MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Water Quality, Fish and Wildlife RCG Meeting

August 17, 2016

Final HGM 09-16-16

ATTENDEES:

Bill Argentieri (SCE&G)
Ray Ammarell (SCE&G)
Randy Mahan (SCE&G)
Caleb Gaston (SCANA)
Brandon Stutts (SCANA)
Tom McCoy (USFWS)
Bill Marshall (SCDNR)
Dick Christie (SCDNR)
Alex Pellett (SCDNR) via phone
Rusty Wenerick (SCDHEC)
Bill Stangler (Congaree Riverkeeper)
Fritz Rohde (NOAA) via phone
Gerrit Jobsis (American Rivers)
Henry Mealing (Kleinschmidt)
Bret Hoffman (Kleinschmidt)
Jordan Johnson (Kleinschmidt)

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Henry opened the meeting with introductions and explained that the purpose of the meeting was to discuss the revised Downstream Flow Evaluation Memo. At the WQFW RCG meeting on January 21, 2016, the RCG discussed the initial Downstream Flow Fluctuations Memo. An action item stemming from that meeting was that Kleinschmidt and SCE&G would develop a better routing model for inflows to the Parr Reservoir; compare those inflows to actual project releases as measured by the Alston gage; and use the downstream hydraulic model to examine the differences between a "run-of-river" scenario versus the actual project operational flows, and include the river downstream of the project to the Congaree River gage near the Congaree National Park. The model was reviewed for its ability to produce accurate representations of the flows moving downstream from the Carlisle, Enoree and Tyger gage locations to the Congaree gage location and from the Alston gaged flows down to the Congaree gage. The results were summarized in the revised Downstream Flow Evaluation Memo, which was distributed to the RCG for review on June 9, 2016.

Bret began the discussion by briefly recapping the original analysis and the action items from the prior RCG meeting. He moved into the methodologies used for the flow routing analysis. The methodologies included four tasks broken down as follows.

1. Develop flow data sets for the routing simulations being compared at the USGS gage on the Congaree River at Columbia:
    - Develop a run-of-river inflow data set for the Parr Reservoir node, using a hydrologic routing model (HEC-HMS) based on the three upstream gages.
    - Develop a model input flow data set for the actual Parr flow releases, which are assumed to be identical to the USGS flow data from the Alston gage #02161000.

- Develop a model input flow data set for the ungaged flows between the Alston gage site and the Congaree gage site. This was added independently to the run-of-river inflow and actual Parr flow release data sets.
- Develop a model input flow data set for the Saluda River flows, which are assumed to be identical to the USGS gage #02169000.

2. Extend the river routing (HEC-RAS) model from the previous terminus at the Columbia dam, down to the USGS Congaree gage at Columbia.
3. Perform model (HEC-RAS) validation for the existing conditions, by simulating a period and comparing peak values and the timing of flow peaks and comparing with the Congaree gage data.
4. Performing simulations with the Parr run-of-river data, and comparing with existing conditions.

After reviewing the methodologies used, the group reviewed figures illustrating the modeled Parr inflow and observed flows in the Tyger, Enoree, and Broad River upstream of Parr Reservoir. The figures illustrated that the models respond correctly to different inflow events. The group then reviewed a figure illustrating the models ability to route flows correctly as compared to the observed conditions at the Alston gage and the Congaree gage. Bret noted the difference in flow estimated by the model and the observed Congaree flow. He explained that this is related to contributions from the ungaged tributaries present below the Alston gage. These ungaged inflows were accounted for in the modeling as a pro-rated amount. The ungaged inflow was incorporated into both the run-of-river model simulation and the existing model simulation as to not introduce any bias during comparisons.

