years since, the school didn't keep it up. It doesn't work anymore.

Lee Stefanakos, with the university's Clean Energy Resource Center, was part of the team that created the carport.

"After a few years, interest went down. Gas prices went down. We kept it here, but moved onto other things. Now, the interest is back," said Stefanakos.

Now, Stefanakos is guiding Pilz with a proposal to bring charging stations back to the carport. It would cost $25,000 to breathe life into the old project, and add two charging stations.

If the interest grows, the school could add more if funds are approved.

The proposal could be approved by November.

COMMUNITY CALENDAR

Find out what's happening in your neighborhood!

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- Hernando County
- Hillsborough County
- Manatee County
- Pasco County
- Pinellas County
- Polk County

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Usf Prof Puts Florida Sunshine In Van`s Tank

September 19, 1992 | By ARDEN MOORE, Staff Writer

TAMPA -- A University of South Florida professor never puts a drop of gasoline in his van.

He doesn`t need to. His vehicle runs on sunshine.

Professor Lee Stefanakos operates the country`s first solar-powered vehicle test site at USF`s Tampa campus.

The entire fleet of 12 electric vans, cars and trucks get their juice from the sun via solar panels mounted in a carport roof.

``Florida really does not have any energy resource of its own except the sun. So, it makes sense to use it,`` said Stefanakos, chairman of USF`s electrical engineering department.

The solar-powered cars, in use for about a year, come fully equipped with air conditioning, AM/FM radios and other options. They look just like other cars and vans from the outside except for the tell-tale outlet latch.

The vehicles cover up to 60 miles per charge at speeds up to 55 miles per hour. They hum quietly and do not pollute.

The cost: about 4 cents per mile compared to 40 cents a mile for gasoline- dependent cars.

The main glitch: finding smaller batteries that offer longer charges. Right now, a set of 36 batteries weighing a total of 1,200 pounds are mounted to the vehicle`s underbelly. A full charge takes about eight hours.

``We`re working on a system that charges in 15 minutes,`` Stefanakos said. ``It may be three or four years away, but it is hard to predict for sure. It depends on the development of the batteries.``

Another problem is devising a statewide network of quick-charge stations so the vehicles can travel farther.

Once the bugs are worked out, the solar-powered vehicles could be used by tourists, commuters and workers such as utility company meter readers, says Jan Rickey, transportation program manager for the Florida Energy Office.

``Lee`s project is an extremely attractive energy alternative,`` said Rickey, whose office promotes energy conservation methods. ``For example, a tourist landing in the Orlando airport doesn`t need to go a great distance to a hotel or Disney World.``

USF, in conjunction with Florida Power Corp., received a $1 million, five- year grant from the U.S. Department of Energy to study ways to make motorists less dependent on gasoline.

Another test site is planned for California, where by law, 2 percent of vehicles must be electric by 1998, Stefanakos said.

Although mass production of these vehicles is still far off, Stefanakos remains a staunch optimist.

``I don`t think it will be soon, but there will come a day when the sky is clear and pollution will be gone,`` he said.

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Plug-In Electric Vehicle Handbook

for Workplace Charging Hosts

Clean Cities

U.S. Department of Energy

Photo from Southern California Edison, NREL 26481

Clean Cities Helps Establish Charging Infrastructure

The U.S. Department of Energy's Clean Cities program supports local actions to reduce petroleum use in transportation. Nearly 100 Clean Cities coalitions across the country work to deploy alternative fuels, advanced vehicles, and fuel economy improvements. Each coalition includes a diverse and capable team of stakeholders from businesses, utilities, government agencies, vehicle manufacturers, fleets, and other organizations. Find your local Clean Cities coordinator by visiting *cleancities.energy.gov.*

Table of Contents

Acknowledgements

Thanks to the Minnesota Pollution Control Agency (MPCA) and the Electric Vehicle Infrastructure Training Program (EVITP) for contributing information used in the development of this handbook. For information on MPCA, visit *www.pca.state.mn.us*. For information on EVITP, visit *eere.energy.gov/cleancities/evitp.html*.

Photo from The Coca-Cola Company, NREL 26455

Introduction

Plug-in electric vehicles (PEVs) have immense potential for increasing the country's energy, economic, and environmental security, and they will play a key role in the future of U.S. transportation. A full transition to electric-drive vehicles (including all-electric vehicles, plug-in hybrid electric vehicles, and hybrid electric vehicles) could reduce U.S. dependence on imported petroleum by more than 80% and greenhouse gas emissions by more than 60%.[1] By providing PEV charging at the workplace, employers are perfectly positioned to contribute to and benefit from the electrification of transportation. To help you get started, this handbook answers basic questions about PEVs and charging equipment, helps you assess whether your organization should offer workplace charging for employees, and outlines important steps for implementation.

1. *DOE analysis:* eere.energy.gov/vehiclesandfuels/electric_vehicles/index.html

Join the Workplace Charging Challenge

The U.S. Department of Energy (DOE) is inviting employers to advance the deployment of PEVs by signing the Workplace Charging Challenge Pledge. Partners that sign the pledge commit to the following:

- Assessing employee charging demand and developing a plan to install charging stations
- Implementing workplace charging plans
- Sharing best practices and progress on meeting plan milestones.

DOE recognizes Workplace Charging Challenge Partners' successes and provides them with technical assistance, information resources, and a forum for dialogue among Partners and industry stakeholders. Prospective Partners can find out which organizations within their industry and geographic area are already implementing workplace charging by visiting *electricvehicles.energy.gov*.

Key Acronyms

EVs (all-electric vehicles) are powered by one or more electric motors. EVs plug into off-board sources of electricity and store the energy in a battery. These vehicles produce no tailpipe emissions.

EVSE (electric vehicle supply equipment) delivers electrical energy from an electricity source to charge a PEV's battery. It communicates with the PEV to ensure that an appropriate and safe flow of electricity is supplied. EVSE units are often referred to as "charging stations."

HEVs (hybrid electric vehicles) are powered by an ICE that runs on conventional or alternative fuel and an electric motor that uses energy stored in a battery. HEV batteries are charged by the ICE and through regenerative braking. HEVs are not plugged in to charge.

