High Efficiency Motors for Refrigerated Open Display Cases

2016 Building Technologies Office Peer Review

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

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Project Summary

Timeline:

Start date: 10/1/14

Planned end date: 3/31/18

Key Milestones

1. ORNL Report; Sep 2015
2. Fortune and Other Press; Sep 2015
3. Site Demonstrations; Ongoing - 3/31/18

Budget:

Total DOE $ to date: $387,393

Total future DOE $: $617,259

Target Market/Audience:

This project is demonstrating and testing high efficiency Q-Sync fan motors in application with support from end user grocery sites, retrofit contractors, utilities and commercial refrigeration OEMs.

Key Partners:

Oak Ridge National Labs	HyVee
Safeway-Albertsons	Price Chopper
Other Supermarkets	Utilities
Installers	Distributors

Project Goal:

QM Power is targeting the demonstration, testing and deployment of replicable, cost-effective, low-risk, higher efficiency fan motor solutions with market leaders. Using Q-Sync technology instead of incumbent solutions would be the equivalent of taking at least one of every two existing fan motor solutions off the grid.

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Purpose and Objectives

Problem Statement: Grocery sites are typically 1-2% net margin businesses with significant energy costs. Even with a much more efficient and more reliable product at the same cost, end-users and OEMs often rely on product demonstrations before adopting new solutions.

Target Market and Audience: The project will demonstrate and test high efficiency Q-Sync fan motors in application with support from grocery sites, retrofit contractors, utilities and commercial refrigeration OEMs. QM Power's technologies have the potential to achieve over one quadrillion btu or over $30 billion of energy savings in HVACR building applications annually.

Impact of Project:

- **Near-term**: Over 10,000 motors will be installed in up to 50 sites across the US during the course of the project. Demonstrations will expedite customer adoption and the development and use of QM Power's technologies in other HVACR fan applications.
- **Intermediate-term**: QM Power HVACR fan motors exceed $100 million per year in sales. Additional building system solutions utilizing QMP's technologies, such as for pump and compressor applications and advanced fan blades and shrouds, will be commercialized.
- **Long-term**: Synchronous motors become the de facto standard in the industry, displacing shaded pole, PSC and ECM offerings. DOE minimum efficiency and Energy Star designations are easier for OEMs to achieve, utilities solve major grid congestion issues and end users rapidly deploy cost effective, low-risk energy efficient solutions.

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Approach

Approach: QM Power is targeting high visibility demonstrations.

Key Issues: Validating performance with end users, contractors, utilities and OEMs. Getting utilities to offer rebates and on-bill financing alternatives, ideally at levels beyond those offered for ECM solutions, is an important goal which would accelerate market adoption.

Distinctive Characteristics: Q-Sync obtains the efficiency advantages of permanent magnets without the losses associated with continual power conversions from ECM designs.

- QM Power's motor is perfectly synced to the 60Hz AC line frequency
- The yellow lines in the diagram on the right show the power losses and wasted energy inherent in an ECM design

