AFV Insider

A Word from the Publisher

Introduction to AFV Insider

TABLE OF CONTENTS

Welcome to the AFV Insider! This exciting new service aims to be just as dynamic, innovative and exciting as the developing market and industry it covers. All across the world, entrepreneurs, inventors, start-up and old-line automakers, trade unions, government regulators, legislators, venture capitalists and millions of consumers are creating the brave new world of alternative fuel vehicles. Whole new industries will be needed to manufacture and service a range of new AFVs. Consumers will face a greatly expanded set of alternatives that can be tailored to their individual life-style and budget. The promise of a technological, commercial and ecological revolution is in the air.

The AFV Insider offers three main features:

- The AFV Insider ***blog*** *launched in July 2011 (http://afvinsider.com/blog). We post items of various lengths and invite comments on them. We also regularly add links to news items related to AFVs. Anyone may register at no cost to read and comment on the blog.*

- The AFV Insider ***Website,*** *the world's most ambitious on the subject, is reserved for AFV Insider premium subscribers. In it you will find: a wealth of information relating to the production, distribution, servicing and regulation of new fangled vehicles in the United States, China, Western Europe and elsewhere; data on taxis, municipal fleets, buses, trucks, and personal vehicles; profiles of the leading companies, especially in China, which are emerging as players in the production of vehicles and parts; a comprehensive glossary of terms relating to AFVs and their equivalent in Mandarin Chinese; a Calendar of Events; and more. We aim to make the Website as comprehensive and up to date as humanly possible.*

- The AFV Insider, a ***quarterly publication*** *for regular and premium subscribers. We intend to help all our readers play their part in the AFV revolution no matter their location or areas of interest. Our multilingual staff pays special attention to developments in China, sorting out conflicting data and linguistic uncertainties to produce what we believe is a unique resource in any language. AFV Insider will not, however, ignore the rest of the world. The world vehicle industry has roots all around the globe, and we will do our best to gather and organize data from every major region.*

This inaugural issue of the AFV Insider includes features not easily found elsewhere:

- *A concise summary of recent market, policy and technology developments around the world relating to AFVs.*
- *Two special reports: one on China's strategy for building fleets of AFVs; the other on Better Place's program to establish battery swapping systems for electric vehicles in Israel, Denmark and the United States.*
- *In our Perspectives section, a summary of the views of Professor C. C. Chan, considered the father of China's AFV industry, and a critique of a recent study by Boston Consulting Group.*
- *Profiles of the Chevrolet Volt and the Nissan Leaf.*

In coming issues, we plan to introduce new features, including interviews with and commentary from a wide range of experts and industry leaders. We welcome your letters and will gladly consider opinion pieces for publication.

In every aspect, the AFV Insider is your tool. With your help, we will continuously expand, refine and update it. Whenever you inform us of any information, documentation or analysis that is needed for a fuller understanding of the global AFV market, we will do our utmost to locate and post it.

So, throughout the period of your subscription, please check the Website and the blog regularly. We will not be waiting for the next quarterly publication to post important news, statistics, documents and analysis. You need all those things in real time, and we'll do our best to provide them.

Welcome aboard for an exciting ride!

Quarterly Developments

NORTH AMERICA

1. Market

Fisker Delays EV Production in US	Fisker has delayed US production of its all-electric Nina sedan until 2013. The Nina is to be produced at its plant in Delaware, which Fisker estimates will create 2,500 jobs. Fisker's Finnish-produced luxury Karma EV, which has a sticker price of $96,000, is currently available on the U.S. market, after a two-year delay and issues meeting expected efficiency standards. In contrast to the Karma, the Nina is designed to be an affordable family car. Fisker is backed by a $500 million Department of Energy loan guarantee, which stipulated that Fisker would produce and sell a minimum of 11,000 cars by the end of September.
Toyota & BMW Cooperate on Batteries	In December, Toyota and Ford formed a partnership to develop next-generation batteries and explore other green automotive technologies. Additionally, BMW will provide diesel engines to Toyota. The two companies have cooperated before: Toyota supplied the diesel engine for BMW's Mini. BMW also has a partnership with Peugeot Citroën to develop hybrid technology.
Toyota & Ford Cooperate on Hybrids	In August, Toyota and Ford signed a memorandum of understanding to jointly develop a gas-electric hybrid system for the light-truck and sport-utility vehicles market.
GM Partners with LG for Future of EVs	General Motors (GM) has signed an agreement with LG Chem to jointly develop several components for its next generation of electric cars. LG Chem supplies GM with the lithium-ion batteries used in the Chevrolet Volt. The batteries are manufactured at LG Chem's plant in Holland, Michigan, which was half-funded by a $151 million DOE stimulus grant.
GM Announces First EV	In October, GM announced plans to release in 2013 its first all-electric vehicle since the EV-1: the Chevrolet Spark minicar. The Spark's battery will be supplied by A123.
Xtreme Green Secures EV Sales Agreement with Mexico City	On September 1st, Las Vegas-based EV manufacturer Xtreme Green Products signed a 16-month agreement with Mexico City company AB Safe SA De CV to distribute Xtreme Green's products in Mexico. It is Xtreme Green's first international distribution agreement. AB Safe will distribute Xtreme Green electric vehicles, scooters, motorcycles and utility trucks to individuals, companies and government agencies in 29 states and the Federal District in Mexico (all states except for Yucatán and Jalisco). Xtreme Green's all-electric vehicle models are: the 80-mile range Xtreme Green Sentinel three-wheeled police mobility vehicle (PMV) designed to replace bicycle and foot patrol; the 100-mile range X Rider Electric Police Motorcycle (EPM), which is currently selling for $7,999; the 75 mile range Police Pro All Terrain Vehicles (ATV); the 75-mile range Xtreme Green Sentinel four-wheel PMV, with a price of $12,900; the 75-mile range 2-person Transport Pro Utility Terrain Vehicle (UTV), which is priced at $13,784; the 75-mile range 4-passenger Transport Pro Extended UTV; and the 75-mile range scooter, which costs $8,000. Xtreme Green uses lithium ion iron phosphate battery cells. Xtreme Green's vehicles are all produced in Las Vegas. The agreement with AB Safe covers 16% of its projected production capacity for 2012, or 192 units. Xtreme Green's total projected capacity for 2012 is 1,200 units. AB Safe has a 30-plus year history of distributing security products to government entities and consumer and commercial markets in Mexico. In September the company also signed a distribution agreement with Puerto Rico-based distributor ISP for 120 units. It next plans to expand to Europe, Australia, South America and the Middle East this year and next. The US is currently Xtreme's primary market. Its Green X Rider motorcycle qualifies under the American Recovery and Reinvestment Act of 2009 for a $2,500 plug-in electric vehicle tax credit.

Quarterly Developments

NORTH AMERICA

II. Policy

NHTSA to Propose Pedestrian-Friendly EV Measures	Under a mandate from the Pedestrian Safety Enhancement Act of 2010, the National Highway Traffic Safety Administration (NHTSA) is developing a set of proposals to protect pedestrians and the visually impaired from the quietness of hybrid and electric vehicles.
Portland Passes Comprehensive EV Plan	In May, the Portland (Oregon) City Council passed an electric vehicle plan to meet its Climate Action Plan goals, which were set in 2010. Key policies include fleet purchases by the city government (20% by 2030), streamlined permitting, designated parking, "clean taxi" airport rules, partnerships with car-sharing companies, green job creation, and a drive to educate residents about incentives for EV purchases.
LA Air Force to Launch First All-Electric Fleet	In September the Los Angeles Air Force Base, home to the Space and Missile Center in El Segundo, announced plans to become the first federal facility with an all-electric fleet by 2012. All the base's cars, trucks and forklifts will be included in the conversion.
Canada Launches ecoENERGY	In early August the Canadian Federal government launched an ecoENERGY Innovation Initiative to invest CA $97 million in research, development and demonstration projects for clean energy technologies. Electric vehicles are one of its five project areas. The government is especially interested in research on lithium ion battery recycling.
US-China JCCT ends with US Gains on EV Market Access	The semiannual meeting of the US-China Joint Committee on Commerce and Trade ended November 21 with apparent gains for the American side with regard to China's new energy vehicle industry. The communiqué includes several potentially significant concessions by China: 1) it clarified that it "does not and will not maintain measures that mandate the transfer of technology" by foreign investors; 2) it further clarified that the "establishment of brands is a corporate decision " and that the Chinese government "does not and will not impose any requirements for foreign-invested companies to establish domestic brands in China"; 3) it pledged to accord foreign-invested companies equal treatment with regard to subsidies and other preferential policies for NEVs; and 4) it pledged that its NEV policies would be "implemented in a manner consistent with WTO rules."

III. Technology

MIT Researchers Create Breakthrough Battery	MIT researchers have made a major breakthrough in battery architecture that physically separates the storage and discharge functions of the battery. Using a semi-solid flow cell, the battery's cathode and anodes are suspended in liquid electrolyte, which is then pumped through a filtering system. The researchers claim their design could halve battery costs. The design would also allow for vehicle batteries to be refilled with liquid much like conventional cars are refueled with petroleum. This research received funding from the Department of Defense's Defense Advanced Research Projects Agency and Advanced Research Projects Agency/Energy (ARPA-E).
Tester Volts Catch Fire	In November, two Chevrolet Volts caught fire, and a third emitted smoke, at the NHTSA testing center in Wisconsin. The first vehicle had undergone a side-impact crash in May, while the second and third were crash-tested in November. NHTSA is currently investigating the accidents in cooperation with GM and LG Chem. GM offered to provide Volt owners with loaner cars while the investigation proceeds. In December, GM further offered to buy back Volts from concerned owners.

Quarterly Developments

EUROPE

I. Market

Volvo and Siemens form EV Partnership	Volvo and Siemens have formed a partnership to develop electric vehicles and related equipment. Volvo has committed to supplying 200 test vehicles to Siemens by the end of 2012. The partnership will focus on electric-drive technology, power electronics and charging technology in addition to the integration of these technologies into Volvo's C 30 electric cars. Volvo is also planning to develop a V60 plug-in hybrid electric vehicle. Siemens is already working with BMW and Renault to develop electric-car charging equipment.
BMW Acquires Stake in SGL Carbon	In November, BMW AG acquired a 15.2 percent stake in SGL Carbon SE, a producer of lightweight carbon fibers and composites. BMW is planning to incorporate carbon-fiber components in its i3 EV and i8 plug-in hybrid cars. SGL's largest shareholder, Susanne Klatten, is a member of the family that holds 47 percent of BMW's voting shares.
EON Installs First Fast-Charging Station	On August 29 German electric utility EON announced it was beginning to install the first fast-charging stations for electric vehicles along public roadways in the country. The stations are direct current, 50-kilowatt models.
Smart Announces Fortwo Upgrade	At the Frankfurt Motor Show, Smart announced it is preparing a 3rd generation upgrade and worldwide distribution for its flagship Fortwo electric car. The new Fortwo will be equipped with an improved 55-kilowatt electric motor and a 17.6 kilowatt-hour lithium-ion battery. The car has a range of 60 miles and a top speed of 75 mph. The Fortwo is to be rolled out in at least 30 markets. Pre-order reservations are expected to start by the end of the year.
Honda Unveils EV Concept at Geneva Auto Show	Honda unveiled its EV concept car at the Geneva Auto Show as part of its "Road to Zero Emissions" display. Honda plans to introduce a plug-in electric version of its Fit car to the U.S. and Japanese markets in 2012. The car will feature Honda's new two-motor hybrid technology.
Tesla Roadster Wins E-Miglia Again	On August 2nd, 32 electric vehicles participated in a nearly 500-mile race from Munich, Germany to St Moritz, Switzerland. The E-Miglia race, which started in 2010, currently spans four countries. The Tesla Roadster won for the second time, playing into Tesla Motor's bid to expand in the Swiss market.

II. Policy

Paris Experiments with Pay-as-you-go EVs	In October, the city of Paris launched a two-month pilot pay-as-you-go EV program modeled on the popular Vélib self-service bicycle program. Membership costs 10 euros and allows users to rent an all-electric BlueCar for 4-8 euros per hour. The program is managed by the Bolloré Group, which has invested $1 billion euros in the development of a new lithium-metal polymer battery. Bolloré partnered with Italian company Pininfarina to design the BlueCar. Pininfarina also has a partnership with Ferrari. The Autolib program aims to roll out 3,000 BlueCars at 1,100 hire stations.

III. Technology

Competence E Breakthrough to Halve Battery Cost by 2018	A group of researchers working on the Competence E project at the Karlsruhe Institute of Technology in Germany have announced the development of iron-carbon nano-materials that can double the energy capacity of a lithium-ion battery. The researchers estimate the innovation will halve the cost of batteries by 2018. Competence E is a 200 million euro project that involves 250 scientists.

Quarterly Developments

ASIA

1. Market

Japan

Nissan's ESFLOW EV Sports Car to Reach Market in 2013	Following a successful reception at the Geneva Auto Show this year, Nissan has announced that it will begin production of its newly designed ESFLOW concept EV sports car, which it plans to bring to market in 2013 for $32,500. The car is powered by dual electric motors in the rear wheels, has a laminated Li-ion battery providing a range of 150 miles, and can accelerate from 0-100mph in less than five seconds.
Toyota to Build Hybrid in Iwate	In July, Toyota Motor Corp. announced plans to produce a new compact hybrid vehicle for both the domestic market and exports – either the Yaris hybrid compact or Prius C compact – in the northeastern Iwate Prefecture. The Prius C and Yaris hybrids are scheduled for release in 2012. The former will be introduced to the US and Japanese markets, and the latter to Europe. Toyota has officially released the Prius C's specifications, which include a 4.4 kwh Li-ion battery and a 51 MPGe in the city (48 MPGe on the highway). Toyota plans to introduce 11 new or upgraded hybrid models within the next two years.
Mitsubishi Scouts for New Batteries	Mitsubishi Motors Corp. is looking to source more lithium-ion battery packs globally to guarantee supply. It plans to launch eight electric or plug-in hybrid vehicles globally by 2016 as part of its ambition to become a global EV leader. Mitsubishi currently uses Toshiba batteries for a short-range version of its commercial EV van. Most of its Li-ion batteries are sourced from Lithium Energy Japan, its joint venture with Japanese battery manufacturer GS Yuasa Corp.
Honda Launches Fit Shuttle Hybrid in Japan	In June, Honda launched the Fit Shuttle Hybrid compact in its home market. An IMA electric motor and an efficient 1.3-liter i-VTEC engine are used to deliver power and provide 25 km/liter (compared to 18.6 km/liter for the regular Fit Shuttle). The battery for the hybrid system is located under the rear cargo to enable flexible seating configurations without sacrificing space. The price of the new hybrid starts at $22,420. Honda is producing the vehicle at its Suzuka plant, which is located 250 miles to the west of Tokyo. Honda plans to export the hybrid to other markets, including the US, by mid-2012.

South Korea

SK Invests in Lithium-ion Battery Plant	SK Innovative Company has announced an investment of 25 billion won (approximately $25 million) to build a lithium-ion battery factory in Korea that will come on line 2012. It is expected to annually supply batteries to about 25,000 EVs produced by auto companies such as BlueOn, Mercedes-Benz and Mitsubishi. SK currently has one rechargeable battery plant in Daejon, located 164 km south of Seoul. The plant has an annual capacity of 80,000 units for hybrid vehicles. SK has been supplying Li-ion batteries for Mitsubishi's Fuso hybrids since October 2009, and to Hyundai and Kia since July 2011.

Quarterly Developments

ASIA

11. Technology

Japan

Nissan, Mitsubishi and Toyota Develop V2G Devices

Nissan, Mitsubishi and Toyota are separately developing new devices for the Japanese market that enable V2G (vehicle-to-grid charging). The first systems are expected to be available to customers within a year. Nissan's "Power Control System" will be designed for use with the Leaf, Mitsubishi's system for its upcoming crossover plug-in hybrid, and Toyota's for its Estima hybrid van (used after the tsunami in March) and 2010 plug-in Prius. The V2G technology enables plug-in hybrids or purely electric vehicles to become generators that could power houses during a blackout, for example. After testing the Power Control System with the Leaf, Nissan found it would be able to power a typical Japanese residence for two days. Japan intensified R&D efforts on these new devices after the tsunami. While Japan will be the target, Nissan has also invested in the marketability and feasibility of introducing the device to the American market, and Mitsubishi plans to incorporate the V2G system into the crossover plug-in hybrid vehicle slated for introduction in the U.S. market in 2013.

