Graphene: The Renewable Energy Solution

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NEW YORK (TheStreet) -- Companies from **Tesla Motors** (TSLA) to **Boeing** (BA) to **First Solar** (FSLR) have one big problem in common.

Batteries.

Lithium ion batteries are heavy, as Tesla has found, and have limited range. They can catch fire, as Boeing has found with its Dreamliners. The capacity is limited, which is why utilities will only take some of the power a First Solar solar installation provides.

Capacitors charge up quickly, and they can be made safely, but as *GigaOm's* Josie Gartwhite wrote back in 2011, they are short on capacity. They're a small bucket with a big spout. But what if you could make a big bucket capacitor, and have it discharge slowly?

The answer is graphene. It's a one-atom sheet of carbon, each atom fully connected to four neighbors. The structure is like the Buckyballs that won a Nobel Prize in Chemistry back in 1996 for my wife's chemistry lab teacher, Robert Curl (along with the late Richard Smalley and Harry Kroto.)

When the structure is open at both ends it becomes a carbon nanotube, or Buckytube. Flatten it like paper and it's graphene. Two British scientists won the 2010 Physics Nobel for their studies of graphene's properties.

One problem with Buckyballs and carbon nanotubes is they're hard to make. But researchers at UCLA recently found a way to make graphene with a simple DVD burner, as *Extremetech.com* notes, like the one in that old PC you may have thrown out last week.

Even graphene's ability to hold a charge can be limited. But Rice professor Jim Tour has found a way to mount nanotubes on a sheet of graphene, creating a cheap material with a surface area of over 2,000 square meters per gram. That can store a lot of electricity.

To turn graphene into a capacitor you take two graphene sheets and place a polymer electrolyte between them, then cover it with plastic insulator as you would a wire. The result is thin, flexible, has more than 17 times the conductivity of other materials, and it won't degrade even after cycling through 10,000 charges, according to *Cleantechnica.com*.

Combine easy manufacture with high capacity and you have an elegant solution to the electricity storage problem. A graphene capacitor recharges quickly but lasts for years. A high-capacity graphene capacitor would take an electric car a very long way, and power up in the time it takes to order a cup of coffee. Since it's just carbon, it would be safe on the airplane. Scale it up and you have a grid storage solution.

The science is done. What's left is engineering, including financial and legal engineering, so these findings can get into mass production in the shortest possible time.

That will be difficult given the present patent system. Patent holders, even universities, have a habit of holding onto patent rights like Rod Blagojevich holding a Senate appointment. Egos and greed can get in the way.

But we don't have time for this. The future of renewable energy can't wait. These discoveries need to be broadly licensed, quickly, so that high-capacity graphene capacitors get into the market as soon as possible. Challenges like this are what America does best.

Imagine an electric car that can go hundreds of miles on a charge, and that recharges in minutes. Imagine a solar power installation that can hold its power until the grid needs it. Imagine an airplane that really is lighter, and whose primary functions run on electricity?

Now stop imagining.