

Our Ocean Backyard — *Santa Cruz Sentinel* columns by Gary Griggs, Director, Institute of Marine Sciences, UC Santa Cruz.

#234 April 16, 2017

Looking Offshore for Energy



Installation of the only offshore wind farm in the USA, Block Island, Rhode Island.

Nine years ago this month Dan Haifley and I started our Ocean Backyard columns. When I began I felt that there might be enough to write about for maybe six months, but not much longer. Between the continuing stream of ocean-related issues and events, the interesting changes that occur nearly continuously offshore, the occasional requests from readers and friends, the columns have continued. How much longer? I think at this point Dan and I are each wondering who is going to retire first.

Before our detour to the Azores, I had written about California's energy sources and our progress towards renewables. Wind is one of our fastest growing sources and California now generates 6.7% of our electricity using wind turbines, all of these sited on land. Wind is our 5th largest source of electrical power behind natural gas (47.5%), hydropower (14.1%), solar (13.4%) and nuclear (9.2%), with the last operating plant at Diablo Canyon scheduled for closure in 2025.

Interest has grown in California over the past several years in offshore wind energy. Placing wind turbines out on the continental shelf has the advantage of not taking up valuable coastal land, access to often stronger and more persistent winds, and therefore, the potential to generate larger amounts of electricity. In addition, due to the large coastal concentrations of people around the world, offshore wind farms can be sited close to electrical grids and, therefore, eliminate overland transmission line costs and power losses.

On the other hand, offshore placement involves construction costs about two and a half times greater than land-based wind farms. The turbine itself typically makes up about one-third to one-half of the costs of offshore installations, with infrastructure, maintenance and management making up the rest.

Installing an offshore wind turbine with 200-foot long blades requires some extraordinary equipment, including a very large vessel, which is specially designed to transport and erect each turbine and its foundation.

Denmark installed the first offshore wind farm in 1991, and by the end of 2016 ten European countries had installed 3,589 individual offshore turbines at eighty-four

different wind farms with a total capacity of 12,630 MW. In Europe this would provide for the power needs of about 12-15 million homes.

Five more large facilities are under construction offshore of the Netherlands, Germany, and the United Kingdom, with more in the planning and permitting stages. The UK has by far the largest offshore capacity, followed by Denmark, Belgium, Germany, the Netherlands and Sweden. The three largest operational wind farms in the world are located off the coast of the UK, and each has between 140 and 175 individual turbines.

The total operating capacity of offshore wind energy more than doubled between 2006 and 2009, then quadrupled between 2009 and 2014. Although offshore wind turbines have been successfully providing power to northern Europe since 1991, there is only a single operating offshore facility in the U.S.

With the exception of the Block Island, Rhode Island project, which went on-line late last year with five individual turbines, all efforts to date to put a wind farm in U.S. water have failed because of a combination of projected or perceived costs, bureaucratic challenges, permitting issues, political opposition, and environmental concerns.

There have now been sixteen years of experience with European offshore wind turbines, however, as well as considerable baseline information gathered along the U.S. Mid-Atlantic offshore area on birds, sea turtles, and marine mammals, so that many of these concerns can be resolved or greatly reduced through technology refinements and optimal siting of the facilities.

We need to build on this existing foundation of research, environmental impact assessment, and experience with existing facilities and not see every new proposal as the time to start all over again.

While any large energy facility will be visible from somewhere and there will always be some local opposition, we need to look carefully at the alternatives and their impacts. As long as we continue to oppose and delay well-planned renewable energy projects, the more fossil fuels we will continue to burn and the more greenhouse gas we will emit, with all of their impacts. Next column: offshore California.