

# **Johnson Controls Inc. domestic advanced battery industry creation project**

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5/11/2011

**ARRAVT019**

# Introduction to Johnson Controls: A global, \$34.3 billion diversified multi-industrial company

## Leadership positions in growth markets worldwide

### Automotive Experience



A global leader in automotive seating, overhead systems, door and instrument panels, and interior electronics.

### Building Efficiency



Global leader in products and services that optimize energy use, and improve comfort and security for buildings.

Portfolio of more than \$3.8 billion in performance guarantees in the U.S.

### Power Solutions



World leader in lead-acid automotive starter batteries, advanced batteries for Start-Stop vehicles, and lithium-ion hybrid battery systems that make vehicles more energy efficient.

# Johnson Controls domestic advanced battery industry creation project overview

## Timeline

Grant award: 11/6/2009  
Pack assembly: 9/12/2010  
Cell validation: 3/5/2011  
Cell ship: 7/2011

## Budget

Total project size: \$599.4M  
DOE share: \$299.2M  
Johnson Controls share:  
\$300.2M

## Barriers

Market demand vs. capacity  
Fledgling U.S. supply chain  
Significant investments in  
R&D required to mature the  
technology

## Partnerships

Johnson Controls-Saft  
Entek Membranes  
Azure Dynamics  
Argonne National Laboratory

# Johnson Controls project objectives

## Stand up a domestic advanced battery industry scaled to be globally competitive

- Build a demand base
- Manufacture battery cells and systems
- Create jobs
- Build a domestic supply chain
- Accelerate the deployment of charging infrastructure
- Develop advanced recovery technology and cradle-to-cradle recycling infrastructure



# Johnson Controls is meeting the goals of ARRA and the DOE



## American Reinvestment and Recovery Act (ARRA) Goals

- Create new jobs and save existing ones
- Spur economic activity and invest in long-term growth
- Foster unprecedented levels of accountability and transparency in government spending



## DOE Vehicle Technologies Program Goals

- Develop energy efficient and environmentally friendly highway technology
- Use less petroleum
- Increase mobility
- Promote energy security
- Lower cost and reduced impact on environment

# Addressing market demand vs. capacity barriers

## Issue

*Market demand for advanced energy vehicle batteries is projected to lag manufacturing capacity*

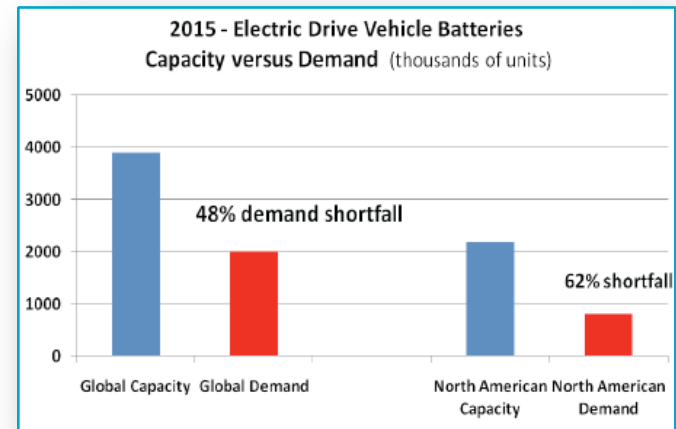
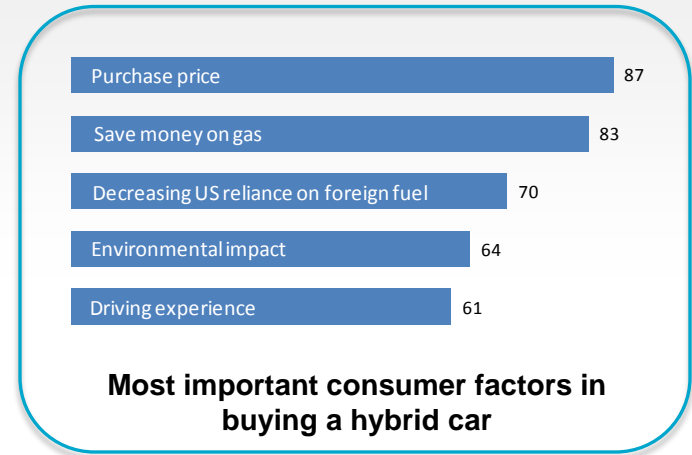
## Solution

Understand market demand to foster adoption of electric drive vehicles

- Start-Stop and Hybrid Electric Vehicles will drive near-term mass commercialization
- EV technology will prove itself in fleets
- Need to aggressively address the cost side of the electric vehicle equation

## Takeaway

Market demand will be phased and only increase when the economics are equal or better than internal combustion engines. Johnson Controls is leveraging our position as a technology leader through the electrification of our fleet .



