

Interim Low Inflow Protocol (LIP) for the Keowee-Toxaway River Basin

Purpose – To establish an interim joint management plan Duke Energy Carolinas, LLC (Duke), Seneca Light & Water (Seneca) and Greenville Water (GW) (the “Parties”), the current large water withdrawers from Lake Keowee, can follow to properly respond to drought conditions in the Keowee-Toxaway River Basin (“K-T Basin”).

Key Assumptions

- 1) The Parties believe this Interim LIP will support the management of the Duke Reservoirs (Bad Creek, Jocassee and Keowee) for Duke’s operations while meeting the water resource needs of the public.
- 2) The Parties agree the Interim LIP stages, drought trigger levels, recovery trigger levels, water use reduction goals for each stage, and any other items referenced in this document were developed cooperatively by GW, Seneca and Duke. This Interim LIP requires unanimous consent of all Parties before being considered final.
- 3) It is anticipated the Water Quantity and Operations Resource Committee (WQORC) and the Keowee-Toxaway Hydro Relicensing Stakeholder Team (KTST) will work towards a longer term LIP for inclusion in the Relicensing Agreement. Member organizations of the KTST will be eligible to sign the Relicensing Agreement at a later date (currently scheduled for November 29, 2013). This Interim LIP will serve as a starting point for negotiating the longer term LIP. This Interim LIP will terminate automatically on the date Relicensing Agreement signatures are due (currently scheduled for November 29, 2013), unless the Parties to this Interim LIP unanimously agree in writing to extend this Interim LIP.
- 4) The Parties are the only entities with Large Water Intakes (i.e., maximum instantaneous capacity greater than or equal to 1 Million Gallons per Day (MGD) for municipal, industrial or thermal power plant cooling use) withdrawing water from the Duke Reservoirs as of the date of this Interim LIP. The Parties reviewed drafts of this Interim LIP with the WQORC and the KTST and considered the feedback received prior to finalizing this document.

- 5) It is Duke's desire to limit the number of separate Large Water Intakes on the Duke Reservoirs and to direct any future Large Water Intakes owned by other entities to Lake Keowee only. However, once the Parties have agreed on this Interim LIP, any Large Water Intake Owner locating a new intake on Lake Keowee prior to the termination of this Interim LIP will be required to abide by this Interim LIP.
- 6) Nothing in this Interim LIP amends or replaces any other contract or agreement to which Duke and/or any other Large Water Intake Owner is a party.

Basic Responsibilities

Duke's Responsibilities:

Duke accepts the following basic responsibilities in furtherance of this Interim LIP:

1. Monitor the following interim drought triggers and relevant data once per week:
 - Remaining usable storage in the Duke Reservoirs
 - Composite average of selected United States Geological Survey (USGS) streamflow gages (Twelvemile Creek near Liberty, SC (USGS Gage # 02186000), Chattooga River near Clayton, GA (USGS Gage # 02177000), French Broad River near Rosman, NC (USGS Gage # 03439000))
 - U.S. Drought Monitor for the upper Savannah River Basin (i.e., from Thurmond Dam upstream)
 - Composite Duke Energy rainfall gage readings for the K-T Basin (Note: Data from other rainfall gauges can be added in the future if beneficial)
 - Oconee County USGS groundwater gage (USGS Gage # 345051083041800 OC-233)
 - Remaining usable storage in United States Army Corps of Engineers (USACE) reservoirs downstream
 - USACE Savannah River Basin drought status
2. Coordinate drought calls (monthly or bi-weekly as noted for the particular drought stage) and provide trigger updates and operational and meteorological projections. In consultation with the Large Water Intake Owners, select and communicate the Interim LIP Stage based on the triggers established herein.
3. Provide estimated water consumption rate by Oconee Nuclear Station (ONS) (average for the current month and projections for the next month) and the estimated

natural evaporation rate by reservoir from the Duke Reservoirs for the current month and projections for the next month.