Nissan and 4R Energy Develop New Solar EV Charging System

In July, Nissan started testing 4R Energy Corporation's newly developed charging system for EVs that combines a solar power generation system with a high-capacity lithium-ion battery. The new system will enable the full charging of EVs through a renewable energy source. The collection will include 4 level-2 chargers and 3 level-3 chargers. By using stationary storage batteries, electricity could be supplied to EVs regardless of the time of day or weather. Based in Yokohama City, 4R Energy conducts demonstration tests and commercialization studies for second-life use of vehicle lithium-ion batteries. 4R's stakeholders are Nissan (51%) and Sumitomo (49%).

South Korea

Consortium Develops New 'Secondary Battery' Materials

In September, Ulsan National Institute of Science and Technology (UNIST) and LG Chemical Institute of Technology announced the development of new electrode materials that can completely charge or discharge a rechargeable battery in two minutes. This technology could dramatically shorten charging times for EV batteries and make possible the development of more powerful EVs. The South Korean government is currently providing tax breaks for hybrid vehicles purchased between July 2009 and the end of 2012. These include exemptions from consumption, registration, education and other taxes up to 3.3 million won ($3,000). The Korean government has set a production target of the 1.2 million AFV units by 2015, and has allocated 3.1 trillion won ($3 billion) for AFV development beginning in 2011.

Quarterly Developments

CHINA

1. Market

BYD Sales Tally for Dual-mode F3DMs Reaches 732	BYD has sold 732 F3DMs to individual customers from March 2010 – when it was made available to the general public for the first time – through the end of June, including 730 in Shenzhen and 2 in Shanghai. The F3DM is a dual mode plug-in hybrid sedan that was released for fleet purchases in December 2008 at a cost of 149,800 RMB ($23,400). BYD claims that demand for the F3DM has reached up to 500 units/month. However, due to battery shortages, F3DM is only able to supply 100 units per month.
BYD Signs Electric Bus Contract with German City	On June 15, Frankfurt awarded BYD a contract to supply three eBus-12 units and two DC charging stations to the city's electric mobility system in the first quarter of 2012. The contract also includes technical support. The eBus-12, BYD's longest-range bus, can travel 250km per charge. BYD concluded a similar deal in June with SMRT Corporation for public transportation in Singapore, and one with Taiwan in August.
BYD & Hertz Partner to Introduce E6	BYD has partnered with Hertz to introduce its all-electric e6 crossover to Chinese consumers in September 2011, making Hertz the first global car rental company to offer EVs in the Chinese car-rental market. The e6 has a 240 km range and costs around 300,000 RMB ($47,000). It is currently operating in the Shenzhen taxi fleet, where the original fleet of 50 e6s has already logged over 4 million km. Multinational corporations are the primary targets for Hertz's e6 leases, which are more expensive than regular vehicle leasing.
FAW Begins Production of Besturn EVs & PHEVs	On August 22, FAW Group broke ground on production at its new Changchun plant, which will produce its new Besturn sedan in both EV and PHEV models. The EV has a range of 170 km, while the PHEV has a range of 70 km. The plant has a production capacity of 10,000 – all for Changchun's market. FAW will also produce the Besturn at its plant in Dalian, Shenyang Province. FAW plans to invest 9.8 billion RMB ($1.5 billion) in AFV development, including 8 product platforms, 13 passenger vehcles and 3 commercial vehicles. FAW's timeline reflects the central government's *Twelfth Five-Year Plan*. Furthermore, Changchun plans to subsidize AFV purchases and has committed to purchasing 200 Besturns for it government fleet. The Besturn plant is FAW's second plant in Changchun.
FAW-Volkswagen to Begin Production of First Forward E88 in 2013	FAW-Volkswagen has announced plans to begin production of its compact "First Forward" E88 EV at its plant in Foshan by the end of 2013. The final model of the vehicle is to be finalized shortly. The Ministry of Industry and Technology has already approved the vehicle's inclusion under its "new energy vehicle category," meaning that it will be eligible for central government subsidies.
Zhuzhou to Build Largest AFV Manufacturing Base in China	Zhuzhou city in Hunan province aims to build China's largest AFV manufacturing base. According to its most recent auto industry plan, it aims to attract 3 AFV manufacturers with a total annual output of over 110,000 vehicles by 2015. Automakers Chery and Ford are mentioned in particular. Zhuzhou aims to build a 100 billion RMB ($15.6 billion) AFV industry cluster within 3-5 years.
Hunan Guifeng Creates EV Manufacturing Base in Yueyang	Hunan Guifeng EV Manufacturing Company, Ltd. has invested 150 million RMB ($23.5 million) to build a manufacturing base in Yueyang in Hunan province that will be able to annually produce 30,000 EV street sweepers and tour buses. The plant began production in August 2011. Guifeng specializes in manufacturing special purpose EVs. Hunan's *Strategic New Industry Development Plan* aims for the production of 50,000 EVs and 10,000 electric buses by 2015.

Ruihua Builds New EV Manufacturing Plant in Liaozhong	In July, Shanghai Ruihua Group inaugurated two new EV manufacturing plants in Liaoning province. Ruihua invested 3 billion RMB ($470 million) in a plant in Liaozhong to produce a planned 10,000 EV buses and 10,000 electric engines and other core components annually. The plant will produce two EV models released on 2007: a tour bus with a range of 300 km, and a public transportation bus with a range of 250 km. Both models were released in 2007. The Liaozhong government has offered Ruihua support should any problem occur during the plant's construction. Liaozhong is located at the rim of Shenyang's economic zone, which released an AFV development plan in 2010. Shenyang's government aims to deploy 1,000 AFVs by the end of 2012, including 600 hybrid buses, 400 hybrid taxis and 100 all-electric vehicles for government fleets. Ruihua's second Liaoning plant is in Dalian and has an annual capacity of 3,000 EV buses and 10,000 core components. Ruihua has a third plant, in Chengdu, Sichuan, with the same capacities as the Dalian plant.
Coda & Great Wall Motors Form EV Partnership	In August 2011, California-based CODA Holdings partnered with China's Great Wall Motors to develop new EV models for global markets combining the former's technology and the latter's vehicle platforms. China's Great Wall Motors is based in Baoding, Hebei Province. It has already successfully developed 7 AFV models: GWKULLA, Smart EV, HAVAL M3 EV, DEER electric coach car, HEV HAVAL, Florid Intelligent Control, and COWRY Plug-in HEV. Great Wall Motors and Coda aim to produce an EV that will compete with Nissan's Leaf.
Chery Launches QQ3EV Model	On June 7, Chery Auto Company opened a 4S AFV Auto Services store in Wenzhou, Zhejiang province. 4S (Sales, Spare parts, Service & Survey) car shops are authorized dealerships. Chery currently has over 50 AFV service shops in China, mostly in Shandong, Henan, Anhui, Fujian, and Zhejiang provinces. At the same time, Chery officially launched its all-electric QQ3EV hatchback on the market with a sales price of 50,000 RMB ($7,800). Chery produces the QQ3EV at its New Energy Vehicles Technology Company plant in Wuhu's Hi-tech Industries Development Zone (Anhui province). The QQ3EV has a silicon battery with a driving range of 80-120 km and maximum speed of 70 km/hour. Chery claims that the vehicle's charging cost for 100km is 90% less than that of its ICE equivalent. Chery also produces the all-electric M1EV hatchback, using a lithium-ion battery with a range of 120 km and maximum speed of 120 km/hour. Additionally, Chery's portfolio includes two hybrid models: the A5ISG mid-sized sedan and the A3ISG compact sedan. Chery's 4S auto shops service all four of its AFV models.
Wuzhoulong Becomes the World's Biggest Supplier of Hybrid Buses	In July, Wuzhoulong became the world's biggest supplier of hybrid buses, with over 2,000 hybrid buses running throughout China. Wuzhoulong manufactures its own control systems, charging stations, and batteries, which are sold to other automakers as well. It is based in Baolong Industrial City of Long Gang District in Shenzhen, Guangdong Province. In addition to its home city, Wuzhoulong has sold buses to Kunming, Yunnan Province, and Shenyang, Liaoning Province. The company has also exported a small amount of buses to Macao, Hong Kong, the Philippines and the U.S. Hybrid models include the FDG6111HEVG, of which Shenzhen leased a fleet of 1,350 for the Universiade, the FDG6921AGC3, and the FDG6120HEVG. Wuzhoulong also has 2 LNG bus models (FDG6921NG and FDG6111NG) and 1 CNG model (FDG6121GC3).

Quarterly Developments

CHINA

11. Policy

National Level

Twelfth Five-Year Plan for EVs

On July 13, 2011, the Chinese government released its *National "Twelfth Five-Year Plan" for Scientific and Technological Development* affirming China's commitment to alternative energy, a smart grid, and the EV industry. The plan emphasizes the development of purely electric-driven technologies and anticipates 1 million registered EVs by 2015.

With regard to R&D the plan focuses on the development of core technology for components (battery, engine), technology integration in hybrid and electric vehicles, and platform technology (technology standardization and regulation, infrastructure, and evaluation tools). Policy goals mirror the *Ten Cities, One Thousand Vehicles Program*, with an emphasis on producing a couple of world class manufacturers with intellectual property rights over key technologies.

By 2015, the plan anticipates breakthroughs in 23 core technologies, an expansion of the *Ten Cities, One Thousand Vehicles Program* to over 30 cities, the commercialization of AFVs in over 5 cities, the registration of 1 million EVs and an output value of 100 billion RMB ($15.6 billion) for AFV industries.

Chinese Government Finalizes Definition of Alternative Fuel Vehicles

In August, the Chinese government finalized the definition of alternative fuel vehicles in its AFV Industry Development Plan (2011-2010). The term now includes plug-in hybrid vehicles, electric vehicles and fuel cell vehicles, but excludes regular hybrids for the first time. Plug-in hybrids qualify for a subsidy of 3,000 RMB/KWh ($470/KWh), up to a maximum subsidy of 50,000 RMB ($7,800). All-electric vehicles qualify for a subsidy of 3,000 RMB/KWh ($470/KWh) up to 60,000 RMB ($9,400).

Regular hybrid vehicles fall into the category of energy-saving vehicles because their fuel savings do not cross the 20% threshold (i.e. their average fuel consumption is 6.3 liters of gasoline or less for 100 km). Energy-saving vehicles qualify for a subsidy of 3,000 RMB ($470) per unit.

State Grid Corporation Announces Charging Infrastructure Corridor

In August 2011 the State Grid Corporation of China announced a *Plan on Interconnecting the EV Smart Charging Networks for Suzhou, Shanghai and Hangzhou* to facilitate travel in EVs between the cities. Specifically, 8 charging stations will be built in Zhejiang Province, along the Shanghai-Hangzhou, Changzhou-Taizhou, and Shanghai-Jiaxing highways. Another 6 stations will be built in the Shanghai service area along the Shanghai-Kunming highway, the Jiangsu service area along the Shanghai-Nanjing highway, and the Suzhou service area along the Changzhou-Taizhou highway. Suzhou, Shanghai and Hangzhou are major cities in the Ten Cities and Thousands Vehicles Program.

Latest Statistics Reveal Over 10,000 Registered EVs in 25 Experimental Cities

The Ministry of Industry and Information Technology has released statistics revealing that in July 2011 over 10,000 EVs were registered in 25 pilot cities, including over 1,000 units registered by individuals. Pilot EV fleets have logged over 330 million km so far. They also counted 100 charging stations encompassing 4,500 chargers in China. These results were in line with government goals.

Local Level

Shenzhen Launches EV Ownership Program	The Shenzhen Development and Reform Commission launched a new EV program in September to incentivize EV purchases by its residents. The program includes a maximum subsidy of 60,000 RMB ($9,400) for all-electric vehicles, and 30,000 RMB ($4,700) for plug-in hybrid vehicles. BYD's F3DM is this program's recommended model, although other models qualify for the subsidies. The Guangdong Price Bureau has set the electricity rate for EV charging at 1.0064RMB/kwh ($0.1577) during peak hours and 0.2495RMB/kwh ($0.0391) during off-peak hours. Shenzhen issued its first AFV plan in 2009.
BYD & Shenzhen Sign Largest EV Fleet Leasing Contract	Shenzhen awarded BYD a contract to be the sole provider of electric vehicles at the 2011 International Universiade, an international multi-sport event organized for university athletes by the International University Sports Federation. The 26th Summer Universiade took place from August 12 to 23. Shenzhen made the EV fleet deal to comply with clean air requirements and the principle of "Government hosting with citizen involvement, an economic event with a marketing operation." The agreement is also a part of Shenzhen's 2009-2012 AFV deployment plan. The leasing agreement includes 200 eBuses and 300 e6s. The BYD e6 is a 5-seat crossover with a 300km range. Its BYD-developed "Fe" lithium iron-phosphate battery has level-2 and level-3 charging capabilities. The e6 was released in May 2010 at a starting price of 200,000 RMB ($35,000). The e12 is a 12-meter long electric bus with a 155-mile range that was released in December 2010. In addition to using BYD's iron-phosphate battery, the e12 draws energy from solar cells. The vehicles were integrated into Shenzhen's public transportation system after the games. Shenzhen Bus Group, Shenzhen Eastern Bus Group and Shenzhen Western Bus Company will service the vehicle. The BYD-Shenzhen deal is the world's largest electric vehicle leasing agreement to date. It builds on a previous BYD-Shenzhen deal whereby BYD delivered 40 e6 vehicles to Pengcheng Electric Taxi Company, making Shenzhen the first Chinese city to adopt electric taxis.
AFV Owners Could Bypass Beijing License Lottery	In June, the central government announced that it will shortly implement its *Beijing Experimental Plan for Subsidizing Private-Owned AFVs* enabling individuals purchasing AFVs to obtain license plates without going through Beijing's lottery system. Any new energy vehicle qualifies, regardless of where it is produced. Beijing's City Government has been holding license lotteries since December 23, 2011 under its *Provisional Regulation on Controlling Passenger Car Quantities*. The lottery, which is unique to Beijing, is held every month on the 26th. It awards 17,600 licenses per month. The probability of winning decreased from 10.6:1 in January to 23:1 in March. The plan has led many AFV companies to open sales stores in Beijing. BYD Vice President Zhibing Xia has designated Beijing as the major target for BYD AFV sales this year, and Zotye plans to open its first AFV sales store at the end of 2011.
Chery Finalizes First Government Fleet Order of Chery QQ EVs	In July, Wuhu-based (Anhui Province) Chery Auto Company delivered its first AFV government fleet order of 4 Chery QQ EVs to Jiangsu province. The EVs will be assigned to local health agencies. Chery QQ EVs have a much lower price and higher engine efficiency than comparable EV models from competitors, such as Zotye's Multipla, BYD's e6, and Changan's Benni Mini EV.

Hefei Grows EV Fleet & Services

In June 2011, Hefei city in Anhui province committed to implementing a comprehensive plan to encourage the widespread adoption of alternative fuel vehicles. By the end of this year, it expects to add another 1,250 EVs to its fleet, build 2 EV charging stations and 4 battery replacement service stations, and open a 6S auto after-sale service store. In addition to the services that 4S stores provide, 6S stores provide customized design services and vehicle performance data collection. The city is still mulling a plan to subsidize AFV purchases. Hefei's plan refers to Anhui Jianghui Automobile's JAC Tongyue as a preferred vehicle. The sedan was released in 2010, has a range of 150 km, and costs 65,000 RMB ($10,156) after subsidies. The full cost without subsidies is 150,000 RMB ($23,400).

Foshan Approves AFV Program

In August 2011, the city of Foshan in Guangdong province approved its first AFV Development Plan that envisages the operation of 1,050 AFV buses by 2012, including 1,000 LNG buses and 50 hybrid or purely electric buses. Foshan also plans to introduce hybrid or electric taxis and to encourage the electrification of government fleets. The plan particularly emphasizes support for Beiqi Foton Nanhai Company, Foshan Feichi Automobile Transportation Group, Green Wheel Electric Vehicle Company, Advanced Electronics Energy Company, and FSPG Hi-Tech Company. Foshan is home to AFV manufacturers FAW and Beiqi Forton.

In the first stage of its AFV plan, Foshan aims to introduce 329 AFV buses in 2011 for use in public services, such as postal services. In the second stage, Foshan will introduce another 438 AFVs, including 388 LNG buses and 50 hybrid and all-electric buses. Foshan currently has 283 LNG buses in service.

Under the March 2010 *Plan for Electric Vehicle Development in Guangdong Province,* Guangdong plans to have 2-3 world-class EV manufacturers and a production capacity of 200,000 EVs by 2015.

