

MEETING NOTES

**SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
OPERATIONS TECHNICAL WORKING COMMITTEE**

**SCE&G Training Center
May 21, 2008**

final acg 8-11-08

ATTENDEES:

Alan Stuart, Kleinschmidt Associates
Alison Guth, Kleinschmidt Associates
Bill Argentieri, SCE&G
Bret Hoffman, Kleinschmidt Associates
Bud Badr, SCDNR
Michael Waddell, TU
Jon Quebbeman, Kleinschmidt Associates

John Martin, SCDHEC
Ray Ammarell, SCE&G
Scott Harder, SCDNR
Feleke Arega, SCDNR
Titus Rotich, SCDNR
Jim Cumberland, SCCCL
Mark Giffin, SCDHEC

DATE: May 21, 2008

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.

DISCUSSION

Bret Hoffman opened the meeting, presented the group with some background information on the hydraulic model, and introduced Jon Quebbeman who was presenting. Bret explained that the purpose of the meeting would be to run through the model with the TWC before it was presented to the RCG's.

Jon began the presentation and explained that, reflecting Dr. Badr's request, they extended the modeled data back until around 1940. Jon pointed out that there are two gages on the river that were used, and roughly 100 square miles of drainage area between the gages. Jon reviewed that there were two approaches for the modeling. He explained that one method was to look at the gages in the upper end of the reservoir and calculate inflows. He noted that the second approach would be to use the mass balance method. Jon pointed out that it appeared that the mass balance method was more accurate, as it accounts for evaporation. He continued to explain that the goal is to determine how much flow is coming into the reservoir and run various scenarios of operation to see how well the model can meet certain guide curves.

Jon reviewed how USGS developed the extended period of record to model data. It was explained that USGS hindcasted data was incorporated into the model. Bret explained Dr. Badr's concerns for incorporating an extended period of record; he noted that model results from the last 16 years would not look as good as the last 60 years due to the extended drought that has been ongoing. Bret

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continued to note that information has been obtained from the RCG groups on desired run scenarios and those requests have been tiered. Dr. Badr questioned how SCE&G's desires were incorporated into the model. Ray Ammarell explained that as long as the plant is available for reserve, their needs are met. Bill Argentieri added that SCE&G's piece of the model is a set amount of acre/feet of water for reserve. It was also explained that the more often SCE&G has to generate for reservoir pool management, the less time it is available for reserve. Dr. Badr asked how the model was going to measure how often plant was available. Jon replied that there are two methods for determining how often the plant was not available; it could be done by counting the recreation days, or if because of previous operations in a drought period the reservoir has dropped below 345', where reserve is not used in the model. Bret added that reserve capabilities were taken care of outside the model by discussing recreation flows with the Downstream Flows TWC.

Jon continued through the presentation and explained that some of the constraints incorporated into the model are up for discussion. He noted that there was a guide curve incorporated for certain years so that the lake level drops down to 350' on January 1st for water quality. Jon also presented the group with the recreation tiers. He explained that Tier 1 is what is maintained as the highest priority for recreation flows.

After a break the group continued to discuss the tier 1 and tier 2 recreation flows. It was explained that tier 1 included the swiftwater rescue training. Jon also reviewed minimum flows with the group.

After lunch and the inputs to the model were discussed, Jon reviewed the model results with the group. It was shown that model results matched up well with the reservoir guide curves. The group viewed curves with 10, 20 and 40 hours of reserve generation. Generally under normal circumstances, all the needs could be met. As the group reviewed the results, they also discussed any changes that should be made to the model. These are outlined below:

- Tier 2 Recreational releases to be cut off 1 foot below guide curve, Tier 2 Recreation releases to be cut off 3 feet below guide curve.
- Elevation 358' should be met by March 1.
- Reserve operations should be stopped at 345' instead of 335'.
- Minimum flows should be cut off at 335'
- The model should be run with zero hours/month for reserve calls
- Flood forecasting should be incorporated into the first band level of operations
- Minimum flows should be cut down to 400 cfs when elevation 350' is met.

Desired Results: frequency and duration of violations.

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The group noted that they were happy with the model and the results and moved on to discuss the low inflow protocol (LIP) and guide curve. Ray provided the group with a presentation on the proposed LIP and guide curve. He explained that SCE&G will strive to operate the Project within the target operating band under normal conditions. Ray also explained that the purpose of the LIP would be to allow for staged reductions in minimum flow and other releases during periods of drought or low inflows to the reservoir. In the presentation, Ray shared many of the LIP definitions with the group and noted that the LIP is structured very similar to what Duke did on the Catawba Wateree. Ray pointed out the three gages that they generally monitor are Saluda River at Chappells, Little River near Silverstreet, and Bush River near Prosperity. The group then looked at the proposed low inflow protocol trigger points and actions. Ray explained that during recovery from a drought, all three LIP triggers must be met for the previous stage before the LIP stage is moved up.

As the group reviewed the LIP, Dr. Badr suggested that the analysis be run based on the last 16 years of data in order to see how it corresponds to what is currently happening in the state. Dr. Badr also suggested that Lake Greenwood low flows be looked at in order to see how they compare in percentile rankings. Ray continued with the presentation and the group discussed that under stage 1 of the LIP there was not much impact to downstream flows. The group continued with discussions and upon completion of the presentation everyone agreed that, in principle, it looked like a good start to the LIP and guide curve. It was noted that this information would be sent out to the group for review and Dr. Badr pointed out that he would like the information sent to Feleke. The group adjourned.