# Addressing the fledgling domestic supply chain

## Issue

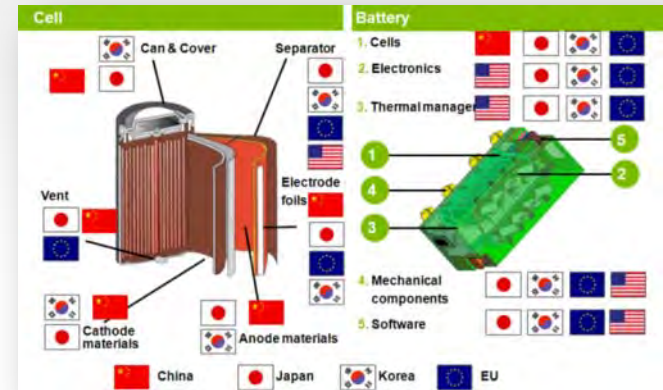
*Nearly all the batteries for hybrid electric vehicles and plug-in electric vehicles, along with the materials and equipment to manufacture them, are made in Pacific Rim countries*

## Solution

- Developing a domestic supply base throughout the advanced battery value chain
- Giving first consideration to U.S.-sourced materials
- Recruiting foreign suppliers to locate in the U.S., for example Toda America has located their operations in the United States to support the industry

## Takeaway

- Johnson Controls, with ARRA matching grant funding as a catalyst, is developing a domestic supply base. We are sourcing all major components of our cells domestically.
- Eighty-seven percent of our capital expenditures have been with companies that produce their equipment in the U.S.



# Addressing the barriers to domestic technology development

## Issue

*America needs to reestablish our position as the world leader in transferring innovation into commercially successful products that are made in the U.S.*

## Solution

- Johnson Controls is building two domestic plants to produce high-tech products. Our first plant launched September 2010.
- Our plant is designed to launch breakthrough technologies, after Government incentives expire
- Continue to develop the technology development collaboration model between the national labs, universities and private sector to drive technology improvements.



## Takeaway

- The ARRA matching grant has knocked down the barrier to building manufacturing domestically. The matching grant solidified Johnson Controls' decision to expand advanced battery production in the U.S. versus Europe or Asia.



# Johnson Controls goals and accomplishments overview

## Investing in America

- We are making an investment in the U.S. to build an advanced energy industry
- Developing and bringing advanced products to market

## Investing in people

- We are hiring engineers, technicians, and an experienced manufacturing workforce in the U.S.

## Delivering successes

- Vehicles that use our batteries, like the Ford Transit Connect Electric, are reaching the public with great interest and success
- We are building a domestic supply base, as well as anchoring foreign suppliers in the U.S.
- Our plant has already begun domestic production of complete advanced battery systems



# Accomplishing Johnson Controls goals – manufacturing excellence

Installing state-of-the-art equipment delivers:

- Automotive quality product
- High volume capability
- Significantly reduced cost
- Reduced environmental impact
- Processing efficiency

Reducing costs

- Domestic production will allow us to reduce shipping and duty costs from our European plant
- Domestic sourcing
- Design optimization
- Manufacturing process optimization
- Johnson Controls operational excellence, Best Business Practices, and continuous improvement



# Accomplishing Johnson Controls' goals – sustainability

## Certified LEED® factory

- Our plant performs more efficiently with less impact on the environment

The Power Solutions plant has leveraged our Building Efficiency expertise to design our plant to maximize energy efficiency to meet our aggressive environmental goals and set the standard for green domestic manufacturing

## Cooling for free

- Our plant's cooling towers relieve significant pressure from our facility's chiller plant
- As a result, the plant will have more consistent operating costs throughout the year

## Recovering heat

- Heat from the battery formation process is captured and used in other areas of battery manufacturing

## Reclaiming what would have been wasted

- We have designed our processes to reclaim materials used in manufacturing to save time, cost and energy

## Accomplishing Johnson Controls' goals – employee safety

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**At Johnson Controls, maintaining a safe, clean and sustainable environment for our employees is our top priority. Our safety plan is explicit:**

*Equipment must provide adequate protection from hazards or safety risks to the operators or to those who are working on or in the area during normal operation, standing alone or during its non-production functions (e.g., manual cycles, set up modes, re-work modes, etc.). Servicing and Maintenance for equipment must be user friendly, safe, and convenient. In order that these goals may be met, Johnson Controls has compiled this specification, which represents Johnson Controls' interpretation of applicable standards and laws. Johnson Controls must authorize all deviations from this specification...*

# Accomplishments towards ARRA goals

## Employing people – high quality jobs are being created

- In the last quarter, this project has resulted in direct 112.8 FTE jobs in the U.S.
- The Holland, Michigan plant will employ 95 workers by the end of next year. 320 permanent full time jobs will be created when at full capacity

