ElecTruck™ Drive System and Related TransPower Capabilities

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Executive Summary

Transportation Power, Inc. (TransPower, or the "Company") is a California corporation whose mission is to become a leading supplier of power generation, energy storage, and power control technologies for the "green economy." TransPower's products include integrated electric drive systems for heavy-duty vehicles and large stationary energy storage systems, both of which are characterized by storage of large amounts of energy in advanced lithium-ion batteries, new power electronics capabilities, and sophisticated energy management controls. This document provides technical information on TransPower's "ElecTruck™" electric propulsion system, which is designed to power the largest heavy-duty road vehicles including Class 8 trucks, school buses, and transit buses.

The ElecTruck™ system was developed for locally-driven, short-duty-cycle trucks and buses garaged each night (or day) at the same location. A variant of the ElecTruck™ system is custom designed for each individual truck or bus model, then installed into the vehicle either at TransPower's integration facility or the vehicle manufacturer's own factory. Electric drive motors are used to propel these vehicles, with all of their energy obtained from onboard batteries. This completely eliminates the need for internal combustion engines or fuel. Such vehicles are simpler and more reliable than conventional internal combustion engine or hybrid vehicles. The ElecTruck™ system offers technological innovations in several key areas, including:

Power conversion – In a joint development effort with EPC Power Corp., a partially-owned subsidiary company, TransPower has developed an advanced "Inverter-Charger Unit" (ICU) that combines the functions of the vehicle inverter, which controls the drive motors, and the battery charger, which regulates recharging of the vehicle battery pack. The ICU is mounted on the vehicle and thus eliminates the need for the vehicle to be plugged into a large, expensive off-board charger to recharge its batteries. Integrating a high-power charger onto a vehicle represents a leapfrog technology that will simplify battery recharging and accelerate market acceptance. This breakthrough is enabled by recent improvements in power electronics technologies, which have enabled TransPower and EPC to design a grid-compatible ICU that is much smaller and lighter than competing chargers with equivalent power ratings.

Energy Storage – TransPower builds high-energy battery modules using lithium-ion cells that are very inexpensive, but that the Company has tested to validate their performance and reliability. Using a standard module that weighs approximately 350 lb., TransPower can customize the number of batteries to the needs of specific vehicles. An advanced battery management system (BMS) is used to monitor each individual battery cell and extend the life of the battery subsystem by enabling the replacement of failing cells before they degrade the performance of adjoining cells. The batteries used with the ElecTruck™ system are expected to last for at least ten years if cycled once each day.

Main Propulsion – The main propulsion system used to drive the vehicle's wheels consists of one or two electric drive motors, depending on vehicle power requirements. The motors currently used in the ElecTruck™ system are AC synchronous motors developed by Quantum Technologies for the Fisker Karma hybrid automobile. This motor has an exceptionally high power density and a compact, "pancake"-style design that provides a range of integration options. The motor has also been vetted through extensive testing that Quantum and Fisker have funded to meet the certification requirements of the Fisker Karma. The Quantum motor also comes at a substantially lower cost than competing motors, benefiting from the high production rates required by the Karma program. TransPower is developing a customized automated manual transmission that uses proven, rugged gearing and that can be tailored to the requirements of different electric vehicle duty cycles.

Vehicle Control – TransPower has developed a proprietary vehicle control system that builds on years of simulations of electric and hybrid vehicle duty cycles, enabling the development of algorithms that will optimize vehicle efficiency, maximize battery life, and protect key components such as batteries and power electronics from excessive temperatures, voltage spikes, or current surges. The vehicle control system is fully integrated into the control system used by each vehicle model into which the ElecTruck™ drive system is installed, as well as being fully integrated with the ICU and BMS.

TransPower is led by an experienced and talented team that is uniquely qualified to take on the challenges of developing and manufacturing such a wide range of game-changing energy and transportation-related technologies. Its CEO Michael Simon was Co-Founder of ISE Corporation, one of the leading electric and hybrid vehicle technology companies of the last decade. During his tenure as its Co-CEO from 1995 to 2005, ISE experienced ten consecutive years of revenue growth. Technical activities are led by Dr. James Burns (VP and Chief Scientist) and Dr. Paul Scott (VP, Advanced Technologies), both of whom are prominent scholars as well as industry technologists. TransPower's scientific and engineering capabilities are augmented by a team of experienced master mechanics and technicians. Of TransPower's six most senior personnel, four possess more than 45 years of technical experience.

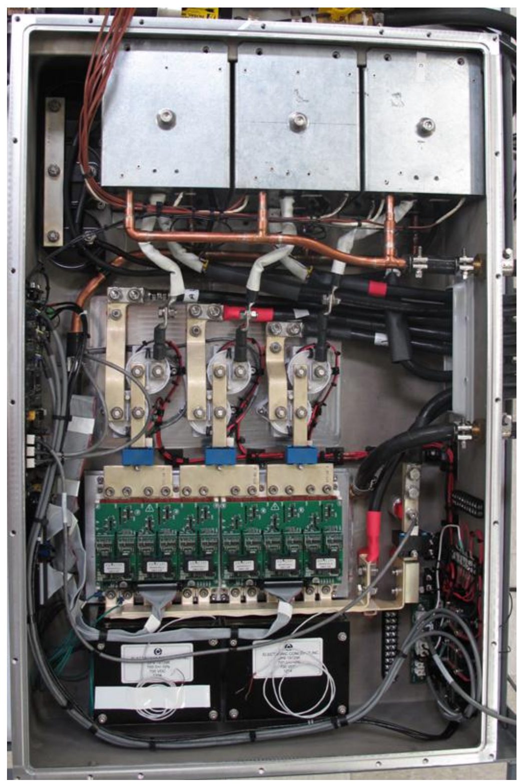
TransPower presently operates in an 8,000 square foot R&D and office facility in Poway, California, and is developing expansion plans based on the strong interest that has been shown in its emerging transportation and energy products. Below is a photo of a Class 8 truck having an electric drive system installed in one of the high bay work areas in the current facility.

