QUALLION

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Advanced Li Ion Battery Manufacturing Plant for the Future of California

Electric Drive Vehicles
Staff Workshop for the 2010-11 Investment Plan

September 9, 2009

Powering Life.

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Overview

- Introduction
  - What problems are we solving
  - Why Quallion is part of the larger solution
  - Proposed solution
- Applications – Vehicle and Smart Grid Technologies
  - Heavy Duty Vehicles – Anti-Idling APUs
  - Light Duty Vehicles – PHEVs & HEVs
  - V2G
  - Smart-Grid – Utility Management
- Manufacturing Capabilities, Expansion, and Benefits

Key Business Metrics:

- Quallion is currently the largest manufacturer of Li cells in the US
- Quallion is fiscally sound going concern with cash reserves and profitable for the past 5 years;
- Unique knowledge of Li ion chemistry as technology is rooted in Japan
- Active large Li ion battery programs include: Boeing C-17 Retrofit, Lockheed Martin BattPack, Blackhawk Helicopter Retrofit, APUs for HMMWV, UAVs, Launcher Vehicle Batteries, Satellite Systems, USAF X-51 Scramjet, NASA Orion program (new space shuttle)
- Quallion is one of the largest Li ion cell manufacturers outside of Asia--> More than 60,000 cells produced annually

- In-house battery electronics capability
- 5 year/$52M United States Military contract to establish 30 year supply of materials and cells for satellite and military applications
- Strong Li ion battery IP Position with over 60 chemistry, cell and battery patents issued and 91 pending
- Operations contained within 52,000 sq ft production facility in Los Angeles, CA, with an option to expand to 200,000 sq ft of contiguous manufacturing space
- Certifications include ISO 9001:2000, AS9100B, and ISO 13485:2003

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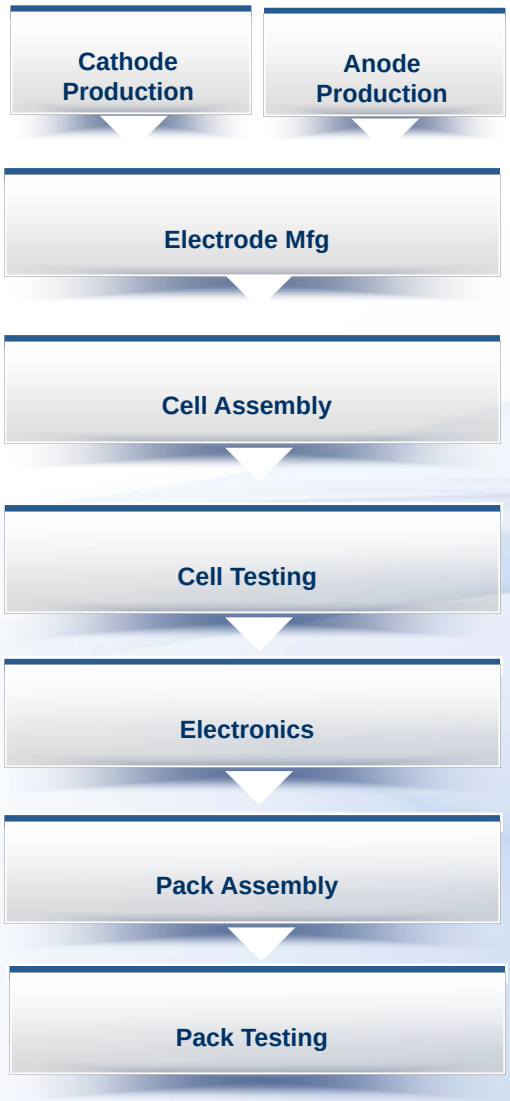
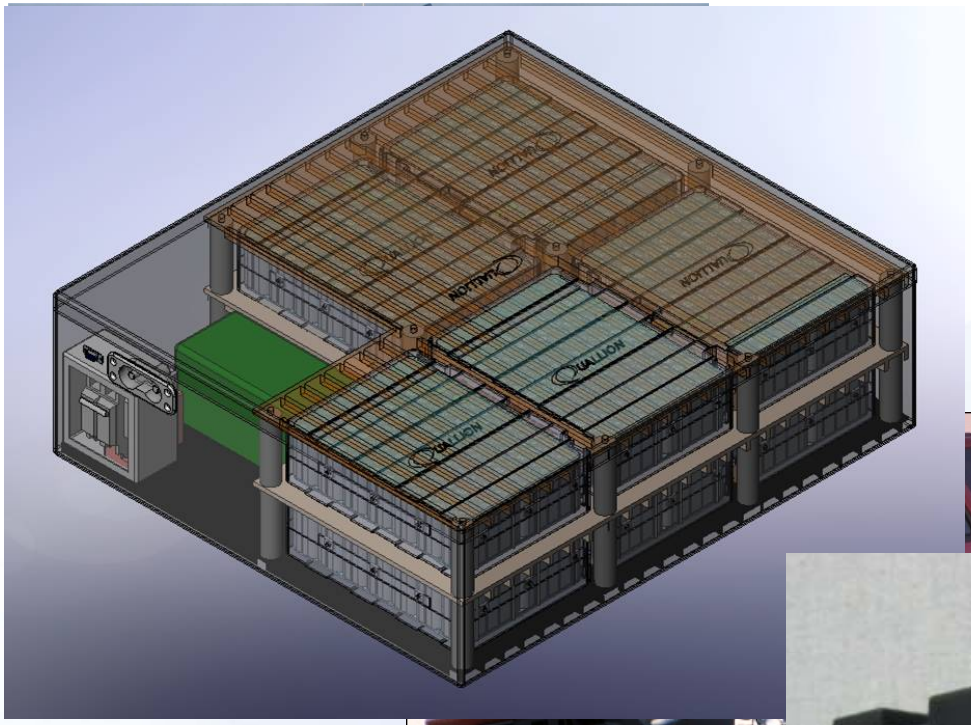
Highly Reliable Manufacturing