4. Describe flow releases made from Keowee Hydro Station for the current month.
5. Coordinate with the USACE to make flow releases from Lake Keowee in accordance with the 1968 Agreement between Duke, USACE and the Southeastern Power Administration (SEPA) until the Minimum Usable Storage Threshold is reached. For the purposes of this Interim LIP, Minimum Usable Storage Threshold is defined as 86,600 ac-ft of water remaining in the Duke Reservoirs above the point at which Duke must implement alternative operating and maintenance procedures at ONS due to a lack of adequate water supply for normal power operations. For example, the Minimum Usable Storage Threshold would be reached if Lake Keowee was at 794.6 ft above mean sea level (amsl), Lake Jocassee was at 1086.0 ft amsl and the Bad Creek Reservoir was at Full Pond Elevation (i.e., 2310.0 ft amsl) simultaneously. The Minimum Usable Storage Threshold may be seasonally adjusted to a lower amount in the fall and winter periods during which times the risk of depleting the water resources are lower. The remaining usable storage calculation for Lake Keowee will be based on a maximum drawdown elevation of 778 ft amsl in accordance with the 1968 Agreement regardless of the ONS lake-level restriction.
6. Request voluntary or require mandatory water use restrictions for withdrawing water from the Duke Reservoirs to irrigate lakeside properties depending on the Interim LIP Stage.

Other Large Water Intake Owners' Responsibilities:

Other Large Water Intake Owners withdrawing water from the Duke Reservoirs accept the following basic responsibilities in furtherance of this Interim LIP:

1. Provide current month and projections for next month's water use from the Duke Reservoirs and from any alternative water supply sources.
2. Provide overview of system conditions related to water use from the Duke Reservoirs (i.e., leaks, status of alternative water sources, etc.).
3. Request or require water use restrictions from water customers and/or make greater use of alternative water sources for the purpose of reducing water withdrawals from the Duke Reservoirs below what those withdrawals would have been otherwise,

consistent with best practices and operating principles for those Large Water Intake Owners' systems.

Interim LIP Stage Triggers

For the purposes of this Interim LIP, the following triggers will define the Interim LIP Stage:

Stage 0 (Low Inflow Watch) Drought Trigger Levels:

1. Remaining usable storage in USACE reservoirs (Hartwell and Thurmond) and in the Duke Reservoirs is less than 90% (drawdown capability of Lake Keowee is based on the 1968 Agreement (i.e., 778.0 ft amsl)), and
2. One of the following triggers:
 - a. Area-weighted U.S. Drought Monitor for Upper Savannah River Basin (Thurmond Dam and upstream) is greater than or equal to 0, or
 - b. Streamflow based on composite average of selected streamflow gages (Twelvemile Creek near Liberty, SC, Chattooga River near Clayton, GA and French Broad River near Rosman, NC) is less than 85% of long-term average for the previous three months, or
 - c. Rainfall based on a composite average of the Duke Energy rain gauges for the K-T Basin is less than 85% of long-term average for the previous three months.

Note: The storage trigger for this stage coincides with the point at which Duke becomes at risk of having to make downstream flow releases to the USACE under the 1968 Agreement.

Stage 1 Drought Trigger Levels:

1. Remaining usable storage in USACE reservoirs (Hartwell and Thurmond) is at the point at which the USACE implements Level 1 of its existing Drought Contingency Plan, and
2. One of the following triggers:
 - a. Area-weighted U.S. Drought Monitor for Upper Savannah River Basin (Thurmond Dam and upstream) is greater than or equal to 1, or
 - b. Streamflow based on composite average of selected streamflow gages (Twelvemile Creek near Liberty, SC, Chattooga River near Clayton, GA and French Broad River near Rosman, NC) is less than 75% of long-term average for the previous three months, or

- c. Rainfall based on a composite average of the Duke Energy rain gauges for the K-T Basin is less than 75% of long-term average for the previous three months.