Jinhua Announces AFV Subsidy

In August 2011, the city of Jinhua in Zhejiang province announced a decision to offer up to 80,000 RMB ($12,500) in subsidies to local government agencies and residents for the purchase of an electric vehicle. The subsidies are part of a broader Zhejiang policy to promote AFVs. Jinhua is home to AFV manufacturers Kandi Vehicles, China Youngman Automobile Group, and Zotye Auto. Jinhua's plan promotes the purchase of vehicles from local brands: Kandi's KD5010XXY mini, which was released in 2010, has a range of 120 km, and costs 19,800 RMB ($3,093); Yongman's eBUS; and Zoyte's JNJ700EVA1 and JNJ6400EVL2 SUV, which was released in 2010, has a range of 200 km, and costs 119,800 RMB ($18,800).

Chinese Government Invests in Linzhou AFV Program

In August 2011, the Chinese central government invested 15 billion RMB ($2.4 billion) in a national AFV program in the Red Flag Canal economic development zone (EDZ) in Linzhou, Henan province. The Red Flag Canal EDZ is one of 19 provincial EDZs in Henan province. It was created in 2006 and expanded into an industrial cluster that includes high-tech, auto, biology and equipment manufacturing. The project is to be carried out by the Chinese Committee for Energy Conservation, Energy-saving Technology Company, RCG Holdings, and automakers Zhongnenghua Group and Hongqiqu Company. After the project is implemented, the Red Flag EDZ is expected to produce 100,000 AFVs annually.

Quarterly Developments

CHINA

III. Technology

CSR, FAW & Changan Motors to Launch Joint R&D Program For EVs

In July, China South Locomotive & Rolling Stock Corporation Limited ("CSR") partnered with automakers FAW Group Corporation and Changan Motors to launch an R&D program for the creation of EV platforms. They aim to jointly build 2 platform models and 3 transitional platform (i.e. extended-range) models that will form their EV core technology. CSR and FAW had previously cooperated (in November 2010) on a program to develop core technology research on electric bus engines.

FAW is headquartered in Changchun, Jilin Province, while Changan Motors is based in Chongqing. Both released electric vehicles with 150 km ranges in 2010. FAW released its E-Bora sedan at a price of 107,800-146,500 RMB ($17,000-23,000). Changan released the Benni Mini EV compact, which has a range of 150 km and costs 100,000-150,000 RMB ($16,000-23,500). Hunan-based CSR is the world's largest electric locomotive manufacturer.

The three companies are members of the "State-owned Enterprise EV Industry Alliance", which is headed by the State-owned Assets Supervision and Administration Commission of the State Council (SASAC). The Alliance was founded in Beijing on August 18, 2010 with an initial investment of 1.3 billion RMB ($200 million). Its short-term goal is to promote the standardization of electric car technologies. Its mid to long-term goals are to master core EV technologies and to build internationally competitive Chinese EV brands. The alliance's members include automakers FAW, Changan and Dongfeng, and 13 state-owned enterprises in related sectors: Dongfang Electric Corporation, China South Locomotive and Rolling Stock Corporation, China National Offshore Oil Corporation, China Aerospace Science and Industry Corporation, Aviation Industry Corporation, State Grid Corporation of China, China Petrochemical Corporation, China Southern Power Grid Company, China Aviation Technology Import-Export Corporation, China Poly Group, China South Industries Group Corporation, China Potevio, and General Research Institute for Nonferrous Metals.

First All-in-one EV Charging & Battery Replacement Station Put Into Service in Qingdao

On July 11, Shandong Electric Power Corporation and XJ Group Corporation (the leading power equipment manufacturing company in China) put China's first full-service EV charging and battery replacement station into service in Qingdao, Shandong province. It has the capacity to charge 120 electric buses or 360 passenger electric vehicles at the same time, and to replace batteries for 540 vehicles per day. It also has a comprehensive measurement system to determine electric power consumption and charging fees. The State Grid Corporation funded the project, which will mainly serve public transportation fleets. Qingdao is currently applying to be included in the *Ten Cities, One Thousand Vehicles Program*.

Hangzhou Puts EV Taxi Fleet Back Into Service After Accident

Hangzhou's taxi fleet of Zotye Multipla (Langyue) EVs was put back in service on June 14 after a two-month suspension. The fleet was idled in April after one of the vehicles burst into flames. According to a panel of 11 experts appointed by the Zhejiang government the accident was caused by the improper installation of a battery pack. Battery leakage and insulation damage ensued, resulting in a short circuit. The panel also surmised that the improper installation may have been compounded by the use of "cheap and inferior equipment" to install batteries. Zotye accepted the investigation results and committed to re-evaluating the risks associated with its technological innovations in EV platform and engine design. However, Zotye declined responsibility for battery design and pack failures.

The Multipla vehicles were reintroduced into Hangzhou's taxi fleet with three adjustments: a GPRS was added to monitor vehicle performance; the manual shift was switched to automatic shift to increase driver control; and an iron fender was added between the back seats and battery tank to improve safety by creating a buffer between passengers and the battery should an accident occur. Hangzhou New Energy Taxi Company will service the EV fleet. Hanghzou has announced plans for 200 additional electric taxis by the end of this year.

The Multipla compact has a range of 200 km and costs 250,000 RMB ($39,000) at full price and 148,000 RMB ($23,000) after subsidies. Zotye also produces two EV SUV models with 200 km ranges. The 2008 model was released in April 2009 at a starting price of 119,800 RMB ($19,000) while the 5008 model was released in July 2010 for 210,000 RMB ($33,000). The 5008 model's principal innovations over the 2008 model are a BMS battery management system that monitors battery performance, and a fast charging option.

Quarterly Developments

REST OF WORLD

Australia

Blade Partners with DLG to Produce First Aussie EV

In September, energy systems company IRES Asia Pacific Pty Ltd. and Blade, a wholly Australian-owned EV start-up, formed a joint venture with Chinese-based lithium battery manufacturer DLG Battery Limited to create Australia's first domestically-produced electric vehicle and renewable energy service and distribution network. According to Blade founder and CEO Ross Blade, "The Blade DLG joint venture will bring 100 new high-tech jobs to Castlemaine in Central Victoria". IRES Managing Director Steve Carter added that the IRES service and distribution network would support Blade-DLG EVs while creating 250 new jobs throughout Australia. Production of an initial 800 units is slated to begin in 2012.

Blade has been developing electric vehicles and batteries since 2006. The company produced and exported its first electric vehicles in 2008. Its latest model, the Electron Mark VI hatchback, was released in June. It has an 18 KWh battery that provides a range of 100 km. The vehicle costs AUS $47,000 (US $45,500).

DLG began producing battery cells for the EV market in 2007.

IRES Pacific (International Renewable Energy Systems) was founded in 2009 in Melbourne as an offshoot of IRES Germany. It will provide servicing and network support to the joint venture.

India

Volvo Begins CNG City Bus Trial in New Delhi

In June, Volvo Buses India Ltd. commenced a trial of the CNG version of its Volvo 8400 City Bus along the Delhi Transport Corporation (DTC)'s Teevra Mudrika route. The bus has 6 roof-mounted cylinders that give the vehicle a range of over 300 kilometers. The buses will be tested for 4 to 6 months before they replace DTC's phased-out buses.

Delhi implemented a CNG conversion kit program in 2002 to cut air pollution emissions. The program spurred New Delhi to develop one of the world's largest fleets of CNG vehicles. Approximately 90,000 CNG buses, taxis, and three-wheelers now operate in Delhi.

Volvo Buses has an 80% Indian market share in luxury inter-city buses and a 50% share in diesel buses. Volvo's share translates into 4,000 buses operating in 12 cities across India.

Volvo is producing the 8400-model CNG buses at its state-of-the-art Volvo Buses India manufacturing plant in Hoskote, near Bangalore.

Maruti Suzuki's 2011 Annual Report Pledges CNG Development

According to India's National Roadmap for expanding the use of CNG vehicles, which was released by the Gas Authority of India in 2009, India will have 3,708,965 CNG vehicles on the road by 2014. To meet the increase in demand, major Indian gas distributor Indrapratstha Gas Limited (IGL) has announced plans to build 32 more CNG stations by the end of 2012, bringing its total to 310 stations. Thereafter, IGL plans to add around 35 stations every year.

The Indian government has an 18.28% stake in MSIL.

In its 2011 annual report, released in August, Maruti Suzuki India Ltd (MSIL) reiterated its commitment to the continued development of alternative-fuel technologies, and especially natural gas vehicles under its new "Techno Logical" approach. MSIL already increased its R&D budget by 140% between 2010 and 2011. The company has a 44.9% market share of the Indian passenger car market. MSIL is also currently studying the feasibility of electric mobility in India.

Last year MSIL launched CNG versions of five of its models: the Alto hatchback, WagonR hatchback, Eeco small van, Estilo mini MPV and SX4 crossover. Other CNG vehicle models on the Indian market include Hindustan Motors' Ambassador Classic 1800 ISZ CNG sedan, Hyundai Motor's Santro Xing KX hatchback, Tata Motors' Indica 1405 cc hatchback, and Toyota Kirloskar Motor's Innova MPV.

Iran

IKCO Announces Production of CNG Vehicles in Partnership with Renault

Iranian automotive manufacturer IKCO announced plans in June to produce 40,000 Renault-based Logan cars, of which 15% will be fitted with CNG/gasoline bi-fuel engines. About 6,000 of these vehicles are destined for export. The vehicles will be produced in Tehran. IKCO also plans a 2012 release for a new version of its Samand NX7 sedan, with a turbo-charged bi-fuel EF7 engine. Renault and IKCO established a joint venture in 2003. Renault France owns a 51% stake, while the remainder 49% stake is shared by IKCO and auto-manufacturer Saipa Group.

Iran began selling Logan models in 2007 as Renault Tondar 90. In 2010 IKCO and Renault-Pars agreed to produce three new Renault-branded models in Iran, including a revamped Tondar 90, a pickup truck and a station wagon. The pickup truck is expected to hit the market by the end of this year.

Iran's alternative fuel vehicle market was jumpstarted by the government's implementation of a Gasoline Rationing Plan between 2007 and 2010 in an effort to reduce the county's fuel consumption. It aimed to convert most existing cars to run on natural gas within 5 years at a rate of 1.2 million annually. The plan also calls for most new cars to be able to run on natural gas, and for Iran's 10,000 refueling stations to be retrofitted for natural gas within 5 years. In 2010 the Iranian government announced that the plan had saved the country $11 billion in fuel consumption.

Mozambique

Mozambique Capital Receives Tata CNG Bus

This past summer, Mozambique's capital city of Maputo received a shipment of 150 natural gas-powered buses from Tata Motors of India. Maputo's Public Transportation Company (TPM) has put the buses into operation and will service them. TPM sent a contingent of engineers and mechanics to India for training on the vehicles.

The natural gas bus order is part of a national plan to improve public transportation in the highly congested capital. Mozambique's Transport and Communications Fund (FTC) provided TPM with $19.5 million in funding to cover the cost of the bus purchase and spare parts, two tow trucks and four other vehicles that will provide technical assistance. TPM operates two CNG refueling stations and plans to build two more.

Tata currently ships all of its vehicles to Mozambique, but it has announced plans to build a plant in Mozambique to produce its Nano model.

New Zealand

Mitsubishi and SolarCity Unveil Solar Charging System for i-MiEV

Mitsubishi New Zealand and New Zealand-based SolarCity have formed a partnership to create a charging system that would allow i-MiEV EV consumers to lock in energy costs for 25 years and entirely use rooftop solar panels to charge their vehicle. The system was released on August 31, 2011. It has a 1.5-kilowatt capacity and is expected to produce an average of 1,900 kwh annually, providing enough power for the i-MiEV to travel 1,250km/month. The system is also able to power homes.

The complete solar system for i-MiEV car owners starts from NZ $9,999 (US $7,625) and is designed for installation on a home or garage roof. SolarCity will service the system.

SolarCity is the only solar power company in New Zealand to provide the full spectrum of solar services ranging from design, product development and manufacturing, installation financing, and servicing.

According to the *New Zealand Energy Strategy to 2050*, New Zealand aims to be one of the first countries to widely deploy electric vehicles. The government is also developing policies to promote the production and purchase of vehicles that are capable of accepting blends with 10% biofuels. The strategy also includes LPG and hydrogen technologies.

South Africa

Hyundai Introduces CNG Van in South Africa

In September, Hyundai Automotive South Africa (HASA) introduced a CNG-converted H1 panel van in South Africa. Hyundai claims the converted vehicle can achieve fuel savings of up to 45%. Local fleet companies are currently testing the 3-seater cargo van. HASA also plans to test the viability of CNG buses and passenger vehicle conversions to CNG.

HASA currently imports all of its vehicles, including the H1, from the South Korean Hyundai Motor Company, but it has just started the construction of an assembly plant in Gauteng, South Africa. HASA is the third largest market player in the South African passenger car and light commercial vehicles market, behind Volkswagen and Toyota.

South Africa's Department of Science and Technology rolled out a Green Transport Program in 2009 to showcase green transportation technology at the 2010 Soccer World Cup. The South African National Energy Research Institute has announced plans to set up a Green Transport Research and Demo Center.

Additional original documents and translations available in **AFVInsider online** edition:

- Portland Electric Vehicle Plan
- US-China JCCT proceedings
- China's Twelfth Five-Year Plan
- China's Ten Cities, One Thousand Vehicles Program
- Provisional Regulation on Controlling Passenger Car Quantities
- Plan for Electric Vehicle Development in Guangdong Province
- India's National Roadmap
- New Zealand Energy Strategy to 2050

GLOBAL FEATURE STUDY
BETTER PLACE IN ISRAEL

Facts on Israel

Population:
- 7.5 million

Total vehicles:
- 2,458,716

Vehicles Per 1000 People:
- 457 (2009)

Standard Vehicle Taxes:
- 83% purchase tax (average)
- 7% custom duties (Japan/South Korea)
- 16% VAT

Gas Prices:
- 27.82 NIS per gallon (or $7.50, including a per gallon tax of $2.92), September 2011

Israel's first all-electric vehicles will hit the road in December 2011. However, it remains to be seen whether they will take off.

In many ways, Israel, a country of 7.5 million and the size of New Jersey, is an ideal candidate for electric vehicle use. Because of cold or overtly hostile relations with its neighbors, driving is confined to Israel's borders—250 miles is the maximum a driver can effectively travel.[1] About 90% of drivers travel under 70 km a day.[2] Much as in an island country, this confined driving space limits the costly EV-infrastructure needed to power Israeli EVs. Moreover, taxes on standard cars are high and fuel costs are on par with the high rates in Europe. Gas in Israel cost approximately 7.50 dollars per gallon.[3]

Moreover, with its domestic energy consumption continually rising, energy security is a major concern for Israel. The country currently relies on imported fossil fuels to meet most of its energy needs, including oil (230 thousand barrels per day), natural gas (60 billion cubic feet), and coal (14 million tons).[4] Recent disruptions in the natural gas Israel receives from Egypt—40% of its total supply—have further stoked Israel's energy security fears. Egypt's natural gas pipeline to Israel was sabotaged 4 times in the past 6 months.[5]

Likewise, Israel's diplomatic relations with its neighbors have worsened in recent months. In early September, Israel's embassy in Cairo was stormed by Egyptian protesters. And its once-close ties with Turkey have deteriorated, culminating with Turkey's downgrading of diplomatic relations with Israel. On September 2, 2011, Turkey announced its decision to expel Israel's ambassador. These events have only served to stoke Israel's security concerns.