- Dry room
- Mixing, coating, slitting, die cutting
- Micro-winding & stacking technologies
- Welding technologies:
  - Ultrasonic, Resistance, Laser
- 100% X-ray inspection
- 100% GC/gross leak detection
- 100% Helium fine leak detection
- 100% Electrochemical testing
- Battery Development
- Battery Integration
- System Testing

The Solution



Gas Consum

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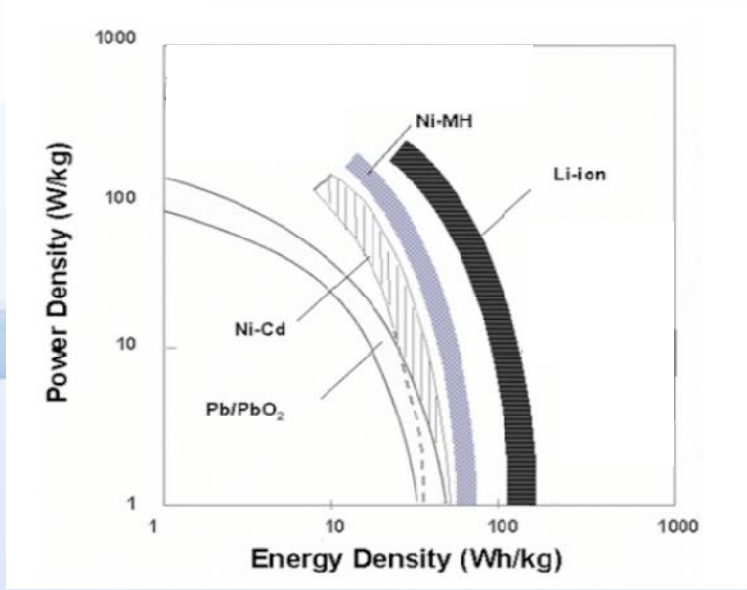
Why Li-ion Technology?

- EV technologies offers the least amount of CO2 gas emissions
  - EV 50 g-CO2/km
  - CNG 145g-CO2/km
  - Diesel 145 g-CO2/km
  - Gasoline 195 g-CO2/km
  - Gasoline Hybrid 125 g-CO2/km
  - FCV 85 g-CO2/km
- Li-ion technologies offer the most optimal solution for EVs
  - Highest energy density
  - Long life



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Transportation: Anti-Idling for Heavy Duty Trucks

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- EPA estimates heavy-duty idling in the US consumes 3B gallons fuel annually.
- The average heavy-duty truck burns 0.8 gallons per hour. According to the EPA, truck idling results in annual emissions of
  - 11 million tons of CO_2
  - 180,000 tons of NOx
  - 5,000 tons of particulates
- Truckers are required by law to stop idling and therefore must adopt a solution
- The estimated cost of this system will be competitive with current HVAC systems with small APU diesel generators.
- A lithium-ion battery price of $1K per kWh will be competitive to current small-engine diesel generators

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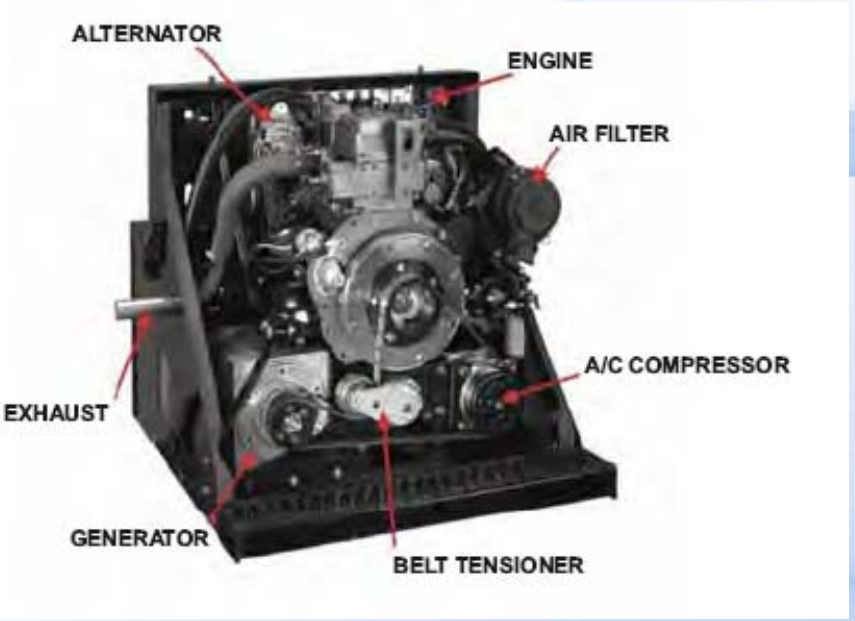
The All-Electric APU System Design:

Quallion's Matrix Battery Technology



Existing Solution

Simplifies the APU design, reduces cost, less maintenance:

