THE CASE FOR A RENEWABLE ENERGY TRANSITION IN NEW JERSEY

by

NJ FREE
(New Jersey for Renewable Energy and Efficiency)

Introduction

NJ FREE is a broad-based coalition of organizations and individuals committed to the transition of New Jersey's energy economy from a fossil fuel-based system to one based on renewable energy. NJ FREE seeks the adoption of a requirement for 80% renewable electricity by 2050, with an intermediate requirement of 30% renewable electricity by 2025. It also seeks a requirement that the total electric usage in New Jersey be reduced by 20% by 2025 relative to 2012 usage, and be reduced by 30% by 2050 relative to 2012 usage. In considering such an important and wide-reaching change, several questions must be addressed. Such questions are discussed below.

Is 80% Renewable Electricity by 2050 feasible?

This question is already being answered in the real world. Many European countries have already adopted requirements that are as ambitious or even more so. Denmark's goal is 80% of *overall* energy by 2050. The Nordic countries (Denmark, Sweden, Norway, Finland, and Iceland) as a group had already surpassed 63% renewable electricity by 2012. It is true that the Nordic countries are blessed with rich natural resources that make their renewable energy transition easier than for some other countries. Germany, on the other hand, has a much lower solar resource than New Jersey (New Jersey's solar resource is roughly 38% better than Germany's), and America's fleet of wind generators is 60% more productive per megawatt of installed capacity than Germany's fleet. Even so, Germany has adopted a requirement of 80% renewable electricity by 2050 and 30% by 2025. Furthermore, it is well ahead of schedule, achieving 26% renewable electricity in the first half of 2012. With a peak national power load of 80 GW, it boasts 32 GW of installed solar capacity and 30 GW of wind[1], plus significant biomass and hydro capacity.

Germany's rapid transition toward renewables and equally rapid phase-out of nuclear power has not hurt its economy. According to the country's top economic research institutions, Germany's "Renewable Energy Transformation" has been a net benefit to the economy, and has created 370,000 new jobs. Indeed Germany, the world's largest exporter and its fourth-largest economy overall, remains by far the strongest economy in Europe.

The large amounts of intermittent renewables (solar and wind) connected to the grid have not damaged the reliability of Germany's electric power grid, either. In 2011 it set a new record low for the System Average Interruption Duration Index (SAIDI). At below 15, it was the lowest in Europe and less than half as high as most other European countries. *In the U.S. for 2011, the nationwide SAIDI was 244*. Germany accomplished this feat without large-scale infrastructure upgrades or massive new electric storage resources to handle the intermittent renewables. It did it primarily by using careful data gathering, prediction, and grid management practices. This experience indicates that the cost of infrastructure upgrades to handle high-penetration renewables may be substantially lower than was previously thought.

[1] 1 GW (one gigawatt) is equal to the output of a nuclear power plant or a large coal-fired power plant.

Why now?

New Jersey has arrived at a time of decision for its energy future. Several factors put us at a crossroads.

A new report by PJM, the electric grid operator for New Jersey and 12 other states, says that the new EPA regulations on air pollutants, CSAP and NESHAP, will put 20 GW of coal-fired power plants at high risk of retirement. The report did not even consider the costly new fly ash disposal rules. 20 GW is about 2.2 times the average electrical load for the entire state of New Jersey – potentially a huge loss in generating capacity for the PJM region.

Furthermore, the Oyster Creek nuclear power plant is slated to retire in 2019. There will be a need to guide decisions regarding what sources of energy will make up new electric generation capacity.

New nuclear power is very expensive, and difficult to justify as safe after Fukushima. It takes a great deal of time and social conflict for a new nuclear plant to get built, and a great deal of financial risk must be borne in advance by ratepayers. New coal or oil-fired generation is also unlikely in Jersey.

Natural gas is thought of by some as the answer. Gas availability is up and the price is down. However, the emerging picture of the environmental cost of increased production – which must come through unconventional drilling (fracking) - reveals local pollution risks as well as a greenhouse gas footprint that may be as bad or even worse than that of coal.

New Jersey's perspectives have also changed since Superstorm Sandy. For one thing, there is a new perception that the cost of global warming is no longer something that will impact our lives later in this century – rather, there is a growing belief that its effects are costing us dearly now (see the attached report from Harvard University). The storm also highlighted the fragility of our electric grid. The perception of the need for emergency power has changed to emphasize highly distributed, community-based emergency power resources that help meet people's everyday needs, from supermarkets to gas stations to community shelters. Solar energy offers a highly distributed, onsite, uninterruptible source of energy.

Meanwhile, the costs of solar energy and battery storage have both been dropping very rapidly. The combination of these two developing technologies can not only deliver solar power efficiently and provide highly distributed emergency power capacity, but they can simultaneously provide "ancillary services" to help stabilize the electric grid – day and night. These additional services include frequency regulation and local reactive power absorption or generation. PV and batteries together can also be used to cut electric demand charges for the host site.

In fact, these novel services can now produce enough revenue so that the emergency power capability can be provided at little or no net cost. Solar power can thus play an important role in storm hardening and grid stabilization without the high cost associated with other infrastructure changes. New business models are already emerging to take advantage of these capabilities.