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SALUDA HYDRO PROJECT RELICENSING
All RCGs Operations Meeting**

**Saluda Shoals Park
October 12, 2006**

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ATTENDEES:

Alison Guth, Kleinschmidt Associates	Shane Boring, Kleinschmidt Associates
Alan Stuart, Kleinschmidt Associates	Dave Anderson, Kleinschmidt Associates
David Price, LM Power Squadron	Amy Bennett, SCDHEC
Kim Westbury, Saluda County	Jim Ruane, REMI
Bret Hoffman, Kleinschmidt Associates	Trisha Priester, Lexington County
Ronald Scott, Lexington County	Andy Miller, SCDHEC
Patrick Moore, CCL, AR	Reed Bull, Midlands Striper Club
Ron Ahle, SCDNR	Brandon Stutts, SCANA Services
Kristina Massey, Kleinschmidt Associates	Mike Schimpff, Kleinschmidt Associates
Bob Olson, NRE	Tom Bowles, SCE&G
Jenn O'Rourke, SCWF	Richard Mikell, Adventure Carolina
Dick Christie, SCDNR	Bob Perry, SCDNR
Jeff Duncan, NPS	Theresa Thom, NPS
Tony Bebbler, SCPRT	Ed Schnepel, LMA
Tom Ruple, LMA	Ed Diebold, Riverbanks Zoo
Bob Seibels, Riverbanks Zoo	Jon Quebbeman, Kleinschmidt Associates
Bill Argentieri, SCE&G	Mike Waddell, Saluda TU
Karen Kustafik, CoC Parks & Rec	Amanda Hill, USFWS
Bill Brebner, YCOA	Kenneth Fox, LMA
Roy Parker, LMA	Bob Keener, LMA & LMSCA
Steve Summer, SCANA Services	Bud Badr, SCDNR
Randy Mahan, SCANA Services	Bob Keener, LMA
Ray Ammarell, SCE&G	

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Alan Stuart of Kleinschmidt Associates welcomed the group and noted that the purpose of this meeting was to introduce two items to the RCG members, a presentation on the research SCE&G has done on Alternative Energy Sources, and secondly to discuss the HEC-ResSim Operations Model. Alan noted that in order to aid in the understanding of hydrology when discussing the model, Dr. Bud Badr would also be providing the group with a hydrology 101 presentation. Subsequent to Alan's introduction, the following presentations were given (click below to view)

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Alternative Energy Source Presentation – *Carl Hoadley & Skip Smith SCE&G:*
<http://www.saludahydrorelicense.com/documents/ALTERNATIVEGENERATION.pdf>

An Understanding Of Hydrology – *Dr. Bud Badr : Coming Soon*

Discussion On The HEC-ResSim Operations Model – *Mike Schmipff & Jon Quebbeman – Kleinschmidt Associates :* <http://www.saludahydrorelicense.com/documents/SaludaProject10-12a.pdf>

Following the presentation on Alternative Generation, the floor was opened up for questions. One individual asked how the reliability numbers presented in the presentation were calculated. Carl H. replied that in order to calculate those numbers, they looked at forced outage rates, routine maintenance, as well as industry numbers. Bill A. also explained that many of the equipment cost numbers come from recent numbers that the vendors supplied. The group also briefly discussed how future demands will be fulfilled. One individual asked if SCE&G has evaluated how Saluda may be used in the future. Steve S. replied that SCE&G is looking at fulfilling future capacity needs through a nuclear station. There was also brief discussion regarding the use of Saluda over the past year. Bill A. explained that last year SCE&G tried to keep the lake level up around 358' and because of this, they had to get rid of the rainwater that entered the system rapidly to avoid exceeding the normal high water level. Due to problems with some of the other units at Saluda, Unit 5 was run to expel the excess rainwater. Reed B. also asked if there was any way to look at how Saluda was used for reserve in the past in order to predict how Saluda may be used for reserve in the future. Randy M. noted that because of the unpredictable nature of reserve calls, it would be difficult to forecast how often they may be called upon for reserve in the future. Patrick Moore asked if the alternatives analysis had considered partial replacement of only 50 or 100 MW because the most problematic impacts occurred at high flows. Bill A. replied that the Code of Fed. Regulations only required the full replacement cost analysis and that no partial analysis had been done. Later in the meeting Patrick commented that the 34 million dollar relicensing cost cap was an internal, SCE&G figure and that it in no way limited what SCE&G would be required to spend to address project impacts. He cited a recent court of appeals case that stated FERC has no obligation to issue an economically viable license.

After a short break, Dr. Bud Badr gave a presentation on hydrology to the group. There were no questions following Dr. Badr's presentation.

The next presentation was given by Mike Schmipff and Jon Quebbeman on the HEC-ResSim model developed for Saluda. The presentation can be viewed from the link above. Mike S. explained that the HEC-ResSim model was used for Lake Murray and was incorporated with the HEC-Ras model for the lower Saluda River. The floor was open for questions throughout the presentation. Tony B. noted that in the last 16 years he doesn't believe there have been any major flood events, and asked if something was built into the model to account for this. Mike S. explained that this being a water

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allocation model, he was not as concerned about the high flow times because water can be allocated for all the needs. He noted that the concern lies in the low flow times. Jeff D. asked if data from the Catawba Wateree model could be integrated into the Saluda model. Jon Q. noted that it was possible to add in other data to the model, however he noted that he did not believe it would be necessary or appropriate to add the Catawba data in.

The group began to discuss in a little more detail the constraints to be developed by the Resource Conservation Groups. Dave A. asked if the flows in the lower Saluda River can be calculated at the gage by the Zoo. Jon Q. replied that it could. Dave A. also asked if the model could predict what would happen when Saluda is used for reserve. Jon Q. explained that they were going to handle this by adding in, for example, 200 MW, 1 day a month, for 24 hours. Dave A. asked how the constraints will be obtained from the Resource Conservation Groups. Jon Q. noted that it depended on the RCGs time schedule, once an RCG makes a recommendation for the model, he could input the data. Ron A. added that he believed that instream flows would be the last input to the model. Mike S. and Jon Q. concluded their presentation and the group adjourned.

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**Saluda Hydro Training Center
August 23, 2006**

Final brh 10-2-06

ATTENDEES:

Bob Olsen, NRE
Bret Hoffman, Kleinschmidt
Bud Badr, SCDNR
Jon Quebbeman, Kleinschmidt
Feleka Arega, SCDNR

Larry Turner, SC DHEC
Michael Waddell, TU
Mike Schimpff, Kleinschmidt
Ray Ammarell, SCE&G

ACTION ITEMS:

- Refine model inputs for inflows and evaporation; if necessary, consider longer period of input from Chappells gage.
Jon Quebbeman, Mike Schimpff
- Update members of improvements/changes to the model using hydrographs (via email).
Jon Quebbeman, Mike Schimpff
- Contact USGS for verification of data used in model during joint RCG meeting.
Ray Ammarell
- Check with SCE&G management about posting the model for downloading.
Ray Ammarell

DATE OF NEXT MEETING: October 12, joint meeting with all RCG's

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Mike S. opened the meeting and stated the objective was to review and finalize, or make recommendations to finalize, the base model structure. Using a projector, Jon and Mike displayed numerous screenshots from the HEC-ResSim program, explaining the various inputs and simulations of the model.

