



## May 2007 TREND EVENTS

### Long Ranger: EESor's EV Ultra-Capacitor

#### *A replacement for electric cars' lithium-ion batteries?*

By Dave Chameides

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Just about anyone who has ever considered buying an electric vehicle (EV) and then decided against it cites one fact — and one fact alone — that caused them to rethink the idea. Range. The inability to drive long distances without enduring a five- or six-hour "refuel" has kept many of us out of the EV market. EESor, a privately held Cedar Park, Texas, company dedicated to the design and manufacturing of high-density storage devices, has taken a major step forward in eradicating this problem.

Those long charging times result from the fact that most EV power systems rely on lithium-ion batteries, which take time to charge. Quick-charging the packs is possible, but this will result in shorter battery life. Neither way works well for the consumer. So the folks at EESor decided to turn away from traditional battery systems and look toward capacitors, power storage devices that rely on two charged terminals separated by a non-conductive material called a dielectric.

There has been speculation all over the Web these past few months that EESor had finally "cracked the code" and created an ultra-capacitor that is better than a lithium-ion battery cell in almost every way. It seems that the company has finally done so: On January 17 EESor announced third-party verification of the dielectric powders needed to make these capacitors.

"This is a very meaningful milestone in terms of production of an ultra-capacitor for use in electric vehicles," noted Ian Clifford, CEO and founder of Zenn Motor Company. Zenn is an electric vehicle producer that holds exclusive rights to use this new technology in vehicles up to 2,645 pounds curb weight, roughly the same as a Honda Accord or Toyota Prius. "It will allow for the commercialization of high-range, high-speed vehicles for mass production," he said, finally making these cars a reality for the general public.

Clifford pointed out that there are presently more than 40 million cars worldwide that fit this weight specification, so the potential uses for this technology are huge. Zenn expects to receive the first capacitor units by the end of the year and will have them in its NEVs (Neighborhood Electric Vehicle, meant for around-town driving) by the middle of next year. Zenn is also developing a vehicle using the new capacitors that will be capable of highway speeds and meets all highway safety standards. It is actively seeking dealers to partner with throughout North America.

Unlike regular lithium-ion battery cells, the EESor ultra-capacitors, or EESUs as they are called, are lighter, more versatile and can be charged and discharged up to a million times.

"To put this in perspective," says Paul Scott, co-founder of Plug In America, "I drive an electric Toyota RAV4 with a 1,000-pound battery that is capable of holding 27 kWh (kilowatt-hours) of power. I could replace my battery with three EESUs, weighing a total of only 300 pounds, that are capable of holding 45 kWhs of power." The additional power and reduced weight would more than double the vehicle's 120-mile range and it would recharge in a matter of minutes off 220 volts, slightly longer when using household 110 volts.

What's more, the EESU power system would not need to be replaced for well over a million miles. If replacement were to ever occur, the units are fully recyclable, and unlike batteries, contain no environmentally harmful compounds, according to Richard Weir, EESor's president and CEO.

Electric vehicles may have a long way to go in terms of availability and popular acceptance, but with the announcement of EESor's breakthrough, range will no longer be an issue. With this new technology in place, an all-electric vehicle that is simpler, more efficient and less expensive than a comparable gasoline



continent. It would mean that much generating capacity would no longer be needed. Power from solar and wind could be sent anywhere it was needed. A substantial portion of the most inefficient and polluting generation could be dumped. The Midwest has huge wind power potential but no one there needs the power. With a continent transmission system it could be fully utilized.

Solutions to our problems are available but they are not simple and they will take time to construct. People like simple solutions. Sometimes they solutions that look simple create more problems than they solve. Careful consideration is a requirement.

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**NORTHWEST GRID FEELS THE HEAT...** Last summer's heat storm could prove a harbinger of more energy crises by Michael Milstein – The Oregonian – May 20, 2007

Searing heat last summer threatened the Northwest's power supply, just as California drew more electricity than ever. As the temperature soared past 110, a Bonneville Power Administration converter in The Dalles was in danger of shutting down, cutting power to Southern California. As climate change brings milder winters and warmer summers to the Northwest, the region's peak energy usage has switched seasons...

Monday, July 24, the summer of 2006... Temperatures shot toward the upper 90s, far higher than expected. The West Coast burned red on weather maps. Air conditioners strained, gulping electricity like Gatorade. With each degree, demand accelerated... Above the trading desks a screen glowed with more trouble: A Montana coal-fired power plant that supplies PGE sputtered and shut down. In California, broiling transformers exploded like Fourth of July rockets. Power managers there teetering close to blackouts, declared an emergency, seeking precious power from the Northwest's hydroelectric dams. Energy prices spiked nearly fivefold hitting a federal price cap of \$400 per megawatt hour. Some sellers milked the frantic market, demanding \$600... Then, suddenly, nobody had power to sell at any price. For the first time in company history, PGE declared an electrical emergency as it came closer than ever to running out of power to keep lights on.

