Testimony by
Gerald M. Erjavec
Indeck Energy Services, Inc.
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IN THE MATTER OF:	)	
	)	
NATURAL GAS-FIRED, PEAK LOAD	)	R01-10
ELECTRICAL POWER GENERATING	)	
FACILITIES (PEAKER PLANTS)	)	

The purpose of the instant hearings is to address five questions with respect to the siting of "peaking" power plants. Before these questions can be addressed, however, a fundamental understanding of "peaking" plants and their impacts is necessary. "Peaking" plants are so named because their practical use is limited to operating during periods of the highest or "peak" need for electricity. As can well be imagined, the use of electricity varies over the day. From periods of low use over night to the time of highest use during the day, generating units are turned on, or dispatched, to meet the needs of the system. Generally, the least cost units are operated all of the time as "base" units. As the load increases through the day, less efficient, intermediate, units are dispatched on. During the highest demand period of the day, particularly in hot weather when there is more need for electricity to power air conditioners, the peaking units are dispatched on. Combustion turbines are well-suited to the task of meeting peak needs because they are easily brought on line in a short period of time.

A combustion turbine works by expanding a "working fluid", in this case air, through a series of blades to turn a generator shaft. They are also called gas turbines; however, this name sometimes causes confusion, because the "gas" referred to in the name is not the natural gas fuel, but the air that passes through them. The operation of these machines is really quite simple. The front end of them is actually operates as a compressor that takes filtered air, draws it in, and delivers it to the combustion chamber under pressure. In the combustion chamber, fuel, most commonly in our area natural gas, is introduced and the mixture is ignited, causing a rapid expansion of the gas. The expanding gas passes through the turbine end of the machine, releasing energy while moving the blades that spin both the generator and the compressor. Contrary to popular notion, combustion turbines predate jet airplanes by quite a while, having first been used to turn generators in 1898. They were first adapted for airplane usage in the 1940's.

The nature of a combustion turbine is such that the amount of power is dictated by the mass of air that moves through it. Because hot air is less dense than cold air, less mass passes through the machine in hot weather, even though the flow volume remains constant. This results in lost output on hot days when it is needed most. To counter this effect, various methods are employed to cool the inlet air and increase its density. One such method is the use of chillers; however, these require power to operate and are sometimes counter productive. Another method is called evaporative cooling, in which the air stream is passed over water and the air is cooled through evaporation, much like perspiration cools the skin. This cooling effect can be limited on humid days. While water consumption varies based on temperature and humidity, an evaporative cooler on a 300 MW plant will average about 40 gallons per minute (gpm) of water consumption.

Even though these hearings are directed at peaking plants, the subject of combined cycle plants is sure to come up, so a brief discussion of them is in order. Simply put, a combined cycle plant adds a steam cycle to the process but directing the hot exhaust gas from the combustion turbine through a boiler, which generates steam to turn a steam turbine. Because more energy from the fuel is recovered and used to produce electricity, combined cycle plants can be as much as 50% more energy efficient that “simple cycle” peakers; however, they are not suited to peaking use because they cannot be brought on line quickly enough to function as peakers. Combined cycle plants also have increased water needs compared to peakers. The first use of water, in the steam system, is minimal, about 25 gallons per minute in a system that has been coupled to 300 MW of combustion turbines to create a 200 MW steam cycle. Water can also be used to cool the steam after it passes through the steam turbine. If water is the sole medium, up to 2,500 gpm can be consumed, which may be significant in some areas. Fortunately, advances have been made in cooling technologies so that this use can be greatly reduced or eliminated if the situation calls for it.

Another advantage to combustion turbines fueled with natural gas is that they have about the least environmental impact per kilowatt-hour of just about any technology available today. From an air pollution standpoint, the impact of any combustion source is evaluated by using computer models that examine what happens to the gas stream when it leaves the stack, mixes with the air around it, and at some point returns to the ground where people can be exposed to it. Using a five-year history of meteorological data and examining the effect of different weather conditions, the maximum concentration of exhaust contaminants that the public will be exposed to can be predicted. These predictions are then compared to ambient air quality standards to see if any adverse effect may result. The air quality standards are established by the USEPA, and are set at levels to provide an adequate margin of safety for sensitive populations such as the very young, the elderly, and those with respiratory difficulties such as asthma.

As a representation of the impacts of a combustion turbine peaking plant, information submitted in support of a 300 MW facility proposed for a site in northern Illinois is offered. The most discussed air issue was probably NO_x impacts. The ambient air quality standard for annual exposure to NO_x is 100 micrograms of NO_x per cubic meter of air ($\mu g/m^3$). The maximum concentration of NO_x attributable to the plant is 0.028 $\mu g/m^3$, which, compared to the standard and to the existing ambient concentration of 59 $\mu g/m^3$, is negligible. Similarly, CO, particulate, and SO_2 impacts are also negligible. To put these levels in comparison to familiar situations, the NO_x level to which a person would be exposed is 500 to 3000 times less than what that person would be exposed to when cooking on a gas stove. Similarly, the level of exposure to the public is approximately the same as that from three home furnaces or one tenth of that which would be caused by a typical school boiler. This is not to suggest that a stove, house, or school emits contaminants at the same rate as a power plant; however, after dispersion, the resultant exposure to the population is on the same order.