Electric Drive Subsystems

TransPower's product offering balances technology advancement and simplicity. While it uses the most advanced propulsion, power conversion, and energy storage technologies, the ElecTruck™ drive system consists of just four major subsystems: Power Control and Conversion Subsystem (PCCS), Motive Drive Subsystem (MDS), Energy Storage Subsystem (ESS), and Electrically-Driven Accessory Subsystem (EDAS). Following are brief descriptions of these subsystems.

Power Control and Conversion Subsystem (PCCS)

The PCCS combines a network control architecture, control software, and power conversion modules into an integrated subsystem that links all drive system components and enables them to communicate with vehicle controls and displays. The PCCS uses a Controller Area Network (CAN)-based architecture that offers unparalleled flexibility. Inexpensive, standardized microprocessors are used to interface each drive system component with the control network, similar to how PCs and peripherals can be linked in an office IT network using Ethernet connections. The "plug n' play" nature of the PCCS enables TransPower to develop variants of its drive system customized for different vehicle models more quickly and efficiently than competitors. It will also facilitate the smooth evolution of TransPower's drive system as new technologies and components become available.



A key component of the PCCS is a new onboard Inverter-Charger Unit (ICU) recently developed with EPC Power Corp. The ICU revolutionizes electric vehicle design by combining the functions of the inverter, which controls the drive motors, and the battery charger, which recharges the vehicle's batteries on a "plug-in" basis. This innovation, which will reduce the overall cost of ownership of plug-in electric and hybrid vehicles, is made possible by several recent technical advances that have enabled TransPower and EPC to shrink the size of the magnetic materials required for high power, grid-compliant devices. These advances include new insulated gate bipolar transistors (IGBTs) that switch at higher frequencies than competing inverters, producing less electrical switching noise and reducing the materials required to filter this noise. Liquid-cooled heat sinks reduce the cost of cooling and improve reliability by eliminating fans, as well as contributing to the more compact, efficient ICU packaging. Hence two ICUs can easily be integrated into larger trucks and buses, providing a total of up to 300 kW of peak power for the main drive motors and the capability to support battery charging at power levels of up to 140 kW. The above photo shows the interior of the ICU module.

A retractable cord will allow vehicle operators to plug the inverter-charger into 220V outlets equipped with the right receptacles. The inverter-charger will then automatically regulate the recharging of the vehicle's batteries, and safely terminate the charging process when the batteries are brought up to a full charge. If both chargers are plugged in simultaneously, they will provide a full battery charge for a large 300 kWh battery pack in less than three hours. Eliminating the need for a separate off-board battery charger not only reduces the cost of ownership, but simplifies facility requirements and charging logistics. TransPower believes this will accelerate customer acceptance of plug-in electric and hybrid vehicles using the ICU.

The first prototype ICU recently completed a series of tests to validate its charging capabilities and development efforts are now focused on perfecting the inverter software the ICU will utilize to provide smooth acceleration, regulation of regenerative braking, and other motor control functions. By the end of 2012, the ICU will be standard equipment in all ElecTruck™ drive systems.

Another key component of the PCCS is TransPower's proprietary Electric Vehicle Control (EVCon™) system, which controls all vehicle functions and makes the difference between battery-electric propulsion and conventional propulsion via internal combustion engines virtually transparent to the vehicle operator. All vehicle components are fully integrated into the vehicle's usual system of controls and displays, allowing drivers to easily monitor such parameters as vehicle speed and battery state of charge using dashboard displays similar to those to which they are accustomed.

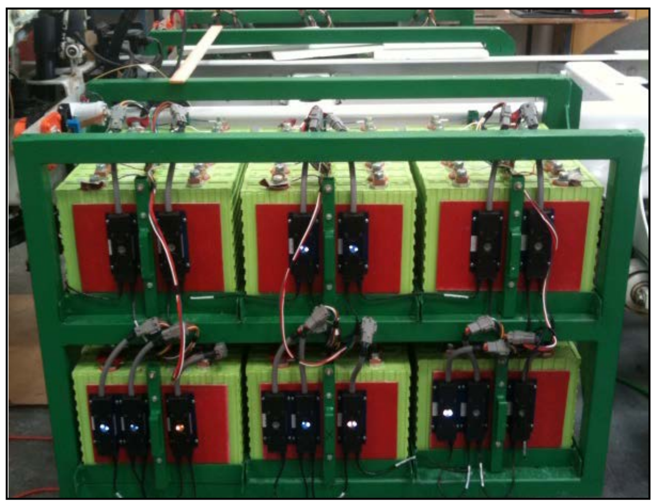
Motive Drive Subsystem (MDS)

The TransPower motive drive subsystem converts electrical power from the battery subsystem and ICU into mechanical power to drive the vehicle's wheels. The primary component of this subsystem is the main drive motor. TransPower evaluated numerous motor options and, after several months of analyses and discussions with motor manufacturers, made a novel choice in selecting a motor originally designed for a high-performance hybrid passenger car, the Fisker Karma. Developed and supplied by Quantum Technologies, these motors each provide 150 kW of peak power, more than adequate to meet the most demanding truck and bus requirements. Adapting a motor designed for passenger cars has a potentially high payoff as these motors are more compact, lightweight, and economical than competing motors. They have also undergone extensive testing and certification by Quantum to qualify them for automobile use, which adds to the degree of confidence in the reliability of the product.