These concerns have spurred Israeli efforts to promote greater energy independence. Israel plans to tap into recently discovered natural gas reserves off its coast. About 16 trillion cubic feet (Tcf) of natural gas was discovered at the offshore Leviathan Field earlier this year and 8.4 Tcf was found at the Tamar Field in 2009, the largest natural gas discovery of that year.[6]

Israel is also increasingly investing in renewable energy sources, which currently constitute less than 1% of its energy supply mix. The Israeli government has mandated the goal of generating 5% of its power generation from renewable sources by 2014 and 10% by 2020.[7] To promote renewable energy use, Israel offers subsidies to generate greater supply as well as feed-in-tariffs to spur demand.[8]

These policies extend to Israel's motor vehicle sector, which comprises about 2.5 million vehicles. (See figures below and the website for more data on the Israeli auto sector). Of particular note, Israel has a relatively large proportion of vehicle fleets. Its company car fleet doubled between 1996 and 2006, with a 2006 figure of 229,913 company vehicles.[9] The government vehicle fleet amounts to about 50,000 vehicles.[10]

Israel instituted a "Green Taxation" reform in 2009 offering tax breaks to buyers of cleaner vehicles.[11] Under the reform, the tax rate on a vehicle purchase is determined by its emission levels. Vehicles are divided into 15 groups that form the basis for tax credits, ranging from NIS 15,000 (US$3,900) for the cleanest vehicles to zero for the most polluting group. The tax benefit is granted after applying the standard vehicle purchase tax rate of 83%.[12] Electric and hybrid cars enjoy additional tax exemptions. Electric cars have a 10% purchase tax until 2014, when the rate will rise to 30%. In 2020 EVs are scheduled to be taxed like a standard vehicle. Hybrid cars will be taxed at 30% until 2012. The tax rate will then gradually increase until it reaches the same rate as all-gasoline or all-diesel vehicles.[13] According to 2010 numbers, Israel has around 10,000 hybrid and 8,000 natural-gas powered vehicles.[14]

Additionally, in February 2010, the government launched a multi-billion dollar program to promote the research, demonstration and deployment of new technologies in the alternative-fuel vehicle space. The program, which will run from 2011 and 2020, will have a budget of NIS 4 billion ($1 billion) for its first five years, and at least NIS 10 billion ($2.7 billion) for the next five years.[15]

Finally in March 2010, Israel's Department of Environment and Department of Transportation launched a "Cash for Clunkers" program offering NIS 3,000 ($815) to anyone who turns in a vehicle over 20 years old. The Government has allocated NIS 100 million ($27 million) to this program from 2010-2015.[16]

According to a recent Bank of Israel report, these reforms have already succeeded in reducing air pollution from vehicle emissions by encouraging the purchase of less-polluting vehicles.[17]

Better Place

Better Place, the brainchild of Israeli technology executive Shai Agassi, is the company at the center of Israel's efforts to untether its cars from their ICE heritage. The Silicon Valley-based company, formed in 2008, is an electric vehicle service provider that has partnered with Renault to mass produce the first switchable battery EV: the Fluence Z.E. Under this 2009 partnership, Renault agreed to produce 100,000 EVs for sale in Israel and Denmark by 2016, with Better Place investing $150 million to create an EV power infrastructure.

Better Place's business model has several unique aspects. First, it is developing and managing an integrated EV "smart grid" that includes charging spots as well as battery switch stations, in which depleted car batteries are automatically swapped with fully-charged ones in under five minutes. As with conventional EVs, charging spots enable the car to be plugged in and recharged over a longer period of time (e.g., at home during the night). Battery switch stations provide a much faster "refill," thus eliminating the issue of EV range limitation and long charging times. The company plans to deploy 40 battery switch stations throughout Israel by the end of 2011.[18] It also recently signed 400 agreements with parking lot owners to deploy thousands of charging stations as well as cooperation agreements with 27 Israeli municipalities. Four hundred and sixty companies and organizations, comprising a combined fleet of 85,000 vehicles, have pledged to switch to EVs in by 2015.[19]

Another innovation of the Better Place model is that consumers will own the Fluence Z.E., but not its battery. Better Place will own the car's battery and lease its use to the driver through a choice of battery subscription services. Like cell phone owners subscribing to a plan with a certain number of minutes, car owners can buy subscriptions that vary according to the number of miles of they drive per year. Better Place's service package plans include an annual mileage plan, installation and maintenance of a home charging station, free access to Better Place's battery switch stations, battery availability, a computerized driver support system, navigation aids, and roadside service. The table below lists service package plan costs.[20]

Better Place Service Package Plan	Cost (Per Month, Including VAT)
Less than 20,000 km	NIS 1090 ($321)
Less than 23,000 km	NIS 1300 ($383)
Less than 26,000 km	NIS 1470 ($433)
Less than 30,000 km	NIS 1599 ($471)

The Fluence Z.E. has a range of approximately 100 miles per charge. This is largely sufficient for most daily commutes in Israel. The standard model will cost NIS 122,900 ($36,150). A luxury version, which includes leather seats and other amenities, will cost an additional 5,000 shekels ($1,475). Better Place opened its vehicle showroom this past summer. In August 2011, Better Place signed a marketing agreement with Israeli leasing company, Albar. Under the agreement, Albar, will lease the Fluence Z.E. to Israeli business and individuals.[21] Better Place also plans on operating similar electric vehicle services in other countries. On June 28, 2011, the company opened its first switch station in Denmark, the next country to receive a Better Place-Renault network. In June 2011, Better Place and Renault announced a similar agreement to bring the Fluence to Australia. Specifically "Renault will import the first electric car equipped with a switchable battery, the Fluence Z.E. into Australia, and Better Place will provide the electric car charging network and services."[22] Better Place is establishing similar projects in Hawaii, San Francisco, Ontario as well as in Japan and other areas in Europe with Renault as well as other car manufacturers. Most recently, it signed a strategic agreement with China Southern Power Grid Co. to promote EVs with switchable batteries in China.[23]

Bumpy Road Ahead?

Not all Israelis, however, are welcoming Better Place and Israel's EV plan with open arms. Some columnists and others have expressed their skepticism. Most critiques center on the limitations or high costs to consumers.

Many stakeholders, such as automobile importers, favor a system where EV drivers can charge their vehicles at home. However, according to an earlier Ministry of Infrastructure draft of charging station regulations, charging at home may be prohibited. Rather, EV owners would be required to charge at a limited amount of public charging stations or at privately-owned charging stations operated by Better Place.[24]

Under this "managed charging" system, critics lament that EV drivers will pay substantially higher electricity fees than they would on the normal grid system.[25] According to sources from the Israeli Electric Corporation, Better Place pushed for such a system so as to ensure it a market. Its fear is that Fluence Z.E. owners might mostly charge at home using a regular outlet, as recent feedback on Volt and Leaf usage in the U.S. has shown to be more a more popular charging method than anticipated. The Israeli utility, however, has decided to deny Better Place a monopoly and open the system to competing charging systems

These complaints about high prices extend to the pricing of Renault's Fluence Z.E. car as well as Better Places' subscription pricing. The Fluence Z.E.'s cost is slightly more than a regular Fluence, even though the purchase tax on the electric car is only 10 percent instead of the standard 83%. Essentially, critics argue, Better Place, and not consumers, will be the main beneficiary of the tax breaks (amounting to about NIS 70,000, or $20,600, per car).

Likewise, as Haaretz writer Dan Rabinowitz notes, the cost of driving 16,700 kilometers per year—the average annual distance travelled—in a standard vehicle, comes out to NIS 1,000 ($270) less for gas than the fixed cost of the Better Place package for 20,000km. Comparisons with hybrids are even more troubling: the gas the average hybrid car consumes over 16,700 kilometers costs from NIS 5,000 ($1,475) to NIS 8,000 ($2,350) less than Better Place's minimum package.[26]

Sources suggest that Better Place is deliberately pricing the vehicles and plans at a higher rate because its battery swapping and charging infrastructure is not yet complete and ready to handle a large number of EVs. As a first step and testing ground, Better Place would like to focus on fleet purchases, which are easier to manage and service. Fleet purchases and subscriptions are discounted and already economically more attractive when compared to a conventional vehicle fleet.

Despite these reservations, the Fluence Z.E. is sold out for this year and close to sold out for 2012. It remains to be seen, however, how durable Better Place's business model will prove to be in Israel and beyond.

Better Place Early Buyers

More than 460 Israeli companies with combined fleets of 85,000 vehicles have pledged to buy Better Places' EVs. Some of the early buyers include prominent Israeli companies such as:

Direct Insurance
Glasshouse Technologies
Israel Corporation
Jafora
Matrix IT
Netafim, Keter Plastics
Nike Israel
Orange Communications
Orbotech, Manpower Israel
Partner Communications
Pelephone Communications
Rafael Advanced Defense Systems
SQlink
Tabori
Teva Pharmaceuticals Industries [27]

Additional charts available in **AFVInsider online** edition:

- Table of Israeli roads by type
- Chart of vehicles by type
- Table of vehicles by company
- Table of vehicles by country

Notes & Sources:

[1] http://www.wired.com/cars/futuretransport/magazine/16-09/ff_agassi?currentPage=all

[2] http://www.renault.com/en/groupe/developpement-durable/environnement/pages/focus-better-place.aspx

[3] http://www.globes.co.il/serveen/globes/docview.asp?did=1000643878&fid=1725; http://www.globes.co.il/serveen/globes/docview.asp?did=1000670180

[4] http://www.eia.gov/countries/country-data.cfm?fips=IS

[5] http://www.globes.co.il/serveen/globes/docview.asp?did=1000660246 , http://www.energynow.com/video/2011/05/16/israel-factor-energy-security

[6] Brower, Derek. Israel Drills for Energy Security. Petroleum Economist. July 1, 2001; http://www.forbes.com/2011/01/13/israel-energy-leviathan-field-opinions-contributors-wurmser-baron_print.html; http://www.nobleenergyinc.com/_filelib/FileCabinet/PDFs/Presentations/2011_05_Investor_Meetings.pdf

[7] The projected mix of renewable energy in 2020 includes approximately 49% solar, 30% wind and 21% biofuels; http://www.theisraelproject.org/atf/cf/%7B84dc5887-741e-4056-8d91-a38916 4bc94e%7D/ALTERNATIVE_ENERGY_PRESS_KIT_20101111_FINAL_WITH_GRAPHICS_APPROVED_BY_DZH.PDF

[8] "Taxes and Incentives for Renewable Energy" KPMG, 2010

[9] Cohen-Blankshtain, Gila. "Framing Transport—environmental policy: The case of company car taxation in Israel." *Transportation Research Part D.* 13 (2008). Pp. 67-68.

[10] http://www.autoblog.com/2011/05/26/jerusalem-think-tank-proposes-replacing-50-000-israeli-govt-car/

[11] http://www.eiu.com/index.asp?layout=ib3Article&article_id=607842445&pubtypeid=1112462496&country_id=1840000184&category_id=775133077&rf=0

[12] http://www.haaretz.com/print-edition/business/taxman-rolls-out-green-revolution-1.277603

[13] http://www.eiu.com/index.asp?layout=ib3Article&article_id=607842445&pubtypeid=1112462496&country_id=1840000184&category_id=775133077&rf=0

[15] http://www.globes.co.il/serveen/globes/docview.asp?did=1000621360&fid=1724

[16] http://www.haaretz.com/print-edition/business/cash-for-clunkers-the-israeli-version-1.260684

[17] Bank of Israel, Annual Report, 2010.

[18] The first nine of the 40 battery switch stations that have already been deployed are in locations across Israel including: Hadera, Modi'in, Mahanaim, Mitzpeh Ramon, Be'er Sheva, Yavne, Beit Shean and Bilu Junction.

[19] http://www.greenprophet.com/2011/03/better-place-unveils-its-mammoth-recharging-plan/

[20] http://www.globes.co.il/serveen/globes/docview.asp?did=1000645209

[21] http://www.globes.co.il/serveen/globes/docview.asp?did=1000671033&fid=1725

[22] Better Place, Renault, WSJ, http://www.youtube.com/watch?v=3NB0Rvgad0w

[23] http://www.technologyreview.com/energy/37982/page2/ ; http://www.globes.co.il/serveen/globes/docview.asp?did=1000641185

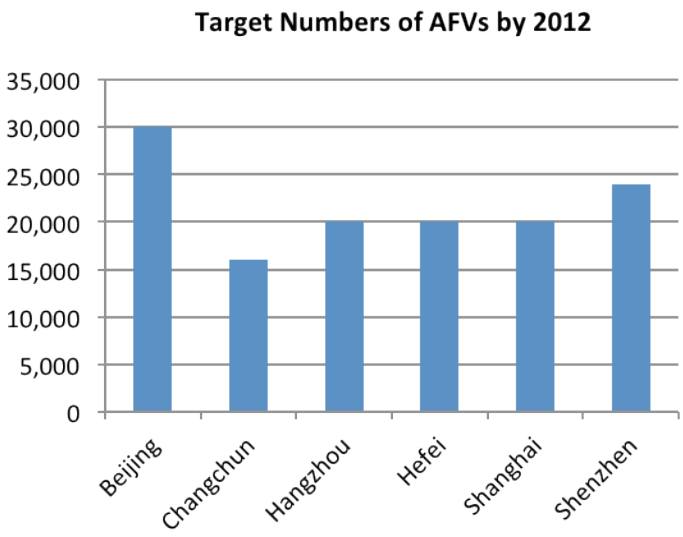
[24] Better Place currently has exclusive rights over the private charging stations in malls, gas stations, parking lots and office buildings. Private charging companies such as Better Place will have Private firms may also set up charging stations in public areas, though it's not clear how many companies will enter the market; http://english.themarker.com/official-electric-car-policy-gives-better-place-the-edge-1.346368

[25] http://www.globes.co.il/serveen/globes/docview.asp?did=1000641185

[26] http://www.haaretz.com/print-edition/opinion/an-electric-car-named-cottage-cheese-1.371672

[27] Jerusalem Post, Better Place & Autoblog.com; http://green.autoblog.com/2009/02/26/better-place-announces-19-vision-partners-aka-early-buyers-i/ ; http://api.ning.com/files/FZXMcE3PELWH*sOXyW0GHfLzImEI1d72ip3Aaorpv3PP6VMJAGAw0CO6mhxqYV6Z3F90PNaJMdEfeJGAqgkZdGlGYK5pAW7F/LocalfirmstohelpBetterPlaceJerusalemPost.pdf

CHINA FEATURE STUDY
CHINESE GREEN FLEETS



An Ambitious AFV Program

China has made an unmatched commitment to the development of alternative fuel - or as the Chinese say, "new energy" - vehicles. The Chinese central government has allocated 100 billion yuan (more than $15 billion) to promoting the industrialization of green vehicles and securing a global leadership position for China in this area. Since January 2009, China has been implementing its *Ten Cities, Thousand Vehicles Program*, jointly launched by the Ministry of Science and Technology, Ministry of Industry and Information Technology, Ministry of Finance, and National Development and Reform Commission. The program aims to accelerate the development of new energy vehicles[1] with national subsidies. Citing a need to reduce fuel consumption and carbon emissions and to promote green vehicles in major cities, the program set a goal of deploying an average of 1,000 new energy vehicles annually for public services in every pilot city through 2012. The program was initially implemented in thirteen pilot cities chosen by the central government[2]. These included Beijing, Changchun, Hangzhou, Hefei, Shanghai and Shenzhen. It has since expanded to 25 cities on the mainland and is still growing.[3]

The central government provides a subsidy of up to 50,000 yuan to any consumer who buys a plug-in hybrid vehicle (PHEV) and 60,000 yuan for a purely battery-electric vehicle (BEV). In addition, the government provides a 3,000 yuan subsidy for fuel efficient cars weighing from 1,205 to 1,320 kilograms and consuming no more than 6.9 liters of fuel per 100 kilometers. More than 400 vehicle models qualify for one of these subsidies, which have been in place since June 2010[4]. On October 1st, China tightened the efficiency threshold from 6.9 to 6.3 liters per 100 kilometers. At the local level, several cities have offered additional subsidies for green vehicle purchases. For example, Beijing will provide a subsidy of 3,000 yuan for each kilowatt of electric battery capacity. This translates into a maximum 60,000 yuan subsidy for a BEV purchase. Shenzhen will provide a similar subsidy for BEV purchases. At the city level, Beijing and Shenzhen offer the most generous consumer subsidies in China. Meanwhile, Shandong province is providing an up to 400,000 yuan subsidy for city buses powered by batteries. Other pilot cities have yet to unveil their local subsidy programs

According to the latest data from China's Ministry of Industry and Information Technology, there are now over 10,000 new energy vehicles registered in the 25 pilot cities. These include electric, hybrid, and fuel cell vehicles. Since the subsidies were implemented in 2010, individual consumer purchases have risen to over 1,000 vehicles. The Ministry of Science and Technology's research expects EV production capacity to reach 300,000 units by 2012.

China's *12th Five-Year Plan* (2011-2015) sets a goal of reaching a production capacity of 1 million AFVs by 2015, with BEVs and PHEVs accounting for 50 percent of the total. The *11th Five-Year Plan* had mainly focused on the research and development of AFV technologies. In March 2011, the Chinese government unveiled a draft Energy-Saving and New Energy Vehicles Industry Development Plan for its automotive industry, aiming for a top global position and a sales volume of 5 million units by 2020. The government plans to invest heavily in core technologies, including motor, battery, and auto parts, to build a competitive AFV industry supply chain.

Building the World's Largest Electric Fleet

China has been focusing on taxi and bus fleet electrification in major cities with the principal goal of stemming air pollution. Currently, China's all-electric cars are mainly used for taxi demonstration programs in pilot cities. Taxi fleets account for the bulk of BEV fleets.