ICEs (internal combustion engines) generate mechanical power by burning a liquid fuel (such as gasoline, diesel, or a biofuel) or a gaseous fuel (such as compressed natural gas). They are the dominant propulsion technology for on-road vehicles today.

PEVs (plug-in electric vehicles) derive all or part of their power from off-board sources of electricity. They include EVs and PHEVs.

PHEVs (plug-in hybrid electric vehicles) are powered by an ICE and by an electric motor that uses energy stored in a battery. PHEVs can be plugged into off-board sources of electricity to charge the battery.

Among U.S. households that own at least one car, about half park their vehicles at locations with access to electrical outlets,[2] providing a great foundation for the country's PEV charging infrastructure. And employers across the country are beginning to offer charging access in workplace parking areas, the second-most-likely place a vehicle will spend time parked. The ability to charge at work can potentially double a PEV driver's all-electric daily driving range. This untapped resource represents a significant opportunity to expand the country's PEV charging infrastructure.

To support the deployment of this infrastructure, the U.S. Department of Energy (DOE) launched the Workplace Charging Challenge in 2013. This challenge aims to achieve a tenfold increase in the number of U.S. employers offering workplace charging by 2018. The initiative is part of DOE's EV Everywhere Grand Challenge, which focuses on the United States becoming the first nation in the world to produce plug-in electric vehicles that are as affordable and convenient for the average American family as today's gasoline-powered vehicles by 2022.[3]

2. *EIA. 2009 Residential Energy Consumption Survey:* eia.gov/consumption/residential/data/2009
3. *EV Everywhere Grand Challenge:* eere.energy.gov/vehiclesandfuels/electric_vehicles/index.html

PEV Basics

Before learning about charging stations, it's useful to learn a little about the vehicles that will use them. A PEV has the ability to be charged by an off-board electric power source. Put simply, PEVs can be "plugged in." This feature distinguishes them from HEVs, which supplement power from an internal combustion engine (ICE) with battery power but cannot be plugged in. There are two basic types of PEVs: EVs and PHEVs.

All-Electric Vehicles (EVs)

EVs (also called battery-electric vehicles, or BEVs) use batteries to store the electrical energy that powers one or more motors. The batteries are charged by plugging the vehicle into an electric power source. EVs can also be charged in part through regenerative braking, which generates electricity from some of the energy normally lost when braking. It's as simple as that—EVs have no ICEs and produce no tailpipe emissions.

Today's EVs typically have a shorter driving range than conventional vehicles have. Most light-, medium-, and heavy-duty EVs have a range of about 100 miles on a fully charged battery, although a few models have longer ranges. An EV's range varies based on driving conditions and driving habits. Extreme outside temperatures tend to reduce range, because energy from the battery must power climate control systems in addition to powering the motor. Speeding, aggressive driving, and heavy loads can also reduce range.

The time required to charge depleted batteries—which can range from less than 30 minutes to almost a full day—depends on the size and type of the batteries, as well as the type of charging equipment used.

Under the hood of a Nissan Leaf. An EV contains no ICE. Instead, the battery supplies electricity to the electric motor. *Photo from Margaret Smith, DOE, NREL 18218*

Neighborhood electric vehicles (NEVs), also called low-speed electric vehicles, are a type of EV with range and speed limitations. NEVs typically have a top speed of 25 mph, and they are commonly used for neighborhood commuting, light hauling, and delivery. They are often limited to use on roads with speed limits up to 35 miles per hour, making them ideal for college campuses and similar applications. There are also specialty EVs, such as airport ground support equipment and personal transporters, that are not intended for on-road use. These types of vehicles are valuable for the niches they serve, but this handbook focuses on EVs designed for highway use.

Why Drivers Choose PEVs

PEVs offer a number of benefits that make them an attractive option for an increasing number of drivers.

High fuel economy, low operating cost: PEVs are highly efficient, and they generally have much lower operating costs than those of conventional vehicles.[4]

Flexible fueling: PEVs offer fueling options not typically available to conventional vehicles, including charging at home, work, public charging stations, or a combination of these sites.

High performance: Today's PEVs are state-of-the-art highway vehicles ready to match or surpass the performance of their conventional counterparts.

Low emissions: Compared with conventional vehicles, PEVs typically produce lower levels of air pollutants and greenhouse gases, even when taking into account the emissions associated with electricity production.

An increasing number of drivers is taking advantage of the financial, environmental, and energy benefits of PEVs.
Photo by Dennis Schroeder, NREL 19699

Energy security: Almost all U.S. electricity is produced from domestic coal, natural gas, nuclear power, and renewable sources, so choosing PEVs reduces reliance on imported petroleum.

4. Alternative Fuels Data Center: afdc.energy.gov/fuels/electricity_benefits.html

Plug-In Hybrid Electric Vehicles (PHEVs)

PHEVs (sometimes called extended range electric vehicles, or EREVs) use batteries to power an electric motor and use another fuel, such as gasoline or diesel, to power an ICE. When running on battery power alone, PHEVs produce no tailpipe emissions. Even when the ICE is operating, PHEVs consume less fuel and typically produce lower emissions than similar conventional vehicles do.

PHEVs have larger battery packs than HEVs, providing an equivalent all-electric driving range of about 10 to 40-plus miles for current light-duty models. During typical urban driving, most of a PHEV's power can be drawn from electricity stored in the battery. The ICE powers the vehicle when the battery is mostly depleted, during rapid acceleration, at high speeds, or when intensive heating or air conditioning is required.

Like EVs, PHEVs can be plugged into the grid and charged, although the time required to charge depleted batteries is typically shorter for PHEVs, because most have smaller battery packs. Their batteries are also charged by the ICE and through regenerative braking.

PHEV fuel consumption depends on the distance driven between battery charges. If the vehicle is never plugged in to charge, fuel economy will be about the same as for a similarly sized HEV. If the vehicle is driven less than its all-electric range and plugged in to charge, it may be possible to use only electric power.

Photo from the Hertz Corporation, NREL 26479

PEV Availability

PEV availability in the United States has grown rapidly in recent years, with more than a dozen models on the market in 2013. To find currently available PEVs, use the Light-Duty Vehicle Search (*afdc.energy.gov/vehicles/search/light*) on DOE's Alternative Fuels Data Center (AFDC).