No Alternator
No Engine
No Air Filter
No Generator
No Exhaust
No Fuel

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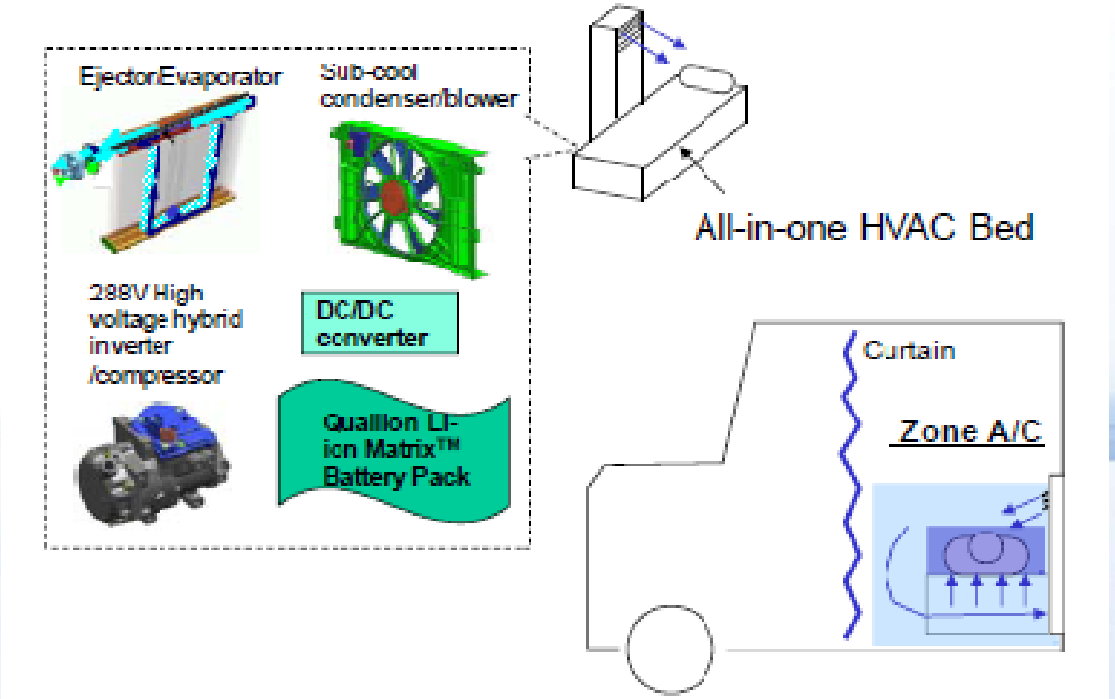
Transportation:
Anti-Idling for Heavy Duty Trucks



The current anti-idling solution, a diesel motor, requires up to 2 gallons a night. At $3/g, and an average 1,830 hours a year, the system will cost $1,098 per year just for fuel.

Quallion anticipates the All Electric Anti-Idling system to cost up to $2K more than the diesel motor option with an average useful life of at least 5 years (1,300 cycles). Allowing drivers to begin recouping the initial investment by the end of Year 2.

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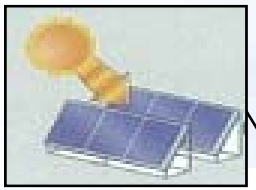
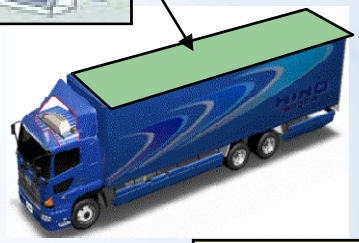
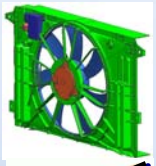
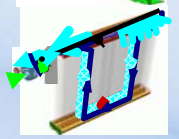
Anti-Idling Li-ion HVAC System









Engine ECU

CAN

HVAC ECU

CAN

AC240V

Noise filter

AC/DC

3kW charger

288V

4-6Kwh

Quallion Lithium-ion Matrix™ Battery Pack

Electrical Compressor

Blower, condenser

12V

288V

DC/DC

On roof
Solar battery (1-3Kw)