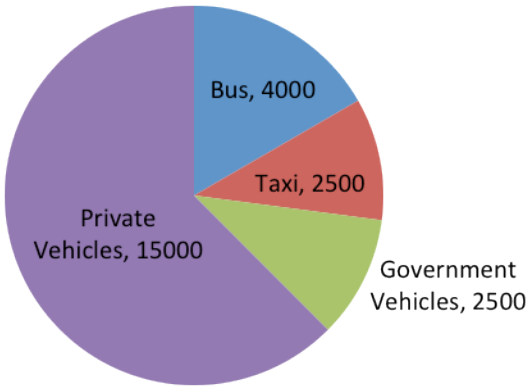
Shenzhen – Southern China's economic and technology powerhouse – was the first city to put the world's largest BEV taxi fleet on the road in May 2010. Pengcheng Electric Taxi Company, a joint venture between BYD Auto and Shenzhen Bus Group solely formed for the taxi deal, operated this 50-BEV fleet in 2010, and expanded the fleet to 300 this August during the Universiade, an international multisport collegiate event that was held in Shenzhen. The taxi is BYD's e6 crossover model, which can reach a maximum speed of 140 km/h (87 mph) and travel up to 300 kilometers (186 miles) on a single charge. According to BYD, Shenzhen's original 50-taxi fleet surpassed three million cumulative kilometers (1.86 million miles) between May 2010 and May 2011.

In addition, BYD concluded a leasing contract with Shenzhen's government to provide 300 e6 and 200 K9 BEV buses for the 2011 Universiade in August. Following the games, these vehicles were integrated into the city's public transportation system. Of the 300 BYD e6s, 250 units were integrated into the Pengcheng fleet, expanding it to 300 taxis. Another 50 e6 cars were used as shuttle sedans for important visitors. To date, the Shenzhen-BYD deal is the world's largest electric vehicle leasing agreement.

BYD produces the K9 BEV bus at its plant in Changsha, Hunan. The bus cuts emissions by 55% compared to conventional buses. The K9 is 12 meters long and 2.5 meters wide, weighs 18 tons, and has a 32-passenger capacity. It costs around 2 million yuan (US$300,000). The K9 has already been made available for use in public transportation in Changsha and Shenzhen since January 2011. BYD claims that sales orders for the K9 have been strong, including a contract in September from the Hunan government to provide 1,000 K9 buses to its public transportation system.

In addition to the K9 electric buses provided by BYD, Wuzhoulong Motors delivered 1,511 new energy buses to Shenzhen's city government during the 2011 Universiade, including 1,350 hybrid power single deck city buses, 20 hybrid power double-deck buses, 53 electric buses, 26 electric feeder buses, 60 fuel cell track buses and 2 fuel cell buses.

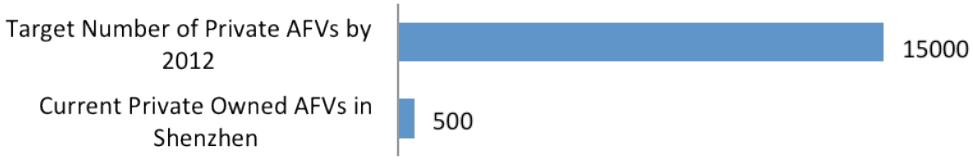
Breakdown of Shenzhen's 24,000 AFVs Target by 2012



Shenzhen aims to have more than 24,000 AFVs by 2012, including 4,000 buses, 2,500 taxis, 2,500 government vehicles and 15,000 private vehicles. By 2015, the city government expects to have more than 100,000 AFVs on the road. According to a Shenzhen Transport Commission statement of September 25, the city currently has the world's largest AFV fleet on the road, including 2,050 hybrid and electric buses, 580 liquefied natural gas buses and 300 electric taxis. However, hybrid and electric vehicles are still a hard sell to average Chinese consumers, even with generous subsidies up to 120,000 yuan from central and local governments. The latest information shows there are about 500 privately owned AFVs in Shenzhen, far behind its 15,000 goal for the end of next year.

Shenzhen currently has six public charging stations for PHEVs and BEVs, with more than 2,345 charging piles installed in Shenzhen. The government is planning to build an additional 18 stations shortly. The city has also set up 57 charging stations for hybrid and electric buses. The charging facilities were built by

AFVs- A Hard Sell to Consumers in Shenzhen



Meanwhile, Hertz will introduce BYD e6s to its rental car fleet in Shenzhen, making it the first global car rental company to offer EVs in the country. It initially plans to have 2 units in Shenzhen, 2 in Beijing, and 2 in Shanghai.

in Shenzhen Bus Group, a CNOOC-Potevio joint venture, and Shenzhen Power Supply Company, a subsidiary of Southern China Grid. To accommodate the growth of AFVs, Shenzhen expects to build more than 250 charging stations and 12,750 charging piles throughout the city by 2012.

While Shenzhen has primarily worked with BYD in its pioneering electric fleets program, other city governments have been actively working with other auto manufactures to deploy AFVs, as detailed in the following table. Beijing has been operating a fleet of 50 Midi electric taxis since March 2011. The Midi taxis are manufactured by Foton Motor Group, Beijing Automotive Industry Holding's commercial vehicle arm based in Beijing.

The Midi EV is a European-style minivan that can travel up to 150 kilometers (93 miles) on a single charge. Its fast charging mode takes only 30 minutes to reach 70% full; however, it could take 8 hours to fully charge with a 220V charger. Beijing expects to put 500 additional electric taxis on the road by 2012. In addition to the 50 Midi e-taxis, Foton also provided 50 Foton AUV electric buses to Beijing Public Transport Holdings this July. Meanwhile, this summer the city government put a total of 1,060 all-electric sanitation trucks into service to transport garbage and sweep streets. The Foton-manufactured trucks come in three sizes – 2 tons, 8 tons and 16 tons – and travel up to 100 kilometers (62 miles) on a full charge. Beijing plans to have 30,000 AFVs on the road by 2012 and 100,000 AFVs, including 35,000 EVs, by 2015. Meanwhile, Beijing aims to build 256 charging stations, 210 distribution stations and 42,000 charging piles by 2015. The 256 charging stations will include 18 stations for city buses and 63 stations for sanitation trucks. Hangtianqiao Charging Station, Beijing's first battery-swap station, allows 200 sanitation trucks swap batteries. One 8-ton sanitation truck can swap its battery within four minutes and one 16-ton truck can make complete this swap in eight minutes.

Haikou, the capital of south China's Hainan Province, unveiled a batch of green buses and taxis this September, including 170 hybrid buses, 30 electric buses, and 27 electric taxis. Haikou plans to increase the number of AFVs to 1,050 by 2012.

Other pilot cities are also in the process of deploying their first batches of e-taxis. For example, Jinan, the capital city of Shandong Province, has initiated a trial program to roll out 200 Chery electric taxis by the end of 2011. Jinan already has 200 hybrid buses, which were provided by Zhongtong in 2010. The city plans to deploy 1,610 AFVs by 2012. Chengdu, a booming city in southwestern China, is planning to deploy 50 e-taxis manufactured by local auto company, Sichuan Auto Industry Group, by the end of the year.

Though China is a major player in developing electric taxi fleets, other electric taxi trial programs can be found in Tokyo, Seoul, and San Francisco. Tokyo was the first city in the world to launch a 90 day e-taxi trial program in April 2010, partnering with Better Place. The three switchable battery electric taxi demonstration projects in Tokyo continued until November 2010. Better Place is also planning to launch a three-year demonstration program of electric taxis in San Francisco and San Jose. Seoul is ready to roll out its first batch of 10 electric cabs this November. Fifty more electric taxis will be introduced next year, 150 more in 2013, and an additional 250 in 2014. Compared to these cities, China's government-led e-taxi fleets are operating at a larger scale and have longer-term commitments.

Electric Taxi Fleets in Major Chinese Cities

City	Electric Taxi Manufacturer	EV Model	N. of EVs	Launch Date
Beijing+	Beiqi Foton Motor	Foton Midi	50	March, 2011
Chengdu	Sichuan Auto Industry Group		50*	December, 2011*
Haikou	Haima Auto (FAW Group)		27	September, 2011
Hangzhou	Zotye Auto & Haima Auto (FAW Group)	Zotye Multipla & Haima Freema	30	January, 2011
Jinan	Chery Auto		200*	December, 2011*
Shenzhen	BYD Auto	BYD e6	300	May, 2010

*Expected
+Beijing expects 500 additional electric taxis by 2012

Ankai Bus is currently the largest provider of electric buses in China. Currently, there are more than 400 Ankai electric buses operating in cities such as Hefei, Beijing, Dalian, Hefei and Shanghai, accounting for over 80% of market share. Since January 2010, Heifei, the capital city of Anhui province, has rolled out more than 180 electric city buses produced by Ankai. Foton, another big player in the AFV bus segment, claims that it has sold 220 Foton AUV electric buses and 1,250 AUV hybrid buses. Meanwhile, BYD is an emerging player in the BEV bus business. The company has secured a contract from the Hunan government to provide 1,000 K9 buses in the near future.

In addition to the electrification of taxi and bus fleets, several companies have electrified their private fleets. Besides the afore-mentioned Hertz e6 fleet, Xiamen Huatian launched an EV leasing business in Xiamen this May, integrating 23 Zotye Multipla and Zotye 5008 EVs into its fleet at the same rates as non-EVs. The company aims to acquire 503 EVs made by Zotye and Kinglong by the end of 2012. Dutch-based international express delivery company TNT launched China's first EV delivery fleet in Shanghai this September. The five electric delivery vehicles are Tianyi Logistics Vehicles produced by Dongfeng Motor, one of the leading auto manufactures in China[5].

A few local governments are starting to introduce electric vehicles into their government fleets. In Shanghai, the city government purchased 35 Lifan 620 EVs in May 2010, and used them as special police vehicles for the Shanghai World Expo. The Lifan 620 can travel 200 kilometers on a full charge and takes 7 hours to charge at 220 volts. The city government of Hangzhou also integrated 3 EVs into its government fleet in June. The 3 EVs, Luxgen7 SUV EV+, Luxgen7 MPV EV+, and Luxgen7 CEO EV+, were provided by Dongfeng Yulon, a partnership between Dongfeng Auto and Taiwan's Yulon Motor.

Bumps Along the Road

Not every electric fleet experience in China has run smoothly. Shenzhen's e6 taxi fleet has had a good safety record so far. However, the e-taxi fleet in Hangzhou, the capital and largest city in Zhejiang Province, was pulled off the road for 2 months after a Zotye Multipla electric cab caught fire on the streets in mid-April. Hangzhou had integrated 30 electric vehicles into its taxi fleet in late January. Half of these were Zotye's Multipla (Langyue) model. Released last April, the compact MPV has a driving range of 200 kilometers (124 miles). The remaining 15 units are FAW's Haima Freema model, which is a compact MPV with a driving range of 160 kilometers (99 miles).

The Multipla cab accident was attributed to a battery pack issue. An investigation into the accident revealed that the vehicle's battery module had leaked and damaged the pack's insulation, leading to a short circuit that caused the fire. The battery cells were manufactured by Zhejiang Wanxiang Group, which was not held responsible for the accident. The individual cells did not present any flaws, but their systems integration with the vehicle was faulty.

Zotye accepted the investigation results and stated that it will carefully evaluate potential risks arising from the process of technology and business model innovation. "Monitoring procedures had been inefficient or neglected in the process of manufacturing, battery charging and switching, and vehicle driving," said Shao Xinhua, deputy administrator of the Hangzhou Quality Supervision and Inspection Administration. After the investigation, the Hangzhou government stated it had made appropriate adjustments to the vehicles and had evaluated the management and operation of the e-taxis. Hangzhou still aims to have 200 electric cabs by the end of the year. It is also building 56 charging stations this year and plans to have 350 charging stations by 2015.

Following the Hangzhou e-taxi incident, an electric bus caught fire while carrying passengers in downtown Shanghai this July. Fortunately, no one was injured. The bus was manufactured by Leibo New Energy, a partner of Anhui Ankai Automobile. "A problem with the battery caused spontaneous combustion," said Yan Yuan, vice manager of Leibo New Energy, a joint venture of East China Power Grid Company, Shanghai Electric Power Company and Shanghai Ruihua Co. Ltd. The Leibo buses were introduced in Shanghai in September 2009. The bus company has suspended the operation of all its buses of this model; meanwhile, Leibo is evaluating the battery issues with its supplier. Currently, more than ten cities[6] are cooperating with Leibo New Energy to introduce its electric buses. The other cities have not responded to this incident.

Another issue is cost. Even though most riders were reportedly enthusiastic and satisfied with Shenzhen's e6 taxi fleet, one year after the trial program was launched the operating loss of Shenzhen's first batch of 50 electric taxis reached 7 million yuan ($1.1 million). "Even with government subsidies, e-taxis are still much more expensive. Due to the lack of electric vehicles, the maintenance cost of e-taxis is nearly double that of regular taxis. "said Du Jun, general manager of Pengcheng Electric Taxi. He was mainly referring to the higher cost of auto parts and labor to service EVs. However, Du expressed confidence that operating costs would fall as taxi fleets electrify and charging and servicing infrastructure is improved.[7]

China's ambitious investment in AFVs is second to none, and its ability to guide the development of a new industry is probably unparalleled in the world. Nonetheless, China will have to overcome some major obstacles before it can become the industry's leading player. Following its demonstration program of energy-efficient fleets across the nation, the government now faces the challenge of convincing individual consumers to choose greener vehicles. The fleet experience shows that sustained infrastructure development, effective safety standards, and substantial cost reduction will be key to helping overcome consumer skepticism.

Additional charts available in **AFVInsider** online edition:

- AFV taxi fleets in China
- AFV bus fleets in China
- AFV government fleets in China

Notes & Sources:

[1] According to Chinese government's policy, new energy vehicles include hybrid vehicles, electric vehicles and fuel cell vehicles.

[2] The initial 13 pilot cities include Beijing, Shanghai, Chongqing, Changchun, Dalian, Hangzhou, Jinan, Wuhan, Shenzhen, Hefei, Changsha, Kunming, and Nanchang.

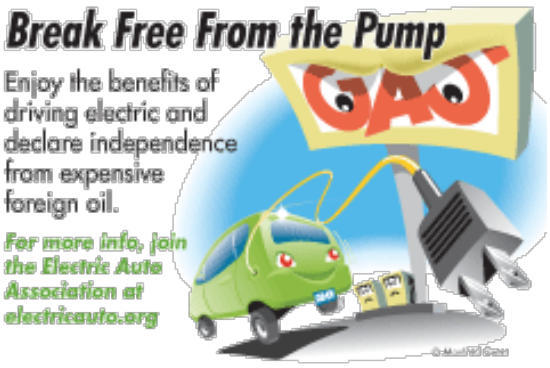
[3] The 25 pilot cities include Beijing, Shanghai, Chongqing, Changchun, Dalian, Hangzhou, Jinan, Wuhan, Shenzhen, Hefei, Changsha, Kunming, Nanchang, Tianjin, Haikou, Zhengzhou, Xiamen, Suzhou, Tangshan, Guangzhou, Shenyang, Chengdu, Nantong, Xiangfan and Hohhot[7] According to Chinese government's policy, new energy vehicles include hybrid vehicles, electric vehicles and fuel cell vehicles.

[4] The February 2009 subsidy program focused on public service vehicles, while the subsidy program unveiled in June 2010 is for individual consumers.

[5] Dongfeng sold 2.6 million vehicles in 2010, making it the second bestselling Chinese automaker.

[6] Beijing, Guangzhou, Dalian, Jinan, Qingdao, Shenzhen, Hefei, Wuhan, Kunming, Nanchang and Urumqi

[7] Shenzhen electric taxi fleet lost 7 million yuan in one year, Lihua Yang, Securities Times, May 11, 2011 <http://business.sohu.com/20110511/n307220536.shtml>



CHINA INSIDER PERSPECTIVE

C.C. CHAN, FATHER OF EVs IN CHINA

"My biggest wish is to see electric vehicles running on streets and alleys of big and small cities – it's a contribution to the conservation of energy, environmental protection and sustainable mobility," said Dr. C. C. Chan[1], one of the world's leading experts on electric vehicle technologies.[2] Currently Honorary Professor in the Department of Electrical and Electronic Engineering at the University of Hong Kong and scholar at the Chinese Academy of Engineering, Chan has been called the "Father of Asian Electric Vehicles" by *Global View Magazine* and selected as "Asia's Best Technology Pioneer" by *Asiaweek*.

