PROTERRA LLC
FAST CHARGE BATTERY ELECTRIC TRANSIT BUSES
ECONOMICALLY AND ENVIRONMENTALLY SUSTAINABLE
SIMPLE AND SAFE  ADVANCED TECHNOLOGY

Proterra EcoRide hybrid / Battery-electric Transit Bus

Proterra Hybrid and Battery-electric ProDrive™ System

Proterra Rapid Charge Station with Terravolt™ Energy Storage

Confidential
Proterra’s Products

- TerraVolt™ Energy Storage Systems
- Bus and Truck ProDrive™ Systems
- Composite Technologies
- TerraCharge™ Rapid Charging Systems
- Total Vehicle Solutions

Best MPGe
Low maintenance
Durable
Practical
**TerraVolt™ Energy Storage System**

### Core System Components
- Battery Management System
- TerraVolt™ Energy Storage
- Module
- Pack
- Strings
- Vehicle Underside
- Battery Strings

### Customer Benefits
- Industry’s only system that can be fully charged in less than 10 minutes
- Ultra safe system design
  - Puncture and heat resistant
  - Sophisticated battery management system operates at the ‘cell’ level
- Energy storage system outlasts the vehicle or longer
- Scales in size and energy capacity to suit vehicle type and duty cycle needs
TerraCharge™ Rapid Charging Stations

Customer Benefits

• Makes it possible to deploy all-electric commercial vehicles in fixed-route applications today

• Small footprint enables customers to place in ‘opportunity charging locations’ along existing vehicle routes

• Uses existing power sources to rapidly deliver significant amounts of energy to charge heavy duty vehicles

• Makes it possible to reduce the amount of on-board energy storage and associated costs

Core System Components

- Retractable Catenarie Arm
- High-capacity, rapid charge energy source
- Computer controlled vehicle charging receiver
Proterra Composite Technologies

Accomplishments

Customer Benefits

- Purpose built designs that achieve maximum performance improvements
- 20-40% weight reduction; up to 10,000 lbs lighter
- 40%+ longer life; not affected by weather, salt or other chemicals
- Easier and significantly less costly to maintain than conventional metal bodies
- Improved safety with crash resistant composite structure
Scalable Across Vehicle Types With A Few Modifications To Suit Range And Duty Cycle:

**TerraVolt™ HDES**
- kWh of onboard energy
  - Range between charges
  - Available fueling infrastructure

**Electric Drive Motor**
- One to two motors depending on
  - Top speed
  - Total load

**Vehicle Control Systems**
- Modifications as needed to accommodate specific route and duty needs.
Management – Seasoned Team

Proterra’s team combines proven and innovative talent from several companies:

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<tr>
<th>Prior Position</th>
<th>Strengths</th>
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| **Jeff Granato**  
Seasoned CEO & CFO, managing, organizing and leading business growth for over 20 years. |
| **Dale Hill**  
Founder, CTO,  
Chairman | Founder *TransTeq*  
Eco Mark IV  
Developed the most successful fleet of CNG hybrid buses in the world, which carried 150 million passengers to date. |
| **Ron Fardell**  
VP Operations | Director of Manufacturing *Textron*  
Textron  
20 years experience in operations, advanced manufacturing, engineering and Lean Sigma. Deep experience in vehicle and vehicle system manufacturing and product development. |
| **Ben van der Linden**  
Director - Product Prototyping | Director of R&D *NABI Bus*  
NABI CompoBus  
Considerable global bus industry, R&D, manufacturing experience, and launched the world’s first composite body bus. |
| **Stephen Misencik**  
Director – Composites Tech. | VP Product Dev. *Martin Marietta Composites*  
MMC Composites  
Technology transfer of high strength marine composites to the bus industry, and has over 25 years experience in composite engineering design and manufacturing setup. |
| **Joshua Goldman**  
Director - Business Development | Director *Hybrid Systems ISE*  
ISE Hybrid Sys.  
Led the development of hybrid drive systems for ISE, co-chairs several standards boards and is widely considered an industry expert in hybrid drive systems. |
| **Reuben Sarkar**  
Director - Marketing | Lead Engineer *Chevy Volt, GM*  
Chevy Volt  
Lead engineer on game changing electric powertrain for the Chevy Volt electric vehicle; directed the daily activities of all electric drive unit product development teams. |
Proterra has begun to implement its plan to meet industry demand for cost effective zero emission buses