The group reviewed comparisons of the run-of-river and existing conditions model simulations. The first showed a situation where a high inflow event occurred at Parr Reservoir and how that affected the conditions in the Congaree. Ray noted that the "pulses" observed on the hydrograph when compared to run-of-river conditions are related to Fairfield operations. He explained that Parr can pass roughly 4,800 cfs through the powerhouse and that flows greater than that result in gate operations. He also noted that Fairfield doesn't operate when inflows are greater than 40,000 cfs. The group also discussed an event influenced by Saluda operations. Bret pointed out that the comparison in this figure is between simulated run-of-river conditions at the Congaree gage and simulated existing conditions at the Congaree gage to account for the ungaged inflows entering below the Alston gage. This allows for a comparison of the two without introducing any bias created by the ungaged inflows.

Bret continued the presentation of various flow fluctuation events to include an event with influence from both Saluda and Parr. Ray pointed out that the "sawtooth" affect noted in the Congaree existing conditions simulation that wasn't present in the Congaree run-of-river simulation was related to Fairfield operations. Parr mimics inflows until they are greater than plant capacity (4,800 cfs) or Fairfield operates. These events trigger gate operations at Parr. Bret noted that operations at Parr are very complex. Ray added that SCE&G would like stakeholder input on the importance of limiting fluctuations during high inflow events versus during more normal or stable inflows. Gerrit commented that they would like to see less fluctuations at the end of high inflow events as they could affect sturgeon in the Congaree. Gerrit cited a study that showed sturgeon spawn on the tail end of a high flow event during the spring. Henry asked if Gerrit could provide that report so we could bring that information into the analysis. Bret also reminded that Parr has to lower gates

because it is not a storage project and they have "backwatering" restrictions due to an article in their license.

The group discussions an event related to a Parr release. Ray explained that the spike shown at Alston, and as a result the Congaree, was related to what the operators refer to as an "inventory" spill. Inflows at Parr were slightly higher than plant capacity, so storage in the reservoir was gradually increasing. Eventually, the reservoir was completely filled and the operators had to lower the gates which resulted in the spike in flows downstream. Gerrit pointed out that events like these could have effects on downstream striped bass during their spawning period. The group also reviewed simulations during a prolonged high inflow event. They noted the sawtooth created by Parr gate operations as compared to run-of-river conditions.

Bret concluded the presentation by explaining to the stakeholders that SCE&G wanted the group to be comfortable with the simulations produced by the model which compare run-of-river conditions at Parr with existing conditions at Parr and the differences in flows observed at the Congaree gage site. He added that the model will be made available to the group.

The group shifted discussions to another action item from the prior meeting. SCE&G presented their findings from their discussions with operators about what operational changes could be made to mitigate downstream flow fluctuations. Ray noted that their first finding was that operators are constrained by two parts of their license. Article 39 limits downstream flows to less than 40,000 cfs unless they are exceeded naturally. Section 13 limits the amount they can allow the reservoir to backwater, as this will result in flooding of a railroad line near the project. Ray continued on to note that the crest gate operation is also limited by when plant operators are on site. Gates are generally only operated during the normal business hours on weekdays. There are brief checks on the weekend, but the plant is unmanned. Safety concerns do not allow for remote gate operations. Ray's final comment was that the addition of the crest gates increased the project head. This resulted in the plant no longer being equipped to run at full hydraulic capacity. Plant hydraulic capacity was effectively lowered from 6,000 cfs to 4,800 cfs. Ray also added that this is also impacted by the number of units available for operation – not under repair. Fewer operational units results in even less ability for the powerhouse to pass flow downstream and results in increased gate operations.

Ray moved the discussion to potential operational modifications. He noted that operators could try to release their inventory spills over a longer period of time by using multiple gate sets. This would reduce the amplitude and increase the wavelength illustrated on the hydrograph. He added that they could install cameras that observe gates 1 and 2 in addition to providing the System Controllers with control of these two gates operations. This would allow for the operation of those two gates remotely when the plant is unmanned. This would allow for the gates to be operated at night and over weekends, reducing spikes downstream created by Fairfield operations. Ray then showed the group a hydrograph illustrating a period where inflows were within the plant capacity. He noted that the hydrograph lacks the "sawtooth". Gerrit asked if this example accounts for flow attenuation. Ray says that it does not, however inflows from the Tyger and Enoree are minimal in the time period illustrated.