12V

Alternator

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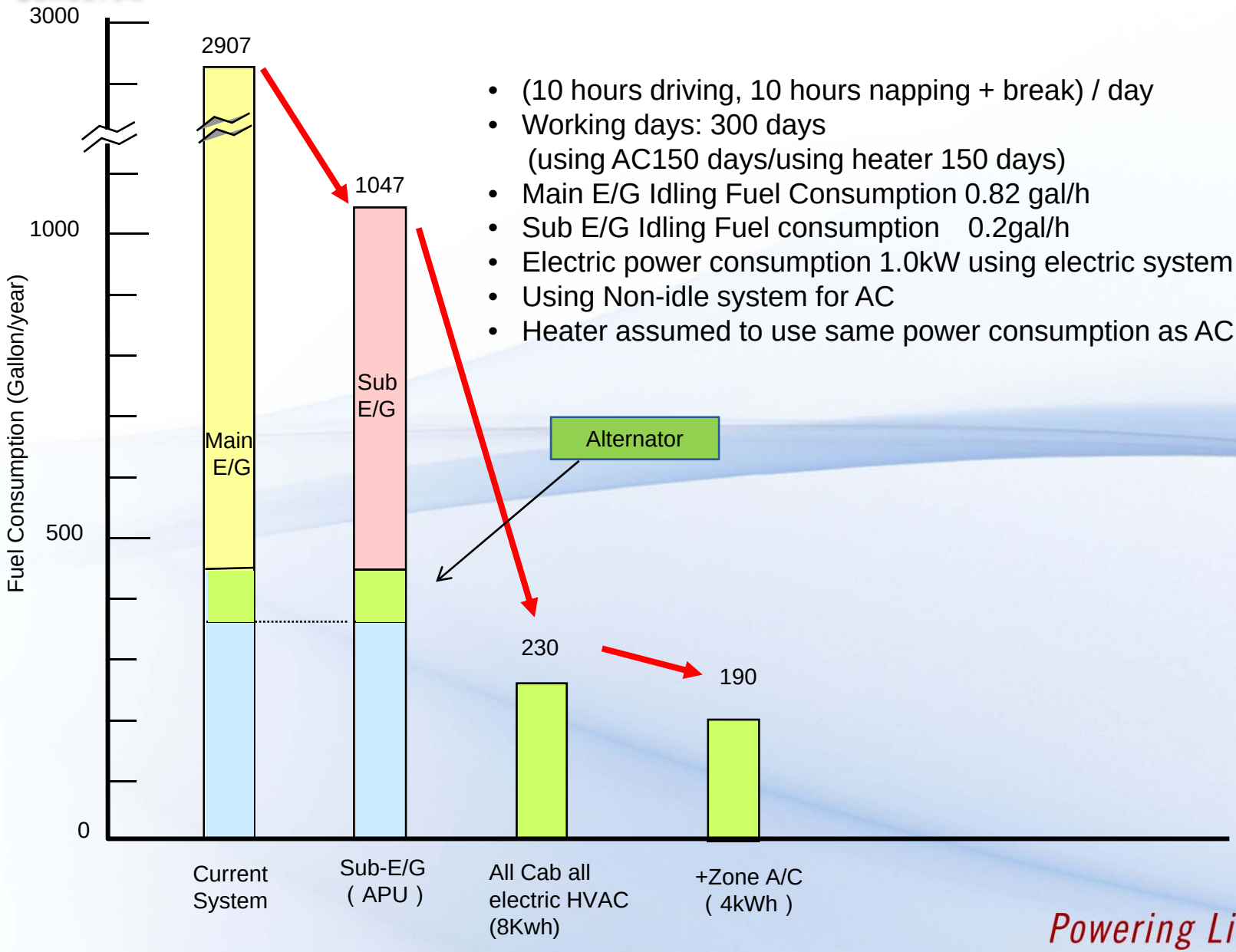
Diesel Savings



- (10 hours driving, 10 hours napping + break) / day
- Working days: 300 days
  (using AC150 days/using heater 150 days)
- Main E/G Idling Fuel Consumption 0.82 gal/h
- Sub E/G Idling Fuel consumption 0.2gal/h
- Electric power consumption 1.0kW using electric system
- Using Non-idle system for AC
- Heater assumed to use same power consumption as AC

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Annual CO2 Gas Savings by Truck Anti-Idling for USA

2,295 gallons per vehicle per year
(Assumption: 10 hours-driving/day , 300 days-driving/year)

Equals 11,100,000 metric tons of CO_2 gas savings per year (calculation: 10.1 kg-CO_2/gal)

Equals

831,000,000 trees

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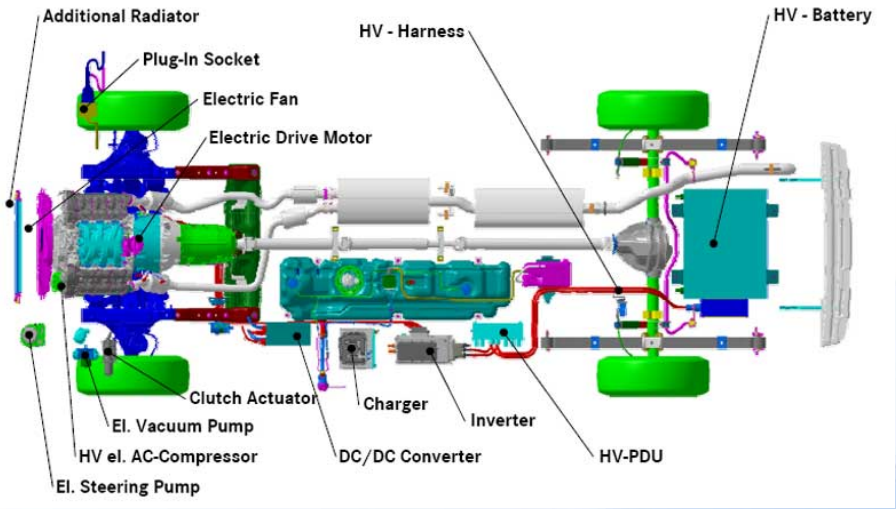
Transportation: Light Duty Vehicles



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In Production	Expected
HEV • Toyota Prius • Toyota Hilander • Chevy Malibu • Honda Civic • Honda Insight • Camry Hybrid **FV** • Th!nk City • Tesla • Reva	**HEV** • Mercedes S400 (2009) • Ford Fusion (2009) • Chevy Silverado (2009) • Honda Fit (2010) • Toyota Sienna (2010) **PHEV** • Chevy Volt (2010) • Saturn Vue (2010) • Fisker Karma (2009) • Ford Escape (2012) • Toyota Plug-in (2010) • Volkswagen Golf (2010) **EV** • Mitsubishi iMiEV • Porsche • Chrysler • Nissan

- **USG has allocated $100 million per year for 5 years towards Li-ion battery R&D**
- DOE's Argonne National Lab estimates hybrids reduce greenhouse gases by 22%, and plug-in hybrids by 36%.
- CARB studies show that battery electric vehicles emit at least 67% lower greenhouse gases than gasoline cars.
- Toyota Prius has emerged as the frontrunner in sales with over 1million Prius hybrid vehicles in a decade, proving that market uptake of technology exists.
- Current NiMH Technology no longer has room for advancement and cannot meet the market need and requirements.