Input for Model

The watershed map was displayed, and gauged inputs for the model were pointed out. Jon and Mike then showed the un-gauged inputs and illustrated their respective basin areas on the map. These four un-gauged inputs were prorated from the Bush River gage. Mike noted that the rainfall directly onto the lake was part of one of these un-gauged inflows. Outflows are measured from a gage on the lower Saluda River near the tailrace; contributions from the Broad River are calculated by subtracting Saluda flows from those measured at the nearby Congaree River gage, which is just downstream of the confluence.

The reservoir stage – storage data was provided by SCE&G, and a reservoir guide curve was derived by averaging 16 years of observed lake level data (from 1990 to 2006). The hydrologic data for inflows corresponded with this 16-year period, chosen because it is the total combined period of record for all inflow gages used in the model. Reservoir evaporation was calculated using a formula incorporating average monthly temperatures. Bob mentioned the evaporation could be examined annually versus monthly. Ray explained that there are two possible calculation method for evaporation, pan and free-surface; he also presented the idea of using NOAA Atlas evaporation data. Mike and Jon agreed to revise evaporation from the reservoir.

The total 16-year period was used to check the accuracy of the model by two methods: 1) matching the outflow of the model to the observed outflows and comparing the calculated reservoir stage versus the actual recorded stage, and (2) matching the model's reservoir stage with the observed stage and comparing the calculated versus recorded outflows. Most years modeled extremely well for the stage matching, with the exception of two heavy inflow years. During those years, the reservoir elevation was calculated higher than actually occurred, even reaching El. 360'. This triggered the model to simulate flood control (opening spillway gates); in reality, the reservoir did not reach that elevation during those years; the spillway gates have not been operated since before Unit-5 was added (1971). Bob noted that the sudden increases during the heavy inflow years that triggered flood control did not readily return the reservoir to acceptable levels (below El. 360'). It

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was realized that this is probably due to the flood control mode overriding the stage matching and switching the model to matching outflows. It was suggested that one of the more significant un-gauged inflows may need adjustment to account for direct lake precipitation, and Larry also proposed doing a volume comparison.

Discussion was held regarding the possibility of eliminating the Little River and Bush River gage contributions because they have a limiting period of available data for inflows. Using only the Chappells gage would allow inflow data dating back to 1965, when the gage was relocated. This would mean changing the Little River and Bush River watershed contributions to un-gauged inflows by following the Chappells rating. Mike and Jon will try to fine-tune the model with all current contributions (including Little River and Bush River gages) to better simulate the recorded stage conditions. If this does not work, the option of removing these two gages and just using the Chappells gage (capturing a longer period of inflow records) will be used. As they make adjustments and refine the model, Mike and Jon will email hydrographs showing comparative modifications to the TWC members. Bud suggested using a back-calculated method of known discharge and stage to determine the inflow hydrograph. This method is preferred as it eliminates uncertainty with respect to evaporation, local basin inflow, and inflow from direct precipitation onto the reservoir.

Lower Saluda River

For the lower Saluda River, 22 cross-sections were used to develop a 1D flow profile model using HEC-RAS. Jon showed graphs of several cross-sections, and noted that roughness coefficients are used for calibration of the model to several steady state calibration points. Cross-sections for the Congaree were also developed to route flows through and determine stages near the Congaree National Park. Flows were calibrated to the USGS curve at the gage near Columbia. The calculated flows from the model were very close to the recorded flows, with calculated flows being slightly higher at the upper end of the flow range and slightly below recorded flows at the lower end.

The question of flow contributions from tributaries on the lower Saluda River arose; the model does not individually address those flows because they are not related to operations. However, overall contributions from the watershed for the USGS gage near Columbia are included, and tributaries are part of that inflow. Since the model treats tributaries as part of the river's cross-section, the calculated velocities in reaches containing tributaries are drastically reduced; predictions in these reaches thus would not be representative of actual flow in the main river channel, and would affect calculated flow travel times. To eliminate these artificial velocity reductions, theoretical levees were placed across the mouths of tributaries entering the main river channel.

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Constraints and Prioritization

Since the purpose of the model is to balance stakeholder interests with hydrologic and physical lake operation limitations, the question arose on how to prioritize constraints within the model. It was agreed that the TWC's purpose was to build an accurate model, and the stakeholders and RCG's would determine the prioritization of constraints. Ray noted that priorities will be alluded to in a low-flow protocol (drought contingency plan). In a typical (simple) low-flow situation, this protocol gives priority to municipal water supply, then environmental constraints (such as minimum flows), then other interests (generation, recreation, etc.). While Lake Murray provides some municipal water supply, this is not expected to be an issue because all supply intakes are below El. 345'. Ray reiterated SCE&G's interest is using Saluda for reserve capacity, then for reservoir management via a guide curve.

Another constraint discussed was the winter drawdown limitation; the purpose of the drawdown is to create reservoir storage for spring rains, and a higher winter reservoir elevation reduces this available storage. Inflows greater than the capacity of Saluda (~18,000 cfs) cause the reservoir to rise; once the lake reaches El. 360', spillway gates are opened in an attempt to match inflows and stabilize the reservoir level. Ray explained that SCE&G considers operating the spillway gates a failure to manage the reservoir as well as a waste of a resource. The Probable Maximum Flood (PMF) was also discussed, which Ray explained can be routed through Saluda without overtopping the dam; this requires that the reservoir is at or below the starting elevation for the PMF event. The FERC will require SCE&G to maintain the ability to route the PMF. The starting elevation for the PMF event, as well as the potential for reaching El. 360' (spillway operation threshold), will be determining factors in the model for the drawdown limitation.

Model Availability

The group held a discussion about whether or not the actual model would be available to stakeholders. The program is readily available for anyone to download from the Corps of Engineers website, and the watershed data can also be obtained online. Jon noted that the file size of the Saluda base model was thirty to forty megabytes, without the operating software. It was agreed that making the model available would not be of any harm, as it would likely only be used by the few people who understand the HEC software. Since SCE&G is paying for the services to develop the model, Ray will ask management for their approval prior to it being available for downloading. If the model data is made available, the one used for relicensing will not be open for changes other than RCG-submitted inputs; a statement to this affect will be posted on the website with the download link. The sole purpose of the TWC is to create the base model, which will not be open for change by outside interests.