Ray also described potential upgrades to the powerhouse that would increase the plant capacity closer to its original 6,000 cfs. This would increase the amount of time where flows could be routed through the powerhouse, reducing occurrences of the sawtooth created by gate operations. These upgrades are still being evaluated for feasibility.

Ray added that while these proposed changes sound easy, changes to gate operation procedures are very difficult due to the complexity of the system. Gerrit asked what the timeline would be for these improvements post license issuance. Henry commented that the cameras and any changes to gate operations would be started quickly after issuance of the license. Plant upgrades would be more long term covering multiple years into the license. Ray reiterated that they will continue to work with operators on their methods of gate operations. Bill Marshall asked if the model could simulate conditions post-upgrades and what are they exactly. Henry noted that you would no longer have inventory spills when inflows are below 6,000 cfs. Ray added that the group could look at the flow duration curves and quantify how often conditions would be improved. Gerrit added that the group has emphasized improvements during the spawning period, but noted that the benefits could be year around. Ray commented that the upgrades are only being considered because of the increased control over environmental impacts. He added that the pay-back on plant upgrades is long-term and that the upgrades would be a no-go otherwise.

The group decided to pull up flow duration curves for the project. They noted that the proposed powerhouse upgrades would decrease the amount of time where inflows are greater than plant capacity by about 10% annually. They also noted that the most improvement would be during earlier months of the year. The group decided that SCE&G and Kleinschmidt will produce a table with percentages from the flow duration curves at potential plant capacities. Alex added that flow duration curves from the modeled Parr inflow dataset should be used in the analysis. Henry reiterated that the proposed gate operation changes will also reduce the amplitude of spikes in the hydrograph. Bill Stangler asked if the changes in gate operations will affect proposed gate operations to improve water quality in the west channel below Parr Dam. Ray commented that it will not and that they will prioritize the use of gates 1 and 2 when spills are necessary.

After Ray's discussion of SCE&G's findings, Henry asked the group for any questions. Alex P. asked how cross sections and channel slope were calculated in the model for the stretch of river added below Columbia Dam. Bret stated that he will provide Alex with the methods. Gerrit asked if it would be possible to estimate how much the proposed changes will affect spikes at higher flow ranges. Ray commented that the powerhouse upgrades will provide the largest effect, however it's difficult to quantify. He added that the upgrades could be introduced to the model. Bret noted that with more water routed through the powerhouse, there will be steadier releases downstream. Gerrit adds that Figure 9 from Bret's presentation illustrates the event he is most concerned with. Would it be possible to quantify the frequency of these events and how much they could be reduced? How much would the spikes in flow be attenuated? Ray noted that powerhouse upgrades will result in slower inventory accumulation in the reservoir which will result in few spill events. He added that they will decrease amplitude of these spills with the proposed gate operations changes. Gerrit added that he would like to see the benefits quantified with examples of reductions. Rusty asked if the model could be used to add a line to existing graphs showing conditions post upgrades and management operations changes. Bret commented that this request would likely be a very large effort. Gerrit added that he would like to see benefits during spawning periods via lower flow fluctuations in flows during high inflow events. Henry commented that SCE&G does not want to change Fairfield operations to help with fluctuations. He noted that SCE&G and Kleinschmidt will continue to research ways to quantify and report anticipated improvements.

Meeting adjourned. Action items from this meeting are listed below.

ACTION ITEMS:

- Kleinschmidt will provide meeting notes to the group.
- Kleinschmidt will provide methodologies for the additional reach added to HEC-RAS model.
- Kleinschmidt will produce a table of flow duration curve percentages for upgraded capacities using curves produced from the modeled Parr inflow data set.
- Kleinschmidt will provide the model data to Alex P. of SCDNR.
- Kleinschmidt and SCE&G will explore ways to quantify and estimate improvements to downstream fluctuations through the proposed plant upgrades and gate operational changes.
- Gerrit will provide study that shows sturgeon spawning on the tail end of a high flow event during the spring.