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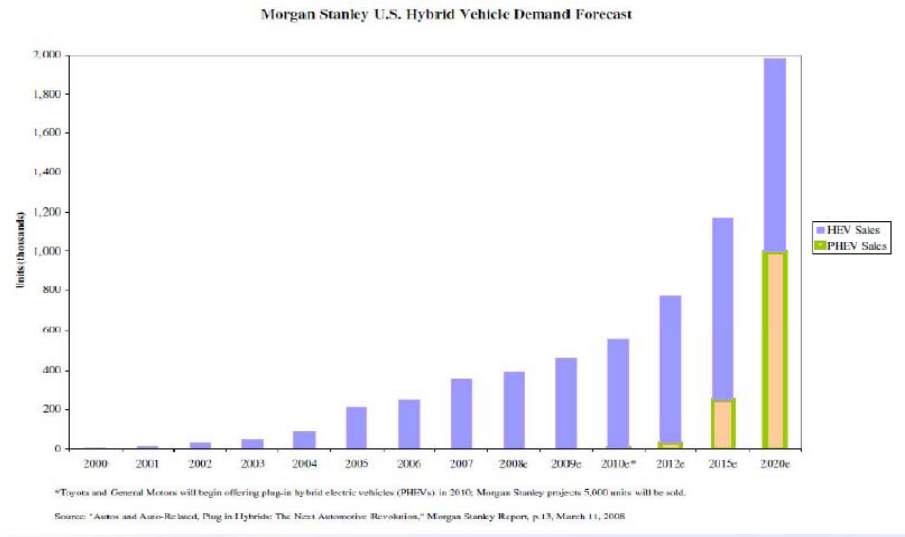
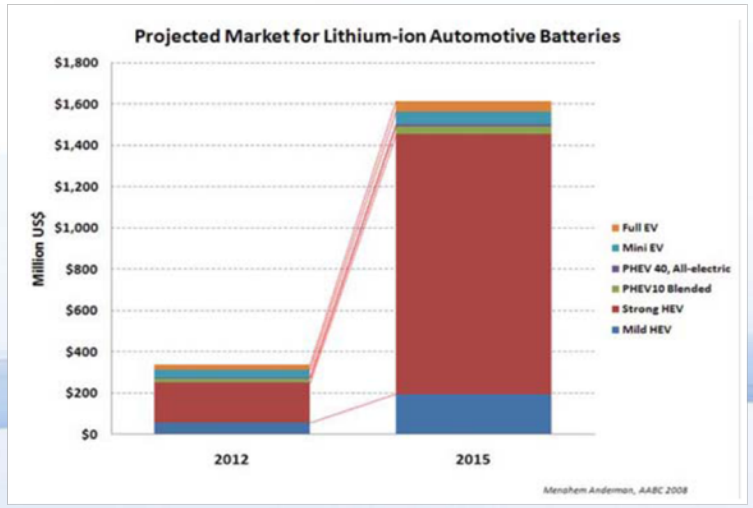
Transportation: Light Duty Vehicles





Morgan Stanley (left graph) "forecasts hybrid growth at an 18-20% compound annual growth rate between 2009 and 2012 and states that the introduction of Plug-in Hybrids in 2010 will have the potential to revolutionize the auto industry."

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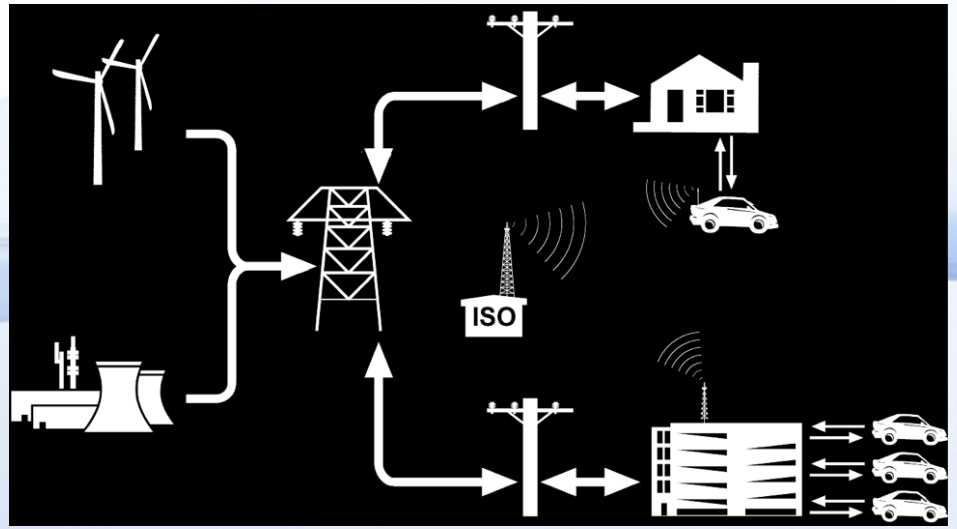
What is V2G?

