

SPX – where ideas meet industry



**SPX electric vehicles  
solutions: where the power and  
automotive industries meet**



## introduction

A number of forces are converging throughout the transportation and power generation industries that could make regular trips to the gas station a thing of the past for many automobile drivers. SPX is among the companies helping to make alternatives to fossil fuel-powered vehicles practical for consumers and companies alike.

### About the Author

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### Driving Change

Imagine driving home from work in your all-electric, plug-in car.

Rather than making your weekly stop at the gas station, you proceed home, pull into your garage and plug in your car.

An intelligent system in your home waits until off-peak electric usage hours. At the designated time, all your home's appliances are recharged — cell phone and car battery included — putting the least strain on the grid and getting you the cheapest rate.

In the near future, this scenario could be reality for the many drivers around the world expected to make the switch to the new-generation of electric plug-in vehicles being introduced over the next few years.

“A plug-in electric vehicle (PEV) is any motor vehicle that can be charged or recharged from an external electricity source. The PEV category includes all-electric or battery electric vehicles, plug-in hybrid vehicles and plug-in

### The Push for Plug-in Vehicles

Increasing concerns about fossil fuel dependence, global warming and other issues are driving automotive manufacturers, policymakers and others to develop viable alternatives to conventional oil-fueled cars.

Among the many options proposed, plug-in electric vehicles (known as PEVs, which encompasses both pure electric vehicles and hybrids) may have the brightest future.

Compared to conventional gasoline vehicles, PEVs have been reported as being able to reduce oil consumption by 50-100% and climate pollution by 40-100%. Opportunities also exist for powering these vehicles with greener alternatives such as solar and wind power.

The first affordable mass-produced electric vehicles are expected to debut in the United States this year with the highly anticipated introduction of the General Motors® Volt®<sup>2</sup> and the Nissan® Leaf™<sup>3</sup>. Meanwhile, most major automotive manufacturers, as well as a number of start-up companies, have announced plans to launch their own PEV models throughout the world over the next few years.

However, mass adoption of these vehicles is expected to impact more than gasoline usage or pollution. Driving habits are likely to change. And, just as fossil fuel-based vehicles required a gasoline infrastructure, PEVs will require an energy infrastructure for battery charging.

### Changing Value Chain

Within the next decade, electric and plug-in hybrid vehicles could account for nearly 10% of new vehicle sales globally<sup>4</sup>. According to PRTM, a global management consulting firm, the PEV manufacturing industry could spur growth across the entire transportation sector, reaching nearly \$300 billion by 2020 and creating more than one million jobs.<sup>5</sup>

At the same time, shifts would occur in revenue streams and a new value chain would emerge. To succeed in this changing market, companies must understand the products and services that customers across the electric vehicle value chain will need — and build the operational strategies to deliver them.

### New Revenue Streams

Consider the shift of the automobile’s powertrain from internal combustion to a lithium based battery pack, as is the case in PEVs. Currently, lithium based batteries enable a range of up to 100 miles (160 km) before needing a recharge, making driving PEVs more practical than was the case with previous electric and hybrid cars. However, lithium based batteries are expensive to manufacture, and can add thousands of dollars to the cost of a car.

Companies that can design and produce lithium based batteries with the same or better performance but at a significantly lower cost will likely gain a competitive edge in the market. Not surprisingly, businesses across the value chain are racing to tap this potential revenue stream.

1. [http://www.connectusfund.org/files/2020%20PEV%20white%20paper\\_0.pdf](http://www.connectusfund.org/files/2020%20PEV%20white%20paper_0.pdf)

2. <http://www.chevrolet.com/pages/open/default/future/volt.do?seo=qoo> | 2009 Chevy Awareness | IMG Chevy Volt Phase 2 Branded | General Motors Volt | general motors volt

3. <http://www.nissanusa.com/leaf-electric-car/index?dcp=pnp.39666654.&dcc=0.216878497#/leaf-electric-car/index>

4. <http://www.hybridcars.com/news/jd-power-annual-us-hybrid-sales-beyond-1-million-2015-28126.html>

5. <http://www.prtm.com/NewsItem.aspx?id=3609&langtype=1033>

Even governments around the world view battery technology as strategically vital and are providing incentives to support research and manufacturing advances, along with public adoption of PEVs.

A number of businesses may be able to tap into new service revenue streams such as construction, new media and advertising. For example, in-home battery chargers could become part of new home construction projects or existing home renovations, with the general contractor potentially offsetting initial installation and service-provisioning costs.