One of the challenges involved in adapting these motors for use in heavy-duty vehicles is generating sufficient torque for vehicles with gross weigh ratings of up to 80,000 lb. TransPower's motive drive subsystem achieves this by combining the torque from two motors by integrating two motors with a combining gearbox, as shown here. The drive shaft is then run through a custom-developed automated manual transmission to provide higher starting torque without compromising efficiency at higher operating speeds. Maintaining high efficiency across the vehicle speed range is important because this directly affects the operating range a vehicle can achieve on a single battery charge. Even with two motors, combiner, and transmission, the total cost of the TransPower motive drive subsystem compares favorably with the costs of competing electric propulsion systems of equivalent capability.

Energy Storage Subsystem (ESS)

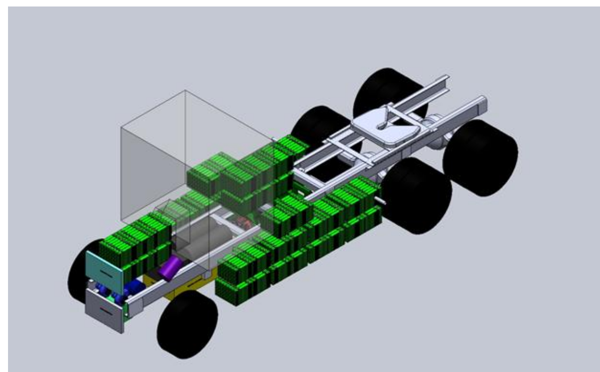
In any electric vehicle, the battery subsystem is the element of the electric drive system that will have the greatest impact on vehicle efficiency, safety, reliability, operating range, and cost-effectiveness. The TransPower Energy Storage Subsystem (ESS) addresses the importance of battery performance by combining the best value lithium-ion batteries available anywhere in the world with a sophisticated battery management system (BMS) and a well-engineered integration concept. This results in an ESS with a lower cost of energy than competing systems, but that also offers high performance and long operating life – projected to be as long as 10-15 years depending on how the batteries are utilized.



TransPower has established relationships with several leading battery manufacturers around the world and is constantly performing its own testing of different battery cell products to better understand their performance under conditions likely to be created by large trucks and buses. The batteries TransPower presently uses in its ESS are 3.2-volt cells which typically have energy capacities of 200-300 ampere-hours (Ah), so each cell stores approximately 640 to 960 watt-hours (Wh) of energy. The photo at the right shows a battery pack developed by TransPower for one of its trucks that consists of 60 cells, each rated at 260 Ah. The illuminated black boxes and wiring on the side of the unit are elements of the battery management system (BMS) TransPower integrates into its system. The BMS helps to assure proper, safe functioning of the high-energy cells by monitoring the condition or each individual cell, storing this data indefinitely, and providing early warning of changes in cell voltage or temperature that could indicate a problem. The BMS also helps to equalize charge among cells – which can extend cell life – and works in conjunction with TransPower's vehicle electrical safety and control systems to assure that batteries are not damaged by overcharging or overdischarging, that electrical risks to operations and maintenance personnel are minimized, and that such personnel are alerted to changes in cell characteristics that could be indications of future problems.

Use of advanced battery monitoring techniques is one of the strategies that allows TransPower to take advantage of lower cost lithium-ion battery chemistries. The lithium iron phosphate cells used in TransPower's ESS modules cost substantially less than other advanced battery chemistries. These cells are rated by the manufacturers to last 3,000 to 5,000 cycles, depending on how deeply they are discharged. This should result in at least 10 years of operating life for most vehicle applications, assuming batteries are discharged throughout the daily duty cycle and recharged once overnight.

Pictured below on the left is a photo of two battery clusters installed on an electric truck. Pictured below on the right is a CAD illustration of a Class 8 tractor with battery clusters mounted in all areas that can accommodate batteries – along the frame rails, behind the cab, and in the engine compartment. Such configurations could supply up to 320 kWh of total energy. For each vehicle equipped with the ElecTruck™ drive system, TransPower engineers perform loading and finite element analyses to confirm that ESS configurations conform to axle weight limitations and other real-world constraints. Within vehicle weight and space constraints, ESS capacity can be tailored to a wide variety of vehicle operating voltage or range requirements.



Electrically-Driven Accessory Subsystem (EDAS)

TransPower has developed a new means of powering vehicle accessories such as power steering, braking, and heating, ventilation, and air conditioning. The photo to the right shows the main components of this Electrically-Driven Accessory Subsystem (EDAS) installed in an electric truck. In conventional vehicles, these functions utilize engine-driven power takeoff units, but in our electric vehicles, the engines are removed. TransPower's EDAS assembly uses a rugged air compressor and hydraulic pump to make the truck accessories fully electric, allowing them to function without an engine or alternator. TransPower also supplies electrically-driven accessories to provide power for lighting, refrigeration, and any other electrical appliances or loads. In fact, these accessories can be combined with lithium battery packs and installed into conventional diesel trucks to provide electric power without having to idle the engine.

Systems Engineering and Integration

The value of the ElecTruck™ drive system is driven not just by the superiority of the subsystems and components just described, but is also a function of the expertise TransPower brings in adapting the system – or selected subsystems – to different vehicle models and operating requirements. TransPower's team understands the particular requirements of the largest heavy-duty vehicles and the entire focus of the Company's vehicle work is on electrifying such vehicles reliably and cost-effectively.

Successful physical and electrical integration of electric subsystems into large vehicles requires an understanding of the vehicle's duty cycle and other operating requirements, and detailed knowledge of the workings and interface requirements of the vehicle components with which the drive system must interact. As compared with most competing electric drive system and component suppliers, TransPower believes it has a more disciplined and thorough process for performing the systems engineering and integration necessary to achieve this compatibility.

Requirements Analysis

TransPower employs a requirements-driven approach to subsystem and component design. TransPower has analyzed requirements for a range of Class 8 trucks, tractors, school buses, and large transit buses. This typically involves review of published reports but can also include field measurements to confirm published data.

