Refinery advisory group
Community hearing
August 27, 2019

My name is Pouné Saberi, and I am a physician in occupational and environmental medicine. In my medical specialty I see first hand the negative health impacts of job loss on a person and their family. But also in my medical specialty I see the negative health impacts of air and water pollution on people and communities. I am here tonight wearing my hat as the board president of physicians for social responsibility, a local health based non-profit and on behalf of dr. Kenneth Lande, professor emeritus of physics at university of Pennsylvania. We want to highlight a solution that will bring economic prosperity without worsening environmental pollution.

We propose that the present PES site be converted into an offshore wind turbine manufacturing, assembly and maintenance facility. Offshore wind turbine farms are the most appropriate and feasible renewable energy generating systems for high population density coastal regions such as the mid-Atlantic. In 2015 a report by department of energy projected that the mid-Atlantic offshore wind turbine industry will create 24,300 long-term construction jobs, 2,400 maintenance and operation jobs and thousands of supply chain jobs. The Delaware river-bay region can end with 1/3 to ½ of the projected effort.

The size of the site and the geography of the location are also ideal. Wind turbines can be massive, their large-scale construction requires vast spaces and are difficult to move on land. Their construction requires large spaces and then transported by ship. Of the three possible ports in the northeast corridor, the current PES site has the most favorable conditions for this manufacturing industry.

Given the promise of this new industry, clearly we are not the only ones thinking about this possibility. There is competition. In fact, I think about where we would have been if the city had the vision to act on this back in 2015. The people who have lost their jobs need help to transition to new industries. This transition must include health benefits and training for new skills. If the city had started a just transition in 2015, the year us entered the Paris climate agreement, both the job and the environmental prospects of our city would have much more positive. With the increase in demand for electricity, this region would have been in prime position to meet that need.

As an environmental health physician I am worried about the clean up of water and soil pollutants at the PES site. Us environmental laws would dictate that polluters pay. I am discouraged by the lack of transparency about how PES is going to be held accountable for comprehensive and thorough clean up at the site.

Lastly, as a Philadelphia resident who lives within the 5-mile radius of this site, i want my neighborhood and city to have clean air and not be threatened by the explosion of an extremely dangerous chemical.

I appreciate the opportunity to speak today and can only hope the city will truly act on its promise to hear us.

Note to rag:
For full documentation please refer to attached proposal.

We, Kenneth Lande, Professor Emeritus of Physics , University of Pennsylvania and Pouné Saberi, MD, MPH, President of the Philadelphia chapter of Physicians for Social Responsibility and clinical faculty of the Hospital of the University of Pennsylvania, served on the Renewal Energy and Environmental part of Mayor Kenney's Transition Team.

We propose that the present PES site be converted into an offshore wind turbine manufacturing, assembly and maintenance facility. Offshore wind turbine farms are the most appropriate and feasible renewable energy generating systems for high population density coastal regions such as the mid-Atlantic. The economic and technical case for such facilities was made by the U.S. Department of Energy, National Renewable Energy Laboratory publication NREL/TP-5000-61315, February 2015, entitled "Offshore Wind Jobs and Economic Development Impacts in the United States: Four Regional Scenarios". We - New Jersey, Pennsylvania, Maryland, D.C, and Virginia, are one of those four regions. Based on existing facilities elsewhere, this report projects that the mid-Atlantic offshore wind turbine industry will create about 24,300 long term construction jobs, 2400 maintenance and operation jobs and thousands of supply chain jobs. A recent McKinsey study (April 2019) assumes five construction ports covering the mid and north Atlantic region. However this finally plays out, the Delaware River – Bay region may end up with 1/3 to ½ of the projected construction effort.

Although the only action required of the Refinery Advisory Group or its successor entity is to offer the PES site for wind turbine construction and operation, it is useful in evaluating this proposal to understand a bit more about the nature of offshore wind turbines and some of the issues involved in their construction and operation.