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Next Step

As the meeting closed, it was agreed that the base model structure was good, and Mike and Jon agreed to fine-tune inputs in attempts to more closely match calculated results with recorded conditions; their progress will be communicated to other TWC members via emails of hydrograph screenshots. The group agreed that the base model can be finalized without another TWC meeting, and considered it appropriate to present the model to all RCG's in a joint meeting.

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SOUTH CAROLINA ELECTRIC & GAS COMPANY SALUDA HYDRO PROJECT RELICENSING GENERATION REVIEW TWC

**Lake Murray Training Center
July 11, 2006**

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ATTENDEES:

Alan Stuart, Kleinschmidt Associates
Alison Guth, Kleinschmidt Associates
Bill Argentieri, SCE&G
Bill Marshall, DNR, LSSRAC
Michael Waddell, TU
Patrick Moore, SCCCL, Am. Rivers
Steve Bell, Lake Watch
Randy Mahan, SCANA Services
Tom Eppink, SCANA Services
Karen Kustafik, City of Columbia Parks
Theresa Thom, Congaree National Park

DATE: July 11, 2006

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HOMEWORK

- Provide flows for FFPS – *Bill A*
- Look into providing low and high cost of MW for last 10 years – *Bill A*
- Provide list of additional questions to Bill A – *TWC members*
- Arrange for corporate attorney to attend next RCG/TWC meeting to respond to confidentiality issues – *Bill A*
- Send Mike Waddell the FERC form for the other ¾ of 2005 – *Bill A*
- Arrange for Lee Xanthakos to attend the next RCG meeting – *Bill A*
- Prior to next RCG meeting, email Bill A. dates from which information is requested on how plants were operated – *TWC members*

DISCUSSION

Alan Stuart welcomed the group and noted that the meeting had been convened at the request of stakeholders, and the primary purpose was to review the information

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distributed by Bill Argentieri (listed in blue) after the April meeting. The group decided to review each of the items and discuss questions as they came up.

1. Provide a weekly generation report for all of the plants on the SCE&G system. At this time the group would like to see one of these reports, let's say the week of August 28, 2005. If it provides the group with the information we are looking for, I will obtain a copy of each week from January 1, 2005 through December 31, 2005.

Response: The data requested regarding prior operation of all plants on our system is not maintained in the manner requested. We do not keep a weekly aggregate of generation for our plants. Thus, this information is not readily available. In addition, generation information at this level of detail is business-confidential and market-sensitive information. Disclosure of this information could result in substantial damage to SCE&G's position as both a purchaser and seller of energy in unregulated regional energy markets. Once information of this nature is disclosed to the market, there is no practical way to undo damage to SCE&G and its customers.

Nevertheless, in an effort to give you all available non-confidential material, attached are excerpts from the FERC Form - 1 annual filing made by SCE&G at the Federal Energy Regulatory Commission for the calendar year ending December 31, 2005. These excerpts include the annual generation for each of SCE&G's facilities.

After the group reviewed the first question Steve Bell asked if records were available on how SCE&G operated its system to meet demands for a given day. Bill A. replied that they do not have all that information in one place. He noted that each plant maintains a record of how they operate, however it is not all in one form. Bill A. also noted that they do provide some information to the Public Service Commission, however, the detail that the group has requested is not for the general public to have access to. Steve asked if the group could pick out particular days in order to receive information on, and Mike Waddell suggested that the past plant outage in May be used as an example. Bill noted that he had information on the past plant outage in June but not in May. Bill A. briefly reviewed the June 21 occurrence with the group and discussed the logic behind what particular plants were used. It was noted that for that occurrence, many plants on SCE&G's own system, including Saluda, were used and they did not have to call upon VACAR. Bill A. noted that since Saluda was being used in this emergency instance, that they had contacted VACAR to notify them that they were using their reserve and that it

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would probably not be available for the next hour to hour and a half. This was when SCE&G could purchase power on the market or bring other units online. Steve asked if SCE&G was required to first expend all of their resources before VACAR was called. Bill replied that they would have to first use their 200 MW in reserve before they called on VACAR or they had the option of meeting their need internally. Bill A. also added that there were advantages to meeting the needs internally.

The group noted that they had sufficiently discussed the first item and moved to the second question.

2. Provide a write-up on the reason why SCE&G operates their plants in the manner that they are operated.

Response: Describing how the units are operated on any particular day provides information of only limited value, since operations on one day do not necessarily correlate to operations on future days. Actual operations of the plants are subject to an infinitely variable set of conditions. Nevertheless, the general process/protocol (Economic Dispatch) relied upon to determine which plants/units SCE&G at least “plans” to operate is reasonably consistent.

Economic Dispatch is a generation planning tool employed faithfully at SCE&G. Twice each day, SCE&G engineers in the Economic Resource Commitment (ERC) group communicate with employees in the Transmission Services Operation Planning (OPS) group. These two functionally separate groups agree on hourly load forecasts for every hour of the coming 7 days.

Once agreement upon the forecast has been reached, the ERC engineers develop hourly economic dispatch plans to match. The economic dispatch plans that are created project a mix of planned generation from SCE&G units as well as off-system purchases. Units and purchases are economically stacked in every hour (most economically favorable to least economically favorable) to create a plan the system can be controlled by to most economically serve its obligations – including the possibility of serving reserves.

Once the Reliability Coordinators review the economic dispatch plan and make the changes deemed necessary to preserve reliability (remember, reliability trumps economics), the result is a constrained dispatch plan. For example, it may be more economical to generate from Plant A, but the Reliability Coordinators may determine it not to be reliable to do so from a transmission of energy

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perspective. Conversely, it may not be as economical to generate from Plant B, but it may be necessary to do so in order to serve load in a remote area. Saluda Hydro operations provide a perfect example of this. As one of SCE&G's most economical plants, it should always be generating from a purely cost-of-generation perspective. Nevertheless, because of reliability factors, it is kept off-line so that it can be available to serve as reserves if emergencies occur. Some amount of generation must be available to respond to emergency reserve calls within the fifteen minute time period required by SCE&G's VACAR/SERC/NERC obligations.