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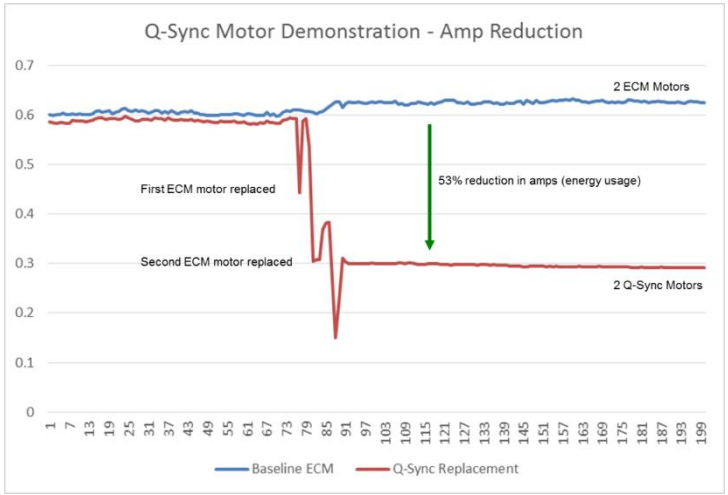
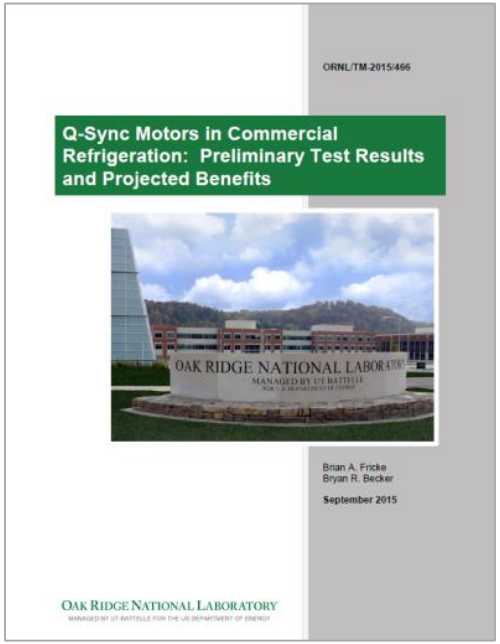
Real Results: HyVee Demonstration

Q-Sync motors consumed less than half of the amps of the incumbent market share leading ECM motors





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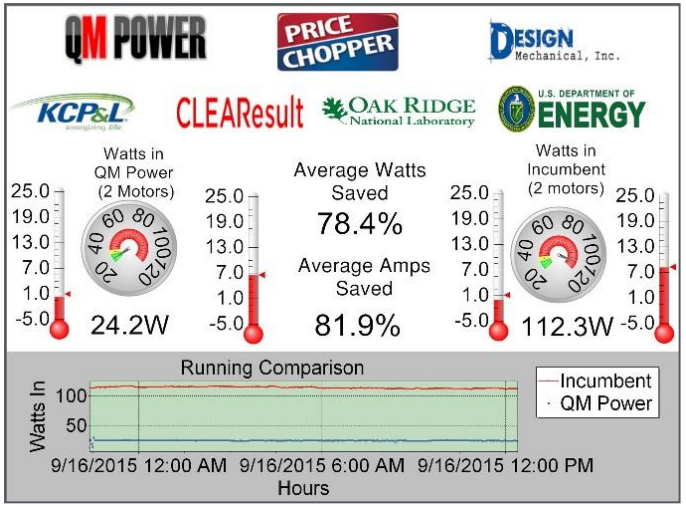
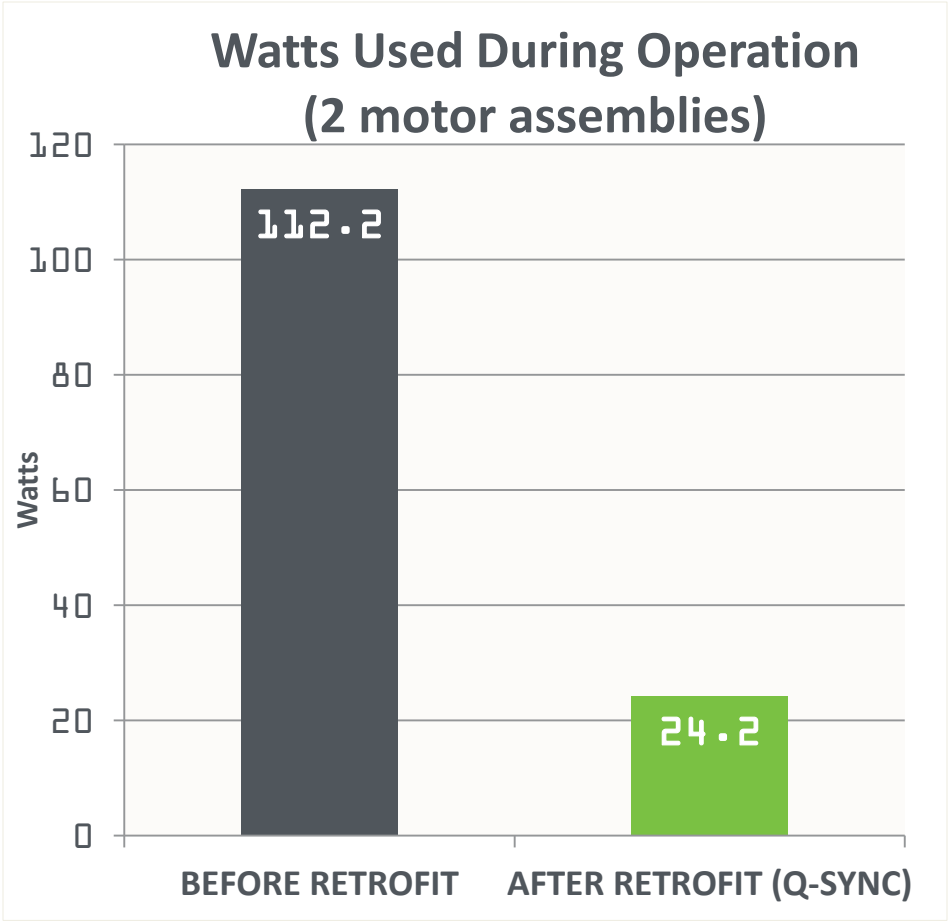
Real Results: Price Chopper Demonstration

