

## Photovoltaically Energized in Germany

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If you are a solar enthusiast, no doubt you get excited when you see a solar array. Family and friends are probably bored with the efforts you make to describe the characteristics of the array, whether it is solar thermal, thin film, or possibly a sun-tracking mount. Imagine my joy when right after retirement I could take the opportunity to spend one month in Germany with my brother-in-law Dieter Faber (yes, Dieter is German), my sister Martha, and my wife Jane. We drove 3000 kilometers visiting dozens of both large and small cities and enjoying the many experiences that Germany has to offer. It means a lot to the solar enthusiast to drink a pint of beer in a Bauhaus that uses solar thermal and photovoltaics (PV) to brew the beer. If you want to see lots of solar panels (and wind turbines), tour Germany by car. Let me share some observations.

Bavaria in Southern Germany appears to have the greatest concentration of PV per capita anywhere on the Earth. Near 25% of Bavaria's electricity comes from renewables and because of the progressive policies of the German government that figure will grow to 50% by 2025<sup>1</sup>. Yet, the sun resource in Bavaria is about the same as the states of New Jersey and New York, and about 2/3s of the sun energy that falls onto much of the Southwestern USA. South Carolina has around 20% more solar insolation than Bavaria, but here in our state we capture and use only a tiny fraction of this energy (.04 watts/resident)<sup>2</sup>. Germany (~83 million people) leads the world in per capita PV installed (~212 watts/resident)<sup>3</sup>. The USA with ~310 million people has ~7 watts/resident installed<sup>2</sup>. Germany installed more than 2 GW of solar in the month of Dec. 2011 alone. In comparison, the U.S. installed about 1.7 GW of PV panels in all of 2011.

The greater energy efficiency of the buildings and the neighborhoods we visited in Germany was apparent in several ways. We spent several days at Dieter's family home in Leichlingen. Leichlingen (1910 persons/mi<sup>2</sup>) is similar to Easley, SC (1887 persons/mi<sup>2</sup>) in population, land area, and population density. Yet, at night the stores, parking lots, gas stations, and residential areas are more dimly but adequately lit. Our suburban homes in SC with their diverse architectural styles and with higher levels of neighborhood lighting create quite a contrast. The Germans may have laws against using high levels of light to call attention to a retail business; however, in SC we use bright lighting to stimulate commerce. The excessive brightness of many areas in Easley after dark sticks with me as a real difference in cultures. With electricity costs about 3.5 times higher in Leichlingen as in Easley (~30 cents/kWh vs. ~8 cents/kWh), it is easy to see why Germany uses about ½ the electricity per capita as we do in SC. German

<sup>1</sup><http://www.renewablesinternational.net/bavaria-wants-farmland-pv-back/150/510/30938/>

<sup>2</sup>Koshmrl, M, (2011) Solar Today, 25, no. 6.

<sup>3</sup>Photovoltaic Barometer (2011), Euroserv'er, April.

electricity consumption patterns are quite similar to those in California where electricity costs are about twice as high as in SC.

The Southeastern USA has been called the "Saudi Arabia of energy efficiency" because of the incredible amounts of electricity that can be saved through conservation. Germany learned the lessons of greener building through the dual realities of high energy costs and damaging pollution of both air and water. In SC the cost of electricity is in the lowest 10% of the states, however, the per capita use of electricity is in the highest 20%. The result is that South Carolina residents have unnecessarily high electricity bills. In fact, South Carolinians pay a greater percentage of their family income on electricity than most any others in the USA. And, with Duke Energy, the electricity provider for the upstate of SC raising its rates, SC residents will see their disposable income further erode. The additional costs of electricity passed on to the consumer include expensive, but necessary technologies to better clean the air and water. The life expectancies of people living in Germany are significantly higher than those of South Carolinians (79.4 vs. 76.6 years). Air and water quality have something to do with these differences in longevity. Solar electricity stimulates both greater efficiency in our buildings and landscapes by making a cleaner environment.

A high percentage of mobile home housing in SC (~19%, highest in USA<sup>5</sup>) contributes to the disproportionately high utility bills our residents must pay. A 10-20 year old mobile home built to the SC environmental standards of the 1980's and 1990's could require twice the energy per square foot to remain livable than a newer and conventionally built home. A Leadership in Energy and Environmental Design (LEED) home could easily be 10 times more energy efficient per square foot than a typical mobile home in SC. Just how rapidly should our state move toward requiring efficiency standards that save our citizens lots of money?

The Bavarian Motor Works (BMW) has a huge presence in the upstate of SC. Its home office in Munich, Germany dominates the skyline. BMW's commitment to solar energy in Germany and elsewhere may soon spill over to their manufacturing facility in SC. A BMW retail sales outlet in Hawaii recently installed a solar system that will both meet 90% of the electricity needs of the dealership and in four years to pay for itself.<sup>6</sup>

<http://bmwusfactory.com/news-center/press-releases/2012/bmw-adds-solar-to-alternative-energy-portfolio/>

<sup>4</sup><http://www.worldlifeexpectancy.com>

<sup>5</sup>[http://www.statemaster.com/graph/hou\\_per\\_of\\_hou\\_uni\\_tha\\_are\\_mob\\_hom-housing-percent-units-mobile-homes](http://www.statemaster.com/graph/hou_per_of_hou_uni_tha_are_mob_hom-housing-percent-units-mobile-homes)

<sup>6</sup><http://www.hawaii247.com/2010/11/07/bmw-of-hawaii-going-solar-sunetric-to-install-113-8-kw-system/>

BMW Manufacturing in SC recently commissioned a 400 module PV array to fully power the Zentrum museum and visitors center. The panels are visible from Interstate 85 and will be seen by the 50,000 visitors each year. If you would like to see this solar installation, please come to the SC Solar Council meeting scheduled in the Zentrum on March 28<sup>th</sup>, 2012 1-3 pm.

I've spent nearly 4 decades living in the upstate of SC, and traveling through Germany for one month has not convinced me to move there. The people of Germany are no smarter or better than we. Yet, the quality of life in SC would be improved with the use of more solar and other renewable energy. Clean energy sources reduce electricity waste, improve air and water quality, and help the economy by creating jobs and reducing health care costs. The use of electricity is a privilege. I want more South Carolinians to recognize the urgent need to better conserve electricity and to actively support a transition to renewable energy. There is too much electricity wasted in the ways we live, much of it through ignorance. A more rapid transition to solar electricity just makes good sense. Our citizens have spent many years ignoring the liabilities associated with cheap but dirty electricity and seeing their money leave the state to buy coal and nuclear fuel. Let's take better advantage of our sun resource and create a South Carolina solar community that powers itself.