Chan grew up in a Chinese family of entrepreneurs running a bus business in Indonesia. Seeing the dirty environment of auto-repair garages in his childhood, the young Chan started to wonder about the possibility of creating cleaner vehicles. Through hard work, Chan's childhood dream turned into a career in researching electric vehicles. Chan earned degrees in electrical engineering from the China University of Mining & Technology, Tsinghua University and University of Hong Kong. His book "Modern Electric Vehicle Technology" published in 2001 reviewed the latest EV technology developments and highlights the importance of EV infrastructure for EV commercialization and adoption. *Power Engineering Journal* praised it as the work of "unabashed enthusiasts for the EV," noting that it had "the ring of authority."[3]

In 1986 Chan founded the International Research Centre for Electric Vehicles at the University of Hong Kong with the support of the U.S. Department of Energy and co-founded the World Electric Vehicle Association in 1990. He served as a Distinguished Lecturer of the Industrial Electronic Society of the Institute of Electrical & Electronic Engineers (IEEE) in the U.S. and as visiting professor at top universities including the University of California at Berkeley, MIT, Cambridge University, Tokyo University and Tsinghua University. Chen was also selected as fellow of the Royal Academy of Engineering (UK), the Institution of Engineering and Technology (UK), the Ukraine Academy of Engineering Sciences, the Institute of Electrical and Electronics Engineers (US), and the Hong Kong Institute of Engineers. He has been working on electric vehicle research projects around the world, including in China, Japan, India, Europe and the United States. In 1993, he worked with the University of Hong Kong, Honda and Amerigon to successfully develop the U2001, an electric car with a 45 kW motor and 264V battery pack. Chan has been sharing his expertise with the industry and has served as technology advisor for Ford, Honda, Samsung and other leading corporations. While promoting international collaboration to advance EV technology, Chan brought the latest technology from abroad into Asia. Over the past 20 years Chan has been teaching in China, sharing his electric vehicle expertise and experience.

Chan's Perspectives on China's EV Industry

Chan is optimistic about China's electric vehicle development plan. In an interview with *Science Times* in 2010, Chan said that he is expecting China to become the "Kingdom of Electric Vehicles."[4] He anticipates the number of alternative fuel vehicles will reach 500,000 by 2015 in China and double to 1 million by 2020. Chan forecasts that China will lead the EV sector with an estimated 15 percent market share for hybrid and pure electric vehicle sales by 2020.

C. C. Chan thinks China has an urgent need to develop alternative fuel vehicles. "Due to serious traffic congestion and environmental deterioration, the development of electric public transportation will be the most important project in China," said Chan at the 25th World Electric Vehicle Symposium in Shenzhen. "As electric vehicles do not use engines, the electric vehicles market is the only market segment where Chinese enterprises have opportunities to lead across the world," said Chan.[5] Chan believes the opportunities include the research and development of electric buses. As foreign competitors already have decades of experience in building hybrid vehicles, Chan suggested China should focus on developing battery electric vehicles.

While the battery is the key component in developing electric vehicles, Chan sees two major shortcomings in Chinese electric vehicle battery technology. Chan explained, "The first one is the lack of fundamental technology research, such as temperature problems and components; the other one is the absence of an evaluation system for battery safety in low- or high-temperature environments, for example."[6]

In an interview with *China Investment* this August, Chan pointed out that in order to commercialize Chinese electric vehicles, China should increase its investment in the battery industry and in charging infrastructure.[7] The key to expanding the market would be to develop it in conjunction with the battery industry, as well as to establish a comprehensive network by integrating the EV supply chain. "To successfully promote electric vehicles, we need good products, good infrastructure, and a good business model," noted Chan.

Chan's Perspectives on International Competition in the AFV Sector

"The United States is the first country that started to research and develop electric vehicles; however, the U.S. is facing the challenge of industrialization," said Chan. Chan believes that leading auto companies in the U.S. have no credible or sustainable strategy for alternative fuel vehicles. Whenever the economic and financial environment worsens, automakers tend to abandon their AFV development projects. He sees Japan as the most successful country in promoting the industrialization of hybrid and electric vehicles. According to Chan, there are five key factors to Japan's success in developing hybrids: Japan has a clear roadmap and strategy; the Japanese government supports the industry by providing substantial funding; Japanese industry possesses core technologies and a strong innovation base; Japan has a strong industry alliance between auto makers and battery manufacturers; and Japanese auto makers have a better understanding of markets and consumers.[8]

Though Chinese AFV technology istill lags behind Japan and the United States, Chan thinks China is making great progress and catching up quickly. He projects that total sales of hybrids and EVs will account for 7 % to 12% of global car sales in 2020. As mentioned above, Chan further anticipates China will surpass the rest of the world, reaching 15% of the market share in 2020. Chan noted two routes to achieving the goal of rolling out millions of EVs across the world.[9] One is to satisfy the needs of "sophisticated consumers" who require innovative and high precision EVs. These consumers are primarily located in the US, Europe and Japan. Another route is to attract "new consumers", mostly from China and India, where the primary concern is low cost. International collaboration between industries is key to achieving technological breakthroughs and lower production costs.

With his multicultural background, C. C. Chan strongly believes in integrating the strengths of the East and West for the advancement of science and technology. "Scientists invent things with the greatest hope that it will be used to help the society go forward and prosper. Science itself is without borders. It serves all mankind," said Chan.[10] At the age of 74, Chan still works actively all around the world, teaching in leading universities, giving speeches at global conferences, and providing advice to industry leaders and policy makers, in order to promote his dream: the massive industrialization of electric vehicles.

Notes & Sources:

[1] C. C. Chan, also known as Qingquan Chen.

[2] Success stories of HKU- Professor C. C. Chan <http://engg.hku.hk/home/people/ccchan/ccchan.htm>

[3] Bio of C. C. Chan, Department of Electrical and Electronic Engineering, University of Hong Kong <http://www.eee.hku.hk/people/ccchan.html>

[4] C. C. Chen's interview with Science Time, Chinese Academy of Science, 06/08/2010 <http://www.cas.cn/xw/zjsd/2010006/t20100628_2888644.shtml>

[5] Chinese automakers seek to lead global electric bus market, People's Daily, 11/09/2010 <http://english.peopledaily.com.cn/90001/90778/90860/7193177.html>

[6] C. C. Chan: Two major shortcomings of Chinese electric vehicle battery, Auto Sina, 07/21/2011 <http://auto.sina.com.cn/news/2011-07-21/0903808022.shtml>

[7] Interview with C. C. Chan, China Investment, 08/05/2011 <http://www.qqddc.com/html/news/201108/news_20719_1.html>

[8] C. C. Chen's interview with Science Time, Chinese Academy of Science, 06/08/2010 <http://www.cas.cn/xw/zjsd/2010006/t20100628_2888644.shtml>

[9] 2011 China Plug-In Electric Vehicle Forum: China to take own route to market, cars21.com, 03/14/2011<http://www.cars21.com/content/articles/53020110314.php>

[10] Success stories of HKU- Professor C. C. Chan <http://engg.hku.hk/home/people/ccchan/ccchan.htm>

CRITICAL PERSPECTIVE
BCG STUDY CRITIQUE

Commentary by Carolyn Amon, Editor-in-Chief

PHEV: Procrastination Has Ephemeral Value

The Boston Consulting Group's (BCG) latest report on electric cars put a damper on EV buzz by significantly lowering its previous study's estimate on EV market penetration by 2020. While "The Comeback of the Electric Car?" report cites progress in incentivizing automakers to increase fuel efficiency and reduce emissions, it concludes that in the next decade they will principally do so by optimizing internal-combustion-engine (ICE) technologies. Thus, while automakers should still think about EVs in their long-term strategies, they are still safe for now to procrastinate on EV deployment. This conclusion is based on a number of questionable assumptions and omissions.

Assumptions

1. Prohibitively high battery costs

First, BCG assumes that EV lithium-ion batteries currently cost $2,000 per KWh. This means that it costs EVs $140 to $280 for every percentage point reduction in carbon emissions, versus half those amounts for ICEs. But BCG's battery cost assumption is higher than current battery costs as reported by automakers. Over a year ago, a Deutsche Bank study had already noted "steeper-than-expected" price declines, from $650/kWh in 2009 to bids for mid-$400/KWh on high-volume contracts for 2011-2012. GM estimates that its current battery cost is already as low as the $500/kWh, which is BCG's minimum estimate for 2020 and the threshold at which it claims EVs become competitive with oil prices at $100-$120 per barrel. Battery costs remain the primary reason for the higher upfront price of EVs, but the barrier is far lower than BCG makes it out to be, and it is coming down much faster than BCG anticipates.

2. No technological breakthrough

BCG includes the caveat that "costs could change radically" as a result of technological breakthroughs, but it does not factor any in its scenarios for 2020. If the past ten years are any guide, battery technology is likely to be optimized if not revolutionized. Already, EV manufacturers have moved from nickel-hydride to lithium-ion batteries, which still leave room for improved chemistries. Several technologies that are currently emerging would fundamentally change the way batteries operate, such as MIT's recently unveiled 'Cambridge crude' refillable battery. BCG grants ICE technology improvements the benefit of the doubt when it estimates a 20% improvement in fuel efficiency by 2020. To be fair, at least one scenario should apply similar assumptions to batteries with regard to EVs.

3. Charging infrastructure roadblocks

The BCG report mentions that "it's hard to make a business case for a public electric charging infrastructure" from a power company's perspective. It claims that utilities would have to make high investments in a high-risk area that would take more than a decade to amortize, even if electricity rates for EV chargers were doubled. We challenge the premise that power companies should be on the hook for building any charging infrastructure at all. Why would power companies be responsible and financially liable for the development of charging stations? Oil companies don't do the same for gas stations. In fact, the private sector sees a business case for charging infrastructure, as demonstrated by start-ups AeroVironment, Coulomb, ECOtality, EV-Charge America, Milbank, Shorepower Technologies, and SolarCity. Even the corporate giants AeroVironment and GE have joined the fray. Each of these companies has teamed up with city, state and/or business partners to install chargers. BCG mentions residences, hotels, and shopping centers as necessary sites for power companies to install chargers; the aforementioned companies have partnerships in all of these areas. Moreover, EV infrastructure does not need to be as fully developed as gasoline infrastructure before EVs are more widely adopted. Indeed, most consumers could charge their vehicle at their homes and most likely during hours of off-peak demand – enhancing the efficiency of the existing electric grid – where a regular outlet would suffice.

Omissions

1. Oil price volatility

BCG's scenarios assume three different oil prices, but do not address the probability of an oil shock within the next decade. The global financial crisis eased oil price pressures over the past several years, but demand is poised to resume its upward trend, driven by fast growing demand from emerging economies, and especially China. As spare capacity shrinks, the risk of a severe oil shock increases. As opposed to a scenario of gradual oil price increases, an oil shock scenario would have a much more dramatic effect on consumer preferences and be conducive to the following point.

2. Conversions

The BCG study's "electrification path" does not mention the option of converting ICEs into EVs. While purchasing any new vehicle is a major household expense, a conversion is only a fraction of the financial and environmental cost of a new vehicle, and furthermore qualifies for a $1,000 federal tax rebate. Conversions could extend the life cycles of ICEs reaching the end of their lives and accelerate our national vehicle's fleet turnover to EVs.

3. Competitive proactivity

The BCG study recognizes that Denmark, France and Israel's ambitious EV schemes could give their automotive and power companies a competitive edge, but then concludes that unless other governments follow suit EVs "may be off to another false start". This conclusion ignores the importance of competitive proactivity. As BCG states, EVs will eventually gain market share in the automotive market, albeit only beginning in 2020 in its view. And so the crucial issue here is not false starts, but rather head starts. Whatever automaker has the most experience with EV deployment will be best poised to take advantage of new market opportunities come 2020. At the same time, national policies matter and will determine where automakers move forward most aggressively on EV deployment.

Procrastinating on EV deployment is a short-sight strategy. Milquetoast automakers will find themselves at a competitive disadvantage if they ignore the technological, economic, environmental and national security forces that are already creating a viable market for EVs today.

POLICY PERSPECTIVE
EU & CHINESE ENERGY POLICY

Energy policy determines many of the opportunities and limitations that shape the deployment of alternative fuel vehicles in various markets. It plays a large part in explaining why some cities, regions, and countries have more ambitious AFV goals than others and/or are closer to achieving these goals. Domestic proponents of AFVs have long argued that US energy policy is inadequate,incoherent, or lacking altogether, and thus structurally favors the incumbent oil-fueled vehicles and infrastructure.

Three principal criticisms are leveled at US energy policymaking: it fails to effectively coordinate between the federal government and states, to take advantage of the full array of policy tools to promote alternative energy, and to address transmission and distribution bottlenecks. One way to assess the merits of these arguments and gravity of their implications is to explore how other similarly large energy markets with federal-like structures operate. The two most relevant energy markets with which to compare the US in this respect are the European Union and China. In order to shed light on US energy policymaking and place it in a global context, we will look at:

I. Coordination between different levels of government in the European Union and China on energy policy.

II. Steps the EU and China are taking to transition to renewable energy resources.

III. Their management of transmission and distribution across their territories.

1. Energy Policy Coordination: A Work in Progress

Neither the EU nor China is technically a federation, but they are both arguably moving in that direction.

The EU is really a sui generis entity, which depending on one's perspective is either inexorably moving towards becoming the United States of Europe or alternately just a web of treaties and institutions that in the final analysis strengthen its 27 members states. The EU's policymaking process reflects this ambiguity.

There are two principal ways in which the EU makes policy: Inter-governmentalism in the traditional sense where states cooperate in areas of common interest, but remain in control of how and to what extent they cooperate. This is the prevalent form of governance on sensitive issues related to security and defense. On the other hand, with the Community Method member states give up some of their national sovereignty in the process of integration. Here, the European Council provides strategic direction; the European Commission drafts a proposal; and the Council of Ministers from the 27 governments and the directly elected European Parliament debate, amend, and pass or defeat the proposal.

The European Commission can issue either non-binding recommendations and opinions or binding regulations, directives and decisions. Regulations are the most binding form of EU law. They have legal force in every member state right away, whereas directives require that national authorities transpose measures into their national laws. The Commission then ensures that EU law is properly applied and can bring member states to the European Court of Justice if they fail to comply[1].

EU Energy policy is a hybrid, combining inter-governmental coordination with the Community Method. Member states retain their right to frame their national energy policies, and a unanimous vote is needed to pass any measures involving energy taxation, conditions for energy resource exploitation, and the structuring of energy supply and choices[2]. Meanwhile, the Community method applies to issues related to internal energy market competitiveness, security of supply, and priority infrastructure projects[3].

The EU's current policy framework is defined by the 2007 Lisbon Treaty, which for the first time added a specific chapter on energy into European primary law, and included a principle of solidarity whereby any member experiencing a severe energy supply disruption will receive assistance from other members. The Treaty states four energy goals: "ensure the functioning of the energy market; ensure security of energy supply; promote energy efficiency and energy saving and the development of new and renewable forms of energy; and promote the interconnection of energy networks"[4]. The Treaty also pushes for achievement of these goals through international agreements.

Table 1: Comparative Federal Energy Policy in the EU & China

	EU	**CHINA**
Quasi-federal actors	- EU Institutions (CEU, EC & EP) - 27 member states	- Central government (CCP, NPC & State Council) - 33 provincial divisions
Energy policymaking	Inter-governmentalism & the Community method	(De-) Centralization
Policy framework	Lisbon Treaty	Twelfth Year Plan

Though lacking in transparency, China's policymaking process is simpler or in any case more direct in the sense that it is just one country with one party. As the table above shows, its system also involves many actors and layers. Increasingly, China's economy is centrally planned in name only, making its system just as difficult to understand, if not more so, than that of the EU.

The Chinese Communist Party and State Council issue guidelines every five years that set targets and policies for the whole country and then break them down for each of the provinces, which also need to submit their own five-year plan. A plenary session is then convened for the National People's Congress to rubberstamp the plan. At the provincial level, and each local level below it, there is a double leadership structure: a head of the people's government who is appointed by the provincial legislature and a party secretary who is appointed by the central government [5].