Software applications could be developed for smart phones that would notify PEV owners when their charge is running low. Billboard space could be sold that informs drivers of the nearest battery charging stations. Big box retailers could offer free battery charges in their parking lots through 'green' loyalty or frequent shopper programs.

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“At the Consumer Electronics Show (CES) in Las Vegas, General Motors unveiled details of mobile phone applications unique to its Chevy<sup>®</sup> Volt. The apps will enable real-time remote operations including displaying the car’s charging status and scheduled charging, displaying the car’s state of charge, as well as electric and total ranges, and giving the

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### Repositioning and Retooling

Losses in gasoline sales could potentially be offset by focusing on production of petrochemical products — products that may have higher profit margins and be in greater demand internationally<sup>6</sup>.

For companies that have traditionally serviced cars with internal combustion engines, there is likely to be a shift in revenue as well; cars powered by electricity have fewer parts and therefore typically require less maintenance. To stay in the game, these businesses may need to retool so they can service electric drivetrain systems or provide battery charging, maintenance and other relevant services.

To combat declining sales and underutilized assets, OEMs that provide traditional transmissions and other engine components may need to leverage core competencies, like precision machining and automated mass production, so they can provide equivalent products and services for PEVs.

### Utilities Power Up

Utility companies are expected to be among the companies with the most to gain with the mass adoption of electric-powered vehicles as each electric vehicle means more electricity usage.

Despite concerns about stressing the grid, the existing electrical grid's off-peak capacity for power generation is sufficient to power 73% of commutes to and from work by cars, light trucks, SUVs and vans without building a single new power plant, according to the DOE<sup>7,8</sup>.

Power demand from electric vehicle charging could strain transformers and switching equipment in neighborhoods with the highest electric vehicle concentrations. Utilities could prepare for any additional electricity demand by tracking vehicle sales.

Recent advances in smart grid technology combined with discounts for off-peak charging could also help; smart charging could allow customers to save money by charging during off-peak hours when rates are lower. Some utilities may also be able to inform charging station customers that excess renewable energy is available if that is their charging preference.

6. <http://www.gulfoilandgas.com/webpro1/prod1/suplista.asp?id=619>

7. <http://www.pnl.gov/news/release.aspx?id=204>

8. 2007, Environmental Assessment of Plug-In Hybrid Vehicles, Electric Power Research Institute (EPRI), which is the utility industry's research arm, and the Natural Resources Defense Council (NRDC).

### Public Charging

To accelerate development and acceptance of electric vehicles, the U.S. Department of Energy (DOE) and other organizations are spending millions of dollars to support the development of publicly available charging. A few companies have begun putting the infrastructure in place by developing charging stations where drivers can charge their vehicle batteries wherever they park — at home, work and even at public locations such as grocery stores and big box retailers.

### Nonprofits Take Charge

Project Get Ready, a non-profit initiative led by Rocky Mountain Institute®, plans to work with at least 20 cities and a variety of technical partners to develop and implement comprehensive strategies for adopting electrification into their transportation systems. That includes the city of Orlando, Florida, which is working with the Institute and Nissan North America to launch the Zero Emission Mobility Project an initiative to promote the development of electric-vehicle infrastructure and the adoption of electric cars. Orlando is expected to be one of the first markets in the world where the Nissan LEAF will be available when it is scheduled to go on sale later this year.

The Electric Power Research Institute® (EPRI) is working with the Tennessee Valley Authority (TVA) to develop a prototype solar-assisted electric vehicle charging station that is scheduled to be erected at the institute's Knoxville, Tenn., research laboratory. When completed, the test station is expected to produce data that will assist in implementing key components of a smart grid, such as integrating renewables onto the grid, utilizing a battery storage system, assessing the impact on reliability of a distributed resource generation, testing advance metering infrastructure and analyzing electric vehicle supply equipment.<sup>9</sup>

### State-level Action

In 2008, DTE Energy®, General Motors and the University of Michigan were awarded a research grant from the Michigan Public Service Commission to study the interface between plug-in electric vehicles (PEVs) and the electric utility system. Project activities are divided

into five categories — Economic Impacts, Market Analysis, Real World Demonstrations, and Environmental Impacts, and Electric Utility System Impacts.<sup>10</sup>

In June 2010, the Maryland Energy Administration (MEA) announced plans to use federal stimulus funds to build 65 charging stations in Baltimore and throughout the rest of the state to support a hoped-for influx of battery powered cars and trucks. Funds also will go to wiring truck stops so truckers won't have to idle their vehicles as much.<sup>11</sup>

### Independent Companies Pave the Way

Coulomb Technologies®, a California-based start-up company, received a DOE grant to provide nearly 5,000 charging stations in nine cities: Austin, Detroit, Los Angeles, New York, Orlando, Sacramento, the San Jose/San Francisco Bay area, Redmond, Wash., and Washington, DC.