Charging Basics

If your organization is interested in providing employees with workplace charging, it will help to become familiar with electric vehicle supply equipment (EVSE). There are multiple types of EVSE, which differ based on their communication capabilities and how quickly they can charge a vehicle.

Types of Charging Equipment (EVSE)

EVSE is the equipment used to deliver electrical energy from an electricity source to a PEV. EVSE communicates with the PEV to ensure that an appropriate and safe flow of electricity is supplied.

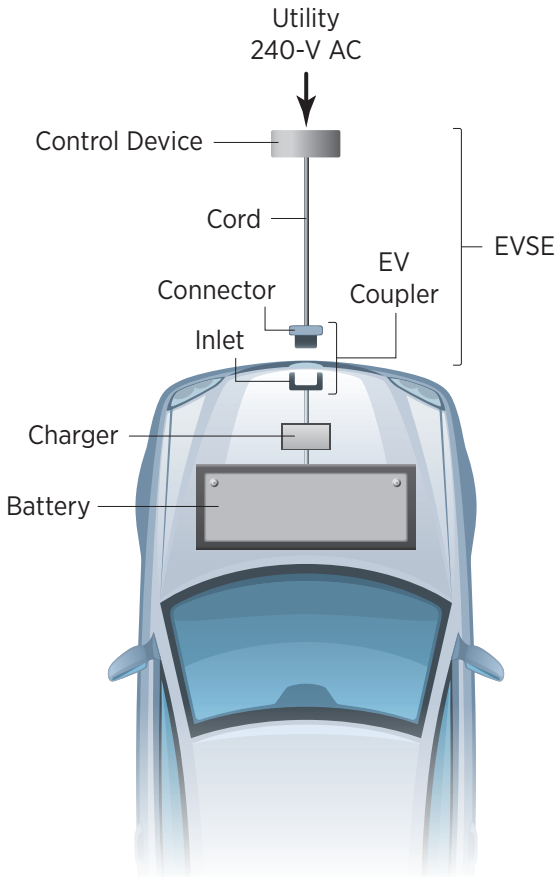


Figure 1. Level 2 charging schematic.

Source: eTec (2010), Electric Vehicle Charging Infrastructure Deployment Guidelines for the Oregon I-5 Metro Areas of Portland, Salem, Corvallis and Eugene. EV Project publication (www.theevproject.com/documents.php). Illustration by Dean Armstrong, NREL

EVSE for PEVs is classified according to the rate at which the batteries are charged. Two types—Level 1 and Level 2—provide alternating-current (AC) to the vehicle, with the vehicle's onboard equipment (charger) converting AC to the direct current (DC) needed to charge the batteries. The other type—DC fast charging—provides DC electricity directly to the vehicle.

Charging times range from less than 30 minutes to 20 hours or more, based on the type or level of EVSE; the type of battery, its capacity, and how depleted it is; and the size of the vehicle's internal charger. EVs generally have more battery capacity than PHEVs, so charging a fully depleted EV takes longer than charging a fully depleted PHEV.

Level 1

Level 1 EVSE provides charging through a 120-volt (V) AC circuit and requires electrical installation per the National Electrical Code. Most, if not all, PEVs come with a Level 1 EVSE cord set. On one end of the cord is a standard, three-prong household plug (NEMA 5-15 connector). On the other end is a J1772[5] standard connector, which plugs into the vehicle.

Level 1 typically is used for charging when only a 120-V outlet is available, such as at some residential and workplace locations. Based on the battery type and vehicle, Level 1 charging adds about 2 to 5 miles of range to a PEV per hour of charging time.

Level 2

Level 2 EVSE can easily charge a typical EV battery overnight, and it is a common installation for residential, workplace, fleet, and public facilities. Level 2 EVSE offers charging through a 240-V (typical in residential applications) or 208-V (typical in commercial applications) electrical service. These installations are generally hard-wired for safe operation (although a wall plug connection is possible). Level 2 EVSE requires installation of charging equipment and a dedicated circuit of 20 to 80 amp (A) depending on the EVSE requirements (Figure 1). Most Level 2 EVSE uses a dedicated 40 A circuit. As with Level 1 equipment, Level 2 equipment uses the J1772 connector. Based on the battery type, charger configuration, and circuit

5. J1772 is a trademark of SAE International.

The standard J1772 receptacle (right) can receive charge from Level 1 or Level 2 equipment. The CHAdeMO DC fast charge receptacle (left) uses a different type of connector. *Photo by Andrew Hudgins, NREL 19558*

The standard EVSE connector fits into the standard receptacle. *Photo by Andrew Hudgins, NREL 17634*

capacity, Level 2 charging adds about 10 to 20 miles of range to a PEV per hour of charging time, depending on the power level of the onboard charger.

DC Fast Charging

DC fast-charging EVSE (sometimes referred to as DC Level 2 EVSE) enables rapid charging and is generally located at sites along heavy traffic corridors and at public fueling stations. Some DC fast-charging units are designed to use 480-V AC input, while others use 208-V AC input. A DC fast charger can add 60 to 80 miles of range to a light-duty PEV in 20 minutes. DC fast-charging is not commonly used as a workplace charging option. Workers' vehicles are typically parked for several hours at a time, so they don't require rapid charging at work.

Connectors and Plugs

Today's EVSE and PEVs have standard connectors and receptacles based on the J1772 standard developed by SAE International. Vehicles with this receptacle can use any Level 1 or Level 2 EVSE. Most major vehicle and charging system manufacturers in the United States support this standard, which should eliminate concerns about vehicles' compatibility with charging infrastructure. Most currently available PEVs that are equipped to accept DC fast charging are using the CHAdeMO connector (see image above). SAE International recently developed a "hybrid connector" standard for fast charging that adds high-voltage DC power contact pins to the J1772 connector, enabling use of the same receptacle for all levels of charging.

Minnesota-based 3M aims to provide workplace charging to every employee who drives a PEV at its St. Paul headquarters. *Photo from 3M, NREL 26453*

EVSE Ownership and Payment Models

A growing number of vendors not only sell Level 2 equipment but also offer installation and ongoing service and maintenance. Some vendors of EVSE units require drivers to subscribe to a charging service that uses credit card, cash, or radio-frequency identification (RFID) devices to control access to the EVSE and to enable the owner of the EVSE to collect usage data and payments for charging. Owners can also set up charging to be free for all or some users. Some EVSE vendors share in the revenue generated by the EVSE and charge service fees for managing payment transactions, maintenance, and trouble-shooting services.