Two competing forces have put us on course for the same thing to happen again: Rising summer temperatures, on one hand, and growing legions of energy-hungry air conditioners on the other... Our demand for electricity historically peaked in the winter. Now it is rising fastest in summer, when it's in shortest supply. Northwest utilities are aggressively seeking new sources of summer electricity and promoting more conservation. Without that, the Northwest will run short of summer electricity within 10 years – and possibly as few as three, says John Fazio, systems analyst with the Northwest Power and Conservation Council...

Going into that scorching weekend last summer, forecasts predicted the heat wave would let up by Monday. So PGE traders, finishing work on Friday, lined up what should have been plenty of electricity to keep air conditioners humming for their 1.5 million consumers... Nighttime temperatures at the Portland airport Saturday hovered near 74 degrees. Never since record-keeping began had it stayed so warm through the night. Eugene, Medford and Salem all set similar records... Sunday it hit 101 in Portland and 105 in Salem. The heat wave was hanging on... Monday morning at 6:30, Jim Lobdell, PGE's vice president for power operations, held a conference call with his staff. Lights and air conditioning would soon switch on in offices that had baked like ovens through the weekend. Temperatures were heading toward 97, 7 degrees higher than forecast. "It effectively told us we needed a whole other power plant out there that we weren't anticipating," Lobdell says. "And so did everyone else... Utilities across the Northwest scrambled to make up the shortage. "You'd call someone, and they'd say, 'I'm glad you called – you got anything to sell?' "Says David Mills, director of power supply operations at Puget Sound Energy. "You'd say, 'Well, no – we called to buy from you.

A decade or two ago, summer nights turned cooler than they do now. Even if they didn't, fewer air conditioners drained energy from the system. The Northwest never really needed air conditioning; nights brought reliable, cool relief... That set up an elegant West Coast electrical balance. In summer, the Northwest sent extra electricity south to run California's air conditioners. The sales brought in money that helped offset power rates here... In winter, when Oregonians crank their furnaces and space heaters, Northwest power demand peaked. That's when California has energy to share... But now the Northwest's peak power needs are upsetting the balance that worked so well, in 2002, PGE's annual power demand peaked during summer for the first time. The peak came in summer again in 2003 and again 1st year.

Summer peaks should be routine within 15 years, PGE says... Air conditioning drives the trend; Not 20 years ago, fewer than a third of PGE homes had air conditioning. Today, more than two-thirds do. New homes are bigger, and almost everyone is built with air conditioning. And hotter summers like last year's ush more homeowners to add air conditioners.

At a control panel in the Boneville Power Administration's Celilo Converter Station above The Dalles on Friday, July 21, Larry Townsend watched a temperature gauge tick toward disaster... The Celilo station, a vast yard of wiring and transformers the size of U-Haul trucks, feeds one of the nation's largest electricity pipelines. The California-Oregon Intertie carries more than enough electricity to supply Seattle three times over. The power flows south on 1 million-volt wires across 846 miles of Oregon and Nevada desert to Sylmar, Calif., near Los Angeles... Loading that power onto the lines generates tremendous heat. Water flowing through tubes cools the machinery, carrying the heat away... The water continues into a cooling building full of fans which helped dissipate the heat. But on July 21 the outside air was a fiery 113 degrees. The fans couldn't cool the water. Its temperature rose, hitting 120 degrees.

At 126 degrees, the station's multimillion-dollar converters shut down so they don't burn up. That would be like unplugging the extension cord to California, which that same afternoon was drawing more power than ever in the state's history, Streetlights would go dark. Computers would shut off. Hospitals would lose power... Others rushed to Townsend's side. The water hit 122 degrees. Everybody's watching that screen going, 'What in world can we do?'" recalls Dave Potter, a senior substation operator... Potter and co-worker Bob Canavan raced to the cooling building Looking around in the glare, they hit upon a plan: Hook up a fire hose, run it across the rocky yard and spray water onto vents where air enters the cooling building. They tied the hose to a green golf cart, aiming water toward the vents, in the control room, Townsend noticed the temperature had stopped rising. Then, thankfully, it began to drop.

Unusually hot summers have been five times more frequent in the Willamette Valley since 1990 than in the 100 years before, according to the Western Regional Climate Center... Summer nights especially stay warmer, which keeps buildings from venting heat. Air conditioners must turn on earlier and work harder on each subsequent day. In the past decade, night-time summer temperatures in Portland registered about 2 degrees higher on average than 30 years ago, according to data from the Oregon Climate Service... The trend matches the way global warming works. During the day, the sun drives temperature by heating up the planets service. At night, temperatures depend on how quickly the lingering daytime heat dissipates. "The main thing that affects the surface temperature at night is how efficiently it is able to cool," says Alexander Gershunov, a research scientist studying the trends at San Diego's Scripps Institution of Oceanography... But rising levels of carbon dioxide, a greenhouse gas released by burning fossil fuel, trap some of the heat. That warms the atmosphere. The warmer air can ten hold more moisture. The extra moisture also acts as a greenhouse gas. "It's still cooling at night." Gershunov says. "It's just not cooling as much as it used to..." At the same time, winters are warmer, holding power needs down. The Willamette Valley has not had a colder-than-average winter since 1993, the longest run of warm winters on record...

