# Session 2: Stationary and Infrastructure

## Renewable Energy Generation to Support Electric Transportation

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**Technology Advancement Office**

# Renewable DG projects Update

- RFP #P2011-21 released 5/6/11 and awarded at January 2012 Board meeting
- Incentivize 5 MW or more of clean renewable energy and storage projects
- Support electric transportation technologies
- Highlight four projects

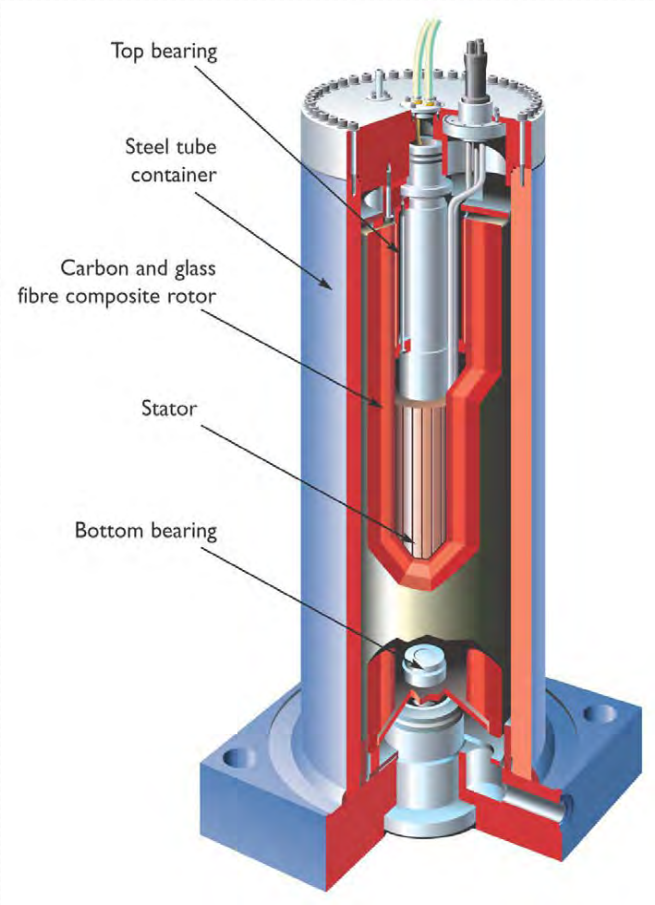


**1 MW flywheel energy storage system at Los Angeles County Metropolitan Transportation Authority's Gold Line with 2kW of solar PV panels to power ancillary equipment.**

# Flywheel Energy Storage System

- Five 200kW GTR flywheels
- 2 kW of solar PV to support system
- Absorb braking energy as the trains enter the station, capture and store this energy by converting it to kinetic energy, and regenerate the stored energy into clean, instant power to accelerate trains leaving a station.
- Design for discharging 1.0MW for a minimum of 15-29 seconds and fully recharge within 30 seconds assuming sufficient DC track power is available.

# Flywheel


Top bearing
Steel tube container
Carbon and glass fibre composite rotor
Stator
Bottom bearing

# Highland Park station


# Trackside  energy storage

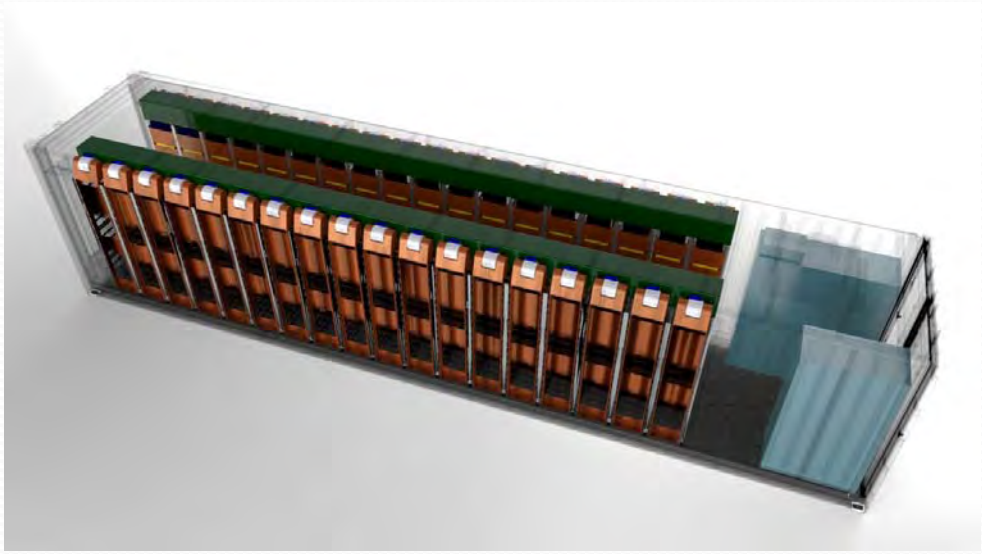
- Reduces electrical power consumption, enhances train performance, decreases resistor heating, and minimizes greenhouse gas and criteria pollutant emissions of metro transit rail systems.