Some workplace charging hosts may decide to purchase, install, and operate stations themselves. This model gives the host or owner control of the station and its revenues. For example, a parking lot owner might buy and operate a pay-for-use charging station as part of its business strategy.

Benefits of Workplace Charging

Workplace PEV charging offers many benefits to employers, employees, and building owners. For a project to be successful, it is important for all stakeholders to understand these benefits.

Benefits for Employers and Building Owners

Employee recruitment and retention: The availability of charging conveys that your organization stays on the leading edge of technological development, even to workers who don't drive PEVs. And employers that offer charging may be better positioned to attract and retain employees who do drive PEVs.

Furthering sustainability goals: The availability of PEV charging can be a strong addition to an organization's larger portfolio of sustainability practices, particularly if the organization has existing objectives related to employee commuting practices, greenhouse gas reductions, and/or transportation emissions reductions.

Public image: Providing workplace charging can help demonstrate an organization's leadership in supporting cutting-edge, clean transportation technologies to customers, consumers, and the surrounding community.

Employee satisfaction: Workplace charging can be an attractive addition to your organization's existing employee benefits package. Employees will likely appreciate that their employer is proactive in seeking out ways to enhance their experience at the workplace.

Tenant attraction and retention: Building owners who offer workplace charging at their facilities send the message that they are interested in providing smart, proactive solutions for their tenants' present and future needs. Entering this fast-growing niche market today may yield significant benefits in the long run.

The Hartford offers workplace charging at various locations across Connecticut, helping the company make progress toward its goal of reducing greenhouse gas emissions 20% by 2017. *Photo from The Hartford, NREL 26470*

Benefits for Employees

Range security: The opportunity to charge at work can help alleviate "range anxiety," a driver's uncertainty about the vehicle's ability to reach a destination before depleting the battery's charge.

Range extensions: Workplace charging can potentially double daily all-electric driving range, accommodating longer commutes and additional trips between the workplace and the home.

Thermal preconditioning: On very hot or cold days, workplace charging allows PEV drivers to achieve a comfortable cabin temperature and to preheat or precool the battery while the vehicle is still plugged in. This extends the vehicle's range by reducing the climate-control load on the battery. Preconditioning can also help extend battery life.[6] (Note that this capability is not available in all PEV models.)

Greater flexibility: By extending range, workplace charging opens up options drivers might not otherwise have, making it easier to manage special circumstances, urgent trips, and unexpected changes in plans or schedules, particularly for EV drivers. Workplace charging also provides flexibility in the location and timing of charging, which may be helpful for drivers whose residential charging options are somewhat limited or inconvenient.

Increased incentive for PEV adoption: The ability to charge at work may provide the encouragement and assurance an employee needs to make the switch from a conventional vehicle to a PEV, and to take advantage of the financial and environmental benefits of such a switch.

In 2013, the New York Power Authority installed three employee charging stations at its White Plains facility as part of the organization's workplace charging pilot program. *Photo from NYPA, NREL 26486*

Employers and employees seeking to take advantage of the benefits of PEVs should explore available incentives for early adopters. See page 13 for more information about finding relevant incentives.

6. *National Renewable Energy Laboratory (2012). NREL Reveals Links Among Climate Control, Battery Life, and Electric Vehicle Range.* www.nrel.gov/docs/fy12osti/53603.pdf

Evaluating and Planning for Workplace Charging

In 2012, Eli Lilly installed several workplace charging stations at its two main campuses in Indianapolis. *Photo from Eli Lilly & Company, NREL 26480*

Successful implementation of workplace charging involves careful planning and a willingness to address potential challenges, many of which may be unique to the physical, cultural, and organizational characteristics of your workplace.

Facilities Ownership Considerations

Implementing PEV workplace charging is easiest when the employer owns and operates its campus or facility. Planning and installation will be more straightforward processes if the employer has singular control of the critical pieces of real estate, including the affected parking area(s), building(s), and electrical infrastructure.

Planning and installation may be more complex when multiple stakeholders are involved, particularly in densely developed urban areas. For example, a business

may lease office space in a building that is owned by one entity, operated and maintained by another entity, with a parking facility operated by yet another entity.

For assistance with evaluating the scope of a project, organizations should contact their local Clean Cities coalitions. Find the nearest coalition by visiting the Clean Cities website at *eere.energy.gov/cleancities/coalitions.html*.

Workplace Charging Scenarios

Easiest: The employer owns the building and parking lots; electricity is accessible, and upgrades are not needed.

Easy: The employer owns the building and parking lots; electricity is accessible, but upgrades may be needed.

Moderate: The employer leases building space and parking lots; electricity is accessible, but upgrades are needed.

Challenging: The employer leases building space and uses independently operated parking; electricity is inaccessible.

Identifying Key Stakeholders

Some workplaces that decide to offer PEV charging may undertake their projects as top-down initiatives. But as PEV ownership rates continue to increase, many organizations will find that employees are driving the conversations early in the process. In small organizations, informal dialogue among colleagues and management are often enough to determine whether the organization should explore the possibility of providing workplace charging. Medium-sized and large employers may need to follow more formal processes and protocols.

Typically, key decision makers include a management-level designee, a sustainability lead, the building owner (if different from the employer), the parking lot operator (if different from the employer), facilities operations staff, human resources staff, and legal counsel. Employers and employees with complex building ownership and/or parking arrangements should engage all relevant stakeholders to ensure that EVSE planning, installation, and operations take all parties' interests and needs into account. See Figure 2 for more detail about relevant stakeholders and their roles and needs.

Evaluating Employee Demand

Regardless of whether a workplace charging project is initiated by the employer or by employees, it will be useful to gauge potential employee demand. Employee surveys can be useful for this purpose. A survey should not only assess existing demand, but also help evaluate future demand.