The Reliability Coordinators hand-off the constrained dispatch plan to the System Controllers who then use it as a roadmap by which to operate the system. Inevitably, real life conditions do not exactly follow the assumptions the ERC, OPS, and Reliability Coordinators relied upon to create the plan, so the System Controllers make real time adjustments to operate the system.

The group began to discuss the dispatch plan and Randy Mahan explained that there were always real-life factors that could not be predicted. Steve inquired as to whether decisions to run certain plants were made for economical reasons. Bill A. noted that there are environmental issues to be considered that often trump the economic considerations. After this question was sufficiently answered the group moved on to discuss Item number 3.

3. Provide a write-up of how SCE&G uses the other plants in our system when Saluda is not available due to a scheduled outage of the whole plant or just one or two units. Last year could be a good example of the second half of this question since some of the units were not operational the entire year. What did you use for reserve when Unit 4 was not available?

Response: The use of generating units other than Saluda's units for reserves depends on the specific situation. Over time we have seen a variety of situations in which Saluda's units become unavailable to serve reserve requirements. For example, Saluda's units may be unavailable because of maintenance activities at Saluda. Likewise, sometimes it is necessary that divers be in and around the towers. Operations are suspended during this time and the units are made unavailable for use to respond to reserves until this activity is completed. A more subtle example is presented when the units are already fully loaded, perhaps in preparation for inflows from a tropical storm or hurricane or during a time when lake levels are intentionally being reduced for dam or equipment maintenance. In

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the hurricane example, because the units are generating, they are not offline and available in 15 minutes which are both requirements for being counted as system reserves. And even if not fully loaded, to the extent the units are loaded, we cannot count that already-in-operation capacity towards our reserves obligation.

Most situations are controllable and planned ahead of time so that the generation plans satisfy both economic and constrained dispatch objectives. For example, if divers need to work on the towers, SCE&G makes sure the work is scheduled when generation from Fairfield Pumped Storage is not needed to serve load. This allows Fairfield Pumped Storage to be dedicated for reserves. Other controllable situations are scheduled maintenance and planned releases, assuming we don't have to deal with high flows down the Broad River at the same time. Canoeing for Kids is a good example of a planned release – it's typically scheduled on a Saturday during an expected low load period. For the 2006 event, Fairfield Pumped Storage was used to carry reserves.

When Saluda units fail or require maintenance and need to be taken off line, the only option is to carry reserves on Fairfield Pumped Storage or on a combination of Fairfield Pumped Storage and quick-start turbines. A combination of the two is most common because individually, they are problematic. Fairfield Pumped Storage has certain constraints such as limited operations when the Broad River is at or above 40,000 cfs. Further discussion about turbine operations appears below in response to questions 4 and 5.

A final alternative is to back down steam generation across multiple units. This is the least desirable method of carrying reserves as well as the most costly for SCE&G customers. Because of the slow response of coal-fired generating units, to achieve the full fifteen minutes reserve requirement obligation, multiple units must be backed off if they are to be replied upon. Also, when using these units, there is a real potential for unit trips. Nevertheless, even if a plan to rely on backing down coal fired generation were to be put in place, this would not fully meet the offline and available definition of VACAR/SERC/NERC. Rather, it more closely resembles a backed down and available situation.

In reference to the third item, Mike asked if SCE&G has enough capacity on its system to handle all of the current demands. Randy noted that they did have enough capacity, and explained that SCE&G does the best that they can to plan to have enough generation to meet the current needs as well as the expected growth. The group cited the construction of the new nuclear plant as an example.

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There was brief discussion on the use of Fairfield Pumped Storage Facility. Steve inquired as to how it was used and whether there were certain times of the year in which all of the capacity at that plant was used. Bill replied there were times when the entirety of Fairfield's capacity was used. Karen Kustafik asked if drought conditions could affect the use of Fairfield. Bill A. noted that drought conditions could effect the pumping to refill Monticello Reservoir because there is a minimum flow requirement at Parr. It was also discussed that Fairfield could not add to flooding if there was 40,000 or more cfs already in the Broad River. The group asked for the flow of each unit and the total plant for Fairfield Pumped Storage.

The group also noted that item 4 (listed below) was sufficiently answered and moved to discuss item 5.

4. Provide a write-up of what SCE&G does in an emergency situation when Saluda is available. How is FFPS used in the equation to meet reserve? Does SCE&G use any other plants on our system to meet this reserve, if so which ones are used? Is Saluda always the first plant used during an emergency? Is Saluda the last plant used in an emergency?

Response: Fairfield Pumped Storage may be available if a base load or other currently generating unit trips. However, if the limited volume of water in Fairfield already is included in the generating plan to serve load later in the day, it may not be used to fulfill the Saluda mission for that day, i.e. to meet a reserves call. At other times however, even though Fairfield Pumped Storage may be planned for later use, if loads turn out not to be as high as forecasted, FFPS may be pressed into service to meet the emergency need. System Controllers must also consider the forecasted need for Fairfield Pumped Storage for the next day, as there may be a need to replenish the water supply for the upcoming day's use. While pumping back, obviously, FFPS cannot be counted on to supply reserves. Finally, there are flooding constraints that can take Fairfield Pumped Storage out of the picture all together. Flows equal to or greater than 40,000 cfs in the Broad River render FFPS unavailable for operation in the generating mode. As the system changes throughout the day, multiple factors continually must be considered. Dependence on a single facility for reserves is not prudent; flexibility of reserve sources is crucial for reliability.

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In addition to Fairfield Pumped Storage & Saluda Hydro, the other plants normally used for reserves are the quick-start turbines. Those are Urquhart Unit 4 and Parr units 1, 2, 3, & 4. Together they can generate about 108 MWs.

Saluda is not always the first plant used to serve reserves, nor is it always the last. As described above, there are a variety of factors to consider in determining which unit should be called upon to meet reserves.

5. How does SCE&G use the gas turbines on our system to meet reserve? Why does SCE&G not use them more than we do now? When does SCE&G use the gas turbines in general, peaking, base load, etc.? How are the gas turbines used, are they started and run for a long period of time or just a few hours a day; started and run just to meet a peak demand then shut off?

Response: See the responses to Questions 2, 3, & 4 above. Gas turbines are used to carry reserves in limited situations because they are not as reliable in meeting the strict NERC 15 minute requirements as Fairfield Pumped Storage and Saluda. Thus they are not used as often.