Simulation

TransPower uses rapid, industry leading modeling and simulation techniques to analyze alternative components and drive system configurations before acquiring hardware, and, when practical, performs hardware-in-the-loop (HIL) simulations before hardware is integrated into its drive systems. As indicated previously, structural and space-claim analyses and simulations are used to determine the optimal locations for mounting battery clusters on vehicles before fabrication begins. The same approach is used in the creation of real-time, digital controls for TransPower products. Advanced modeling and simulation tools and capabilities are used to analyze and adapt CAN communication specifications provided by Quantum for its inverters and for the Navistar chassis database. The as-delivered data base specifications for these components were converted into formats that can be used to generate m-files, which were then used to support development of TransPower's drive system control code using Simulink-based embedded control architecture. Separate m-files are created for BMS and battery charger system components, supporting such tasks as development of state-flow control rules for startup, power-up of accessories, and safety and fault checking. These features are augmented with physics-based modules of truck behavior until a model-in-loop environment is built for use in the development of control strategy, control code, and control flow functionality.

To someone who is not a simulation or controls expert, this simply means that TransPower has a rich data base, tools, and experience that enable it to analyze how a vehicle and its components will react to different situations, *before* actually putting the components into a vehicle or putting a vehicle on the road.

High-Quality Integration

The processes just described can greatly reduce the total time and cost required to achieve a reliably operating vehicle and set of electric drive components. However, once vehicle and component requirements are fully understood and modeled as much as possible, the task of building a high quality product remains. To achieve this, TransPower utilizes a disciplined concurrent engineering and rapid prototyping approach to systems and vehicle integration. The result is a well-engineered product that is more likely to perform favorably under real-world operating conditions than vehicles designed and integrated with less disciplined processes. TransPower's engineers, master mechanics, and technicians work together following the Product Development Team (PDT) model to assure effective communication and mind-share as components and subsystems are integrated into vehicles for the first time. As each prototype or demonstration vehicle takes shape, TransPower develops a new line of proprietary integration products, or "glueware," which facilitates the installation of components into various vehicle models. Each vehicle requires its own mechanical interfaces (brackets, cradle assemblies, etc.), electrical interfaces (e.g., high and low voltage wiring harnesses), and customized control software, and they all must be seamlessly integrated with the truck's own systems. The photo to the right shows TransPower's first prototype electric Class 8 truck tractor during the latter stages of assembly in 2011.

As this work proceeds, TransPower generates high-quality engineering drawings, installation procedures, and bills of material to assure repeatability and to meet the Company's high quality assurance standards. As TransPower's business strategy is to "fill in the gaps" in OEM capabilities, the Company's role during commercial production can evolve – depending on production volumes and OEM capabilities and preferences – from being the vehicle integrator (or integration team member) to becoming a "kit" supplier to providing selected components or intellectual property. Thus TransPower's long term role in the electric vehicle supply chain will vary and evolve for each vehicle model along the following lines:

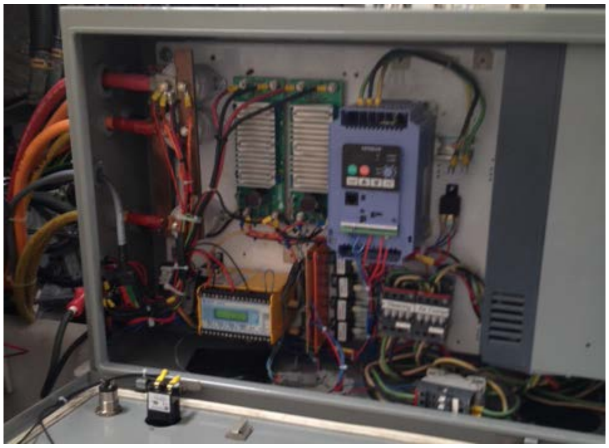
- **After-Market Integration** – For OEMs uninterested in performing electric drive integration, TransPower installs complete drive systems on an after-market basis, buying unpowered "gliders" from the OEMs and installing the electric drive systems at TransPower integration facilities. TransPower also employs this business model when integrating a drive system into a particular vehicle model for the first time, or when major changes are made to the drive system.

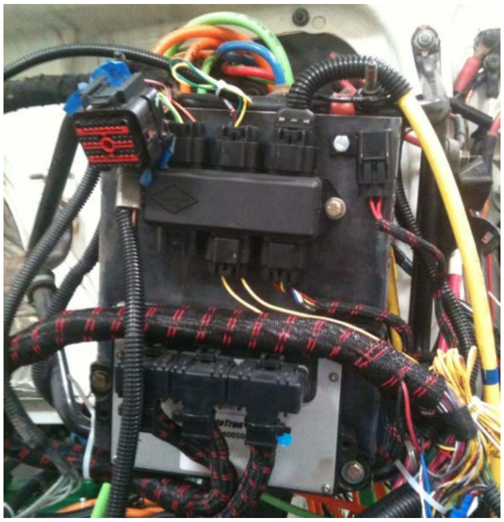
- **Drive System Sales –** Once demand for TransPower's drive system in a specific vehicle model reaches a certain threshold, some OEMs will reconfigure or expand their own assembly lines to install the drive systems. Once this transition occurs, TransPower will integrate and test "kits" at its kit integration facility, then ship them to the OEMs. TransPower's initial manufacturing capability is 5-10 kits per week, and capacity will be expanded in increments of 5-10 kits per week as demand increases.

- **Component Sales –** Once TransPower-supplied vehicles have been operating commercially for a few years, a market will develop for spare and replacement parts, which TransPower will address by selling selected components to the OEMs. TransPower will also sell components such as inverters and integrated battery packs for various vehicle and stationary energy storage applications.

- **PCCS Sales and Licensing of Software and Integration Designs –** For OEMs that develop the capability and desire to buy all components individually and perform the integration themselves, TransPower will sell the PCCS and the rights to use its vehicle integration glueware.