Possible survey questions include:

- If you drive to work, how far is your trip (one-way)?
  - Less than 10 miles
  - 10–25 miles
  - 26–50 miles
  - More than 50 miles
- During the workday, what is your usual travel pattern?
  - I stay at the worksite and do not move my vehicle
  - I leave the worksite and move my vehicle once per day
  - I leave the worksite and move my vehicle more than once per day
- Do you drive a PEV, or are you considering acquiring one in the future?
  - I already drive a PEV
  - I'm considering acquiring a PEV within six months
  - I'm considering acquiring a PEV within 12–24 months
  - I'm considering acquiring one but not sure when
  - I'm not considering a PEV for personal use
- Do you have the ability to install PEV charging equipment at your residence? (Y/N)
- Do you think we should install PEV charging stations for employees? (Y/N)
- If charging stations were available at work, would you use them? (Y/N)
- Would you be willing to pay a fee to use a charging station at work? (Y/N)
- Would availability of workplace charging increase the likelihood that you would consider a PEV? (Y/N)
- Are you interested in participating in an employee task force on workplace charging? (Y/N)

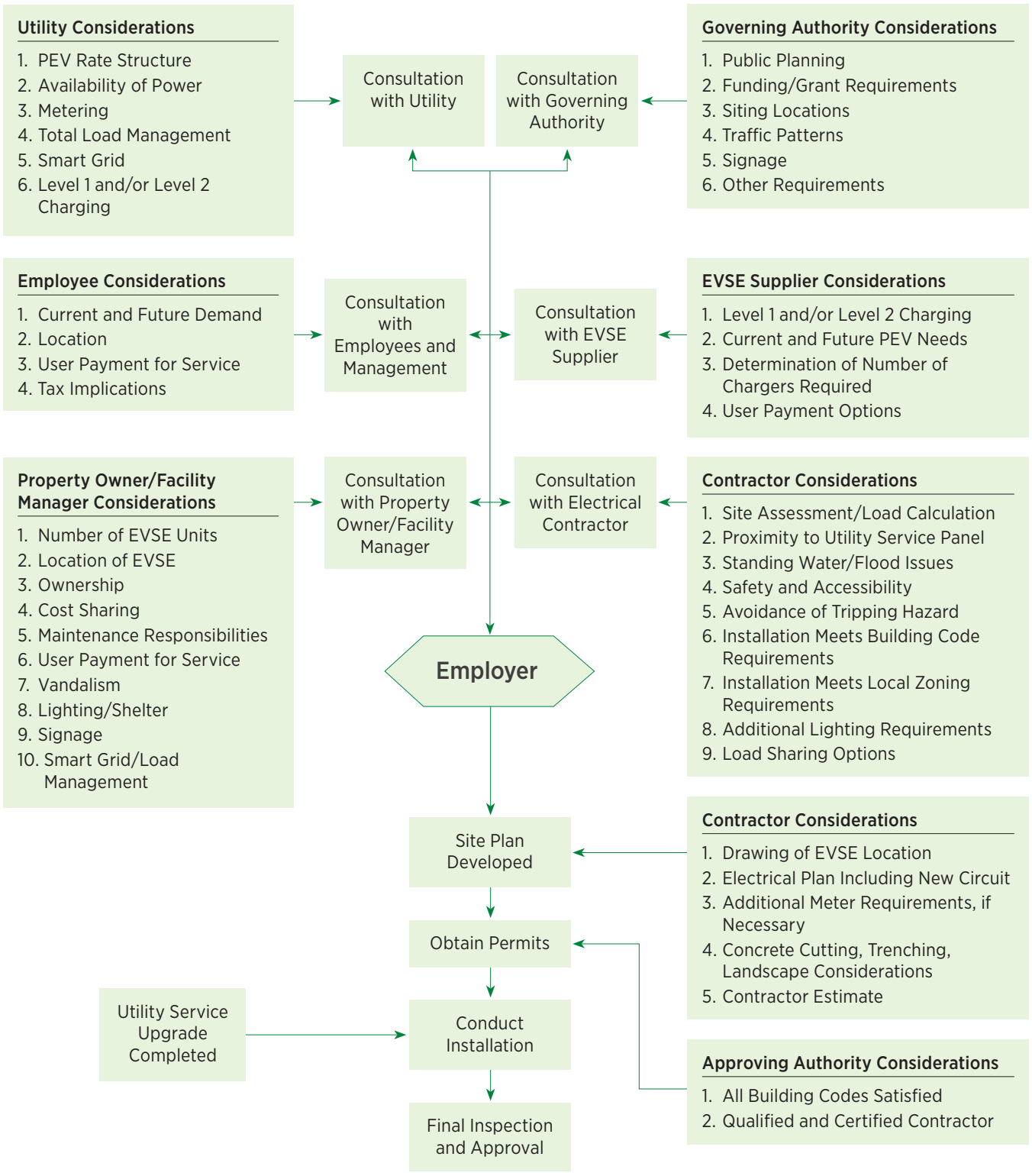


Figure 2. General outline for implementation of workplace charging. A successful project requires thoughtful planning and involvement by all relevant stakeholders. *Adapted from: eTec (2010). Electric Vehicle Charging Infrastructure Deployment Guidelines for the Oregon I-5 Metro Areas of Portland, Salem, Corvallis and Eugene. EV Project publication (*theevproject.com/documents.php*).*

The organization's decision makers should evaluate survey results to help determine the number of charging stations that may be needed. PEV production and ownership are expected to grow rapidly over the coming decade, so employers may want to allow for the possibility of future expansion when developing their workplace charging plans. This may include upgrading a facility's electrical service beyond what is necessary for short-term demand.

To find a template for an employee survey, visit *electricvehicles.energy.gov*.

Selecting a Level of Charging for Your Workplace

When determining which type(s) of charging equipment to provide at your workplace, important considerations include EVSE system cost, proximity of electricity service to parking areas, potential electrical upgrade requirements, EVSE security, and potential maintenance. Perhaps most importantly, employers must take into account the commuting distances of their employees.

Level 2 charging (providing 10 to 20 miles of range per hour of charging) at the workplace can provide PEV drivers with a high level of range security. A single Level 2 EVSE unit could potentially serve multiple vehicles throughout the day, as long as each PEV driver makes room for another after charging is complete. Many available mobile applications notify PEV drivers when their batteries are fully charged. Employers must consider whether it is feasible for employees to take the time to move their cars during the work day.