## Spurring economic activity

- \$145.2M has been spent on customer programs, materials, equipment and service suppliers

## Growing for the long-term

- We are building a sustainable business model that does not rely on Government subsidies

## Defining accountability

- Meeting all reporting requirements of the ARRA and the DOE
- Our program office proactively self monitors and self audits internal processes and procedures to ensure uncompromised integrity in the use of tax payer dollars

Michigan jobs for the quarter

50.3

Wisconsin jobs for the quarter

62.5

# Accomplishments towards DOE Vehicle Technology goals

## Energy efficient and environmentally friendly highway technology

- Vehicles powered by our Li-ion batteries, including Daimler, BMW, Azure Dynamics, and Ford, produce fewer emissions and get better fuel economy than conventional internal combustion engines

## Reduced petroleum consumption

- Our combination of HEVs, PHEVs, and EVs reduce or eliminate petroleum usage

## Freedom of mobility

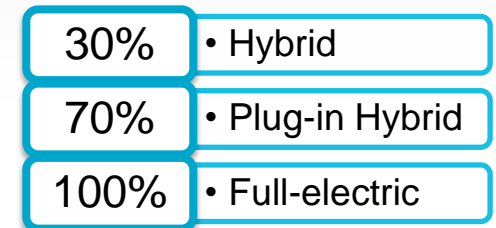
- Battery technology gains in cycle life and energy density are providing Americans with extended all-electric range vehicles to eliminate range anxiety

## Energy security

- Domestic advanced energy products improve energy security by reducing petroleum imports and minimizing the possibility of a foreign battery cartel

## Lower cost and reduce impact on environment

- Batteries manufactured at our facility are optimized for cradle-to-cradle product lifecycle, including recycling and the recovery of key materials



Reduction in petroleum usage

# Project status and milestones

## Environmental Assessment

- Johnson Controls' plant poses no threat to the environment around our plant and area of operations
- Finding of No Significant Impact (FONSI) was issued March 2010

## Milestones

Event	Date
Project kick-off	August 2009
Prototype assembly	July 2010
Pack Production	September 2010
Cell production ramp-up	March 2011
Scale cell production	July 2011

Complete advanced battery systems are being produced in the U.S. and are powering vehicles on U.S. roads

# Johnson Controls' Collaborations and Partnerships

## Johnson Controls – Saft

- Sub-recipient to the grant
- Leader in Li-ion batteries, involved within the Vehicle Technology (VT) Program
- Johnson Controls – Saft is our joint venture that brings electrification to vehicles through battery leadership

## Entek Membranes

- Sub-recipient to the award
- Leader in the industry, involved within the VT Program
- Entek provides state-of-the-art Li-ion battery separators

## Argonne National Laboratory

- Service provider to Johnson Controls
- Federal laboratory, involved outside the VT Program
- Unmatched expertise in characterizing and validating cell materials

## Azure Dynamics

- Partner in innovation
- Established leader in sustainable vehicle technologies, involved within the VT Program
- Azure provides vehicle powertrain electrification expertise





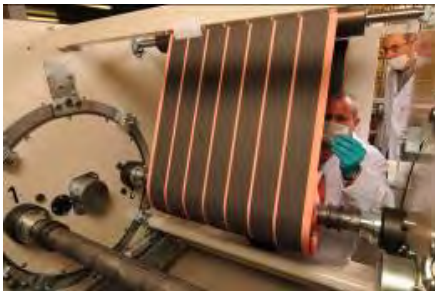
# Future Work

## Within the Fiscal Year

- Our Holland, Michigan will continue assembling battery packs
- We will begin cell assembly at our Holland, Michigan plant
- We will be assembling complete battery packs with domestically produced cells
- We will deliver market-derived solutions to transportation needs

## In the remainder of the project

- Accelerate market demand to support the full capacity of our plant
- Announce location of and build our second U.S.-based Li-ion battery plant
- Continue to win production contracts to produce xEVs
- Continue to refine our technology roadmap to maintain Johnson Controls leadership position



# Summary

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## Johnson Controls is committed to being a leader and establishing a domestic advanced battery industry

- Building a significant manufacturing presence in Holland, Michigan
- Investing in our Wisconsin technology and engineering center
- Building a U.S.-based Li-ion advanced battery plant
- Establishing a domestic supply chain and using U.S.-produced components

## Johnson Controls is meeting the goals of the ARRA and the DOE Vehicle Technologies programs

- In the past quarter, this project has resulted in the creation of 113 jobs
- We have spent \$145.2M to deliver customer products, design and outfit our plant, and build our supply base, spurring economic activity
- We are committed to putting environmentally friendly vehicles into the market including our fleet
- Our business is positioned for long-term growth