As an example of how TransPower can fill in the gaps in a vehicle OEM's capabilities, the OEM could order batteries, drive motors, and other major hardware components directly from their manufacturers, and purchase the basic integration and control hardware and software from TransPower. The package delivered by TransPower would consist of integration hardware such as the high voltage distribution center (HVDC) pictured below to the left, and the EVCon™ vehicle control unit pictured below to the right. Other items that TransPower could supply as options might include wiring harnesses, battery modules or clusters, and operator controls.

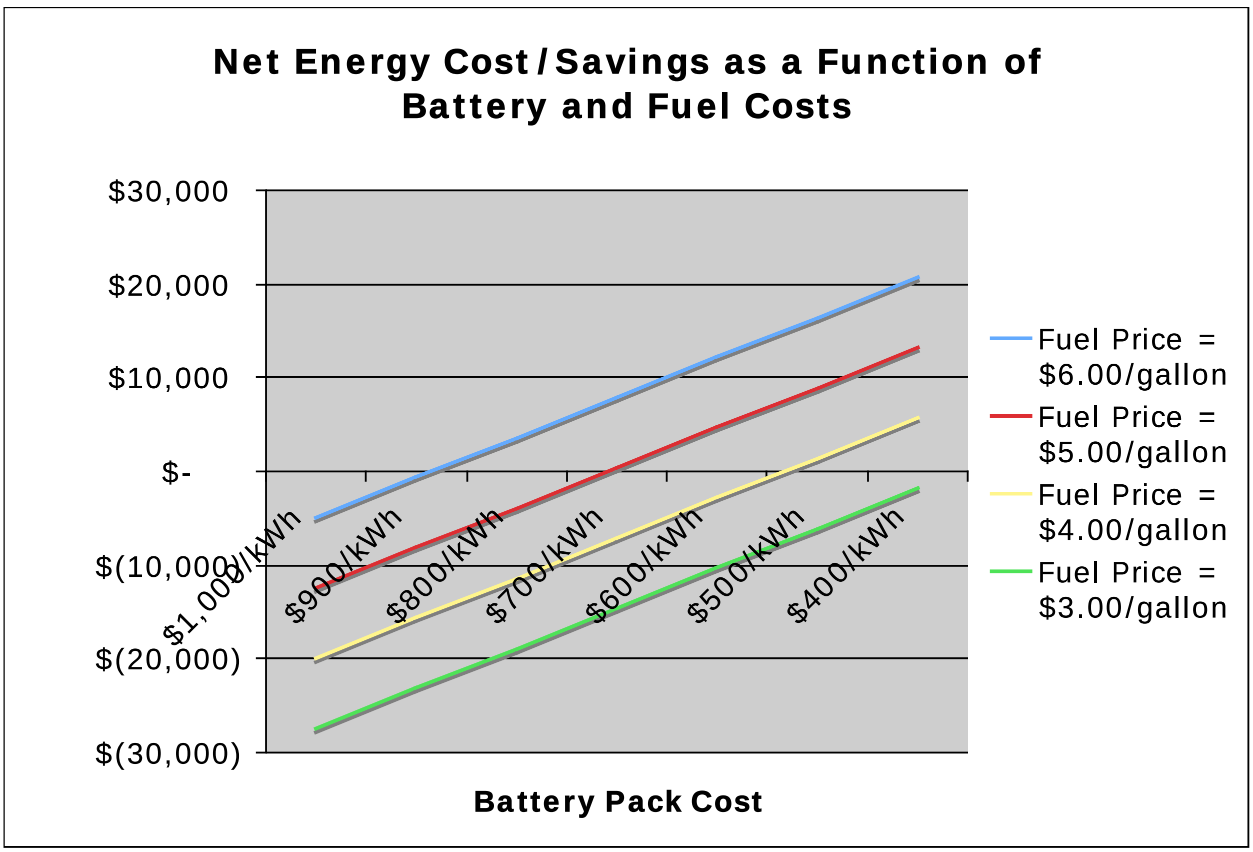




Value Proposition

TransPower believes that ElecTruck™ drive systems and components must be justified on economic grounds to achieve significant market acceptance. Over the last two decades, a number of alternative fuel technologies have been penetrated the heavy-duty vehicle markets solely due to their environmental benefits, including thousands of natural gas and hybrid vehicles. However, today's gasoline and diesel engines have dramatically lower emissions than they produced ten or twenty years ago, so the game is changing. In the long term, TransPower does not believe that electric vehicles or hybrids will attract large subsidies or to command high price premiums based on emissions reductions alone. Therefore, TransPower's approach is to provide drive systems that enable vehicles to be acquired and operated for life-cycle costs equal to or lower than the costs of owning conventional vehicles.

This is key to why TransPower is focusing on battery-electric and battery-dominant hybrid vehicles. The engine-dominant hybrid vehicles commercialized to date typically do not offer significant economic benefits. They reduce fuel consumption, but generally only by 10% to 30%, which is not enough of a fuel saving for a typical user to recover the higher cost of the hybrid system. At the other end of the "EV spectrum," a pure battery-electric system eliminates all fuel consumption, maximizing operating savings. These savings are driven by two primary factors: the cost of fuel and the cost of the batteries that essentially displace the fuel. The figure below shows a family of fuel price curves illustrating the annual savings an electric truck will provide at fuel savings ranging from $3 to $6/gallon, and with battery subsystem costs ranging from $00 to $1,000 per kWh.