- Vehicle to Grid is a setup where electrical power is transferred not only from a grid to charge vehicles, but from vehicles to the grid when not being used for transportation. Basically, energy can flow in both directions and vehicles can act to level load.
- Most vehicles are parked an average of 95% of the time; their batteries could be used to let electricity flow from the car to the power lines and back, with a value to the utilities of up to $4,000 per year per car.
- This makes most sense for ancillary services, specifically regulation that occurs to adjust the grid in a specific area to maintain interconnection, frequency, and balance of power use.



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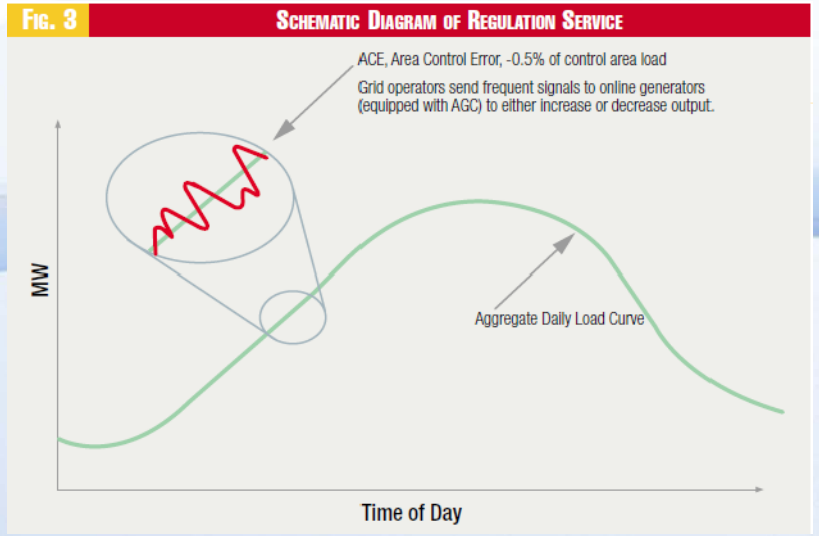
V2G Taps an Underutilized Resource

- US car used 1 hour/day, parked 23 h/d
- Average daily travel = 60 km, thus
  - Most storage unused most days
- Drive train output = 100 kW
- Practical power through grid = 10 - 20 kW
- Cars as significant power? Compare:
  - Vehicle fleet at 15 kW each car, with
  - Total load for country (GW)



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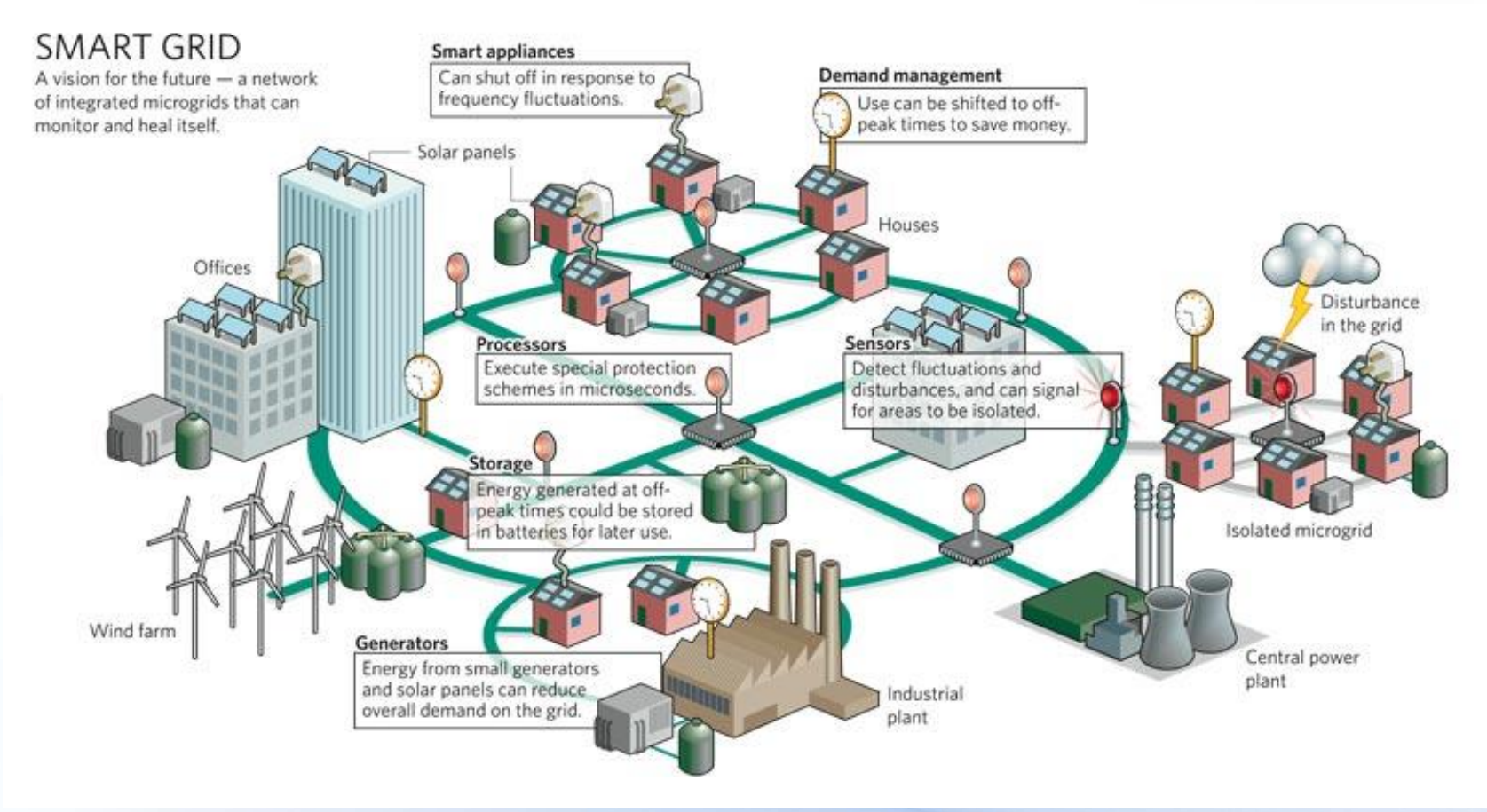
Smart-Grid Vision