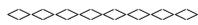
California power officials, and some in the Northwest, say what happened last summer was an unusual weather coincidence unlikely to occur more than once every 80 years. But Danial Cayan, director of the Scripps Climate Research Division warned the California Energy Commission that what is now unusual may become less so. If you believe climate models, he says, in 20 years heat waves will be two to three times more common than now.

Until last July, California's coast cities had never stayed so hot for so long. Nighttime temperatures set records. California's power masters were a push-button away from blocking people out. They asked the BPA for more Northwest Hydropower... Steve Oliver, the BPA's vise president for power supply, had already told the Californians to look for other power. Buy whatever you can, he told them wherever you can... The wind turbines that have sprouted across the West were little help. The high-pressure system making the region a sauna brought wind to a halt... The BPA prepared days ahead of time by moving extra water behind Columbia River dams so they could churn out more hydroelectric power. But the dams operate under federal court orders because of the harm they pose to salmon, limiting the power the dams supply. Judges ordered extra water spilled to help salmon get downstream. Dam operators can shift water to the turbines, generating extra power, only if energy gets scarce enough to put human life at risk... The morning of Monday, July 24, Oliver got on the phone with a team of biologists. It may be time, he said to make that call... But California was not the only place anxious for power. Northwest utilities were in trouble, too. PGE activated backup generators at hospitals and other sites to reduce the strain on its system, but customers drew more and more... It wasn't merely a matter of not enough power. It was also a matter of





this proof of insanity - when you continue to fail in an attempt to do good and expect a different result? The smart money is on he who has the money – Special interests will win, and not we the people! ... Paul C.)



Real Oil Crisis: Documentary available for viewing online: 24 November 2005  
<http://www.abc.net.au/catalyst/stories/s1515141.htm>

Reporter: Jonica Newby - Producer: Greg Swanborough - Researcher: Leonie Hansell

What would happen if the world were to start running out of oil? Conventional wisdom says we've got 30 years, but there's a growing fear amongst petroleum experts it's happening much sooner than we thought – that we are hitting the beginning of the end of oil now. So how soon will the oil run out, and can we stop our economy collapsing when it does? How prepared are we for the real oil crisis?

Transcript... Narration: What would happen if the world started running out of oil?

Jeremy Leggett: It's going to be very difficult to get gasoline for transport. Food is not going to be getting through in enough quantities to the shops,

Narration: Conventional wisdom says that's at least 30 years away. So why does a growing group of petroleum experts believe it's coming within three? - Eric Streitberg: Ah. I think it's happening now frankly. Peter Newman: It gives me nightmares when I think about what we're headed for.

Narration: Are they just scare-mongers or have the rest of us been asleep at the wheel. Are we about to hit the real oil crisis? - Jeremy Leggett: Really when the crisis dawns I think people are going to be looking back in anger... How have we allowed ourselves to get into this mess?

Narration: In just a century, we've allowed our lives to become entirely dependent on cheap oil. Jonica Newby, Reporter: And it's not just that 90% of our transportation is fuelled by oil. This shopping centre is literally full of petroleum products... Look: the fabric in these clothes - petroleum based. These plastics, petroleum based. It takes on average 6 barrels of oil just to bring one cow to market.

Narration: Yet who of us stops to think oil is a finite resource – the lifeblood of our modern world is steadily pouring away. - Jeremy Leggett: We just take it so much for granted that cars drive around, the pumps are always full. I talk to people in financial institutions who are investing on the assumption that oil supplies are going to grow and grow into the 2030's... I hardly ever meet anyone who knows about this problem outside a relatively elite group of whistleblowers inside and around the oil industry.

Narration: Dr Jeremy Leggett is part of an international splinter group of petroleum geologists convinced a tipping point on oil is imminent... This former oil industry insider, now alternative energy advocate, has written a new book outlining the case... It makes startling reading... The most oil ever discovered was way back in 1965.

Narration: This graph traces world oil discoveries... Since 1965, the amount of oil discovered each year has inexorably plunged -despite all our advances in technology. - Jeremy Leggett: The last time we discovered a whole new province was the North Sea in the early 1970's and really you know these days the average size of an oil field that gets discovered is about 50 million barrels. It's nothing, it's a drop in the ocean. We're using 84 million barrels a day... The last year we discovered more oil than we consumed was 1981... We use 2 barrels of oil for every barrel discovered. – Jeremy Leggett: I've been talking to people who I know because of my past in these big oil companies and they tell me there are no more big oil fields left to find.