Unlike onshore wind turbines, which are restricted to 2 – 3 megawatts by the size limitations of over the road transport of blades and towers, off shore wind turbines are built as large as technically feasible. Larger turbines are generally less expensive on a per megawatt basis and because of their increased height experience stronger and more reliable winds. Turbines being installed now are about 10 megawatts. General Electric has just deployed a test 12 megawatt

turbine, Haliade X, whose tower is 460 ft high and whose three blades are each 360 ft long. GE plans to begin deploying this turbine in offshore locations in 2021. Over the past two decades, the power output per turbine has doubled each decade. So, in 2009, the average turbine power was 5 megawatts and in 1999 the average turbine power was 2.5 megawatts. If we project the power doubling to the early 2030's, then we should be prepared for a blade construction facility that is at least 500 ft long and a tower construction facility that is 650 ft long. These become important construction site constraints. At the moment it seems unlikely that turbines will continue to grow beyond the 20 megawatt limit. A 500 ft long blade rotating once every six seconds will have a tip velocity of 750 km/hr or a bit less than 500 miles per hour. That is approaching sound velocity for the blade tip and so is a natural limit.

The components for a 10 megawatt turbine are much too large to move over land and so must be built along a body of water and then moved to their offshore site by ship. For the mid-Atlantic coast there are only three possible ports that can serve as construction site ports; New York harbor, the Delaware River region and the Newport News – Norfolk region of Virginia. If we include New England, as the McKinsey study has, then the number of potential construction ports increases.

The NREL report, table 2, estimates that our region (mid-Atlantic) has a generating capacity of 264,000 megawatts or can utilize 26,400 turbines within 50 miles of the shore. If we assume a 25 year lifetime for each turbine, then a potential scenario is that about 1050 turbines are manufactured each year. During the first 25 years, new turbines are installed and in year 26, we begin making the replacements for those turbines built in year 1. Table ES-1, gives the 23 construction jobs per megawatt or about 24,300 construction jobs and an additional 2400 maintenance jobs. In addition, there are jobs in supply chain industries that are locally sited.

The 2015 NREL report uses 2012 construction cost numbers. A 2019 report of actual costs of offshore wind turbine construction and operation costs in Europe shows a substantial drop in investment cost per turbine since 2015 so that in 2018, it was about $0.028 per watt, (Wind Power Offshore, 11 February 2019).

Note that this number does not include interest costs. Even lower costs are anticipated as larger turbines are marketed in coming years. These lower costs may make offshore wind turbines the least expensive renewable energy source for the densely populated mid-Atlantic region and certainly the only one that can supply the amount of power needed.

The Virginia port area has been aggressively pursuing this same goal. Several years ago, Virginia hired BVG Associates to do an evaluation of the Virginia port facilities as well as the other competing ports along the mid-Atlantic region (including those on the Delaware River). Their conclusion was that Philadelphia did not have a water adjacent site large enough to compete. Now it does!

A likely scenario is that two or possibly three sites will share the construction of the mid-Atlantic wind turbines. Philadelphia should prepare two plans, one in which it is the sole construction site and another in which it shares this task and jobs with one or possibly two other ports.

The present offshore turbine installation method used in Europe is to load components onto a "jack up" vessel, sail that vessel to the site, jack up the vessel so that it is not subject to wave action and then install. The Jones Act requires that only U.S. built and manned vessels can be used for this purpose. There are presently no such U.S. built vessels and each will cost about $200 – 300 million to build. This shortage of jack up vessels will make it critical that the distance from construction port to turbine installation site be as small as possible. That should help the case for our construction port.

For shallow water turbine installation, some of the regions in Europe and the U.S. east coast, the preferred installation method is to install a pier on the ocean floor and then mount the turbine to the top of this pier. That works for water depths less than about 150 ft. For deeper water locations, the preferred method is to have floating turbines. That is the case for the U.S. west coast, for Japan, etc. Floating turbines are now being tested and may be operational by the early 2030's. That will involve turbine assembly at a port and then a tow to the operation site. This method avoids the need for jack up vessels and use tow boats, which are plentiful. For us, this requires a turbine assembly site

downstream of the Delaware Memorial Twin Bridges. The plan would be to construct the components at the PES site, load then onto a barge, and move them to the assembly site.

We have a number of support documents, some of which are referred to here, which we can make available to the Advisory Group. Among these are pictures and sketches of port turbine construction sites in Europe and some cost numbers for the preparation of such sites.