

Third Quarter 2014

Quote of the Quarter

“I think people self-limit more than they realize. The number one thing people should do is they should just try to innovate.” – Elon Musk

In other words, believe in yourself and go for it.

Giant Leaps for Mankind

As the third quarter draws to a close, we wanted to briefly highlight a few recent events.

2014 World Energy Innovation Forum

We recently attended the 2014 WEIF, which was held at Tesla’s sprawling, high tech manufacturing plant in Fremont, CA. Elon Musk of Tesla, Lyndon Rive of Solar City, Jeff Immelt of GE and former Secretary of Energy Steve Chu were speakers, among many others. Solar power was often the focal point, although wind turbines, electric cars and energy efficient buildings were also common themes. The speakers highlighted the many technological triumphs in these areas. Over the course of the first day, it became clear that the best and brightest entrepreneurs have turned their attention to breaking through the next big barrier in renewable energy: cheap, efficient and scalable energy storage solutions. Nearly every speaker described some recent advancement in energy storage or announced research or prototyping efforts in various storage subsectors—next gen lithium-based batteries, flow batteries, ultracapacitors, molten salt, etc. Now that solar and wind power can produce electricity for roughly the same cost as fossil fuels, we need to be able to store it and time shift it so it can be used as baseload power.

Improvements in batteries’ cost, energy density and life cycles are a keen focus of Tesla. As many of you know, Tesla is starting to build its first large scale production facility for lithium ion batteries, a \$5 billion effort dubbed the Gigafactory. Musk expects economies of scale to drive down battery costs by at least 30% and that the demand for such batteries is going to grow exponentially. Output from one Gigafactory will be enough to supply 500,000 cars annually, a fraction of the 83 million cars sold globally in 2013. Musk envisions the need for 200 more factories in the near future for cars and grid storage. Lyndon Rive of Solar City agreed. Solar City will buy batteries from this facility for its solar PV projects.

A few factoids, stats and quotes from the conference:

- 92% of all new energy generation in Q1 2014 was renewable.
- China’s recent “airpocalypse” really got the attention of the Chinese government and they have further increased their already huge efforts in electric cars, solar/wind/hydro electricity generation and pollution controls.
- The first LEDs cost \$50/chip to manufacture; today they cost \$0.001/chip.
- Solar PV panels and wind turbines can now create electricity for about 4-5 cents/kwh at the point of generation. The cost of solar power will drop to 3 cents/kwh very soon due to further reductions in production, financing and installation costs and additional photon-to-electron conversion efficiency improvements.
- While wind power has been bankable for a long time, solar has recently become so. This has dramatically decreased the cost of installing solar, further broadening its appeal and adoption.
- Energy storage will commonly be installed alongside solar and wind installations in five years. There are still various technologies vying to be the winner; one needs to emerge so everyone can get behind it and drive down costs. Sun Edison’s CEO specifically named Imergy (one of our portfolio companies) as a potential winner. GE is already putting 15 minutes worth of energy storage in its wind turbines to smooth out intermittency caused by wind speed variations. Sun Ed is testing a

combined solar/storage system to provide 24/7 power. \$100/kwh is the price point at which storage becomes ubiquitous at utility scale.

- Chinese solar panels cost \$0.60/watt. Importing that panel into the USA increases the price by 25% due to import tariffs.
- Building codes, multiple inspections and administrative hassles with utilities and local government doubles the installation cost for US-residential solar projects compared to Germany (\$5/watt installed USA; \$2.50/watt installed Germany). Solar City is working to streamline the process in the states in which it operates.
- 60% of USA energy usage is wasted or unintended due to poorly designed systems—grid, internal combustion engines and buildings.
- Five new efficiency records for solar panel technologies have been set in recent months, including a very exciting “new” material called perovskite. Perovskite was discovered in the late 1800s but has only been used in solar cells since 2009. Initial perovskite cells were just 3.8% efficient. Five years later, they are already 18% efficient; equal to the average efficiency of all panels sold today. For reference, Sun Power, the industry leader in efficiency, has optimized its monocrystalline silicon cells for 29 years to get to 21.5% efficiency. Perovskite has a theoretical maximum efficiency of 31% vs. 29-30% for silicon.

Final note: I previously had driven the Tesla Roadster and Fisker Karma, among other electric and hybrid cars. At WEIF, I finally drove a Tesla Model S. The car was incredibly fast down the straightaways and well-mannered in the corners. Elon Musk said electric cars are clearly the future of personal transportation and I have to agree. He went on to say, basically, that you currently think your gasoline powered car is pretty good. But the center of gravity is very high and the heavy engine is in the front of the car– it is the automotive equivalent of a bobblehead doll. Once you drive an electric car, with the instant torque and lower center of gravity, you realize your fondness for gasoline cars has evaporated. Placing the battery pack down low and in the center of the car puts Newton on Tesla’s side and Sir Isaac is a powerful ally in the car business! – SB



From top: Elon Musk / Tesla speaking at the WEIF event, Scott Barrington / North Sky Capital at the Tesla manufacturing facility; Tesla parking lot with solar powered charging stations

Space Taxis / Mission to Mars

North Sky Capital portfolio company SpaceX was just awarded a \$2.6 billion NASA contract to build and operate space taxis. SpaceX's Dragon capsule can hold up to seven astronauts and will be used to shuttle astronauts back and forth from earth to the International Space Station. Currently, the USA relies on Russia for this service (at a cost of \$70 million per astronaut). Boeing was also awarded a related contract. SpaceX's ISS shuttle service begins in 2017, but its long-term goal remains a shuttle service to Mars.

Self-driving Cars

We are excited that North Sky Capital portfolio company GeoDigital is partnering with a major automotive OEM to offer a hands-free driving experience. Using LiDAR technology, GeoDigital will provide extraordinarily accurate digital maps of roads and highways throughout the USA. These maps will be "read" by onboard computers and coupled with visual data from car-mounted cameras in order to steer the car along its route. The first model will be available for purchase in late 2016.

3D Printing Prediction Update

In our Q2 2013 market commentary, [A Fascinating Intersection](#), we discussed robots and 3D printing, among other tech advances. As a follow-up, we wanted to report that one of our predictions has already come true, the "printing" of a car. Over the Sept 13-14 weekend, Local Motors printed a car at the International Manufacturing Technology Show in Chicago. It took 44 hours using 3D printing technology to print and assemble this car. The car features an electric powertrain and a handful of parts made from traditional manufacturers such as tires, suspension and headlights. The real breakthrough is in shortening the design-to-production timeframe for new cars, significantly reducing the time and expense of retooling a traditional car manufacturing line. Eventually, 3D printing could allow you to design and print your own car (provided the regulators don't get in the way). Pictured below are John Rogers, co-founder / CEO of Local Motors and Doug Woods, President of the Association for Manufacturing Technology. The car was fully operational and driven around the show.



Impact Report

We have now posted our [2014 Impact Report](#) to our website and encourage you to check it out. In addition to previous private equity investments, several of the infrastructure projects from Alliance Fund I are shown starting on page 14.

Upcoming Events

We are regular speakers and attendees at key industry conferences. We hope to see you at these upcoming conferences:

September 22-24 **National Coordinating Committee for Multiemployer Plans**
Hollywood, FL www.nccmp.org

October 12-14 **International Foundation of Employee Benefit Plans Conference**
Boston, MA www.ifebp.org

November 9-11 **SRI Conference 2014**
Colorado Springs, CO www.sriconference.com

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