

INDIA NEEDS A MASSIVE "SOLAR ROOFTOP WITH STORAGE" AND "ELECTRIC VEHICLES" TO BRING GREEN ENERGY REVOLUTION

By Darshan Goswami

India has made a remarkable transformation in Renewable Energy in a very short time. However, the huge potential for solar energy is not being realized at a desirable faster pace to benefit home owners and India.

Solar Rooftop technology is a proven technology and significant power is being generated worldwide via Solar Rooftop. The Ministry of Power, Government of India has set aggressive targets for 40 GW of power from rooftop solar by 2022. But India is lacking exponential growth in rooftop solar power plants using residential, small and large commercial photovoltaic (PV) installations and Energy Storage to meet these goals. To create this accelerated exponential growth, India need new policies beyond the current programs to provide grassroots solar energy for home owners to own mini solar power plants at their roof or back yards to benefit the country. At present, the policies/regulations at most of the places in India are not supporting of solar rooftop exporting the power back to the grid. We must immediately develop regulations for export of power and net metering from rooftop solar nationwide. India can facilitate this growth by large-scale deployment of 100 million solar roofs with storage, solar co-operatives, and solar cities, etc.

India also need to install a solar rooftop system that will accommodate the demands of an Electric Vehicles (EV) charging. Electric car technology, including batteries and charging systems, has been moving ahead by leaps and bounds, and retail prices have come down within price range of the average consumer. In fact, the affordable battery storage has already arrived in the market (e.g., Tesla's 100 kWh 507 km range battery for EV). Now these batteries can also be used to store solar power for the grid. This can be a win/win situation for home and business owners for years to come. Here are 2 examples:

1. TESLA UNVEILS ELECTRIC-CAR BATTERY (100 kilowatt-hour battery) WITH A 315-Mile (507 KM) RANGE:

Tesla Motors Inc. will sell a battery capable of taking an electric car 315 miles (507 Kilometers) on a single charge. The company will begin selling its Model S sedan and Model X SUV with a 100 kilowatt-hour battery.

<http://www.msn.com/en-us/money/companies/tesla-unveils-electric-car-battery-with-a-315-mile-range/ar-BBvYakV?li=AA4Zjn&ocid=spartandhp>

2. PLUGLESS WIRELESS TESLA ELECTRIC CAR CHARGER IN ACTION (VIDEO) - For Tesla Model S

http://cleantechnica.com/2016/08/19/plugless-wireless-tesla-charger-action-video/?utm_source=EV+News&utm_campaign=e6406d3985-RSS_EMAIL_CAMPAIGN&utm_medium=email&utm_term=0_d002dfc067-e6406d3985-331984261

In addition, we need to adopt nationwide charging of electric cars from solar panels on roofs and solar-powered EV charging stations all over India. Thousands of these solar-powered recharging stations could be spread across India just like the public call office (PCO) about 15 years ago, giving birth to a “**Green Revolution.**” These recharging connections could be deployed at highly-concentrated areas including shopping malls, motels, restaurants, and public places where vehicles are usually parked for short and extended periods all over India.

Proposed “ACTION PLAN” For "Solar Roof-Top with Storage" and "Electric Vehicles" in India:

1. Provide short term incentives to kick start Renewable Energy for 100 million Solar Rooftops with Home Energy Storage Battery like Tesla Power Wall, etc. Develop National Renewable Energy (RE) Policy - Enact and deploy a comprehensive new energy roadmap or innovative RE policies (e.g., PPAs, Net Metering, FIT, etc.) without delay. In addition, set National Renewable Energy Standards/Policy such as 20 percent by 2020, 40 percent by 2030 and 100 percent by 2050 — to create demand, new industries and innovation, and a new wave of green jobs.

2. Electrifying Transportation - Expedite a move to electrify transportation by encouraging expanded use of Electric Vehicles (EV) and plug-in hybrids, and deployment of solar-powered EV charging stations around the country. Develop and implement time-of-day pricing to encourage charging of vehicles at night and other times when peak demand is low. In addition, launch the public transportation system of the future with "zero-emission" battery-powered Electric Buses (like

CHINA is doing in their country) in all major cities to reduce air pollution, reverse climate change and global warming. India must make a massive shift that will lead to widespread adoption of EVs in the next 5 to 7 years.

3. Decentralized Energy – Avoid future fossil fuel investments in India and, instead, emphasize nationwide deployment of community scale solar projects (installing 100 million solar roofs, solar co-operatives, and solar cities, etc.) and micro-grids with storage. India’s present 40GW solar target should be extended to include photovoltaic panels on the rooftop of every home in India, generating enough power to reduce the country’s massive dependence on fossil fuels.

4. Develop Energy Storage including thermal, grid battery storage, compressed air/gas, vehicles-to-grid/home, pumped hydro, fuel cells or hydrogen (H₂ - produced from renewable energy only), flywheels, superconducting magnets and super capacitors. Develop a “**Hydrogen Economy**” plan. If done successfully, Hydrogen and Electricity will eventually become society’s primary energy carriers for the twenty-first century.

5. Solar Roadways - India should also take advantage of the vast, network of roads across India and the sun that beats down on them and turn them into energy-creating solar super highways. The idea of solar panel roads is to replace traditional asphalt roads with glass based "**solar panels that you can drive on**" in a bid to turn roads into sources of renewable energy.



Courtesy: Solar Cities



Courtesy: BYD Chinese EV Bus



Courtesy: Tesla Home Energy Storage



Courtesy: Tesla EV Charging System Courtesy: Solar Roadways Highway
Courtesy: Solar Roadways Parking Lot

Solar is the next big thing for India. India's future lies in Solar Energy. India must put its growth prospects in the hands of distributed generation, including solar, storage, and micro-grids. India is endowed with abundant free solar energy. Using the country's deserts and farm land and taking advantage of 300 to 330 sunny days a year, India could easily generate 5,000 trillion kilowatt-hours of solar energy. In other words, India could easily install around 1,000 GW of solar generation — equivalent to four times the current peak power demand (about 250 GW) — using just 0.5% of its land.

Solar energy provides a golden opportunity for India to move toward a 100 percent clean energy future. Solar energy has the potential to re-energize India's economy by creating millions of new jobs, achieve energy independence and reduce the chronic trade deficit. It offers India a golden opportunity to solve three huge problems — reducing poverty, ensuring energy security and combating climate change. Solar energy can propel India forward as a “**Solar Super Power.**”

However, for India to meet its future energy needs, it can no longer afford to delay massive deployment of solar energy.



Darshan Goswami has more than 40 years of experience in the energy field. He worked as a Project Manager for Renewable Energy, Micro-grid and Smart Grid projects at the United States Department of Energy (DOE) in Pittsburgh. Earlier, he was a Chief of Renewable Energy at the United States Department of Agriculture (USDA) in Washington, DC. Mr. Goswami is a registered professional electrical engineer with a passion and commitment to promote, develop and deploy renewable energy resources and the hydrogen economy. In dedication to his life serving humanity and poor people, the author supports: **India Foundation for Children Education and Care, Inc.** (<http://www.ifcare.org/>).