



*Brunswick Nuclear Power Plant, Southport, NC*

## **Nuclear Power Plants in the Path of Hurricane Florence**

*More than a half dozen nuclear power plants are in states that may be affected by Hurricane Florence. Flooding can threaten the safe operation of nuclear power plants.*

Powerful hurricanes like Hurricane Florence present multiple risks to nuclear power stations. High winds can down power lines that deliver electricity that nuclear plants use to run their cooling systems. Flooding can damage back-up generators or key components needed to keep reactors safe. Flooding can be caused by heavy rain that raises the level of rivers and reservoirs, by intense local precipitation that overwhelms on-site drainage systems, or by wind-driven intrusion of water into buildings. Storm surges can also cause flooding.

Several nuclear reactors are in areas that may be subject to flooding in the wake of Hurricane Florence. Inspections and reviews by the U.S. Nuclear Regulatory Commission have found potential problems at some plants that could allow water into critical systems.

### ***Brunswick Nuclear Power Plant (Southport, NC)***

Located near where the Cape Fear River empties into the Atlantic Ocean in North Carolina, the Brunswick Nuclear Plant has been producing electricity for over 40 years.<sup>1</sup> In 2011, the U.S. Nuclear Regulatory Commission (NRC) identified multiple potential routes by which parts of the plant could be flooded. The NRC expressed particular concern that a strong hurricane could flood the room where oil that fuels backup generators is stored. Cracks, gaps, and unmaintained seals, the result of “a historical lack of a flood protection program at Brunswick,” made the plant vulnerable. The NRC ordered the plant owner to correct these problems.<sup>2</sup> As of the end of 2017, the plant had addressed all of the NRC’s concerns save one, which involves enhancements to the boiling water reactor designs. This last upgrade is planned to be completed in March 2019.<sup>3</sup>

469,000 people live within 50 miles of the plant.<sup>4</sup>

### ***Surry Nuclear Power Plant (Surry, VA)***

Older than most of the other nuclear power plants on the coast, Surry Nuclear Power Plant began operating in 1972.<sup>5</sup> In the wake of the Fukushima disaster, the NRC ordered plants around the nation to re-evaluate danger from external flooding. The findings that emerged at Surry showed that there was a greater risk than was originally calculated, especially of flooding on the east side of the site. The NRC report details how a potential storm

surge could overwhelm the emergency service water pumps on this side of the plant, leading to difficulties with emergency response.<sup>6</sup> Overall, however, the NRC report found that the systems the plant had put in place would be effective at mitigating the damage if implemented properly.<sup>7</sup>

The population within a 50-mile radius of the plant is over 2 million people, and includes the cities of Williamsburg and Norfolk.<sup>8</sup>

### ***Catawba Nuclear Station (York, SC)***

Comprising two reactors that were licensed in the mid-1980s, the Catawba nuclear facility is on a peninsula that juts out into Lake Wylie.<sup>9</sup> Recent evaluations of Catawba found that intense precipitation could flood a building that holds some of the plant's emergency preparation equipment. Duke Energy, which runs the plant, has said that it would modify its emergency strategies to better prepare for flooding.<sup>10</sup>

The plant has also had recurring problems with emergency generators that are important for maintaining safety if external power supplies fail. Two times in the last 10 years the site has been subjected to increased oversight by the NRC for issues related to emergency generators.<sup>11</sup> After a component of a generator failed during a scheduled test in 2017, the NRC's investigation concluded that "the plant staff had failed to adequately develop and adjust preventive maintenance activities using operating experience, maintenance history and performance records."<sup>12</sup>

More than 2.5 million people live within a 50-mile radius of the plant, located 18 miles south of Charlotte, SC.<sup>13</sup>

### ***McGuire Nuclear Station (Huntersville, NC)***

With two reactors that opened in the early 1980s, the McGuire Nuclear Station is located next to Lake Norman, a large artificial reservoir built and owned by McGuire's parent company, Duke Energy.<sup>14</sup>