Level 1 charging (providing 2 to 5 miles of range per hour of charging) is also a viable option, given that PEV drivers are likely to be parked at work for several consecutive hours, and that PEVs used for commuting will most likely have a partially charged battery when they arrive at the workplace. Because Level 1 EVSE can be as simple as a three-pronged extension cord and a standard electrical outlet on a dedicated branch circuit, implementing Level 1 charging is a relatively easy and low-cost strategy to rapidly expand EVSE infrastructure at workplaces.

Using Level 1 as a stepping stone, a business can gain experience and information about how its employees are using workplace charging and gauge employee satisfaction with Level 1 EVSE. The business can then use that information to determine whether to provide faster charging options.

At San Diego Gas & Electric, 37 employees drove PEVs as of May 2013. *Photo from SDGE, NREL 26485*

A number of manufacturers offer EVSE, and product offerings vary in the types of features they include and the corresponding prices. Level 1 equipment ranges in cost from $500 to $1,000. The price of Level 2 equipment ranges from about $500 to $7,000 (before incentives), depending on the level of sophistication. The most basic products have only standard safety features and status lights. More advanced products have features such as enhanced displays, charging timers, communications capabilities, keypads, and enhanced durability and ergonomics. "Intelligent" or "smart" products may have features like payment card readers, billing software, advanced displays, wireless communication, automated diagnostics, internal metering, and smart-grid compatibility and controllability.

Cost Considerations

Employers seeking to provide workplace charging must consider costs associated with equipment, installation, maintenance, and electricity. As noted above, equipment costs for Level 1 and Level 2 EVSE range from about $500 to $7,000.

Installation costs and services vary considerably, so employers should obtain a number of quotes before moving forward. Factors affecting installation cost (and time) include the number of circuits and EVSE units installed, indoor versus outdoor installation, required electrical upgrades, and permitting and inspection

JLA Public Involvement has on-site charging that is available for use both by employees' personal vehicles and by a PEV in the company's corporate vehicle pool, which can be used for work-related trips. *Photo from JLA, NREL 26460*

costs. If necessary for a project, trenching and adding electrical service or panels may add the greatest cost. If an organization anticipates expanding the number of EVSE units in the future, it should consider adding extra circuits, electrical capacity, and conduit from the electrical panel to potential EVSE locations during initial installation. It is less expensive to install extra panel and conduit capacity during initial construction than to modify the site later. For the same reason, it is a good idea to consider electricity infrastructure for EVSE during the planning phases of new facilities.

A typical budget for a workplace EVSE project might include the following line items:

- EVSE unit(s)
- Contracted labor
- In-house labor
- Material/incidentals
- Equipment rental (backhoe, jackhammer, etc.)
- Sidewalk demolition and repair
- Optional EVSE equipment (e.g., RFID card reader)
- Signage and paint
- Permitting and inspection costs
- Incentives (if available)

Typically, there are fairly few EVSE maintenance requirements, and associated costs are relatively low. Cords should be properly stored and inspected periodically for damage. Periodic EVSE inspection, testing, and preventive maintenance by a qualified technician may be recommended by the equipment manufacturer. Employers should have a clear process, budget, and schedule in place to abide by the recommendations.

Electricity costs will depend upon the type of EVSE and the extent to which it is used by PEV drivers, as well as the electricity rate structure applied to the site. Maximum potential electricity use from Level 1 EVSE will total about 4,000 kWh/year. At Level 2, use could range from 6,500 kWh to 13,000 kWh per year, depending on the vehicles using the EVSE and the electrical circuit's capacity. Charging PEVs during peak electricity demand periods may move a customer into a higher rate category and result in higher electricity costs. However, the advanced capabilities of some EVSE products can be useful for optimizing load management. It is important to discuss the effects of PEV charging on electricity rates and loads with your utility. Ask the utility whether it offers special PEV charging rates.

Electricity Demand Charges

Demand for electricity rises and falls depending on the time of day and time of year. Electricity production, transmission, and distribution capacity must be able to meet demand at peak times of use, but most of the time, the electricity infrastructure is not operating at its full capacity.

Some utilities have implemented demand charges that encourage customers to use electricity during off-peak times. Utilities apply demand charges as a price per kilowatt (rather than kilowatt-hour) for power used during peak consumption periods. Charging vehicles during peak times may increase a commercial utility customer's peak monthly demand, thereby increasing the demand-charge portion of its utility bill.

Identifying Incentives

Discounts and incentives can lower the costs associated with establishing workplace charging. Your organization may be eligible for incentives from the state, city, or utility. To find current incentives, search the Alternative Fuels Data Center's database of federal and state laws and incentives at *afdc.energy.gov/laws*. For information about incentives in your area, contact your local Clean Cities coordinator (*cleancities.energy.gov*), state energy office (*naseo.org*), and utility.

Workplace Charging Management and Policy Planning

It is important for employers that provide workplace charging to develop a clear internal policy that governs access, security, usage, and other issues.

Access to EVSE

Employers providing workplace charging can maximize the benefits of their investment by designating EVSE parking spaces for use only by vehicles that are actively charging. If an employer adopts such a policy, parking signage should clearly indicate the requirements. The employer may decide to limit EVSE use to employees only or to allow visitor use as well. An employer or building owner may decide to place a daily limit on the amount of time a given vehicle can occupy a charging space. Access policies should identify the parties responsible for enforcement. Some smart EVSE products can control access through badges or other identification systems.

Registration and Liability

Some workplace charging programs require users to register to use the equipment and sign a standard waiver of liability. A registration form could include language requiring vehicle owners to agree that the employer is not responsible for any costs related to vehicle purchase or repairs or for any damage to the vehicle that occurs while it is parked at the charging station. It could also specify a timeframe within which the employer is obligated to address maintenance issues with the charging stations upon notice of the problem.

Lynda.com offers no-cost charging to employees to reward them for choosing alternative transportation options. *Photo from Lucas Deming, lynda.com, NREL 26461*

Google is aiming to provide charging at 5% of its parking spaces; it has already deployed more than 300 stations across the country. *Photo from Rob Kalmbach, Google, NREL 26459*

Hours of Use

An employer may decide to limit EVSE use to normal business operating hours. If the employer chooses not to institute such a limitation, it should decide whether any restrictions (such as per-vehicle time limits on charging or employee-only access) are applicable outside of regular business hours.