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BATTERY LIFE CYCLE :

Development of Cell & Battery Production Line

Development of Anti-Idling & Silent Watch Systems

Installation of System

Maintenance of System

Recycle of Used Battery in Utility Grid

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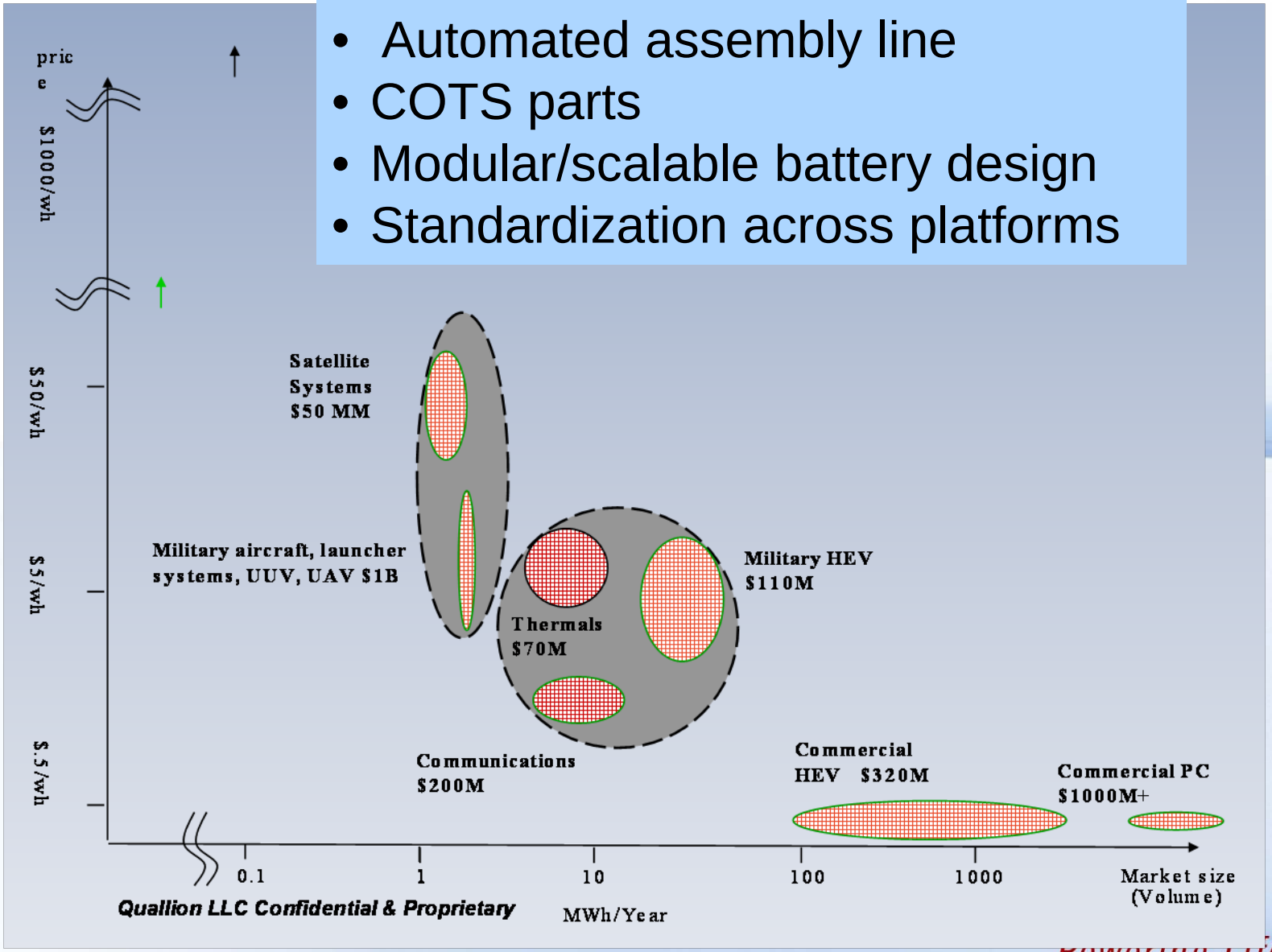
Achieving Economies of Scale for Li ion Cell and Battery Manufacturing Production

- Automated assembly line
- COTS parts
- Modular/scalable battery design
- Standardization across platforms



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Quallion Current and Future Manufacturing Production Capacity