Q-Sync motors consumed about 80% less electricity than incumbent motors





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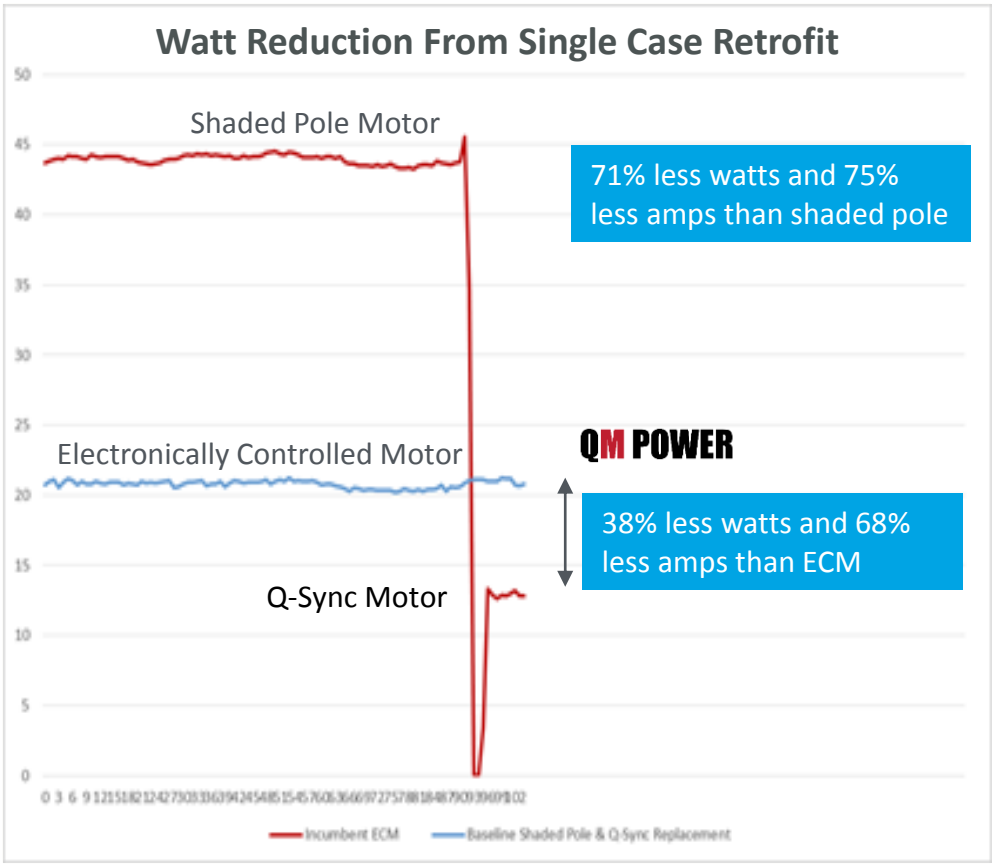
Real Results: Vons (Safeway-Albertsons) Demonstration