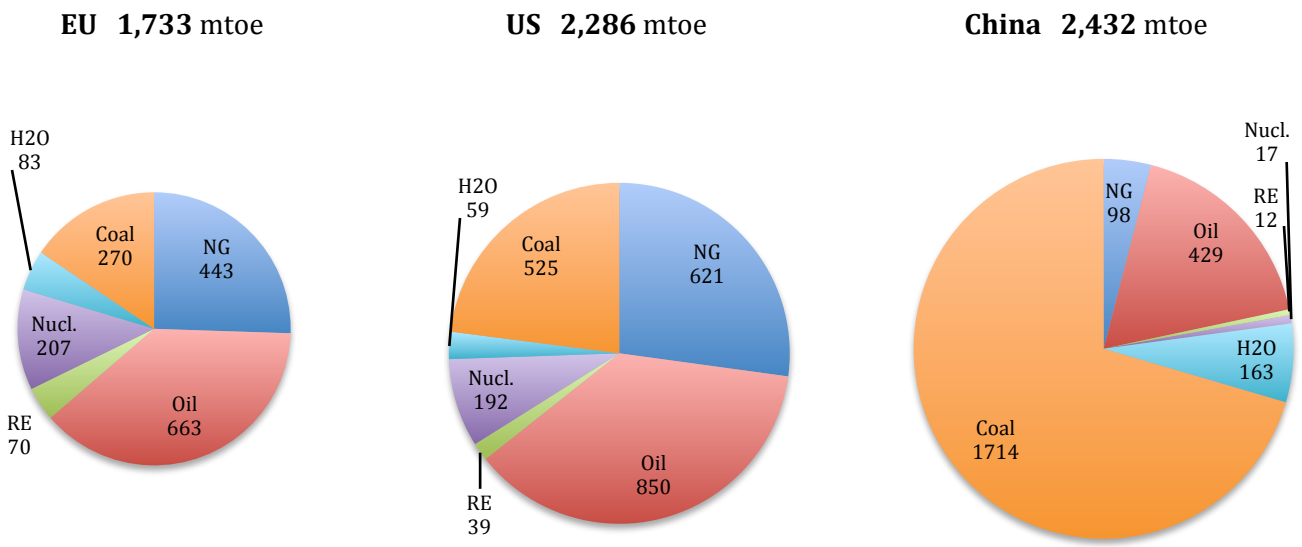
The system is designed to ensure the central government is directly represented at each level and in this sense it is a centralized system, but in fact the provinces have gained more autonomy over time and the central government often finds it difficult to implement its national goals when they compete with provincial priorities or involve cooperation among the provinces, which compete with each other too. For example, in the run-up to the five-year plans, provinces lobby the central government to secure lower targets in a zero-sum game whereby one province's lower target is another one's higher target. The central government is moving towards tailoring its targets for provinces on a more scientific and transparent basis to reduce the gamesmanship[6].

The Chinese government arguably did not have a central energy policy for over a decade, since it eliminated its Ministry of Energy in 1993[7]. After a series of failed attempts to effectively coordinate energy policy through various agencies, in 2010 the State Council set up a high-level National Energy Commission (NEC), headed by the Chinese Premier as a "cabinet within the Cabinet"[8]. The NEC is responsible for drafting and coordinating a national energy development plan.

The *Twelfth Year Plan*, which covers 2011-2015 period, lays out China's current energy policy framework and goals. It notably includes climate change for the first time as a major environmental issue. Of the seven special sectors identified for strategic investment, three are energy-related: clean energy, conservation and alternative fuel vehicles [9].

To place the EU and China's energy policies in context, the following table details energy consumption by source in these two markets and the US. It shows that the EU has the relatively most balanced energy supply diversification. The table also illustrates China's challenges as the world's largest energy consumer. Compared to the US and the EU it is starting with the lowest non-hydro renewable base and the highest dependence on coal.

Chart 1: Comparative Energy Consumption in the EU, US & China *(in mtoe)*



Source: BP Statistical Review of World Energy 2011

11. Renewable Energy Transition: From Coal Bases to Wind Towers

Coal was central to the genesis of the European Union, which started as the European Coal and Steel Community, but the EU has come full circle in the sense that the goal now is to collectively reduce coal and other fossil fuel use and replace them with renewable energy sources.

The EU's Renewable Energy Directive has had two iterations. In its 2001 form, it was non-binding and only covered renewable energy in electricity generation and biofuels in transportation. Only a few countries expect to achieve their targets under this framework. The new version that was adopted in 2009 and transposed in December 2010 made some significant changes. It sets binding targets on green house gas (GHG) reduction and renewable penetration and requires the submission of National Renewable Energy Action Plans from each member state. The scope was also widened to cover all energy consumption, including heating and cooling[10]. The directive provides for several new "cooperation mechanisms": a member country can sell its energy surplus to another in a statistical transfer; a member state can finance a new renewable energy project in another member or third country if electricity is imported into EU and then they can statistically share the production as a joint project; member states to integrate their renewable energy plans into a single market and statistically divide the results in joint support schemes[11].

According to the national renewable action plans submitted this year, almost half of the Member States are planning to exceed their own targets and be able to sell surpluses to other Member States. The EU is also providing 4.5 billion euros of co-funding with matching funds from industry and member governments to help with implementation.

As summarized in the table below the EU's target is 20/20/20, to achieve a 20% cut in greenhouse gases, a 20% cut in energy use, and a 20% renewable energy sourcing by 2020.

Additionally, the Commission has proposed an energy efficiency directive with binding measures, but its details are still being debated[12].

Table 2a: Comparative Renewable Energy Plans Consumption in the EU & China

	EU	**CHINA**
2010 legislation	Renewable Energy Directive I	Renewable Energy Directive II
Key Changes	- Binding targets - Cooperation mechanisms	- Mandatory Connection - Renewable Energy Dvt. Fund
Goals	20 / 20 / 20	15 / 16 / 17

China is also in the second iteration of its Renewable Energy Law. Its first law was passed in 2005 and created a general framework for renewable energy promotion and regulation in China. As in the EU, a new version was passed at the end of 2009 and took effect in 2010. The revision made three major changes.

First, it tightened the Mandatory Connection policy, which obliges grid companies to purchase and connect any renewable energy generated in the country. The original policy had yielded poor results because of a lack of infrastructure and incentives to upgrade the grid[13]. For example, close to a third of China's wind capacity was not being connected to the grid and over half remained unused. Another reason some of the wind power remained unconnected was because it was originating from "rogue projects"[14] that the central government did not approve or even know they existed. The new version of the law requests agencies to set renewable energy targets for the grid companies, making them responsible for meeting the targets. It also includes penalties for non-compliance and mandates more detailed coordination between different levels of government through their Five-Year Plans for energy measures.

Second, the revised law has created a Renewable Energy Development Fund, which will collect surcharges on end-users' electricity bills and use them to compensate grid companies for the cost of purchasing and integrating renewables. This system will also allow the Chinese government to re-allocate funds for renewable projects in less economically developed provinces.

Finally, the government updated its feed-in tariff regime for wind, biomass and solar. For wind, the tariffs range from 7.5 to 9 cents per kwh depending on a region's wind resources. Feed-in tariffs for biomass were increased from 3.7 cents to 5.2 cents. In addition to increased feed-in tariffs for solar power, a Golden Sun program was implemented to provide capital subsidies of up to 70% for PV installations. The government has also exempted all renewable energy projects from local income taxation[15].

China's goals are to achieve a 15% share of renewables, 16% cut in energy use, and 17% cut in greenhouse gas emissions by 2020.

To provide a comparative perspective, the following table displays the current portfolio of clean energy policies adopted in the EU, China, and the US. The EU and its members have adopted the full array of policies. The boxes with numbers specify how many member states have adopted the given measure for policies that only exist at the state level, as opposed to the EU level. China's policy mix reflects that its promotion of renewables energy resources is geared towards the export rather than domestic market. The US is clearly the laggard, having adopted less than half of the clean energy policies.

Table 2b: Comparative Clean Energy Policies in the EU, US & China

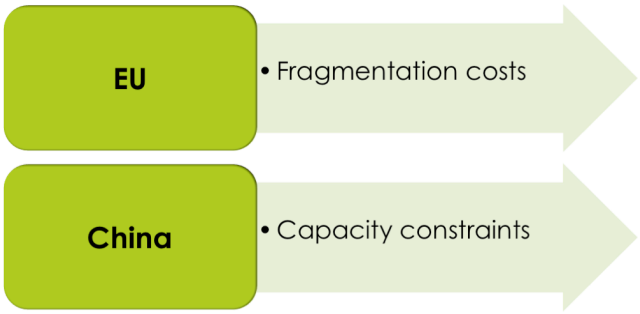
	EU	CHINA	US
Auto Efficiency Standards			
Clean Energy Tax Incentives	26		
Renewable Energy Standard			
Green Bonds			
Feed-in tariffs	21		
Government Procurement	21		
Carbon Cap			
Carbon Market			

Source: Pew Charitable Trusts & European Commission

III. Transmission and Distribution Challenges

The EU and China both face transmission and distribution challenges, but these challenges are very different.

Table 3: Primary Transmission & Distribution challenge in the EU & China



For the EU the primary issue is fragmentation[16]. Electricity networks currently operate as national monopolies with only a small number of interconnections between the different grids, and some limited trading[17]. As a result, there is an up to 30% price gap in EU electricity prices[18]. This is a difficult area for EU members to reach a consensus since lowering the overall price would lead to higher prices in the currently cheapest areas and incur revenue losses for the grid companies.

The EU has passed a directive on grid unbundling and power market opening, but member states are delaying its implementation. In general, transmission and distribution reform has a poor implementation history: the Commission currently has over 60 infringement procedures open against EU members for failure to comply with the previous phase of this directive[19].

However, the member states and Commission are cooperating on some initiatives that require an integrated strategy. The most notable are the North Seas Countries Offshore Grid Initiative for wind power and the Desertec and Solar Mediterranean plans.

China has made great strides is increasing the efficiency of its transmission and distribution network, starting with the implementation of a plant-grid separation reform in 2000. The measure separated the assets of China's electric power corporation into five power generation groups and two power grid companies - the State Grid Corporation and China Southern Power Grid Corporation.

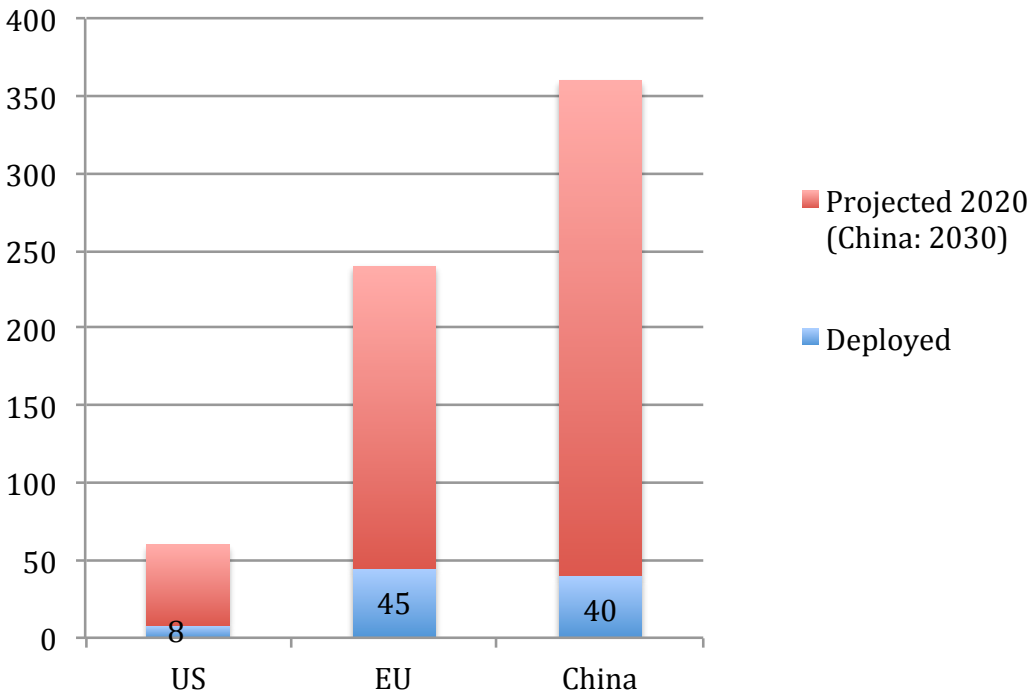
China is already the world's leading transmission and distribution market[20] and its State Grid Corporation is the largest power transmission and distribution company in the world. China's principal challenge is that its power resource development has grown faster than the grid. Its priority is to build more transmission capacity, especially ultra high voltage transmission, between the north and west where most of its power resources are, and the center and east where most of the demand is[21]. To this end, the government has committed $40 billion to power grid development.

The EU and China have also started to develop smart grids, the next generation of transmission and distribution. While some EU member states have already launched smart grid projects, the issue is relatively new at the EU level. In fact, some countries have put their projects on hold until an EU-wide standard is adopted. There has been limited sharing of project experiences this far, as the Commission only this year completed an inventory of smart grid projects in Europe for the first time[22].

China's grid companies are also working on the development of standards. State Grid Corporation has dedicated over $100 billion to developing smart grid technology[23] and improving the quality of meters, which are currently much lower than that of meters in the EU or US[24].

The following chart shows that China is poised to leap ahead of all competition in smart grid deployment, with 320 million meters by 2030.

Chart 3: Smart Grid Prospects in the US, EU & China *(in millions)*



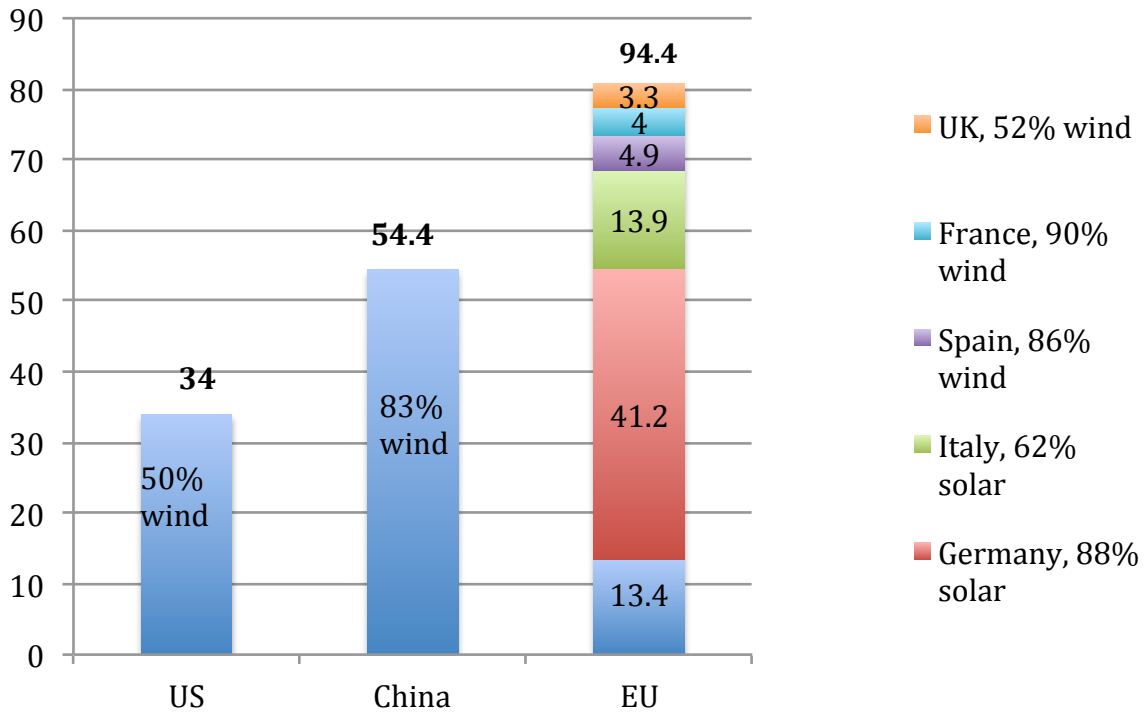
Source: European Commission, JRC, Institute for Energy, GSGF, Pike Research

Concluding Prospects

In comparing different energy policies and goals, how can one assess which country has it right? One way is to look at where private clean energy investment is going, because this is ultimately what countries are going to need to sustain their clean energy efforts. The chart below shows that the EU as a whole is attracting the most private investment: $94.4 billion. At a country level, China is the largest recipient at $54.4 billion. The US lags with only $34 billion; Germany alone, which is the size of Montana, is attracting even more: $41.2 billion. Compared with the EU and China, US energy policy is indeed short on both effort and results.

Energy policy deficiencies have clear implications for the development of a globally competitive AFV industry. If those deficiencies are not addressed effectively in the next few years, America's energy policy could become an albatross that weighs heavily on innovators and entrepreneurs in this country.

Private Investment 2010 *(in billions of $)*



Source: Pew Charitable Trusts/ Bloomberg New Energy Finance

Notes & Sources:

[1] For further detail, see Neill Nugent, The Government and Politics of the European Union (New York: Palgrave Macmillan, 2010).