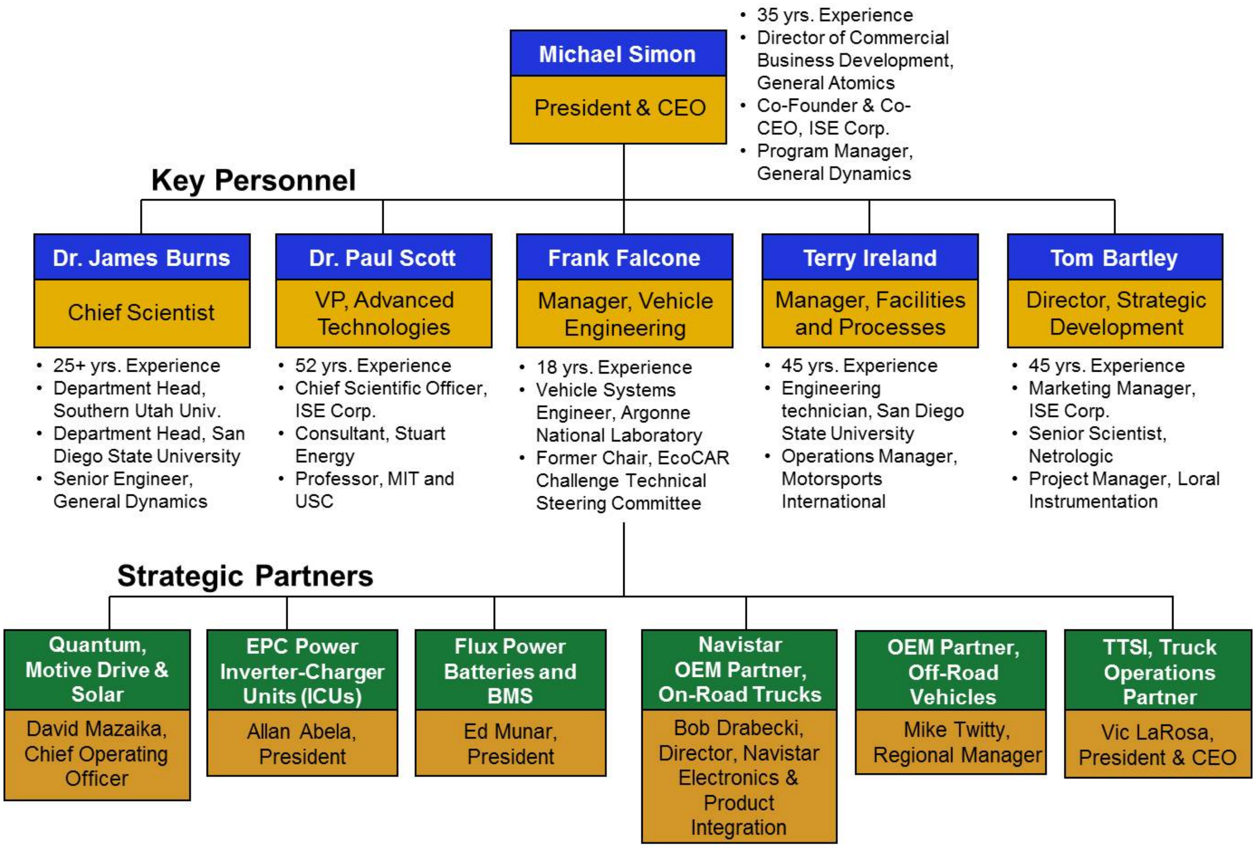


Each upward sloping line in the graph corresponds to a different fuel price. As indicated by the green (bottom) line, an electric truck stays below the break-even line (the x-axis) at a diesel fuel price of $3/gallon. At battery costs of $900/kWh or more, electric trucks fail to match diesel trucks even at higher fuel prices ($4-6/gallon). However, as battery costs decline, crossover points are reached at each fuel price. At a battery cost of about $850/kWh, an electric truck breaks even (on an annual energy cost basis) with a diesel truck when fuel prices reach $6/gallon (the point at which the blue line crosses the x-axis). If battery costs decline further, to about $650/kWh, the electric truck breaks even at a fuel price of $5/gallon (red line crossover). This is about what TransPower's ESS will cost users in low production volumes. However, the cost is expected to decline to $500/kWh or lower as quantities increase, and the graph shows that once battery prices fall to $500/kWh, the electric drive system starts generates positive returns with fuel prices as low as $4/gallon. TransPower believes that continued reductions in battery costs, coupled with higher fuel prices, will steadily increase the electric truck advantage. For example, at a battery cost of $400/kWh and a fuel price of $5.00/gallon (red line in Figure 7), it can be seen that an electric truck will save more than $10,000/year in energy costs. These points are not far off.

In addition to net energy savings, electric trucks will offer other major advantages that will quickly speed their adoption once TransPower's reliable system hits the market. Quiet operation and ease of maintenance are other key advantages of electric trucks. In particular, electric trucks will have much less brake wear and will not require oil changes or engine tune-ups. For these reasons, along with all of the environmental and other imperatives, TransPower believes electric drive will eventually become the pervasive form of propulsion for all short-haul trucks, and potentially even in certain segments of the long-haul trucking industry – representing the potential for global sales of tens or even hundreds of thousands of electric truck drive systems per year.

Management Team

TransPower is led by an experienced management team that has a clear vision for building the Company into a leading supplier of electric drive solutions for the trucking industry. The organization chart below identifies key TransPower management personnel and several of the strategic partners that are supplying critical components or technologies for the ElecTruck™ system, along with channel partners such as Navistar and Cargotec, which provide on-road trucks and tractors, respectively, for conversion to electric drive.



Following are brief bios for key members of the TransPower management team.

Michael Simon, CEO – Mr. Simon, who has 35 years of professional experience, is TranPower's founder, President, and CEO. Mr. Simon's unique blend of technical and economic expertise, along with his lifelong focus on transportation and energy technologies, has enabled him to achieve numerous successes in commercialization of new technologies.