Q-Sync motors consumed over 70% less energy than incumbent motors

SAFEWAY VONS Albertsons



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Progress and Accomplishments

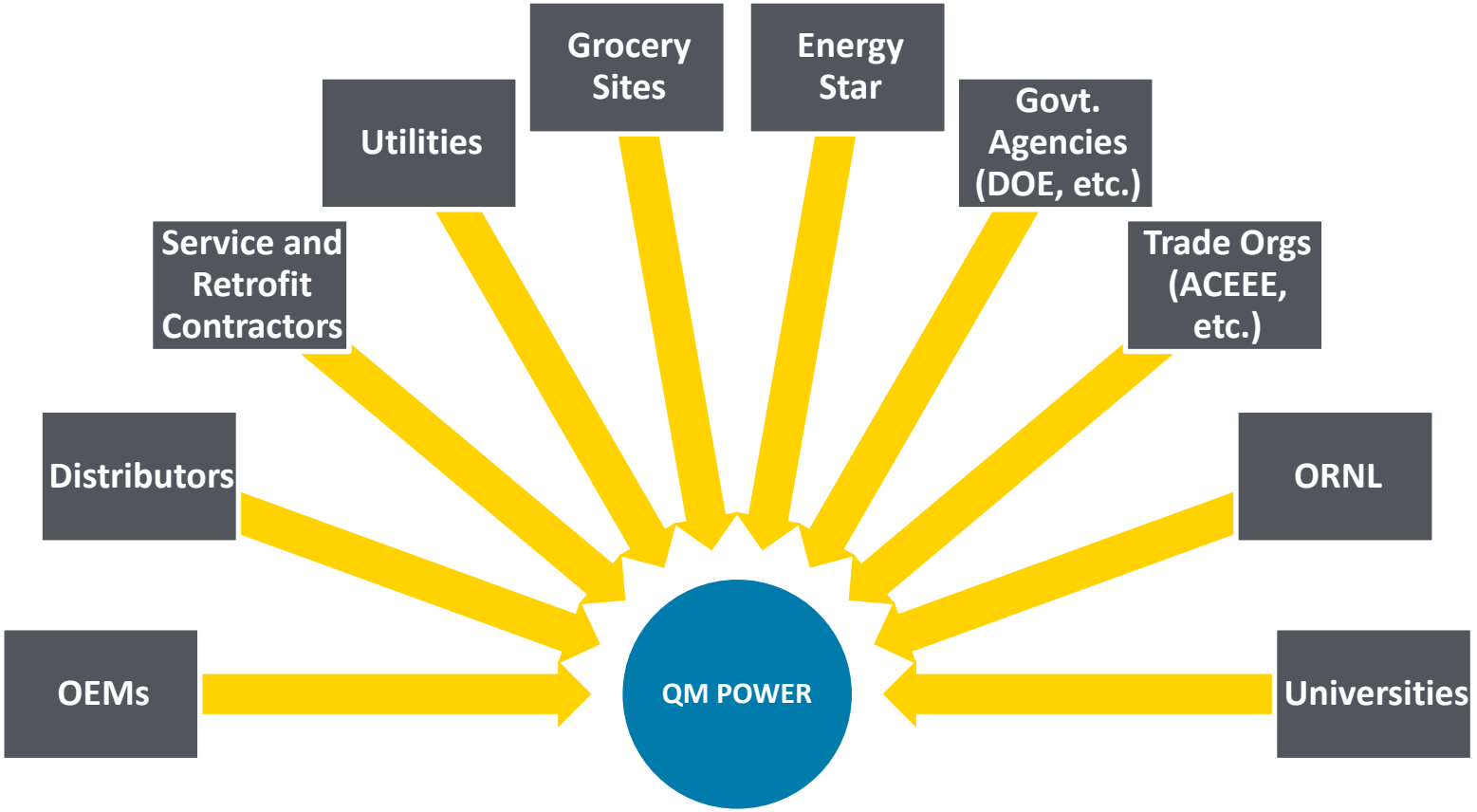
Lessons Learned: QM Power has encountered resistance from OEMs wanting to change, even with their end users now knowing this savings opportunity is available to them and are requesting the change. End user awareness is critical to enabling and expediting adoption. QM Power has also encountered non-uniform utility rebate programs which can slow adoption.