In general, gas turbines are used in peaking situations and normally run for very short periods of time and then shut off. They are always brought on after all steam units and most of Fairfield Pumped Storage is loaded. They are the least economical generation units and fall very late in the economic dispatch stack. Even though they are not as economical, SCE&G still runs them as peaking plants to serve load while it keeps Saluda off line for reserves. Were SCE&G to use turbines and part of Fairfield Pumped Storage for reserves, then to replace their peaking capacity, Saluda would have to be used as a peaking plant in their stead. This would mean Saluda would be used much more frequently than it is now.

While discussing item 5, Patrick Moore noted that during relicensing the possibility exists that some of the studies being done will produce data that would negate SCE&G's ability to use Saluda for reserve. He continued to ask what would be done for reserve if Saluda is not available. Tom Eppink noted that SCE&G is required to, and currently, looking at all options. He continued to note that this data will be shared with the group as soon as it is ready. Bill A. added that they hope to have a presentation ready sometime in September. Bill A. noted that they would also like to look at meeting environmental requirements by upgrading the units themselves. He explained that they are looking at upgrading the units with more efficient runners.

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The group moved to item 6

6. Please provide the date, time, and MW that SCE&G was requested to provide reserve power during 2005. Provide the reason for the reserve usage, i.e. called by other utility, to meet our own emergency situation, etc. if the information is available. Which plants on the SCE&G system were used to meet the reserve request?

Response: Reports that SCE&G compiles regarding reserves operations have sensitive information belonging to companies other than SCE&G. What can be provided without violating those confidences follows. SCE&G played a role as part of the VACAR Reserve Sharing Group Agreement on 9 occasions during 2005. On 6 of those occasions SCE&G called on reserves from its VACAR Reserve Sharing Group partners. On the other 3 occasions SCE&G supplied reserves to other companies. That makes a total of 9 Reserve Sharing Group events in which SCE&G participated. Except for the information it has shared over the past couple of years (and continues to publish) regarding its operation of Saluda to meet reserve requirements, SCE&G has not compiled reports on its use of Saluda for internal reserve needs.

Steve proposed that the stakeholders choose a certain date that SCE&G could then find out more information on what plants were used and why. Bill A. replied that the situation varies on each day and that he does not believe the information is kept in such detail all in one place. Steve also noted that he believed that there would be questions in the upcoming RCG about why some of this information is kept confidential. Bill A. noted that they would have an attorney present to explain this to the group. Bill A. also noted that he would have Lee Xanthakos come to the next RCG meeting in an effort to try to answer some of the groups questions about how the system was run on certain days. A homework item for the stakeholders was to pick out dates they were interested in and they would be sent to Lee prior to the meeting.

Bill Marshall also noted that he was interested in knowing the Megawatts in percent that were used during the 9 Reserve Sharing Group events as well as the flows in the river during those instances.

The group began to discuss item number 7.

7. Provide a write-up of how SCE&G determines when and at what rate to lower Lake Murray during the annual fall drawdown?

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Response: SCE&G considers several factors in determining the appropriate target lake elevation during fall drawdown include current lake elevation, the need to gradually drawdown over several months, expectations and planning for “normal” winter and spring rainfall, predicted or possible severe weather conditions (such as the possibility of tropical storms or hurricanes), and the need and ability to maintain reserves during and after drawdown. Rapid drawdown of the lake always raises the specter of potential detriment to the stability of the dam. This is a major reason that SCE&G plans the annual drawdown to occur over several months. The other major issue to consider is Saluda Hydro’s availability for reserve generation as discussed in the response to Question 3. To the extent Saluda is operating for other reasons, it cannot be counted as reserves in response to its VACAR/SERC/NERC reserves obligations.

Lake Murray is not a flood storage reservoir and must be operated to allow the lake level to be lowered through plant generation without the use of the emergency spillway gates. As the name implies, the spillway gates are for emergency use, to address circumstances where inflow or expected inflow is greater than the discharge capacity of the plant at a time when the lake level is close to the normal maximum pool elevation. SCE&G goes to great pains to manage the lake level so this situation does not occur. A target water level reduction, usually one to two feet per month, has been considered a “typical” drawdown rate from late August through December in anticipation of normal rainfall from January through April of the following year. Generation during this drawdown period is performed as prudently as possible taking into account the issues described in Question 2

Statistically, the highest probability of a hurricane affecting the Saluda River Basin is in the month of September. Thus the lake level drawdown typically will start around the end of August. If there is a possibility of the approach of a tropical storm or hurricane to the Saluda River Basin area, which may appear to require lowering the lake level in anticipation of the storm, SCE&G will use a Flow Forecasting Model that evaluates data from the National Weather Service and United States Geological Survey to predict the elevation of Lake Murray under various discharge scenarios. Based on the results of specific model analyses, SCE&G will then lower the lake level as necessary to keep the level safely below elevation 360’ to maintain compliance with our FERC license. Although hurricane season ends in November, a typical lake level drawdown

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continues through the end of December in anticipation of winter and spring rains as noted above.

Steve asked what criteria SCE&G uses to determine what level the lake should be at any given time during the fall and winter to ensure that flood gates would not have to be used. Bill A. noted that it greatly depends on the weather patterns. He explained that Jim Landreth has been working with the lake groups to keep the level up as high as possible for as long as possible. Bill A explained that SCE&G's current policy is to use information from the National Weather Service in its Flow Forecasting Model to determine the need to lower the lake in the event of an approaching hurricane or tropical storm. Bill A indicated that at this time SCE&G does lower the lake anticipating heavy rains in January and Spring. He also added that water balance is part of the operations model, and until they receive all of the information, SCE&G is working on keeping the lake level as high as possible, while still being prepared for hurricanes and tropical storms.

On a separate topic, Bill Marshall noted that he understood the steep increase in cfs under emergency situations but inquired as to why there were such steep rises for planned releases. Bill A. noted that there were several reasons behind this, one being that they needed to try to use the water in an economical manner, as well as having the system back offline and ready for use as reserve. Bill A. noted that as part of their last settlement agreement meeting with SCCCL, they were looking into having a more gradual release for planned releases, however, in an emergency situation there will need to be an immediate release.

Question 8 was skipped (listed below) and the group moved to question 9.

