

# ETI ALPHADIRECT MANAGEMENT SERIES

MAY 2 , 2017

## IN FOCUS: UQM AND THE RECENTLY ANNOUNCED STRATEGIC ALLIANCE WITH MERITOR TO DEVELOP FULL ELECTRIC E-AXLES SYSTEMS.

This issue focuses on UQM Technologies Inc. (UQM) and its recent alliance with Meritor for the development of a full electric E-Axles system, targeting the medium and heavy duty commercial vehicle market.



Source: [www.energytechinvestor.com](http://www.energytechinvestor.com)

### ETI INSIGHT

We remain bullish on the long-term prospects of the global EV market driven by declining battery prices, tighter emissions standards and improved performance. We believe UQM remains a technology leader in this market as evidenced by the recent announcement with Meritor, which is the focus of this report. Specifically, the revolutionary E-axle technology allows customers to benefit from integrated solutions that should lead to meaningful cost savings, improve on component packaging requirements and improved vehicle performance long term. Furthermore, the relationship with Meritor should bring a strong global presence and established sales infrastructure to the table and help facilitate relationships with major commercial vehicle manufacturers around the world.

### UQM Business Snapshot

**Founded:** 1967

**Headquarters:** Longmont, CO

**Nasdaq Ticker:** UQM (NYSE)

**Stock Price:** \$0.54\*

**Market Cap:** \$26.7M\*

**Website:** [www.uqm.com](http://www.uqm.com)

\*As of April 27<sup>th</sup>, 2017



### About EnergyTech Investor

EnergyTech Investor, LLC (ETI) is a strategic advisory and independent research firm that delivers innovative investor intelligence programs, investor relations expertise and new investor outreach strategies to companies across the Energy Conversion and Industrial Technology sectors. ETI's mission is to generate insightful and credible information flow between companies and their investors through a broad portfolio of investor intelligence products that helps investors clearly understand the issues impacting a company and their stock price including strategic direction, technology and industry dynamics. EnergyTech Investor was founded by Wall Street veteran and research analyst, Shawn Severson, after seeing a fundamental shift in the investment industry that resulted in less fundamental research conducted on small cap companies and a significant decline in information available to the average investor. ETI's mission is to bridge that information gap and deliver solutions to both companies and investors.

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## Participants

**Mr. Joseph Mitchell**  
**President and CEO**  
**UQM Technologies Inc.**

Mr. Mitchell joined UQM Technologies, Inc. in 2012 as Vice President of Operations and took over the role of President and CEO in January of 2016. Mr. Mitchell has extensive experience in the automotive industry serving in a number of international management positions and has over 17 years specifically in the hybrid and electric vehicle industry. Today he has UQM focused on expanding into new markets and growing with both existing and new customer opportunities and applications for UQM's leading electric drive technology.

**Mr. Shawn Severson**  
**CEO and Editor-In-Chief**  
**EnergyTech Investor**

Mr. Severson is the founding partner and CEO of EnergyTech Investor, LLC. He has over 20 years of experience as a senior research analyst covering the technology and cleantech industries. Prior to founding ETI he lead the Energy, Environmental and Industrial Technologies practice at the Blueshirt Group, a leading growth company investor relations firm. He was frequently ranked as a top research analyst including one of the Wall Street Journal's "Best on the Street" stock pickers and multiple awards as Starmine's top three stock pickers.



## ABOUT UQM

UQM Technologies is a developer and manufacturer of power-dense, high-efficiency electric motors, generators, power electronic controllers and fuel cell compressors for the commercial truck, bus, automotive, marine, military and industrial markets. A major emphasis for UQM is developing products for the alternative energy technologies sector, including propulsion systems for electric hybrid electric, plug in hybrid electric and fuel cell electric vehicles, under-the-hood power accessories and other vehicle auxiliaries. UQM's headquarters, engineering, product development center and manufacturing operations are located in Longmont Colorado. UQM is TS 16949 and ISO 14001 certified.



**Shawn Severson:** Thank you for taking the time to speak with us again today Joe. The focus of our last update was on UQM's relationship with Eaton and Pi Innovo. Today we want to focus on the recently announced strategic alliance with Meritor. Could you start by giving us a quick overview of the development agreement?