Accomplishments: The energy and reliability advantages have exceeded expectations. Oak Ridge National Labs has published a confirmatory report on Q-Sync and QM Power has completed several retrofit installations with the largest grocers and supply chain participants. QM Power is hiring and ramping domestic production.

Market Impact: Using Q-Sync technology instead of incumbent solutions would be the equivalent of taking at least one of every two and possibly four of every five existing fan motor solutions off the grid. There is no compelling reason why Q-Sync motors should not completely displace shaded pole, PSC and ECM motors in commercial refrigeration applications over the next few years.

Project Integration and Collaboration

QM Power and ORNL are working directly with a diverse set of collaborators.



QM Power's planned TT&O is targeting presentations at FMI, ASHRAE, the DOE Better Buildings Summit and publications from ORNL, academia and trade organizations.

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Next Steps and Future Plans

QM Power is focusing on a broad and diverse set of retrofit opportunities. These provide the company with highly visible demonstrations of the value proposition for key participants in the supply chain and ultimately help accelerate commercial sales.

The company anticipates future potential opportunities to scale into additional building applications including larger HVACR fan, pump and compressor systems, each of which are among the biggest consumers of electricity in the building envelope. QM Power is already working on integrating smart motor technologies to allow for remote monitoring (Wi-Fi) and control optimization to improve installation, performance, reliability and up-time, as well as advanced fan blades that reduce energy use, are quieter and more durable.

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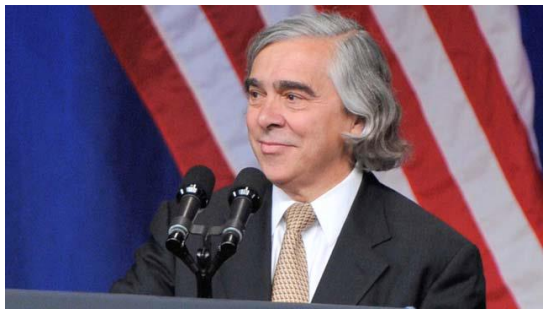
REFERENCE SLIDES

"In our supermarkets and grocery stores, refrigeration can use almost 40 percent of total energy use – contributing a large portion of these businesses' utility bills."

"By improving the energy efficiency of commercial refrigeration equipment – like restaurant-size fridges or the deli case at your local grocery store – we can make our businesses more competitive, reduce greenhouse gas emissions and save money."

-Department of Energy Secretary Ernest Moniz



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Project Budget

Project Budget: Spending is on budget and expected to be on budget at the end of the Phase II period ending June 30, 2016.

Variances: None in current period.

Cost to Date: $1,188,404 through January ($387,393 DOE), 39% of the budget has been expended.

Additional Funding: Series C venture capital financing closed in March of 2016.

Budget History in USD					
10/1/14- 6/30/15 (Through Period 1, Actual)		7/1/15-6/30/16 (Through Period 2, Expected Cumulative)		7/1/16- 3/31/18 (Through Period 3, Expected Cumulative)	
DOE	Cost-share	DOE	Cost-share	DOE	Cost-share
$125,673	$125,679	$515,655	$1,013,241	$1,004,653	$2,036,153

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Project Plan and Schedule

- Project began 10/1/14 and is scheduled to end 3/31/18.
- Schedule and Milestones shown below.
- Go/no-go decision points in June depending on the installation progress.