After the Fukushima nuclear disaster in Japan, the NRC reevaluated flooding risk and found that some potential extreme events couldn't be controlled effectively by the plant operator's existing strategy and equipment. In response, Duke Energy implemented changes and submitted them to the NRC, which concluded that "no further regulatory actions [were] required."<sup>15</sup> Although the facility complies with the NRC's new rules for emergency preparedness, inspectors noted in 2017 that some drain systems are below flood levels and could be vulnerable to flooding.<sup>16</sup> In 2011, the NRC included the McGuire plant in its analysis of facilities that may be at risk from upstream dam failures.<sup>17</sup>

2.9 million people live within 50 miles of the plant.<sup>18</sup>

### ***Virgil C. Summer Nuclear Station (Jenkinsville, SC)***

The Virgil C. Summer Nuclear Station consists of one nuclear reactor from 1982, situated next to the Monticello Reservoir and a stream.<sup>19</sup> While the site has been deemed to be adequately protected from reservoir flooding by a 400-foot earthen embankment, some buildings that contain key safety equipment may flood during intense local precipitation. To address the NRC's concerns, the plant operator must modify some structures to reduce the risk of flooding, and has until December 2018 to complete those changes. Until then, the plant needs to deploy "temporary flood protection features" such as sandbags and temporary flood gates when severe weather is forecast.

More than 1 million people live within 50 miles of the plant.<sup>20</sup>

### ***Shearon Harris Nuclear Power Plant (New Hill, NC)***

The Shearon Harris plant has one nuclear reactor that opened in 1986. The facility also stores radioactive waste from multiple other nuclear reactors.<sup>21</sup> It is situated on a peninsula in the Shearon Harris Reservoir, near the Raleigh metro area.<sup>22</sup> A recent re-evaluation of the Shearon Harris Nuclear Power Plant revealed the original emergency plans and design underestimated the risk of flooding at the facility.<sup>23</sup> Operators of Shearon Harris believe that current safety measures can protect the facility's buildings and infrastructure even under the new, higher

estimated flood levels, although often their defenses' limits are only inches above the reevaluated hazard levels.<sup>24</sup>

As of the 2010 Census, 2.6 million people lived within 50 miles of the plant.<sup>25</sup>

### ***Alvin W. Vogtle Electric Generating Plant (Waynesboro, GA)***

Two units began producing power in the late 1980s, and two additional reactors are under construction for completion in the early 2020s.<sup>26</sup> In 2017, NRC inspectors cited the facility for failing to protect electrical equipment from possible exposure to water after they found an electrical junction box that lacked drain holes, despite containing cables and connections not designed to be submerged.<sup>27</sup> In response, the company planned to inspect other junction boxes across the facility. The plant is located on the Savannah River.

Population within 50 miles is 726,640.<sup>28</sup>

### ***Oconee Nuclear Station (Seneca, SC)***

Licensed in 1973, Oconee is one of the older stations in the potential path of Florence.<sup>29</sup> It has three pressurized water reactors which sit on the 18,000 acre Lake Keowee, a regional tourist destination.<sup>30</sup> Like McGuire, Catawba and Brunswick, Oconee is owned by Duke Energy.<sup>31</sup>

According to the NRC, the original plans for the Oconee Nuclear Station did not properly account for flooding risks.<sup>32</sup> Of particular concern is the Jocassee Dam, which sits above Lake Keowee, and has a 1 in 180 chance of failing in the next 20 years of the dam's operating license.<sup>33</sup> The original Oconee license did not account for a possible failure of the Jocassee Dam, which in one modeled scenario could release enough water to overtop Keowee Dam and flood the Oconee plant.<sup>34</sup>

Since 2016, the nuclear station has taken several actions to reduce its vulnerability to flooding.<sup>35</sup> These include raising some backup transmission lines above the floodplain, armoring embankments to prevent erosion by flood waters, and building a "flood diversion" wall to keep water away from the power bank.<sup>36</sup> After these improvements, NRC Regional Administrator Cathy Haney said the Commission was "[confident] that the Oconee plant is adequately protected from external floods, including scenarios involving the failure of the dam."<sup>37</sup>

More than 1.4 million people live within 50 miles of the plant.<sup>38</sup>

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