Payment for EVSE Use

Employers that provide workplace charging must decide whether and how employees will pay for EVSE use. Many existing workplace charging programs are free for employees. As the market penetration of PEVs expands, providing free charging may merit reconsideration. Check with your accountant or chief financial officer to determine any tax implications of providing free charging to employees.

Some employers charge their employees a fee for using workplace charging equipment. Fees can help offset capital and operational costs associated with workplace charging. Fees may also address issues of fairness, since not all employees can take advantage of charging. Fees may take the form of a charge-per-use or a monthly or annual subscription rate. If an employer does decide to institute a payment system, it is important to develop a fee structure that doesn't discourage use of the EVSE.

Facebook has committed to supplying free PEV charging to its Menlo Park, California, employees as part of the company's transportation-demand management program. *Photo from Lauren Bonar Swezey, Facebook, NREL 26457*

As part of the Las Vegas Sands Corporation's ECO 360° Global Sustainability program, the Venetian and the Palazzo hotels provide charging for both employees and guests. *Photo from the Venetian and the Palazzo hotels, NREL 26484*

Security of Equipment

It is important for the employer and/or building owner to identify any necessary measures to prevent vandalism and theft of EVSE. The employer should also ensure that the communications and information technologies of the EVSE comply with the organization's cyber security policies.

Etiquette for Shared EVSE

The employer should consider developing a policy that guides drivers in cases where the number of PEVs exceeds the number of EVSE parking spaces available. The organization may encourage drivers to make room for another PEV once they have finished charging.

Administration of EVSE Operation and Maintenance

Employers that provide workplace charging should designate the party responsible for ongoing operation and maintenance issues and any related costs. For example, in the case of a damaged cord, the employer's policies should clearly indicate which stakeholder should arrange for the repair and how it will be paid for.

Workplace Charging Installation

Many of your key stakeholders will be involved in the installation of workplace charging. It is important to consult with your utility, governing authority, electrical contractor, EVSE provider, and other stakeholders early in the process (Figure 2).

EVSE Site Considerations

The following are some of the site and equipment issues organizations must consider when installing EVSE for workplace charging. An employer should discuss these and any site-specific issues with its electrical contractor, utility, and EVSE provider, all of whom should be familiar with these topics.

- **Convenience:** Locate EVSE and associated PEV parking as close as possible to the electrical service while also ensuring that spaces are conveniently located for drivers.
- **Avoiding hazards:** Cords associated with EVSE should not interfere with pedestrian traffic or present tripping hazards. PEV charging spaces should not be located near potentially hazardous areas.
- **Ventilation:** Most of today's advanced batteries do not require ventilation during charging. But if your station will be enclosed, there must be adequate ventilation, which may include installation of fans, ducts, and air handlers. Depending on the installation, the National Electrical Code may require ventilation.
- **Pooled water and irrigation:** Most EVSE is designed to operate safely in wet areas. However, users may be more comfortable if it is not located where water pools or irrigation systems spray.
- **Preventing impact:** Curbs, bollards, wheel stops, and setbacks should be used to prevent vehicles from colliding with EVSE. However, accessibility issues must also be considered.
- **Accessibility:** Evaluate and address requirements for complying with the Americans with Disabilities Act, as well as state, local, and organizational accessibility policies. Compliance measures may include adjusting connector and receptacle heights, cutting curbs, and providing accessible parking spaces.

MetLife has installed PEV charging stations for employee use at 14 of its locations across the country. *Photo from Josh Weiner, MetLife, NREL 26465*

- **Lighting and shelter:** Provide lighting and shelter as necessary for the safety and convenience of EVSE users. Lighting should enable users to read signs and instructions and to operate the equipment easily.

Working with an Electrical Contractor

A certified electrical contractor should carry out the installation of EVSE at your workplace. When hiring a contractor, select one who is familiar with the National Electric Code Guidelines found in NEC Article 625, which pertain to EVSE installation. You can discuss potential electrical contractors with your EVSE provider. Your state's licensing board likely will provide a list of licensed electrical contractors (though not specifically those who have received EVSE training).

The electrical contractor will serve as the point of contact in coordinating local permitting, inspections, utility upgrades (if needed), equipment purchasing, and installation of the EVSE. Your contractor should understand the relevant codes and standards and obtain approval from the local building, fire, environmental,