**Joe Mitchell:** Thanks Shawn and it is a pleasure to speak with you regarding our alliance with Meritor to supply them with key components for the E-axle program including motor components and the inverter. With this agreement, we will be working hand in hand with the Meritor engineers to develop a fully integrated electric axle for the commercial vehicle market. Meritor will be the Tier 1 supplier of this system and we will supply key components directly to Meritor. With the agreement, the first phase has us working with Meritor to develop the concept prototypes that Meritor will have on display at the North American commercial vehicle show in Atlanta this September. Phase 2 will have us working with Meritor developing fully functional prototypes for customer trials that should be available later this year. Based on customer acceptance and market demand, this product could go to production within 12 to 24 months after the trials.

**Shawn Severson:** Could you talk about the due diligence process you went through when teaming up with Meritor as a strategic partner?

**Joe Mitchell:** The market is ever changing and since we attended the European Truck Show in Hanover it became apparent that we needed to rethink the medium and heavy duty commercial

market. We originally looked at the potential offering that included a motor/inverter and gearbox, but once it was determined that an axle is on every automotive and commercial vehicle, it became apparent that this offering would address areas that we were not able to participate as a Tier 1 supplier, but as a Tier 2 supplier it was a solid offering.

First, we met with some OEM customers that were interested in our motor/inverter technology but did not have a total solution for implementing full EV platform. We attended an invitation only customer conference to display our technology and based on our initial engagement in Europe with Meritor, it was obvious that as partners this would be a formidable offering to OEM customer. We held a full day workshop with Meritor to address several areas of opportunities that included but was not limited to market size, product offerings, and technical synergies.

**Shawn Severson:** Thank you, Joe. Can you explain the basics of the E-axle technology and how it is different from other systems on the market today?

**Joe Mitchell:** Sure. From the most basic standpoint, the E-axle combines what was the major portion of the driveline, the engine and transmission, into the axle. This means that there are very significant advantages in terms of cost and packaging. Another major advantage of E-axle technology is what it does for vehicle architecture. With the absence of an engine and transmission, vehicle makers can eliminate the body features referred to as the transmission tunnel or driveline tunnel. This area can now be opened up and utilized for packaging the battery

pack or additional cargo space. This is an ideal place for the battery back from an EV architecture standpoint. The batteries can be positioned low in the vehicle between the two axles optimizing the weight distribution and enabling better vehicle dynamics for handling and safety.

**Shawn Severson:** From a mechanical standpoint, can you help us understand how UQM's motors, controllers and software will be integrated with Meritor's drivetrain components?

**Joe Mitchell:** The UQM motors will be packaged within the Meritor axle and the system will be designed as a highly-integrated system. By this I mean we are not simply coupling the motor to the input shaft of the axle and packaging a housing around it. Instead our two teams took a long look at how the traditional components of both motor and axle could be packaged around each other to reduce space claim, components and materials. This is how you achieve a real cost advantage and other value drivers like packaging and good driveline dynamics. Our motors are particularly power dense and therefore minimized the amount of added "sprung weight" to the axle. Minimizing sprung weight is important for optimizing both driveline and suspension dynamics for a traditional feel, smooth ride and low NVH.

**Shawn Severson:** What would be the specific benefits for customers using the new E-axle systems? Could you help us understand the importance of the new integrated solution and how it will help customers reach higher levels of vehicle electrification?

**Joe Mitchell:** The largest benefit is cost savings. There is huge savings in terms of reducing components and materials. For instance, the entire transmission, driveshaft and rotating joints are eliminated. Due to distinct performance advantages, UQM electric motors need less in terms of total number of speeds or gears to begin with. In large vehicles, where there is a cost advantage to have 2 speeds, a shiftable 2 speed planetary gear set will be built into the axle. In addition, the motor and axle share a housing, bearings, cooling system and other components that lead to major cost advantage as well. I have already mentioned packaging and vehicle architecture, but the other major benefit is reliability and maintenance. With the elimination of the driveline, we also eliminate a huge number of possible failure points. The rotating joints in the driveshaft will not need to be serviced and replaced. The transmission fluid will not need to be flushed and replaced and all those wearable parts like gears, bearings and clutches are no longer there for eventual failure. Statistically this will increase the overall MTBF of the driveline by a huge factor.