**50kW solar PV rooftop system, 1.5MW lithium-iron-phosphate battery energy storage system and six Level-2 EV chargers.**

# Solar, Storage & EV chargers

- Manufacturer of lithium-ion battery systems for transportation and stationary applications.
- Combination of battery storage and solar PV will be used to power Level-2 EV chargers to support and accelerate the deployment of in-basin electric transportation.
- Battery storage system used mainly for peak shaving, voltage regulation, power quality and reliability improvement.
- Peak kilowatt hours avoided will be quantified to determine the effective reduction in air pollution.

# Solar PV Carport & Battery Storage



# CODA electric vehicle

- “Sister” company of CODA Automotive


METROLINK

**2MW solar PV carport, 28 Level-2 EV chargers and 28 Nissan Leaf EVs for lease car-sharing program at the City of Industry's Metrolink train station.**

# City of Industry DG project

- 2MW solar PV system
- Electricity produced will be sold to Southern California Edison under a 20 year power purchase agreement.
- 28 Level-2 EV chargers installed at premium parking locations.
- 28 Nissan Leafs will be acquired to implement a cost-effective EV Commuter Lease Program at costs that are competitive with internal combustion vehicles to encourage the use of EVs by the general public.

# City of Industry Metrolink Station

# EV Commuter Lease Program

- Reduce electrical power consumption from grid, greenhouse gas, criteria pollutant emissions and promote EV usage.
- Depending on technology advances for two-way battery capability, plan to expand site to accommodate vehicle to grid energy storage.

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**500kW solar PV, 2 MWh lithium battery storage systems and Level-3 EV charger to support electrification of diesel trolley.**

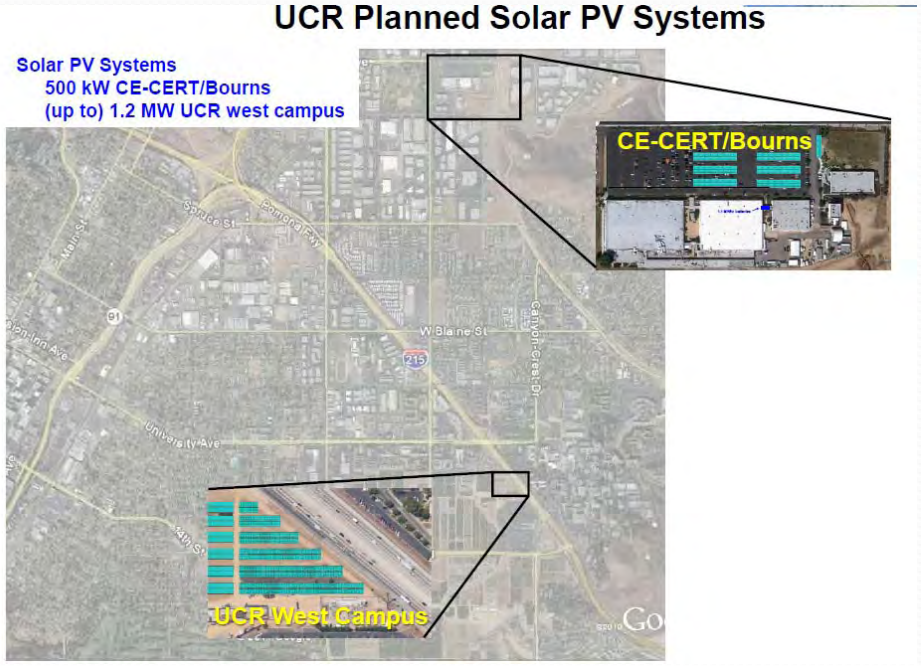
# Solar, Storage, Fast Charging & Smartgrid

- 500kW solar PV system
- Two 1MWh battery energy storage systems.
- Diesel Trolley Bus conversion to electric drive
- Level-3 EV charger to support the operation of electric Trolley Bus.
- Provide controlled monitoring to 13 Level-2 EV chargers throughout City of Riverside.
- Employ a unique utility-connected smartgrid which couples energy generation, storage, and electric transportation to develop improved energy systems for the future.

# Battery storage and Solar PV

1.1 MWh Lithium-ion battery at UCR


www.cert.ucr.edu
www.scrise.ucr.edu




- Peak kilowatt hours avoided will be quantified
- Reduce electrical power consumption from grid, greenhouse gas, criteria pollutant emissions.

# Electrification of diesel trolley bus


- Tailpipe emissions reductions compared to diesel Trolley Bus prior to electric conversion to be quantified.
- Conduct surveys to capture experience and feedback of electric Trolley Bus operator.

UTC Power

A United Technologies Company


# 400 kW renewable fuel cell with absorption chiller and Level-2 EV chargers at an Albertson's Supermarket

# Fuel Cell system

- Albertson’s Supermarket in Marina del Rey
- Fuel Cell operating on directed biogas/natural gas
- Absorption chiller to provide heat and cooling for the supermarket.
- Up to six Level-2 EV chargers to support and accelerate deployment of in-basin electric transportation.

# Fuel Cell site – Marina Del Rey

- Reduce electrical power consumption from grid, and quantify reductions in greenhouse gas, criteria pollutant emissions and promote EV usage.

# EV Chargers

# QUESTIONS?