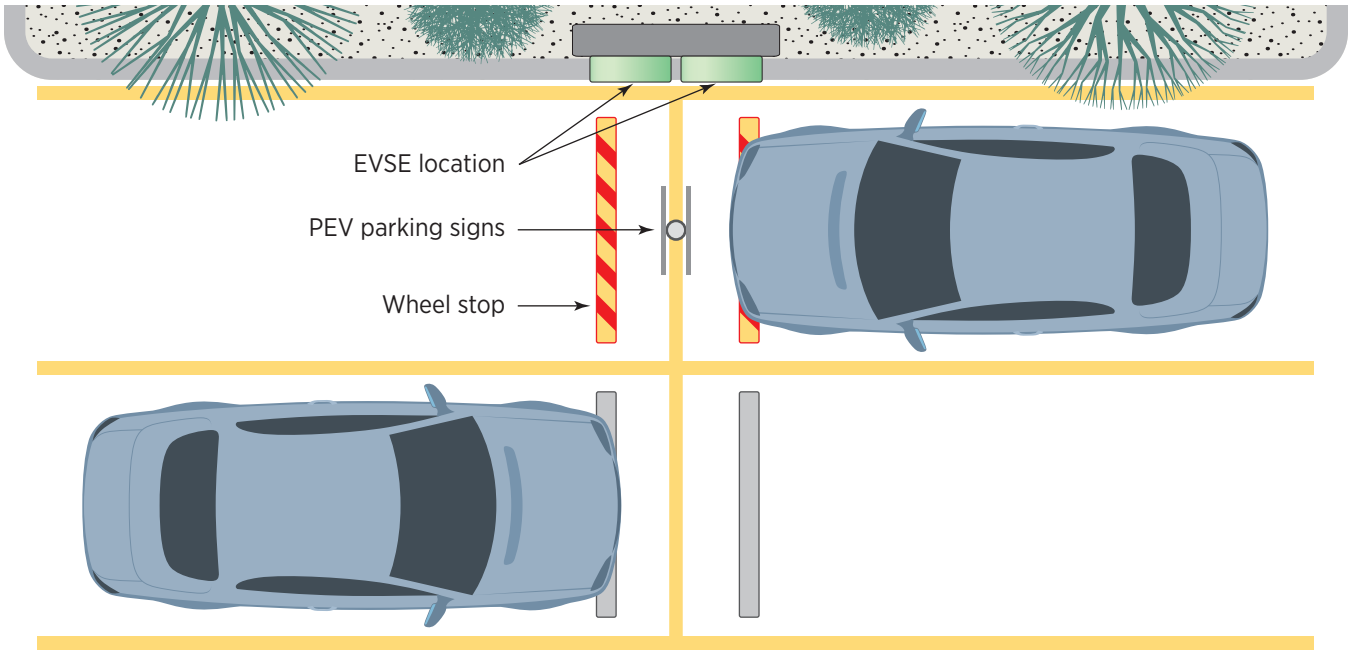


Figure 3. Example public charging station design showing EVSE, wheel stop, and sign locations. *Source: eTec (2010), Electric Vehicle Charging Infrastructure Deployment Guidelines for the Oregon I-5 Metro Areas of Portland, Salem, Corvallis and Eugene. EV Project publication, theevproject.com/documents.php. Illustration by Dean Armstrong, NREL*

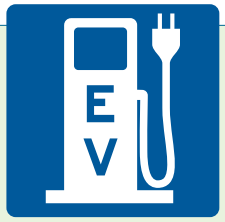
and electrical inspecting and permitting authorities before installing EVSE. After installation, the contractor should walk through the site and review the EVSE operation with the owner of the equipment.

Engineering and Construction

Because EVSE installations involve specialty equipment, extensive electrical work, and standard civil engineering work, select well-qualified contractors with experience in the relevant fields. The condition and location of existing electrical equipment will determine the complexity of the required electrical installations. If the existing electrical system does not support the required EVSE input voltage range, a transformer may be required to step voltage up or down.

Signage

Signage for PEV parking spaces should clearly communicate that the spaces are only to be used by PEVs, and preferably only by vehicles that are actively charging. It can also be useful to paint the pavement of the parking space to provide an additional visual cue. In facilities where enforcement is limited or non-existent, signage may be the only deterrent against parking by drivers of conventional vehicles.



The Federal Highway Administration has issued interim approval for this sign design (D9-11b) to help direct drivers to charging stations. Pending final approval, this sign will be included in the next edition of the agency's Manual on Uniform Traffic Control Devices. *Image from the Federal Highway Administration*

Signage can help maximize EVSE use by letting drivers know that spaces are for PEV use only. *Photo by Dennis Schroeder, NREL 26762*

Photo from iStock 19431754

Electrifying Transportation

In a time of fluctuating petroleum prices and heightened environmental concerns, many workers see PEVs as a convenient way to reduce driving costs and environmental impacts. The number of PEVs on U.S. roadways is increasing rapidly, as is the need for charging infrastructure. Now is a good time to consider hosting workplace charging and becoming a leader in the electrification of transportation.

For more information on workplace charging, visit *electricvehicles.energy.gov*. For assistance with your local workplace charging project, contact your local Clean Cities coordinator at *cleancities.energy.gov*.

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Prepared by the National Renewable Energy Laboratory (NREL), a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy; operated by the Alliance for Sustainable Energy, LLC.

DOE/GO-102013-3925 • August 2013

Printed with a renewable-source ink on paper containing at least 50% wastepaper, including 10% post consumer waste.

Cover photos clockwise from right: from Pat Corkery, NREL 18182, from Google, NREL 26458, and by Dennis Schroeder, NREL 22653

Clean Cities
U.S. Department of Energy

Electric Vehicles Charge Ahead on College Campuses with 35% Increase in Charging Stations

UC Davis, Maryland's Towson University lead universities nationwide

Campbell, Calif. – As college and university students across the country return to school this month, ChargePoint – the largest and most open electric vehicle (EV) charging network – today released new data showing an increase in on-campus EV charging.

There are currently 1,134 charging spots at colleges and universities on the ChargePoint network. That's up about 35%, with just 838 at this time last year. On-campus EV charging is still relatively new, with the first ChargePoint station installed at the end of 2010 at Pasadena City College.

"American universities are often our hubs of innovation and technology" said Pasquale Romano, ChargePoint's CEO. "It is no wonder adoption of electric vehicles and charging infrastructure has prospered on college campuses. Our data demonstrates which colleges and universities are leading the way when it comes to supporting low and zero emission vehicles. We hope this helps spur friendly competition between campuses to be the greenest institutions in the world."

With 38 on-campus charging spots, the University of California at Davis has the most of any university on the ChargePoint network.

Here are the top 5 colleges and universities with the most ChargePoint EV charging spots:

+ University of California at Davis: 38
+ Towson University, Maryland: 36
+ Santa Clara University, California: 26
+ Western Michigan University: 22
+ Massachusetts Institute of Technology: 21

To find out if your local college or university offers EV charging, check out ChargePoint's real-time station locator.

About ChargePoint

ChargePoint is the largest and most open electric vehicle (EV) charging network in the world, with more than 18,500 charging locations. Ranked #1 by leading independent research firm, Navigant Research, ChargePoint makes advanced hardware and best-in-class cloud based software. ChargePoint's open network is utilized by many leading EV hardware makers and encourages all EV charging manufacturers to join.

ChargePoint's real-time network information including the availability of charging locations throughout the nation is available through the ChargePoint mobile app, online and via the navigation systems in top-selling EVs including the new BMW i3 and the Nissan LEAF. A driver connects to a ChargePoint station every 8 seconds and by initiating over 6 million charging sessions, ChargePoint drivers have saved over 5.2 million gallons of gasoline and driven over 126 million gas free miles.

For more information about ChargePoint, visit www.chargepoint.com.