Stage 2 Drought Trigger Levels:

1. Remaining usable storage in USACE reservoirs (Hartwell and Thurmond) is at the point at which the USACE implements Level 2 of its existing Drought Contingency Plan, and
2. One of the following triggers:
 - a. Area-weighted U.S. Drought Monitor for Upper Savannah River Basin (Thurmond Dam and upstream) is greater than or equal to 2, or
 - b. Streamflow based on composite average of selected streamflow gages (Twelvemile Creek near Liberty, SC, Chattooga River near Clayton, GA and French Broad River near Rosman, NC) is less than 65% of long-term average for the previous three months, or
 - c. Rainfall based on a composite average of the Duke Energy rain gauges for the K-T Basin is less than 65% of long-term average for the previous three months.

Stage 3 Drought Trigger Levels:

1. Remaining usable storage in USACE reservoirs (Hartwell and Thurmond) is at the point at which the USACE implements Level 3 of its existing Drought Contingency Plan and remaining usable storage in the Duke Reservoirs is less than 50% (drawdown capability of Lake Keowee is based on the 1968 Agreement (i.e., 778.0 ft amsl)), and
2. One of the following triggers:
 - a. Area-weighted U.S. Drought Monitor for Upper Savannah River Basin (Thurmond Dam and upstream) is greater than or equal to 3, or
 - b. Streamflow based on composite average of selected streamflow gages (Twelvemile Creek near Liberty, SC, Chattooga River near Clayton, GA and French Broad River near Rosman, NC) is less than 55% of long-term average for the previous three months, or
 - c. Rainfall based on a composite average of the Duke Energy rain gauges for the K-T Basin is less than 55% of long-term average for the previous three months.

Note: The storage trigger for this stage for the Duke Reservoirs coincides with the Minimum Usable Storage Threshold below which Duke will no longer make the flow releases to the USACE calculated under the 1968 Agreement.

Stage 4 Drought Trigger Levels:

1. The remaining usable storage in the Duke Reservoirs is less than 42% (drawdown capability of Lake Keowee is based on the 1968 Agreement (i.e., 778.0 ft amsl)), and
2. One of the following triggers:
 - a. Area-weighted U.S. Drought Monitor for Upper Savannah River Basin (Thurmond Dam and upstream) is equal to 4, or
 - b. Streamflow based on composite average of selected streamflow gages (Twelvemile Creek near Liberty, SC, Chattooga River near Clayton, GA and French Broad River near Rosman, NC) is less than 40% of long-term average for the previous three months, or
 - c. Rainfall based on a composite average of the Duke Energy rain gauges for the K-T Basin is less than 40% of long-term average for the previous three months.

Note: The storage trigger for this stage for the Duke Reservoirs coincides with the point at which Duke may be required to shutdown ONS.

Specific Actions at each Interim LIP Stage

Stage 0

Duke:

- Notify the Parties to this Interim LIP that Stage 0 has been reached.
- Initiate monthly drought conference calls.
- Provide detailed updates on drought triggers and other relevant data as noted in the Basic Responsibilities section.
- Provide amount of water released from Lake Keowee required by 1968 Agreement (Duke/USACE/SEPA) for previous four weeks.

Other Large Water Intake Owners:

- Provide detailed updates on relevant data as noted in the Basic Responsibilities section.

Stage 1

Duke:

- Notify the Parties to this Interim LIP that Stage 1 has been reached.
- Coordinate monthly drought conference calls among the Parties and any other interested water system managers.
- Continue to provide detailed updates on drought triggers and other relevant data as noted in the Basic Responsibilities section.
- Provide amount of water released from Lake Keowee required by 1968 Agreement (Duke/USACE/SEPA) for previous four weeks.
- Request those lake neighbors withdrawing water from the Duke Reservoirs for irrigating lakeside properties voluntarily limit their withdrawals to no more than two days per week, with the days to be specified by Duke.

Other Large Water Intake Owners:

- Notify their water customers of the Low Inflow Condition through public outreach and communication efforts.
- Reduce water withdrawals from Lake Keowee, as a goal, by 3-5% (or more) from the amount otherwise expected.
- Provide detailed updates on relevant data as noted in the Basic Responsibilities section.