With respect to impacts on water, as noted above, the only real water use attributed to peaking plants is for evaporative cooling. This technology is usually employed only when ambient temperatures rise above 60 degrees and water use will then vary as a function of temperature and humidity, but is never expected to exceed 80 gpm for the 300 MW plant being used as an example and will probably average half that amount. Put in perspective, this is about as much water as 11 lawn sprinklers would use at the same time and about what 30 homes would use on a yearly basis. Even if converted to combined cycle, as previously noted, water use can be minimized if necessary. The only wastewater generated on site is stormwater, which is captured on site and sent to storm sewers, and the backwash from regenerating the water softeners, which can be treated locally.

With respect to sound, the facility was designed to meet the Illinois noise regulations which were established by the Board in 1973. With this standard in place, Illinois EPA reports that it has never received a complaint regarding noise from any of the approximately 100 peaking plants that are in operation today.

With peaking plants and their impacts characterized, the questions before the Board can now be addressed.

1. **Do peaker plants need to be regulated more strictly than Illinois' current air quality statutes and regulations provide?**

   One of the great misunderstandings regarding peaking plants is that, somehow, they are unregulated. This stems, in large part, from the much-discussed concept of "deregulating" the electric industry. The regulation referred to by that term is the limits on spending and rates of return that are imposed on utilities in exchange for their rights to establish quasi-monopolies. While the utilities see the regulated return as a limit on profitability, independent producers do not receive some of the benefits associated with this regulation, such as protection on the rate of return and the powers of eminent domain. Aside from this "regulation", independent producers are, in fact, highly regulated, being responsible for meeting the same rules, regulations, and standards as the utilities, and, in some cases, even more. Peaking plant developers must meet all conditions of the Illinois Environmental Protection Act, including all relevant permits, US Army Corps of Engineers requirements, industry standards, fire codes, electrical codes, and a long list of other codes which are detailed in the presentation. Therefore, in Indeck's opinion additional regulations would seem unjustified and counterproductive.

2. **Do peaker plants pose a unique threat, or a greater threat than other types of State-regulated facilities, with respect to air pollution, noise pollution, or groundwater or surface water pollution?**

   The analysis of the 300 MW plant cited above indicated that the impacts of peaking plants, when compared to standards and common experiences, are minimal. With respect to other types of facilities, another analysis has shown that peaking facilities have far less impacts that many other facilities that have no additional regulatory requirements. On a local scale, the air emissions associated with the 300 MW facility were a fraction of those associated with a coal-burning power plant and on the same order as a diesel-fueled plant a tenth its size. Looking at a state-wide picture, the average permitted emissions from peaking facilities were compared with those from several other industries including refineries, metal producers and fabricators, other power plants, and airports. In all cases, the level of emissions permitted from the peaking plants was at the very low end of the comparisons.

Water consumption impacts were also compared against other enterprises and found, in most cases, to be at the low end of the impacts. With respect to sound, the plants' exemplary record speaks for itself.

Given the fact that peaking plants have far less impacts that many others types of industry, it seems inconceivable that they pose a bigger or unique threat and are deserving of additional regulation. If, in fact, additional regulation is considered, this analysis would seem to behoove the State to greatly increase its oversight of most other industries.

3. Should new or expanding peaker plants be subject to siting requirements beyond applicable local zoning requirements?

As noted above, the impacts of peaking plants are minimal and additional requirements would seem unnecessary. An examination of local zoning codes shows that most already allow for uses that are more intensive than a peaking plant in one or more zoning classifications. If any alternate process is considered, it should be one that restricts the decision-making to facts in the record.

4. If the Board determines that peaker plants should be more strictly regulated or restricted, should additional regulations or restrictions apply to currently permitted facilities or only to new facilities and expansions?

One of the design bases for power plants are the rules and regulations in existence at the time of the design. Trying to design to hit a moving or potentially moving target could effectively bring design work to a halt. In this or any other industry, a period of regulatory certainty is necessary to allow the industry to move forward. Further, any change in philosophy, whether it be applied only to new construction or to currently permitted facilities, should also be applied evenly to all other industries in the State.

5. How do other states regulate or restrict peaker plants?

The process varies, of course, by state, with no model being the standard. Several other states have a process similar to Illinois'; that is, with local issues handled by one or two local agencies and state or federal issues going, most often, through the State. Other states have adopted a coordinated approach, with all issues being directed through a single siting entity. This entity rules not only on all environmental issues, but also takes precedence over local zoning authorities.