Why New Jersey?

Some of the conditions justifying a renewable energy transition exist in many different states, but it might surprise people to know how many of those conditions coincide in New Jersey.

New Jersey, as the state with the highest penetration of PV power and as the second-largest solar power market in the country, already has a substantial solar industry infrastructure with thousands of skilled workers and professionals ready to deploy. It also has an excellent offshore wind energy resource base.

A recent study published by the National Academy of Science and conducted at Carnegie Mellon University (attached) calculated the value of avoided environmental costs in all U.S. states when solar power is deployed. The study concluded that environmental value delivered by solar energy in New Jersey is 15 times greater than its value in California.

New Jersey was also the state hardest hit by Superstorm Sandy, and is moving forward with great determination to make the infrastructure changes mentioned previously.

Furthermore, New Jersey is served by PJM, which is currently the only grid operator in the country to offer the ancillary services contracts that, as previously mentioned, can provide added revenues to offset the costs of making distributed renewable power with emergency power capabilities.

New Jersey can be said to be the only state in which all of these conditions coincide.

Perhaps it is fitting that the place that gave birth to photovoltaic technology should also be the place to lead our country to a renewable energy transformation.

What would a renewable energy transition do to our economy?

The Mid-Atlantic Solar Energy Industries Association recently commissioned a study by the economic research group Clean Power Research (attached). The study, entitled "The Value of Distributed Solar Electric Generation to New Jersey and Pennsylvania", considered value streams delivered by solar energy that are internal to the electric power industry, such as locational marginal price reduction on the PJM grid, fuel and operating & maintenance reductions, capacity value, fuel price hedge value, etc. It also considered values delivered by solar energy that are *external* to the values monetized within the electric industry, such as economic growth, job creation, & small business growth, energy security, and the avoided cost of environmental damage.

Some of these value streams are related to the simple energy value of the solar power. Others are special values related to the unique qualities of solar power – the "renewable energy attributes". If the values of the renewable energy attributes estimated by the study are added together (i.e., not including the energy-related values), that attribute value can be compared to the cost paid by ratepayers for the renewable energy attributes through the tradable commodity called SRECs. The estimates in the study put the value of the solar energy attributes at $170 to $224 per megawatt-hour, depending on location. The current cost of SRECs is about $125 per megawatt-hour, and MSEIA estimates the levelized cost of SRECs to be in the range of $60 to $120 per megawatt-hour.

The conclusion is that the added value of solar energy is now greater than its added cost, making every kilowatt-hour of solar power a bargain for ratepayers. We still need incentives to *monetize* these added values for solar generators, but they are not subsidies; they are a payment for value delivered.

Wind power, energy efficiency measures, and demand-side management, like solar power - all essential parts of a renewable energy transition - are intensive job creators, especially of local, high-quality jobs. The ability of renewable energy to generate economic growth and create jobs has already been proven in New Jersey and other leading renewable energy states and countries.

Like Germany, New Jersey is poised to benefit economically from a renewable energy transition – except that we can better take advantage of our richer renewable energy resources, and of the lower technology costs and new revenue streams that have now arrived.

Sketching in the Picture of a Renewable Energy Future

Technical details of a renewable energy transition in New Jersey will need to be studied carefully. However, it is possible to conceive some rough idea of the magnitude of some aspects of it. The following is an example:

Current New Jersey electric power usage (EY 2012):	78,000 GWH/yr[2]
Electric power usage in 2050 (30% reduction):	54,600 GWH/yr
Renewable electricity production by 2050 (80% of above):	43,680 GWH/yr
Solar power by 2050 (50% of RE production):	21,840 GWH/yr
Wind power by 2050 (35% of RE production):	15,288 GWH/yr
Biomass, small hydro, & ocean power (15% of RE production):	6,552 GWH/yr

The solar power goal shown above would require the construction of about 450 megawatts of solar power per year on average over the 36 years between now and 2050. For comparison, in Energy Year 2012, 463 megawatts of solar were installed in New Jersey. Thus, meeting the proposed requirement could be done simply by maintaining a pace of solar construction similar to the pace we have already achieved.

In addition to the renewable electricity generation as shown above, it will also be necessary to build substantial new capacity in demand-side management and energy efficiency resources.

It is also vital that natural gas electric generating capacity during the transition be, to the greatest extent possible, be "renewable ready" – that is, it must be the most recent fast-response, high-efficiency type. During the transition natural gas will need to function as "virtual storage" to complement the variability inherent in intermittent renewables. Combined heat and power (CHP), as the most efficient way by far to use fuel, should also be strongly encouraged.

Electric energy storage technology such as batteries, compressed air storage, ice storage, and pumped hydro will be needed more and more as the technologies and business conditions for their construction mature and as renewable requirements ramp up.

Grid management practices will need to be updated, as utility companies take on the task of managing gradually increasing amounts of intermittent renewables. Two-way flow will become common on the electric grid, and there will be both new capabilities for control (such as distributed VAR control) as well as new challenges

[2] 1 GWH = 1 gigawatt-hour = 1 million kilowatt-hours