QUALLION PRODUCTION SCALABILITY HERITAGE	Current Quallion Medical & Satellite Cell/Battery Production Capacity	Current Plant Expansion Activities (online E2009)	With Funding from CEC and Additional Quallion Funding
Cell Production Capacity	~.17MwH	~7MwH	~100mWh
Cell Type & Minimum Production Goals	70,000/yr implantable grade medical cells (prismatic & cylindrical) & low rate production of large format satellite cells	3600/yr - 15Ah and 72Ah Prismatic Satellite Cells	5M 18650 Cells/year
Battery Production Capacity	60,000 external medical battery packs; 200 .5kwh or greater military/aerospace battery packs/yr	Custom 10 to 20kwh satellite battery packs/yr	Approx. 20,000 5kWh/ year

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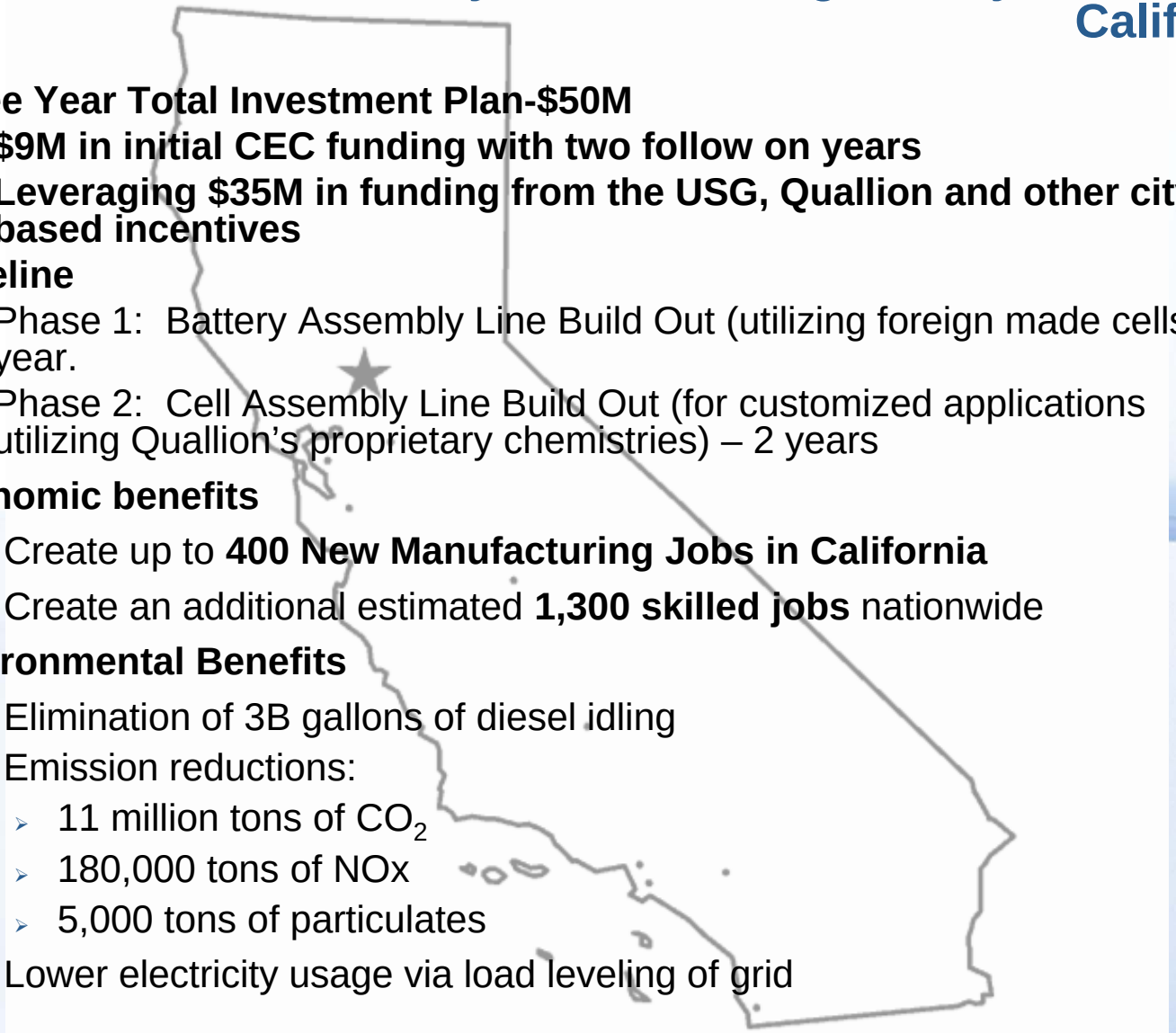
Quallion Proposes to Build a New, State-of-the-Art Li Ion Cell and Battery Manufacturing Facility in Southern California

- **Three Year Total Investment Plan-$50M**
  - **$9M in initial CEC funding with two follow on years**
  - **Leveraging $35M in funding from the USG, Quallion and other city based incentives**
- **Timeline**
  - Phase 1: Battery Assembly Line Build Out (utilizing foreign made cells) -1 year.
  - Phase 2: Cell Assembly Line Build Out (for customized applications utilizing Quallion's proprietary chemistries) – 2 years
- **Economic benefits**
  - Create up to **400 New Manufacturing Jobs in California**
  - Create an additional estimated **1,300 skilled jobs** nationwide
- **Environmental Benefits**
  - Elimination of 3B gallons of diesel idling
  - Emission reductions:
    - 11 million tons of CO_2
    - 180,000 tons of NOx
    - 5,000 tons of particulates
  - Lower electricity usage via load leveling of grid



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