**Shawn Severson:** How will this integrated solution drive cost savings long term for the customer?

**Joe Mitchell:** Great question. Not only is the initial capital cost reduced drastically, but the overall lifetime cost of ownership will also be reduced. I touched on service already, but the amount of labor needed to service and rebuild transmissions, and service, balance and rebuild driveshafts, is very significant over the lifetime of commercial vehicles. This labor and material cost goes away with the E-axle

architecture. I think the overall lifetime cost savings for commercial transit vehicle will be orders of magnitude. Electric commercial vehicles have demonstrated their maintenance costs to be a fraction of a traditional diesel system.

**Shawn Severson:** What's the targeted market for the new systems? Commercial/heavy/medium duty etc.? Are there any similar systems offered on the market today?

**Joe Mitchell:** The target market for these new systems includes the medium and heavy duty commercial markets. The most attractive portion of this offering is that working it allows UQM and Meritor the opportunity to optimize the system for cost, efficiency and performance while integrating the motor and gearbox as a system offering.

Currently, there may be several activities on the automotive side of the business that have something similar, but with respect to the commercial market this technology is not operational in the market. It was identified in similar prototypes but nothing elaborately integrated as this solution.

**Shawn Severson:** How will the marketing arrangement work between Meritor and UQM and what types of industry events will you be attending either jointly or separately to market this?

**Joe Mitchell:** Here at UQM we have positioned ourselves to be a Tier 2 supplier to Meritor. Ironically, some of Meritor's current customers identified UQM as a potential EV supplier, but to team up with Meritor to deliver an integrated solution

has created some excitement in the commercial market.

We plan to jointly attend several industry conferences together; in particular the North American Commercial Truck Show in Atlanta this upcoming September. Also, both parties will continue to attend shows that we go to within our normal operations.

**Shawn Severson:** During your last earnings call, you spoke about the tremendous market potential for this application. Can you talk about how this program has the potential to be a game changer for UQM based on customer acceptance?

**Joe Mitchell:** The forecasts for commercial vehicle electrification trends over the next ten years are very strong with exponential growth, especially in China. Meritor has a significant portion of the global commercial heavy duty axle market and a sizable share of the medium duty market. The ability to provide an offering for both markets at a conservative penetration percentage creates a tremendous potential. Meritor's market reach including their global manufacturing, sales and service capabilities is one of the most exciting and promising opportunities for us to be a direct supplier to Meritor to take advantage of this reach.

**Shawn Severson:** Have you seen an increased level of interest from customers since announcing this deal and can you talk about any potential customers that have already showed any interest for the new systems?

**Joe Mitchell:** Definitely, we have seen an increased level of interest from traditional customers who overlap Meritor and UQM's

customer base. It is too early to name some of the interested customers, but I will say that we have OEM's who are customers of Meritor who were once interested in our technology, but as a Tier 1 it was difficult for us to support their interest. Now as a Tier 2 to Meritor, these OEM's are now coming back with intensified interest due to the synergy between our companies.

**Shawn Severson:** So lastly, when do you expect the prototypes to be ready for on-road testing and could you please elaborate on the commercialization process timeline?

**Joe Mitchell:** As we discussed earlier, Phase 2 of the program will provide demonstration prototypes and they should be ready for deployment later in the fall. Based on customer acceptance, production will commence in the subsequent 12 to 24 months. Meritor is following a very methodical and disciplined development and launch schedule that will require full validation and market acceptance to take this product to the broader commercial market. We are very excited and proud that Meritor selected UQM as their partner to supply the E-drive propulsion technology for this application and the potential it brings to UQM from a market growth perspective.

## SHAWN SEVERSON CEO AND EDITOR-IN-CHIEF

Mr. Severson founded EnergyTech Investor in 2016 after seeing a significant communication and information gap developing between small and micro-cap companies and the financial community. Mr. Severson has over 20 years of experience as a senior research analyst covering the technology and cleantech industries. Previously, he was Managing Director at the Blueshirt Group where he was the head of the Energy, Environmental and Industrial Technologies practice. Prior to the Blueshirt Group, Mr. Severson was at JMP Securities where he was a Senior Equity Research Analyst and Managing Director of the firm's Energy, Environmental & Industrial Technologies research team. Before joining JMP, he held senior positions at ThinkEquity, Robert W. Baird (London) and Raymond James. He began his career as an Equity Research Associate at Kemper Securities. He was frequently ranked as a top research analyst including one of the Wall Street Journal's "Best on the Street" stock pickers and multiple awards as Starmine's top three stock pickers.



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