8. Provide the times in which the Broad River flows were at or greater than 40,000 cfs in 2005.

Response: The SCE&G system dispatchers use three gages (Broad River near Carlisle (02156500), Tyger River near Delta (02160105), and Enoree River at Whitmire (02160700)) above Parr Hydro to determine when flows are **approaching** 40,000 cfs on the Broad River. The dispatchers will add the flows of these three gages to calculate the total flow in the Broad River at Fairfield Pumped Storage. To determine how many times the Broad River actually achieved flows equal to or in excess of 40,000 cfs, for this report we will look at the Broad River at Alston Gage (02161000) which is downstream of Parr Hydro

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on the Broad River. When the flows are at or above 40,000 cfs at the Alston Gage, Fairfield Pumped Storage will already have been taken off line in accordance with our FERC license. The attached spreadsheet lists the times the Broad River exceeded 40,000 cfs based on the Broad River at Alston Gage. The items highlighted (in yellow) show the number of times and percent of time for each month that the Broad River was at or above 40,000 cfs. Below are the exact dates/times in 2005 that the Broad River was at or above 40,000 cfs based on the Broad River at Alston Gage. SCE&G cannot validate and does not vouch for the accuracy of the data provided by the USGS gage.

March 29 - From 4 pm to 12 am
March 30 - From 1 am to 10 pm
June 2 - From 1 pm to 10 pm
October 8 - From 6 pm to 10 pm
October 9 - From 12 pm to 12 am
October 10 - From 1 am to 4 am

9. Provide a range of costs for MWHs of generation that was purchased on the open market for the last two years (2004 & 2005).

Response: This data is business confidential and market sensitive information. Disclosure of this information could result in substantial damage to SCE&G's position as both a purchaser and seller of energy in unregulated regional energy markets. Should power marketers have knowledge of these critical price points, they could adjust their bids accordingly. SCE&G could then be forced to buy energy at less favorable rates. Ultimately, SCE&G system consumers would receive less benefit from energy sales and pay a higher cost for purchased energy if market participants know SCE&G's purchasing history. Once information of this nature is disclosed to the market, there is no practical way to undo the damage to SCE&G and its customers.

Broad River at Alston Gage (02161000) Flows

High		Total
.00 Flows below 40,000 cfs	1.00 Flows equal to or greater than	

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		40,000 cfs			
MONTH		Count	744	0	744
		% within MONTH	100.0%	.0%	100.0%
		% within High	8.5%	.0%	8.5%
		% of Total	8.5%	.0%	8.5%
	Jan	Count	744	0	744
		% within MONTH	100.0%	.0%	100.0%
		% within High	7.7%	.0%	7.7%
		% of Total	7.7%	.0%	7.7%
	Feb	Count	672	0	672
		% within MONTH	100.0%	.0%	100.0%
		% within High	7.7%	.0%	7.7%
		% of Total	7.7%	.0%	7.7%
	Mar	Count	731	13	744
		% within MONTH	98.3%	1.7%	100.0%
		% within High	8.4%	28.9%	8.5%
		% of Total	8.3%	.1%	8.5%
	Apr	Count	720	0	720
		% within MONTH	100.0%	.0%	100.0%
		% within High	8.3%	.0%	8.2%
		% of Total	8.2%	.0%	8.2%
	May	Count	744	0	744
		% within MONTH	100.0%	.0%	100.0%
		% within High	8.5%	.0%	8.5%
		% of Total	8.5%	.0%	8.5%
	Jun	Count	710	10	720
		% within MONTH	98.6%	1.4%	100.0%
		% within High	8.1%	22.2%	8.2%

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	% of Total	8.1%	.1%	8.2%
Jul	Count	744	0	744
	% within MONTH	100.0%	.0%	100.0%
	% within High	8.5%	.0%	8.5%
	% of Total	8.5%	.0%	8.5%
Aug	Count	744	0	744
	% within MONTH	100.0%	.0%	100.0%
	% within High	8.5%	.0%	8.5%
	% of Total	8.5%	.0%	8.5%
Sep	Count	720	0	720
	% within MONTH	100.0%	.0%	100.0%
	% within High	8.3%	.0%	8.2%
	% of Total	8.2%	.0%	8.2%
Oct	Count	722	22	744
	% within MONTH	97.0%	3.0%	100.0%
	% within High	8.3%	48.9%	8.5%
	% of Total	8.2%	.3%	8.5%
Nov	Count	720	0	720
	% within MONTH	100.0%	.0%	100.0%
	% within High	8.3%	.0%	8.2%
	% of Total	8.2%	.0%	8.2%
Dec	Count	744	0	744
	% within MONTH	100.0%	.0%	100.0%
	% within High	8.5%	.0%	8.5%
	% of Total	8.5%	.0%	8.5%

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Total	Count	8715	45	8760
	% within MONTH	99.5%	.5%	100.0%
	% within High	100.0%	100.0%	100.0%
	% of Total	99.5%	.5%	100.0%

In conclusion, Patrick Moore asked if there was any way that the group could be provided with a high and a low cost for power paid over the last 10 years with no particular time sequence attached to it. Bill A. noted that he would ask about this. Mike also asked if Bill A. could send him the FERC form for the other ¾ of 2005. The group noted the homework assignments and adjourned.

Discussions that occurred after the meeting between Bill Argentieri and Steve Bell:

August 2, 2006 – telephone conversation

Subsequent to the July 11, 2006 Generation Review meeting, Steve Bell and Bill Argentieri had a discussion in an attempt to clarify Response No. 7 on SCE&G's June 14, 2006 email, how does SCE&G determine when and at what rate to lower Lake Murray during the annual fall drawdown. The following are details of our conversation.

Steve was interested in more details of how SCE&G determines what target elevations are aimed for in the fall drawdown months. Bill explained that normally SCE&G will attempt to lower the lake approximately 1 – 2 feet a month starting in late August/ early September in an attempt to target elevation 350 to 352 by the end of December. This is for several reasons; first to provide storage area in Lake Murray in the event of a tropical storm or hurricane which if it is going to occur, typically occurs in the late August to end of September time of year in our watershed basin. Second, this scenario provides for greater flexibility to keep Saluda for reserves during longer periods of each month. We will drawdown the lake in the early part of the month to allow for reserve use in the later part of the month. Third, the idea of lowering Lake Murray to the 350 – 352 range by the end of December provides our system operators with better control of inflows during the late winter and early spring rainy season (January – April). This also provides SCE&G a better opportunity to manage the lake level without having to generate as often during the spring months. In 2005, similar to what we have tried other years in the past, Jim Landreth requested that the minimum lake level during the drawdown not go below elevation 354. We did accomplish this, but because 2005 was more of a typical rain year, we had to use Saluda Hydro to generate more throughout the spring and summer months. This created two situations that we are discussing right

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now in the Safety RCG and Fish & Wildlife RCG. The Safety RCG is concerned about more generation during the summer months which creates the need for more safety warning systems along the lower Saluda River. The Fish and Wildlife RCG is concerned with the potential to generate more with Unit 5 from June through August when the DO in the lake is the low.