- Body manufacturing capable of meeting demand is in place

- Hired expert firm to lead a competitive bid process across 20 states to establish Proterra’s assembly plants
  - Hired industry leading manufacturing and engineering management expertise in scalable and efficient manufacturing operations
  - In Q3 2010 Proterra’s scalable assembly plant comes on line: 18 month ramp to a maximum capacity of 500 vehicle annually
  - In Q1 2012 the second scalable assembly plant comes on line
  - Cumulative vehicles produced through Q4 2012 is projected at 975 vehicles as driven by demand
Slideshow:
Proterra EcoRide hybrid / Battery-electric Transit Bus
Slideshow:
EcoRide BE35 Interior Seating    Driver’s Station

37 Seated and 31 Standing passenger capacity

Significant advances in GPS driven control systems; very user friendly and energy efficient
So easy to drive, anyone can learn
Slideshow: 
Proterra EcoRide In Service In San Jose, CA
Slideshow: Proterra FastCharge Station

Technology that will revolutionize urban transit
Foothill Program Announcement

- Unanimous Board Approval 4/24/2009
- Electrify one Foothill Transit Service Line (291)
- Use Proterra’s Unique Rooftop Fast Charging System
- Use Proterra’s Battery Electric 35’ Composite Bus
- Initial order for 3 buses + 2 charging stations @ ~5.6M
- Fast Track Program with initial demonstration targeting Q1 2009
- Vehicle may apply for Foothill CARB ZEV
- Initially Achieve 80% Overall System (Vehicle + Charger) availability
Intended Route To Service

Estimated Route Data (from Foothill):

- **Weekday:**
  - 9 Active Buses
  - ~120 mi per bus per day
  - 12.46 mph avg speed
  - 12.8 hrs revenue service per day
  - 0.8 hrs layover time per day

- **Weekend**
  - 5 Active Buses
  - ~85 mi per bus per day
  - 12.5 mph avg speed
  - 9.78 hrs revenue service per day
  - 0.86 hrs layover time per day
Additional Route Data

Data Sample Collected from 291 North Bound Route 2009-02-03 10 to 11 Am (Proterra)

- Avg overall speed of 10.25 mph (including layover)
- Moving Average: 19.6 mph
- 8.2 miles each way, 16.4 miles round trip
- Approximate 10 minute layover every 40-50 minutes
- First Trip starts 5:00 AM
- Last Trip ends 10 PM
- Typical Bus does 7 full trips on weekday, 5 full trips on weekends
- Short (<3 mile) deadhead
Altoona Testing
Altoona Data

FCBE35 MPG (diesel equivalent)

- CBD: 21.35
- COM: 29.23
- ART: 17.55

Power (kW)

- Fast Charge
- 40 MPH
- 20 MPH

40000 60000 80000 100000 120000 140000 160000 180000

0 20000 40000 60000 80000 100000 120000 140000 160000 180000

CBD ART COM
Advanced TerraVolt Energy Storage Testing

- Build upon cell and module level testing and full vehicle system testing to add confidence to our lifetime and durability of the ESS as applied to the Foothill proposed drive cycle
- Have partnerships with NREL and FTA (Penn State University) as well as UC-Davis for various portions of the complete ESS testing
- Once complete we can then address long term warranty of the complete ESS
Questions?

Joshua Goldman
Director of Business Development
Proterra LLC
303-562-0529
jgoldman@proterraonline.com
www.proterraonline.com

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