[2] Jan Frederik Braun, "EU Energy Policy under the Treaty of Lisbon Rules: Between a new policy and business as usual," European Policy Institutes Network Working Paper, No. 31, February 2011, p.2.

[3] Ibid., p. 9

[4] Treaty on the Functioning of the European Union, Article 194. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2008:115:0047:0199:en:PDF

[5] For further detail, see Michael F. Martin, "Understanding China's Political System," Congressional Research Service, April 2010.

[6] Haibing Ma, "Can China Do a Better Job Delegating Its 2015 Energy and Emissions Targets?", Worldwatch Institute Climate and Energy Blog, 14 January 2011. Available at: http://blogs.worldwatch.org/revolt/can-china-do-a-better-job-delegating-its-2015-energy-and-emissions-targets/

[7] The rationale for the dissolution was the ministry's inefficient coordination. Coordination was subsequently left to the numerous energy-related ministries was left to the State Economic and Trade Commission, State Development and Planning Commission, and Ministry of Science and Technology. See Jimin Zhao, "Reform of China's Energy Institutions and Policies: Historical Evolution and Current Challenges", Belfer Center for Science and International Affairs, Discussion Paper 2001-20, Energy Technology Innovation Project, Kennedy School of Government, Harvard University, p. 7.

[8] Zhiyue Bo, "China's New National Energy Commission: Policy Implications", Energy Associates International Background Brief No. 504, 4 February 2010.

[9] KPMG China, "China's 12th Five-Year Plan: Energy", April 2011.

[10] European Commission, Communication from the Commission to the European Parliament and the Council, "Renewable Energy: Progressing towards the 2020 target", 2011, p. 3.

[11] Ibid., p. 12.

[12] "MEPs to reopen binding 2020 EU energy efficiency target debate", Platts, 7 October 2011.

[13] Barbara Finamore, "China Renews its Commitment to Renewable Energy", NRDC Switchboard Blog, 1 February 2010. Available at: http://switchboard.nrdc.org/blogs/bfinamore/china_renews_its_commitment_to.html

[14] Eric Martinot and Li Junfeng, "Renewable Energy Policy Update for China", Renewable Energy World, 21 July 2010. Available at: http://www.renewableenergyworld.com/rea/news/article/2010/07/renewable-energy-policy-update-for-china

[15] Ibid.

[16] Adrian Booth, Nuri Demirdoven, and Humayun Tai, "The Smart Grid Opportunity for Solutions Providers," McKinsey, Summer 2010.

[17] "Power to the European Market", The Economist, 11 November 2010.

[18] Siobhan Hall, "EU's new energy market reforms kick in," Platts Guide: EU Third Energy Package, 3 March 2011.

[19] Ibid.

[20] David Xu, Michael Wang, Claudia Wu, and Kevin Chan, "Evolution of the Smart Grid in China," McKinsey, Summer 2010, p. 18.

[21] "China – energy transmission is key to industrial transformation," Independent Power Asia, June 2010, p. 17.

[22] "Smart Grid projects in Europe: lessons learned and current developments," JRC Reference Report, European Commission, 2011.

[23] Ibid., p. 13.

[24] Adrian Booth, Nuri Demirdoven, and Humayun Tai, "The Smart Grid Opportunity for Solutions Providers," McKinsey, Summer 2010, p. 49.

Vehicle Review

VOLT vs. LEAF

VEHICLE TYPE

The Volt and Leaf reflect their companies' different visions of what consumers expect and need electric vehicles to deliver. GM's priority is to eliminate the problem of range anxiety. Its extended range electric vehicle achieves this by offering the same range as a conventional gasoline car and the ability to entirely run the car on gasoline. Nissan's priority is to pioneer the first mass-market all-electric car. The Leaf's battery has a greater range than the Volt and covers the average daily driving range of most Americans. The idea is that the consumer will start treating the vehicle as any other electronic device that needs to be charged the end of the day. For a consumer who drives more than 100 miles a day on a regular basis and/or cannot easily charge a vehicle at home or work, the Volt is the better pick. Consumers with average commutes and/or second cars, and green purists will want to take a closer look at the Leaf. Each model's winning features are highlighted in green in the following sections.

	Volt	***Leaf***
EV Type	Extended-Range Electric Vehicle (EREV)	Battery Electric Vehicle (BEV)
Total Range[1]	375 miles	73 miles
All-Electric Range	35 miles	EPA rating: 73 Spectrum: 62 – 138
Mpg Equivalent	93 in all-electric 37 in regular mode	99

PRICING

The Volt's hybrid approach comes with a hefty price premium. Neither is GM making a profit on these cars, nor will consumers make up for the higher price in lower costs of ownership over the average 6-year vehicle lifespan. The Leaf is also significantly more expensive than its conventional equivalent, but consumers will be able to recoup the extra cost through gasoline savings within six years. The $7,500 federal tax break for electric vehicles make the prices much more competitive. Below the full prices are listed. Again, GM and Nissan adopted different pricing strategies. GM pared down some of the Volt's features to bring the price of the 2012 model down by more than $1,000, while Nissan standardized some of the extra features and increased the price of its 2012 model by over $2,500.

	Volt	***Leaf***
Price 2011 / 2012	$40,280 / $39,145[2]	SV[3] $32,780 / $35,200 SL[4] $33,720 / $37,250
Lease 2011 / 2012	$2,500 down $350 for 36 months / $399	$1,999 / $2,599 down $350 for 36 months / $409

DRIVETRAIN

The Volt has less battery, but more power than the Leaf. With its 149-horsepower motor with 273 lbs./ft. of torque the Volt can accelerate from 0 to 60 mph in 9 seconds and achieve a top speed of 100 mph. It also features a sports mode for better acceleration and a mountain mode for steep inclines. The Leaf's only alternate mode is eco, which makes the car feel more sluggish but improves efficiency by around 10%. The Leaf's 104-horsepower motor with 207 lbs./ft. of torque allows for acceleration to 60 mph is 10 seconds and a top speed of 90 mph. Both cars have regenerative braking and low-rolling resistance tires. Both also offer a 100,000 mile or 8 year warranty on the battery.

	Volt	***Leaf***
Battery pack	16 kWh lithium ion battery pack	24 kWh lithium-ion-manganese-graphite
Battery warranty	100,000 miles / 8 years	100,000 miles / 8years
Motor	AC synchronous electric motor/generator 111kW/149-horsepower @ 4800 rpm 273 lb.-ft. of torque @ 0-4800 rpm	80 KW AC synchronous electric motor 107-horsepower @ 2,730-9,800 rpm 207 lb-ft of torque @ 0 – 2,730 rpm
Top speed	100 mph	90 mph
	0-60 in 9 seconds	0-60 in 10 seconds
Additional Driving Modes	Sport: for acceleration Mountain: for inclines	Eco: more efficiency
Regenerative braking	Yes	Yes
Tires	17-inch Goodyear Fuel Max low-rolling resistance lightweight wheels	16 inch Bridgestone Ecopia P205/55R16 low-rolling resistance tires

CHARGING

The Volt's battery is able to connect to level 1 and level 2 chargers. The latter is able to fully charge the battery in 4 hours, versus 7 hours for the Leaf. However, the Leaf SL is also able to connect to a level-3 charger, which could provide an 80% charge in less than half an hour.

	Volt	***Leaf***
Charger	Left side front Level 1 & Level 2	Front center Level 1, 2 (Level 3 available for SL)
Full charge @ 240V	4 hours	7 hours (< 30 min. with level 3)
Onboard charger	3.3 kW	3.3 kW

EXTERIOR DESIGN

Both the Volt and the Leaf are aerodynamically designed, but the Leaf weighs less and has significantly lower drag than the Volt.

	Volt	***Leaf***
Curb weight	3,781 lbs.	3,366 lbs.
Drag coefficient	0.43	0.29

INTERIOR DESIGN

Although the Volt is larger than the Leaf, its T-shape battery does not allow for a middle back seat. Its backseats are more spacious that the Leaf's backseats, but the Leaf has an extra seat. The Leaf also has an extra 4 cubic feet of cargo space.

	Volt	***Leaf***
Seating	4-passenger hatchback	5-passenger hatchback
Seating room	- Head front 37.8 in/ rear 36.0 in - Hip front 53.7 in / rear 51.2 in - Leg front 42.1 in / rear 34.1 in - Shoulder front 56.5 in / rear 56.5 in	- Head front 41.2 in / rear 37.3 in - Hip front 51.5 in / rear 50 in - Leg front 42.1 in / rear 31.1 in - Shoulder front 54.4 in / rear 52.5 in
Battery location	T-shape	Under rear seats
Cargo volume	10.6 ft^3	14.5 ft^3
Other		Built with recycled materials; 95% of components are recyclable

ELECTRONIC FEATURES

The Volt and Leaf are both electronically advanced, featuring LCD screens that monitor gauges and track distance and driving efficiency. The Leaf allows drivers to set up digital readouts to help them drive more efficiently. Its CARWINGS system also keep track of energy use and compares results with those of other Leaf drivers. Both cars have a smartphone application that can be used to start and stop charging from a distance.

	Volt	***Leaf***
LCD screens	Tracks distance and energy used	Tracks distance and energy used; compares to all other Leaf drivers; eco-encouraging digital readouts
Smartphone application	OnStar & MyLink Battery level, tire pressure, lock doors, AC system, charging rate	CARWINGS State of charge, start/end charge, AC system

SAFETY

The Volt and Leaf have equally excellent safety ratings.

	Volt	*Leaf*
NCAP [5]	5 stars	5 stars
IIHS [6]	2011 Top Safety Pick	2011 Top Safety Pick

RATINGS

The Volt and Leaf are highly-rated and have won numerous awards for technological innovation and overall product design, not only when compared to other hybrids and/or electric cars, but in general automotive industry rankings as well.
The Volt's lower value proposition accounts for its lower KBB score when compared to the Leaf.

	Volt	*Leaf*
Accolades	2011 Motor Trend Car of the Year 2011 Green Car Journal Green Car of the Year North American Car of the Year Ward's Ten Best Engines	2011 World Car of the Year 2011 Kelley Blue Book Top Green Car Popular Mechanics Breakthrough Award Ward's Ten Best Engines
Kelley Blue Book rating	6.5/10	7.1/10

MARKET POSITION

The Volt and Leaf were both launched in small batches and initially only in a few states. In November 2011, GM finished its national rollout; the Volt is now technically available at dealerships in every state. Nissan is accepting reservations in 23 states.
GM and Nissan sold out their 2011 models and have announced plans to ramp up production of their 2012 models. Nissan's decision to start producing Leafs at its plant in Tennessee will help reduce the waiting period between reservations and deliveries.
Volt sales outpaced Leaf sales in October by over 250 vehicles. However, to date the Leaf has outpaced the Volt by close to 3,500 vehicles sold.

	Volt	*Leaf*
Manufacturing base	Detroit	2011 model: Japan 2012 model: Smyrna, Tennessee
Current availability	All states	23 states: Alabama, Arizona, California, Colorado, Connecticut, Florida, Georgia, Hawaii, Illinois, Massachusetts, Maryland, Mississippi, North Carolina, New Hampshire, New Jersey, New York, Oregon, South Carolina, Tennessee, Texas, Virginia, Washington, & Washington, DC
October 2011 U.S. Sales	1,108	849
Total U.S. Sales To Date	5,003	8,500[7]

Notes & Sources:

[1] According to the EPA.

[2] Base price. Additional features available.

[3] The price increase from 2011 to 2012 reflects the standardization of the cold weather package: heaters for battery, mirrors, steering wheel, and seats.

[4] The SL has automatic headlights, fog lights, a rear-view monitor and a solar panel to charge the car's accessory battery.

[5] NHTSA's new car assessment program.

[6] Insurance Institute for Highway Safety.

[7] PluginCars.com, 11/17/11.

Word of the Quarter

SMART GRID

The U.S. power grid is aging, inefficient, vulnerable to outages, and unsuited to the diversification of our energy portfolio. A smart grid would fundamentally transform the grid through *real-time pricing*, greater interactivity between energy providers and consumers, and decentralization.

On the consumer side, *AMI* would empower consumers through smart home devices that integrate price signals into their home's energy-using systems, appliances and electronics. The smart devices would automatically modify energy use according to consumers' preferences.

Meanwhile, visualization would provide utilities with real-time information on end-use, weather conditions and other relevant information at the micro level. As a result, utilities could better manage their power to instantaneously balance supply in response to changes in demand and thus reduce the need for high-cost *peaking plants*. Overloads and outages would be more preventable. If a blackout occurred, the utility would instantly know who was affected down to the single household, and in the event that it was unable to quickly restore power communities could still draw on distributed power resources to keep essential appliances, buildings, and services powered via *islanding*.

A smart grid would facilitate the decentralized integration of plug-in vehicles and renewable energy sources. With regard to the former, the Pacific Northwest National Laboratory has calculated that if our nation's entire light-vehicle fleet were to electrify, current U.S. electricity production would already suffice to power close to three quarters of the fleet if vehicles were plugged in at night. During the day, parked electric vehicles could store power that EV owners would be able to sell back to the grid to help utilities meet peak demand. This two-way communication between EV owners and utilities would require a smart grid *V2G* technology using smart chargers.

The National Institute of Standards and Technology (NIST) has been tasked with developing common standards for Smart Grid technologies.

Full AFV glossary in English and Mandarin available in **AFVInsider** online edition.

Trivia of the Quarter

How much does the US spend on imported oil every day?

Look for the answer in the next issue.

Calendar

AFV Events from Around the World

EVENT NAME	DATE AND LOCATION	HOSTED BY	LINK
Charging Infrastructure EV and Grid Integration 2012	January 18 – 19 London, United Kingdom	London Business Conferences	http://www.ev-charging-infrastructure-2012.com/
Advanced Automotive Battery Conference 2012	February 6 – 10 Orlando, Florida	AABC	http://www.advancedautobat.com/conferences/automotive-battery-conference-2012/index.html
Electric Vehicles: Understanding the Rise of EMobility	February 13 – 14 London, United Kingdom	SMI	http://www.smi-online.co.uk/events/overview.asp?is=5&ref=3715
Battery Japan 2012	February 29 – March 2 Tokyo, Japan	Reed Exhibitions Japan	http://www.batteryjapan.jp/en/
Electric Vehicles Land, Sea and Air USA 2012	March 27 – 28 San Jose, California	IDTechEx	http://www.idtechex.com/electric-vehicles-usa-12/ev.asp
EVS26	May 6 – 9 Los Angeles, California	EDTA	http://events.ntpshow.com/evs26/public/enter.aspx
Advanced Automotive Battery Conference Europe	June 18 – 22 Mainz, Germany	AABC	http://www.advancedautobat.com/conferences/automotive-battery-conference-Europe-2012/index.html

NEXT IN AFVINSIDER

Next issue for Spring 2012 will be out in March. Upcoming issues will focus on:

- EV **safety** issues
- **BYD**
- State & local **mandates**

Subscribers receive the AFV Insider published a minimum of four times per year. In addition, premium subscribers have access to the extensive and continuously updated database on alternative fuel vehicles at www.afvinsder.com.

SUBSCRIBE TODAY!

☐ I want to subscribe to AFV Insider at the special introductory price of US $295. That entitles me to:

- Four quarterly issues of the *Insider*
- Option to receive issues via e-mail
- Access to AFV Insider blog

☐ I want to become a premium subscriber at the special introductory price of US $650. That entitles me to:

- Four quarterly issues of the *Insider*
- Option to receive issues via e-mail
- Special alerts to major developments for 12 months
- Access to AFV Insider blog
- Unlimited access to AFV Insider website for 12 months – exclusive analytical reports, company profiles, industry data, original and translated documents, and other research tools relating to the global AFV sector; updated weekly

☐ My organization needs to arrange multiple subscriptions. Please contact us to make special arrangements.

Orders may be placed on our website, www.afvinsider.com

For more information on ad placements, contact us at ads@afvinsider.com

PUBLISHER'S INFORMATION

AFV Insider is a publication of International Advisory Services Group, Ltd.

AFVINSIDER STAFF

Charles Blum
Publisher
charlieblum@afvinsider.com

Carolyn Amon
Editor in Chief
carolynamon@afvinsider.com

Donna Tung
Managing Editor
donnatung@afvinsider.com

Contributors
Jingzhou Meng
Amitai Bick Raziel
Shuwen Zhou

Subscription
(1) 202 642 5186 or via mail at:

700 12th Street, Suite 700
Washington, DC 20005

or via email at:
www.afvinsider.com

Regular subscription price:
$395 (publication only)
$750 (premium)

Special introductory price:
$295 (publication only)
$650 (premium)