About half of the units are scheduled to be installed in public places, primarily curbside, for electric vehicle owners who do not have garages; another 2,000 are expected to be offered to anyone who buys a Ford®, GM or Smart USA electric vehicle. Once the stations are in place, Purdue University® and Idaho National Labs are scheduled to analyze data about vehicle use and charging patterns.

Yet another company, Las Vegas, Nevada-based EV-Charge America, is installing vehicle charging stations through the U.S. that are accessed via a subscription service, set up much like typical cell phone service. Subscribers sign up for a monthly electric vehicle charging station plan that runs the spectrum from unlimited EV charging sessions, any time, to plans that include off-peak, nighttime and economy and limited charging sessions.

An RFID tag authenticates station users as a subscriber to the service. The station is activated, electricity is turned on and the charging unit secures the plug-in cord so that it cannot be removed by anyone else. There is no need to carry coins, cash, or credit cards, no mark-up for credit card processing fees. The subscriber can transparently move from city to city and state to state with no concern for which power grid or whose electricity they are using.

9. [http://www.tva.gov/news/releases/janmar10/solar\\_vehicle\\_charging\\_fact\\_sheet.pdf](http://www.tva.gov/news/releases/janmar10/solar_vehicle_charging_fact_sheet.pdf)

10. <http://pluginmichigan.org/about.php>

11. <http://www.energy.state.md.us/documents/EVPR06242010.doc>

### The SPX Solution Takes It Home

According to Pike Research®, a market research and consulting firm that provides in-depth analysis of global clean technology markets, projects that by 2015 there will be 4.7 million charging units around the world. About 1 million will be located in the United States<sup>12</sup> where Americans are expected to prefer the convenience of at-home charging.

Only a handful of companies are focusing on the residential market; among them is **SPX Service Solutions**, a division of global manufacturer SPX Corporation. SPX has launched an electric vehicle supply equipment (EVSE) program to fully support all aspects of program deployment and successful roll-out of OEM EV programs.

Among the new products resulting from the **SPX Service Solutions** EVSE initiative are charging units that OEMs and car companies can provide to consumers for charging vehicles at home. The compact units can be hardwired or plugged into 240V wall outlets similar to the circuit used to connect an electric dryer, range or central air conditioning.

There is no need for rewiring. If the homeowner moves, the unit can easily be unplugged, taken along and plugged into the new home's garage.

**SPX Service Solutions** is also working with OEMs and car companies to develop a full-service home charging support program, which includes services such as a customer home charging needs assessment with no home visit requirement; a network of certified electrical contractors; versatile home charging units; multi-lingual, toll-free support with extended hours for installation scheduling, customer service and technical support; local utility coordination and ongoing product and warranty support.

The **SPX Service Solutions** Global Team plans to offer these services throughout North America and other parts of the world.

12. <http://www.good.is/post/4-7-million-ev-charging-units-expected-by-2015/>

“SPX Service Solutions supplies Level 1, Level 2 and Level 3 EVSE hardware including a wall box, cable and connector for Level 2 EVSE for the home with an option for outdoor installation. The SPX EVSE design is fully SAE J1772 Level 2 compliant and is expected to be UL listed.”

### What's Next

Many more solutions are in the works, for the residential market and for the commercial and energy production markets, as representatives from SPX's automotive-focused companies and those in the power generation industry collaborate to transform the world's transportation and energy infrastructure —and develop solutions that lower emissions, provide cleaner and cheaper power resources and that make good business sense.

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Certain statements in this white paper including any statements relating to future developments in the PEV market or successful research, development, and marketing of SPX products, may be forward-looking statements within the meaning of Section 21E of the Securities Exchange Act of 1934, as amended, and are subject to the safe harbor created thereby. Please refer to our public filings for a discussion of certain important factors that relate to forward-looking statements contained in this press release. The word "expected," "anticipated," "plans," and similar expressions may identify forward-looking statements. Although the company believes that the expectations reflected in its forward-looking statements are reasonable, it can give no assurance that such expectations will prove to be correct. Statements in the white paper speak only as of

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