Prior to founding TransPower, Mr. Simon was Director of Commercial Business Development for the Electromagnetic Systems Division of General Atomics (GA), where he led the company's marketing of transportation and renewable energy technologies from 2006 until early 2010. In this capacity he led the marketing of GA's high-power inverters for wind turbines, utility-scale solar systems, and other renewable energy applications. Mr. Simon also helped develop innovative transportation concepts based on GA's linear motor and inverter technologies, and supported GA's maglev vehicle program.

Before joining GA, Mr. Simon was Chairman and Co-CEO of ISE Corporation, a company he co-founded in 1995 with colleague David Mazaika. From 1995 until 2005, Mr. Simon directed all company financial, business development, and administrative matters. ISE achieved ten consecutive years of revenue growth over this period, and grew from a start-up operation to a fast-growing high-tech firm with 60 employees and more than $20 million in revenues by the time Mike departed in 2005. While at ISE, Mr. Simon also played a leading role in conceiving and designing ISE's industry-leading products, co-inventing ISE's gasoline hybrid and fuel cell hybrid drive systems.

From 1992 through 1998, Mr. Simon also served as President & CEO of International Space Enterprises, whose long term goal was to promote space colonization and manufacturing by reducing the cost of access to space. ISE negotiated the rights to use low cost Russian launch vehicles, and even arranged for the launch of a facsimile of a Pepsi can into space for a 1996 advertising campaign.

From 1982 until 1993, Mr. Simon worked at General Dynamics Space Systems Division as an engineer and program manager, specializing in advanced space programs. During this period, he won GD's Extraordinary Achievement Award for helping to establish the company's Commercial Atlas launch vehicle program, and managed a key NASA study of future space transportation options. From mid-1981 until mid-1982, Mr. Simon worked for NASA Headquarters in Washington, DC as a Stanford research fellow, where he helped develop policies for use of the Space Shuttle and participated in the early planning for NASA's Space Station. From mid-1980 until mid-1981, Mr. Simon performed research on solar power systems as a Stanford graduate student.

Mr. Simon received his Master's Degree in Engineering-Economic Systems from Stanford in 1981, after pursuing a multidisciplinary undergraduate program combining engineering, economics, and political science and receiving two Bachelor's Degrees, also from Stanford, in 1980.

Dr. James Burns, Vice President and Chief Scientist – Dr. Burns is a leading expert in automotive mechatronics, specializing in the design, simulation, and prototyping of electric and hybrid-electric vehicles. Many of Dr. Burns' most noteworthy achievements were accomplished while he was a professor at San Diego State University (SDSU) from 1994 to 2007 and department chairman from 2008-2009 at Southern Utah University (SUU). During this period Dr. Burns co-created SDSU's Masters in Engineering Program and founded and led the Facility for Advanced Manufacturing Enterprise (FAME), which became one of the industry's most recognized R&D centers focused on electric vehicle design. Projects led by Dr. Burns included a U.S. Department of Energy-funded program to develop sustainable energy solutions for SUVs, in partnership with General Motors.

Dr. Burns' specific areas of expertise are highly relevant to creating and expanding TransPower's industry-leading IP in the areas of electric vehicle integrated systems design and control. He has extensive experience in development of electric vehicle control software and in developing and utilizing simulation tools to optimize controls. While at SDSU, Dr. Burns led development of the university's SHAPES hybrid vehicle system simulator, a stand-alone, graphical, optimizing, energy system and vehicle system design tool. Prior to joining SDSU, Dr. Burns worked for a combined total of seven years at General Dynamics and DuPont, specializing in composite materials research and applications.

Dr. Burns received his Ph.D. in Mechanical Engineering from the University of Delaware in 1994, and his B.S. in Engineering and Mechanics from Penn State University, where he graduated with honors in 1985. He has served as President of the San Diego Electric Vehicle Association and is widely recognized as a luminary in the emerging field of electric vehicle design.

Dr. Paul Scott, Vice President, Advanced Technologies – Dr. Scott is Vice President, Advanced Technologies for TransPower, a position he has held since January 2011. In this capacity, Dr. Scott advises the CEO on technology development priorities, oversees all technology development activities, and manages selected programs of critical importance to the Company. Dr. Scott is TransPower's most senior employee in terms of total years of professional experience, having worked as an engineer, program manager, and college professor with numerous organizations since receiving his first degree from MIT in 1959. Dr. Scott has also collaborated with TransPower CEO Michael Simon more or less continuously since the mid-1990s, including five years during which both were senior executives with ISE Corporation.

Prior to joining TransPower, Dr. Scott served as Chief Scientific Officer at ISE, which for 15 years was a leading developer of electric and hybrid-electric vehicle technologies for the transit industry. In this capacity, Dr. Scott oversaw all scientific research at ISE from 2000 through the end of 2010. In addition, Paul personally managed high risk, high payoff R&D projects. From 2006 through 2010, Dr. Scott was a leader in ISE's development of advanced battery energy storage systems. He led ISE efforts aimed at identifying the most suitable battery chemistry and product(s) for use in large format battery packs customized for heavy-duty vehicles.

In addition to his industry-leading battery expertise, Dr. Scott is one of the world's leading experts in hydrogen fuel systems. He was the driving force behind ISE's development of its pioneering line of fuel cell hybrid buses, which began with ISE's development of a 30-foot hybrid fuel cell bus in 2001-02. That project demonstrated the basic feasibility of combining a deep-cycle battery pack with a hydrogen fuel cell, and led directly to ISE's selection to provide four 40-foot fuel cell hybrid buses to two California transit agencies, AC Transit and SunLine Transit, in 2003-06. Following delivery of the AC Transit and SunLine Transit fuel cell buses, Dr. Scott led proposals which resulted in ISE's selection to build next-generation fuel cell hybrid buses to be used at both the 2010 Winter Olympics and 2012 Summer Olympics. From 2002 to 2006, Dr. Scott also managed ISE's Hydrogen Hybrid Internal Combustion Engine bus (HHICE) program, which resulted in successful development and demonstration of the world's first hybrid bus powered by a hydrogen internal combustion engine. In addition, he managed an ISE project to generate hydrogen using wind power and played a key role in development of ISE's first fuel cell-based APU for class 8 trucks.

