Hydropower's Importance to the Carolinas

Catawba-Wateree Comprehensive Relicensing Agreement (CRA)

More than any other energy source, hydropower is fully integrated into the communities in which it's located. Hydropower is particularly important to the future of the Carolina's because:

• ***Major renewable energy source*** – Hydropower is the only large-scale renewable energy source available in the Southeast, and it provides approximately 80 percent of the nation's renewable energy. Hydropower provides approximately 15 percent of Duke generation capacity in the Carolinas.

• ***Emissions-free source of energy*** – Hydro turbines don't contribute pollutants to the water.

• ***Reduced air emissions*** - Hydro's peaking operation reduces demand on fossil-fueled energy sources, thus reducing air emissions. If new hydro license conditions result in a 10% loss (the national average) of peaking generation to Duke's Nantahala Area and Catawba-Wateree hydros, Duke Energy estimates that at least an additional 42 tons of nitrogen oxides and 139,000 tons of carbon dioxide will be produced each year from its fossil-fueled stations that must be operated extra time to replace the lost hydro generation.

• ***Most efficient energy source*** – Modern hydro turbines can convert 90% of the available energy into electricity making it the most efficient generation source by far.

• ***Reliable public and industrial water source*** – Cities and industries have grown up around many hydro reservoirs. Water intakes located on lakes provide much greater water availability and drought tolerance than riverine intakes. As other parts of the U.S. have already learned, the availability of a reliable public and industrial water source is often the most critical factor in sustaining long-term economic growth.

• ***Cooling water supply for fossil and nuclear-fueled power plants*** – Several of the Catawba-Wateree hydro reservoirs also support power plants that use the steam cycle to produce electric power. Lake Norman, Mt. Island Lake, and Lake Wylie support 8,100 MW of steam- powered electric generation.

• ***Major public recreation opportunities*** – The Catawba River lakes get millions of recreation visits per year, most of which are for various boating and fishing activities. Lake and river users also contribute substantially to the local economies (e.g. boat and equipment purchases, gas, food and lodging, etc.) and their purchases of hunting and fishing licenses and boat registrations help the state wildlife agencies fund their management programs.

• ***Creation of in-lake fish/wildlife habitat*** – Lakes substantially increase fish populations, enabling a much greater sport fishery than would exist in strictly riverine environments.

• ***Secondary waste treatment due to in-lake processes*** - Biochemical processes occurring in hydro reservoirs provide additional treatment opportunities for pollutants entering the reservoirs from their watersheds.

• ***Ability to reduce flood effects*** – High water management is often a forgotten, but very real benefit provided by larger hydro reservoirs. Since hydro owners don't want to frequently spill their fuel supply, most have developed target lake level operating ranges that can store substantial amounts of precipitation and runoff, thus reducing impacts to property and human safety hazards up and downstream. By using modern weather forecasting tech-nology, hydro owners with large reservoirs will often generate around the clock prior to arrival of major storm fronts in an effort to provide additional high water protection.

Hydropower also has very important roles in supporting the regional electric transmission grid; namely:

• ***Quick start capability*** - Normal operation can go from shutdown, through start-up to full power and back to shutdown in less than ten minutes. This compares to two hours for new combustion turbines, six to eight hours for the best coal-fired plants and 72 hours or longer for the largest fossil-fueled and nuclear-fueled plants. This quick response time provides a

ready "safety valve" to help manage rapid shifts in electric system loading.

• ***Load-following capability*** - Hydro units are generally smaller than other types of power generation units, allowing greater incremental adjustments to help follow electric system load. Hydro units on automatic generation control (AGC) increase and decrease water flow to the turbines, thus automatically absorbing the 75-150 MW customer demand swings typically seen every hour. While fossil-fueled generators can also be operated on AGC, the resulting changes in unit output tend to have greater efficiency impacts and cause increased air emissions.

• ***Voltage Support*** - Hydro units can be operated as synchronous condensers to increase reactive power on the grid. In this mode (also referred to as "motoring"), the hydro unit's breaker is closed but no water is applied to the turbine. The unit's generator acts like a motor, rotating the turbine shaft and adding reactive power to the system with little additional real power needed. (Note: Reactive power is the product of magnetizing current and voltage and is expressed in terms of kilovolt-amps reactance (KVAR). Unlike real power (i.e. Kw) which is consumed by electric system loads, reactive power is stored in the magnetic fields of an electric system; much like momentum is stored in a flywheel. Even the electric motor in a common refrigerator will not operate without reactive power. Some amount of reactive power is always required in the electric grid for it to be stable and to allow the real power to be transferred to meet the system demand). Alternative sources of voltage support include installation of distributed capacitors (which are expensive) and reducing the power factors of non-hydro generators (which reduces their efficiencies).

• ***Spinning Reserve*** – Each electric transmission operating area requires the major generating companies to guarantee a specified amount of generation as "spinning reserve," meaning that this additional generation could be brought on-line within ten minutes of notification in response to unexpected demands or generation deficits on the transmission system. With its quick start capability, generation companies with hydropower most often use it to fill the spinning reserve requirement, thus providing an important safety valve. Generation compa-nies without hydropower must either contract for spinning reserve, keep some of their units in a greater state of readiness, or operate some of their units at reduced power levels to respond to electric system demands. These methods are more costly than using hydropower and can also cause greater air emissions.

It's apparent from the above benefits that a substantial reduction in hydropower availability could have significant and cascading effects on the human and natural resource environments.

(References: National Hydropower Association's website (www.hydro.org), Duke Energy's Shoreline Management Plan for the Catawba-Wateree Project dated July 30, 2001)

CONTACT

For more information and updates and other relicensing news, contact Duke Energy at **www.duke-energy.com**.