Q. (Reference CA-NP-115, footnote 3) What percentage of the windings at Sandy Brook have failed in the past 10 years? What are the outage rates for the Sandy Brook hydro plant in each of the past 10 years?

A. There have been no winding-related failures at the Sandy Brook hydro plant in the past 10 years. However, due to the plant's age, industry experience suggests that the plant is exposed to increased risk of winding failure going forward.[1]

Generating winding failures occur infrequently. When winding failures do occur, they are typically high energy and cause collateral damage to adjacent windings and the generator core. If there had been a winding failure in the past 10 years, based on the age of the existing windings, the most likely course of action would have been to remove the generator from service to undertake a complete rewind of the stator.[2]

Table 1 provides annual outage rates for the Sandy Brook hydro plant from 2012 to 2021.

Table 1
Annual Outage Rates of the
Sandy Brook Hydro Plant

Year	Unavailability[3]
2012	3.72%
2013	0.09%
2014	3.16%
2015	1.39%
2016	0.44%
2017	2.42%
2018	0.29%
2019	1.27%
2020	1.01%
2021	2.49%

1 See C. Sumereder, *Statistical Lifetime of Hydro Generators and Failure Analysis, IEEE Transactions on Dielectrics and Electrical Insulation*, Vol. 15, No. 3, June 2008. As stated in the Sumereder report, the leading cause of failure for generator windings is age and contamination of the windings.

2 The Sandy Brook hydro plant generator was placed into service in 1963.

3 Unavailability is based on the percentage of hours per year during which the unit was unavailable due to forced outages, planned outages, maintenance, and system events resulting in the unit tripping offline.