Narration: So if we've found nearly all the world's oil, how long before it runs out? - Surprisingly, that's not so important. The real question is when will we reach half way - it's known as 'peak oil'. - Jonica Newby, Reporter: So what exactly is peak oil, and why is it so serious? - That's what I'm heading to the west Australian oil fields to find out.

Narration: My guide is a geologist from deep within the oil industry. - Eric Streitberg is managing director of Australian oil company, ARK energy. - He's just decided to go public with his fears. - Eric Streitberg: The

reason I feel strongly about this is that people don't understand the underlying causes of why petrol prices are going up and what the effect that could have on our lives.

Narration: Eric is about to show me what happens when an oil field reaches peak oil. - Eric Streitberg: The oil field was discovered in 2001 and it's now on full production doing about 6000 barrels of oil a day which is about 10% of Western Australia's consumption. - Jonica Newby, Reporter: Wow: 10%.

Narration: When oil is first pumped, it's under pressure and comes out easily - production rises. - But over time, oil pressure drops. Water is pumped in to maintain pressure. At the half way point, it reaches peak oil, and then - Eric Streitberg: We're holding on to peak production at the moment but we'll be going into the inexorable decline of all oil fields very shortly. - Jonica Newby, Reporter: Really, and there's nothing you can do? - Eric Streitberg: No you can slow the decline but you can't stop it.

Narration: To ram home the point, Eric takes me to an oil field which passed peak oil in 1992. - Eric Streitberg: Jonica this is what we are getting out of this old oil well. It's 99% water and 1% oil.

Narration: All oil fields follow the same pattern of rise, peak, then fall - even if they encompass an entire nation.- The US hit peak oil in 1971. The UK with its North Sea oil peaked in 1999. Australia peaked in 2000. - So when will planet earth reach peak oil? - That depends on what's really happening here. The place that provides a quarter of the world's oil... the Middle East. - Jeremy Leggett: These governments have not let anyone in to verify how much oil they have for getting on for a quarter of a century and in the 1980's there were some really suspicious treatment of oil reserves data. Most of the Gulf countries increased their national proved reserves supposedly by in some cases up to double, and then ever since the quoted figures have not gone down very much at all. I don't believe that for a minute.

Narration: The dissident geologists went back to original surveys to estimate total Middle East oil. They added world known reserves, and projections of all future oil to be discovered. - That's how they calculated the world will reach peak oil in the next 3 years - if we're not there already. - Jeremy Leggett: 2008 maybe 2009, certainly no later than 2010. That's the point at which we will no longer be living in a world with growing supplies of generally cheap oil but instead living in a world of rapidly shrinking supplies of ever vastly more expensive oil and that point of realisation is going to come as a real shock. - Then we will see world record oil prices. Who knows how high they can go.

Narration: So what does the mainstream think? - The world's largest petroleum company is ExxonMobil - Esso. It employs 20,000 scientists to generate their own exhaustive data sets. - In their Melbourne 3D seismography room, I meet head of exploration, geologist Dr Doug Schwebel. - Doug Schwebel: OK this is a 3 dimensional image of the geology offshore Bass Strait in Victoria.

Narration: Doug acknowledges oil will run down eventually, he just vigorously disputes when. - Doug Schwebel: Well people have been predicting for over a hundred years that we're going to run out of oil. It hasn't happened. We don't think it's going to happen in the near term.

Narration: Exxon calculates twice as much oil left in the world as the so called 'early peakers' - placing peak oil decades away. - Doug Schwebel: I mean we're talking at least out to 2030 with what we know today. And then potentially another 20 - 30 years beyond that with technologies that we can envisage might exist. You know if we can improve technology by only 10% then we can recover an additional 600 - 800 billion barrels of oil.

Narration: If this majority view is correct, we have plenty of time for a smooth, market driven transition to alternatives via hybrid cars. - Cruising in the balm of this reassuring future, it's tempting to dismiss the 'early peak' camp entirely, as a small bunch of vested interest dooms-dayers. But it's not that easy. Petroleum giant Chevron is now running these startling advertisements. - And here in Australia, some surprising people have come out in the early peak camp... Earlier this year, Eric Streitberg asked an extraordinary question at the Australian Petroleum Production and Exploration Association conference.

Eric Streitberg: I asked them to put up their hands if they thought that we had reached peak oil. Fifty percent of the people in the audience put up their hand saying that they believe we're at peak oil and these are practicing petroleum industry professionals.

Narration: So what if they're right? - This is what the early peak camp are terrified of - an apocalyptic gulf between dwindling supply and rising demand from the voracious east. - Jeremy Leggett: It's panic that



