Catawba Wateree River Basin Advisory
Commission
High-Water Management in the Catawba River

September 27, 2013

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Hurricanes and Tropical Storms
Duke Energy Hydro Station Locations
Catawba - Wateree River Basin

- ~225 miles long
- 3 million plus acres of drainage basin
- Ranging in elevation from 1200 feet to 225 feet AMSL
- 11 lakes with total surface acres of ~80,000
- 13 hydro powerhouses
Different Kinds of Dams

Lakes with Ungated Spillways (Overflow Spillways):

- When the lake reaches full pond and there is more river flow coming into the lake than can be passed through the powerhouse, the lake level rises above the crest of the spillway and flows over the top.

- The lake level will be higher than full pond for the remainder of the event.

- The extra flow passes over the spillway. The storm runoff determines the maximum lake level during the event.
Different Kinds of Dams

Lakes with Gated Spillways:

- When the lake approaches full pond and there is more river flow coming into the lake than can be passed through the powerhouse, spillway gates are opened to pass the extra flow.
Brief History

- 2004 Hurricanes: Charlie, Francis and Ivan
- 1989 Hurricane Hugo
- Un-named storm in August 1940

1940 Storm
- Unnamed Category 1 Hurricane hit the South Carolina/Georgia coast sometime between Aug 11th and Aug 12th.
- 15 inches of rain fell across the NC mountains.
- $13 million in damage ….. Over 60 lives lost.
Wateree River near Camden, SC

110,000 cfs peak discharge
106.9 ft at the Wateree Dam
Average over 82 years
41,600 cfs
Managing floods:
What is required?
• Tools – computational, forecasts and lots of experience
• Vigilance - attention to detail, having the “long view”
• Time - using time, understanding what time can buy you, using all of your options

What Duke Energy doesn’t do in managing potential flooding events?
• Manage single lakes, but we do manage the whole system.
• Add to the total water volume over what would have been present without the dam being constructed
USGS 02137727 CATAWBA R NR PLEASANT GARDENS, NC

Discharge, cubic feet per second

attles: 09/01/2004 to 09/21/2004 23:59

EXPLANATION

--- DISCHARGE

MEDIAN DAILY STREAMFLOW BASED ON 23 YEARS OF RECORD
Peak of record 39,500 cfs Aug 13, 1940
“Why can’t you tell how high the lakes will get before the storm arrives?”

• How much is it going to rain?
• Will it rain the same everywhere?
• How fast will it rain?
• How wet is the ground?
• How long will it take for the water to reach the river?

Now, explain these answers for each of the 3,000,000+ acres in the drainage basin……

• The high water impacts cannot be realistically estimated until the rain has finished and stream levels are no longer rising.
Which way is the storm coming?
Here is a projection on a Saturday of what Hurricane Francis was going to do by Tuesday.

In reality, by Tuesday afternoon, the storm had taken a hard right turn and was pounding western NC with rainfalls that produced up to 17” totals.
Drawdowns and Drawbacks

• Would it be possible to draw down the reservoirs to handle the “expected” rainfall from a hurricane?
• What would be the downstream effects?
• What will happen if the “expected” hurricane doesn’t bring rains to our area?
• What happens after that if it doesn’t rain much for the next several weeks or months?
Objective of High Water Event Management

• Operate hydro generating units and floodgates in a manner that will minimize the impacts upstream, downstream and on the lakes.

• Develop a staged preparation strategy to increase preparedness as confidence in the storm path strengthens. (Duke Energy lakes were actually pulled down in preparation for Hurricanes Bonnie and Charley forecasted earlier in 2004... both of which produced much less than expected rainfall in our service area over the Catawba-Wateree River Basin)

• Do not overreact and leave the lakes too low in the event that the path changes and our service territory is not affected. (Hurricane Floyd was predicted to come right across our service area. In the Piedmont, we received zero rainfall from the event while areas in the eastern part of the state received 15 to 20 inches and more in a 30 hour period.)

• Communications, communications, communications
In summary:

- Hydro operations are dynamic
- Weather is important to our operations (along with customer demand, etc.)
- Streamflow is made up of two key components:
  - direct runoff from rainfall events and,
  - base flow from groundwater
- Hydrographs from rainfall are impacted by many different factors including when, where, how fast and how long it rains
- Oh and by the way .... Not all significant rainfall is developed from tropical storms.
NWS Radar Summary of the precipitation that fell over the 5-Day Period May 4 - May 9, 2013. The principle rainfall occurred May 4-6, 2013. Just under 12 inches in places.
“As you can see, ladies and gentlemen, the available data clearly suggest six more weeks of winter.”