Case Study: Impact of Above Ground Spent Fuel Storage on Nearby Meteorological Systems

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Science Applications International Corporation (SAIC) performed an assessment in 2007 to determine the impact to meteorological data of the proposed Independent Spent Fuel Storage Facility Installation (ISFSI) project at the Cooper Nuclear Station (CNS) for the Nebraska Public Power District (NPPD). This assessment included a review of the proposed location of the ISFSI to determine any potential impact to the meteorological monitoring program. This review included the ISFSI including the Pad, Horizontal Storage Modules (HSM), and Storage Building at a location approximately 450 feet northeast (NE) of the meteorological tower. The location and size of the proposed buildings/equipment, etc. were evaluated relative to the impacts on the meteorological instrumentation, as well as the proposed ground disturbance, final grading, and groundcover. The expected anthropogenic heat output from the operational ISFSI was evaluated to determine sensitivities to the temperature differential measurements between the 10-, 60-, and 100-meter levels on the tower. An evaluation of distance of the equipment from the tower in relation to the mean wind direction frequencies was also evaluated to determine potential impacts.

The ISFSI is proposed to be a large facility of 46 HSMs that dissipate heat from spent fuel and could impact the meteorological data recorded at one or more levels on the meteorological tower. The assessment was based on standard meteorological equipment siting requirements for nuclear power plant onsite meteorological monitoring programs outlined in NRC guidelines and committed to in the *CNS Emergency Plan and Updated Safety Analysis Report*. Calculations were performed based on distances from the tower, size, heat output, and 5-year averages of CNS onsite meteorological data to determine impacts. Based on these analyses, the following conclusions can be made:

- The effective height of the HSM relative to the base of the meteorological tower is more than the recommended 10:1 ratio for objects upwind of meteorological towers and should not interfere with wind flow toward the tower. However, the 260-ft. length of the structure may have some minor impact on wind direction fluctuations in the tower vicinity. Fortunately, the wind direction frequency from these directions totals around 5.3% annually, so the potential impacts are small.
- The thermal impacts of the ISFSI are real and have some impact on the meteorological data, particularly in worst-case conditions. Temperatures at the meteorological tower could rise by as much as 1.7º F in worst-case conditions when the wind is blowing directly over the ISFSI in stable light wind conditions. As with the structure issue, the wind direction for this stability is infrequent and occurs less than 1% of the time. However, the impacts on downwind doses in this occurrence can be large.
- When the wind is blowing for the sector directly upwind from the ISFSI, the most common occurrence is the D stability that occurs about 2.3% of the time. This situation raises the temperature at the tower about 0.1 F. This increase would have little to no impact on the downwind dose predictions.
- Mitigation of the above mentioned impacts can be achieved through relocation of the meteorological tower ½ mile NW of its current location.