Who is Advanced Energy?

- An independent non-profit based in Raleigh, N.C.
- We facilitate technology transfer and bring energy saving technologies to the market.
- Solutions that are:
  - economically viable
  - environmentally responsible
  - reduce energy consumption

www.advancedenergy.org
How did we get here?

Four Phases

I. Feasibility Study (2003-2005)

II. Pre-Production Operation (2006-2009)

III. Fleet Testing (2008-2012)

IV. Full Market Deployment (2013)

Technical Feasibility
Business Feasibility
Overall Feasibility
Four Phases

I. Feasibility Study (2003-2005)

II. Pre-Production Operation (2006-2009)

III. Fleet Testing (2008-2012)

IV. Full Market Deployment (2013)

- 20 Bus Purchase
- Data Gathering
  - Emissions
  - Fuel Economy
  - Maintenance
Early success for HD-PHEV

- IC Corporation (International) selected based on specific criteria
  - Plug-in
  - PHEV-22.5kWh Li-Ion
  - $220k (or $139k premium)
- First bus delivered March 2007
- 11 buses delivered to date
PHEV components
Estimated benefits

- Plugging-in is optional
- 90-100% fuel economy improvement for first 45 miles, 40% increase for remainder
- 90% reduction in particulate matter
- 60% reduction in NOx
- Increased engine, transmission and brake life
- Electricity cost of 60¢ / gallon equivalent
- Option for renewable energy at $1 per gallon
Nationwide plug-in deployment

Delivered
- Arkansas (1)
- California (1)
- Florida (2)
- North Carolina (2)
- Pennsylvania (1)
- South Carolina (2)
- Texas (1)
- Washington (1)

Funded / Ordered
- Iowa (2)
- New York (2)

Pending
- Texas (1)
- Virginia (1)
- Washington (1)
- Washington DC (1)
Four more buses have been ordered.

We now have a two year period of watching and recording how these buses fare.

We will be monitoring emission, fuel economy, maintenance, general operation and driving performance. How closely we watch them is dependent upon funding.
Preliminary monitoring results

Florida Buses (Track 1)

- 604 Control Average: 5.4 MPG
- 607 Plug-In Hybrid Average: 7.4 MPG

Plug-In Hybrid Benefit:
- 2 MPG increase
- 30% increase

* Control Route Shifted by 2 weeks to align route and driver
Wake County, N.C., Hybrid School Bus

Plug-In Benefits

MPG

Date


Plugged In

Not Plugged In
Cost Share

$160,000

$200,000

$120,000

Total Cost ($)

Incremental Cost ($)

$80,000

$40,000

$0

0 200 400 600 800 1000 1200 1400 1600 1800 2000

Number of Units Sold

Advanced ENERGY
Push vs. Pull Methodology

R&D Deployment

Level of Activity and Funding

Time (Years)

R&D

Deployment
Balanced Methodology

Insert Money and Effort Here and Here

R&D

Deployment

Advanced Energy
Hybrid Buses
Plug-In Conversions

Time (Years)

Level of Activity and Funding