Stage 2

Duke:

- Notify the Parties to this Interim LIP that Stage 2 has been reached.
- Coordinate bi-weekly drought conference calls.
- Continue to provide detailed updates on drought triggers and other relevant data as noted in the Basic Responsibilities section.
- Provide amount of water released from Lake Keowee required by 1968 Agreement (Duke/USACE/SEPA) for previous two weeks.
- Require those lake neighbors withdrawing water from the Duke Reservoirs for irrigating lakeside properties to limit their withdrawals to no more than two days per week with the days to be specified by Duke.

Other Large Water Intake Owners:

- Notify their water customers of the Low Inflow Condition through public outreach and communication efforts with emphasis on the need to conserve water.

- Reduce water withdrawals from Lake Keowee, as a goal, by 5-10% (or more) from the amount otherwise expected.
- Provide detailed updates on relevant data as noted in the Basic Responsibilities section.

Stage 3

Duke:

- Notify the Parties to this Interim LIP that Stage 3 has been reached.
- Coordinate bi-weekly drought conference calls.
- Continue to provide detailed updates on drought triggers and other relevant data as noted in the Basic Responsibilities section.
- Provide amount of water released from Lake Keowee required by 1968 Agreement (Duke/USACE/SEPA) for previous two weeks.
- Reduce or temporarily eliminate flow releases from Lake Keowee unless required for reasons other than system electrical load needs.
- Require those lake neighbors withdrawing water from the Duke Reservoirs for irrigating lakeside properties to limit their withdrawals to no more than one day per week with the day to be specified by Duke.

Other Large Water Intake Owners:

- Notify their water customers of the Low Inflow Condition through public outreach and communication efforts with increased emphasis on the need to conserve water.
- Reduce water withdrawals from Lake Keowee, as a goal, by 10-20% (or more) from the amount otherwise expected.
- Provide detailed updates on relevant data as noted in the Basic Responsibilities section.

Stage 4

Duke:

- Notify the Parties to this Interim LIP that Stage 4 has been reached.
- Coordinate bi-weekly (or more frequently if needed) drought conference calls.
- Continue to provide detailed updates on drought triggers and other relevant data as noted in the Basic Responsibilities section.
- Provide amount of water released from Lake Keowee required by 1968 Agreement (Duke/USACE/SEPA) for previous two weeks.
- Continue to reduce or temporarily eliminate flow releases from Lake Keowee unless required for reasons other than system electrical load needs.

- Require those lake neighbors withdrawing water from the Duke Reservoirs for irrigating lakeside properties to cease all such withdrawals.

Other Large Water Intake Owners:

- Notify their water customers of the Low Inflow Condition through public outreach and communication efforts with increased emphasis on the need to conserve water.
- Reduce water withdrawals from Lake Keowee 20-30% (or more) from the amount otherwise expected.
- Provide detailed updates on relevant data as noted in the Basic Responsibilities section.

Recovery from Interim LIP Stages

Recovery under this Interim LIP as conditions improve will be accomplished by reversing the staged approach outlined above, except the only requirement to recover from a stage is the storage trigger for the Duke Reservoirs must be exceeded for the current stage. For recovery from a stage that does not have a specific Duke storage trigger, only the applicable USACE storage trigger must be exceeded for the current stage. The following table provides the storage levels required for recovery from a higher numbered “Stage X” to a lower numbered “Stage Y”:

<u>Recovery from Stage X to Stage Y</u>	<u>Required Storage</u>
From Stage 4 to Stage 3	Duke Reservoir storage greater than or equal to 42%
From Stage 3 to Stage 2	Duke Reservoir storage greater than or equal to 50%
From Stage 2 to Stage 1	USACE implements Level 1 of its DCP
From Stage 1 to Stage 0	USACE returns to Normal operations
From Stage 0 to Normal	Duke Reservoir storage greater than or equal to 90%