Before joining ISE, Paul was the on-site engineer for the Xerox/Clean Air Now Solar Hydrogen Project, including development of solar hydrogen fueling for a fleet of three hydrogen-powered trucks, often used for commuting from the power of the sun. He has also participated in programs including representing Stuart Energy in development of hydrogen fueling hardware and infrastructure. Over the course of a career spanning more than half a century, Dr. Scott has established himself as one of the most diversified scientists of his era.

Dr. Scott received degrees through Dr. of Science in Aeronautical and Aerospace Engineering from the Massachusetts Institute of Technology, served on the professorial staffs of MIT and the University of Southern California, and has consulted with over twenty corporations and technical institutes. He has over one hundred publications on diverse topics and has frequently presented papers on solar energy and hydrogen related matters in recent years. Dr. Scott is also a Board Member of Energy Independence Now and President Emeritus of the Hydrogen Business Council.

Thomas Bartley, Director, Strategic Development – Mr. Bartley, whose career spans more than four decades, joined TransPower after serving for several years as a consultant and business analyst specializing in transportation and energy. Previously, Bartley was Manager of New Business for ISE Corporation for several years, where Mr. Bartley led the marketing efforts that resulted in the transition of ISE's prototype hybrid-electric drive products into production articles. Drawing on his strong technical background, Mr. Bartley also supported ISE by developing systems concepts and cost models for energy storage and wrote 39 patent applications.

Prior to joining ISE, Mr. Bartley accumulated 30 years of engineering and business development experience with a variety of companies, ranging from startups to large corporations. He was director of network operations for a startup company developing Voice Over Internet Protocol (VOIP) technology. He served as senior scientist for Netrologic, where he managed technical and financial aspects of several research projects in the area of artificial neural networks applied to machine tool instrumentation. For four years, Mr. Bartley was Product Manager at Loral Instrumentation, where he had joint responsibility for a line of off-the-shelf standard telemetry computer products.

Mr. Bartley has more than 18 years of direct responsibility in the areas of electronic and system design, management, and marketing with multiple Government contractors including SAIC, Cubic, and General Dynamics. His early engineering work also covered a wide variety of interests: nuclear instrumentation, analog to digital technologies, flight test instrumentation, radar simulation and prediction, oceanographic buoy instrumentation, displays and image analysis, and information systems.

Mr. Bartley received his BSEE and MSEE degrees from Stanford University.

Frank Falcone, Manager, Drive System Integration – Mr. Falcone is the Vehicle Integration Manager at TransPower, a position he has held since June 2011. In this role Mr. Falcone has led the mechanical design, modeling, simulation, and control system development of both the energy storage and powertrain systems for TransPower's first prototype electric trucks and tractors. Frank has more than eight years' experience leading teams in advanced powertrain design.

Prior to joining TransPower, Frank was a Lead Vehicle Systems Engineer at Argonne National Laboratory, where he was a part of the Advanced Vehicle Technology Competitions group. This group was responsible for establishing research and development programs as well as developing testing procedures to evaluate alternative energy vehicles in areas such as fuel efficiency, emissions, performance, drive quality, torque security, and customer appeal. Mr. Falcone's primary responsibility was the EcoCAR Challenge, a three year university engineering competition aimed producing future leaders in the advanced vehicle technology space by designing powertrains that lower fuel consumption and emissions while maintaining vehicle performance and utility. Mr. Falcone chaired the EcoCAR Challenge Technical Steering Committee which defines the program philosophy, technical scope, and evaluation metrics.

Mr. Falcone's engineering experience in the field of alternative vehicle propulsion spans mechanical and control system design. Over the last decade, Mr. Falcone has been instrumental in designing lead acid, nickel-metal hydride, and lithium energy storages systems utilized in HEV and PHEV powertrains spanning through-the-road parallel, series parallel, and pre-transmission parallel architectures powered by diesel and spark ignited engines. Mr. Falcone has employed rapid control prototyping practices in the control system design of numerous hybrid electric powertrains.

Mr. Falcone received is BSME and MSME from San Diego State University. During Mr. Falcone's time as an undergraduate and graduate student he took his team from 15th place to 6th place. Mr. Falcone is an active ASME member, and has since authored or co-authored numerous papers in the alternative vehicle powertrain space.

Mr. Terrence Ireland, Senior Technician – Mr. Ireland, whose career spans more than four decades, is TranPower's Senior Technician. In this capacity, which Mr. Ireland has filled since January 2011, Mr. Ireland plays a key hands-on role in fabrication and assembly of all of TransPower's prototype systems. Mr. Ireland is experienced in executing many critical electric vehicle assembly tasks such as making high-voltage connections between the battery subsystem and other major components. Prior to joining TransPower, Mr. Ireland worked as an Engineering Technician at San Diego State University from 1999 until 2004 and from 2008 to 2010, where he served the machining and fabrication needs of more than a dozen faculty and hundreds of engineering students, maintained equipment, created test fixtures, operated and staffed two machine shops and a manufacturing laboratory, and taught machining and fabrication fundamentals in a laboratory setting. Mr. Ireland's experience includes design, fabrication and system integration support of complex ground vehicles and hybrid propulsion systems as part of international competitions sponsored by the US DOE, experience with unmanned electric and hybrid vehicle development in support of AUVSI student competitions, and planning and organization as a founding team member for Dreamscape, a mechatronic and green energy collaborative facility and resource for San Diego County. Mr. Ireland studied chemistry for two years at San Jacinto College in Pasadena, TX and served in the U.S. Army in Vietnam, Turkey, and Germany.