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**Saluda Hydro Field Office
May 3, 2006**

ATTENDEES:

Bob Olsen, NRE
Bret Hoffman, Kleinschmidt
Bud Badr, SCDNR
Feleka Arega, SCDNR
Larry Turner, SC DHEC

Michael Waddell, TU
Mike Schimpff, Kleinschmidt
Randy Mahan, SCANA Services
Ray Ammarell, SCE&G

ACTION ITEMS:

- Determine method of accounting for evaporation.
Bob Olsen, Mike Schimpff
- Complete “planning” model with USGS information on lake levels and downstream flow, and evaporation from the lake.
Mike Schimpff
- Gather un-gauged inflow, rainfall and watershed information for calibrating model.
Mike Schimpff, Bob Olsen
- Contact USGS regarding verification of data used in model.
Ray Ammarell
- Compile tailwater rating curve.
Bret Hoffman

DATE OF NEXT MEETING: Mid-July, Final Date TBD

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***Saluda Hydro Field Office
May 3, 2006***

MEETING NOTES:

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.

Mike S. opened the meeting with a brief discussion of the selected model, HEC-ResSim, noting that it is becoming the standard for relicensing nationwide. After going over the agenda, he explained that he had developed the model structure, and is seeking review and input on it during this meeting. The purpose of this model would be to use constraints to determine impacts to various group interests. Running the model with these constraints will result in a handful of reasonable options for diverse interests, and output information will be available to groups. It was resolved at a previous Operations RCG meeting that all issues can be tied to lake level and outflow.

The current model structure extends downstream on the Congaree River to the Congaree National Park, and up the Broad River for incorporating those inflows into the confluence. It was decided that the model would use the Broad River up to the Alston gage because it is the closest location that gives streamflow data.

Input for Model

USGS data and watershed information are used as inputs for flows when building the model. As the group discussed available hydrologic data, it became apparent that long-term watershed records of rainfall and certain inflows are not available, but lake level and outflow information is. Bob suggested using lake level information (including evaporation) and outflow to build the model, then calibrating this with lake level information combined with more recently available rainfall and inflows. Bud added that two models could be made; the first model (which uses lake levels and outflow long-term data) could serve as the a planning model, and the calibration model could serve as an operations model. The planning model would be used for the relicensing efforts, evaluating impacts of various alternatives; the operations model could serve SCE&G in the future as a guide for operating the facility, incorporating real-time data (such as rainfall in the drainage basin). Since the planning model would be for a long-term perspective, it could be run on daily increments. The operations model, used for short-term evaluations, would be run in hourly increments.

For USGS data, Mike S. explained that the program can automatically collect it from their online database. However, other information needed to calibrate the planning model and create the operations model need to be collected; this includes un-gauged inflows and rainfall. Evaporation data will also need to be collected. Ray mentioned that Bob has already generated a significant amount of information that could be incorporated into the model. It was noted that Lake Greenwood operation results in a regulated inflow, and two other gauged inflows are unregulated

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(Bush River and Little River). Ray and Bob estimated that approximately 75% of the inflow is gauged. An “un-gauged inflow” input can be used to combine other inflows and rainfall runoff. The drainage areas contributing to the gauged inflows will have to be removed from the un-gauged contribution.

For the preliminary structure of the model, Mike S. has input the stage / storage curve data into the model; historical operational data was used for a preliminary guide curve, which shows drawdown levels and schedules for reservoir water levels. Evaporation needs to be incorporated, and a discussion of options for this was held. Bob has monthly evaporation data, and Mike noted that there are many days when the lake has negative inflows because of evaporation. Ray stated that the model needs to use net evaporation, which includes rainfall. Bob suggested developing algorithms to account for evaporation; Mike S. will work with Bob to determine this input.

Turbine performance, generation schedules, dissolved oxygen levels, and other operational constraints can also be incorporated into the model. A tailwater rating curve is another set of information that contributes to energy calculation. Formally, no such curve exists; however, Ray noted that one has been created from two USGS gages (one at the tailrace, the other at the SCE&G boat ramp downstream). Additionally, data exists from recent turbine venting studies that may be compiled for more accurate curves.

Locations of interest need to be provided by the RCG’s and TWC’s, both on the lake and in the river; they will be entered into the model as nodes with constraints or parameters. For each location, the issue of concern (water quality, temperature, etc.) will need to be related to water elevation and flow; these two parameters are required input for each point. Alan Stuart has provided Mike S. with some locations anticipated for evaluation, but they are preliminary. Randy noted that the water quality group was working on selecting points of interest for the lake and the river. At these identified points, cross-sections will be used for computational modeling, determining how operations affect flow and stage. Bob has developed many cross-sections of the project, which may contribute to the model if they are at or near selected locations.

Running the Model and Output Information

A final result of the planning model would be a new guide curve, which SCE&G could use to operate the project to target ideal lake levels. The parameters that affect the curve are impacted by stakeholder requests. The guide curve will reflect the concept of conserving the power pool while taking into account other demands from stakeholder interests.

Larry brought up the subject of years of high flows versus very low flows. As part of the relicensing process, a plan will be created for drought situations, with prioritized water allocations

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outlined; generally, there is no concern about water during years of heavy flow except from a safety perspective to prevent extreme lake levels.

Mike S. explained that there were many other optional parameters associated with each node, but for our process information generated by the model at each node will always be tied back to water elevation and flow. It is an iterative process between the model output and a group's interests; if the output isn't in their format, they have to evaluate it. For example, the program will not run a W-2 model for every scenario and location for the water quality group. Generated information will have to be evaluated by each group to determine if the scenario is acceptable.

Ray noted that HEC-Res could be used to determine hydraulic parameters in addition to stage and flow at selected nodes. While other programs could do this, HEC-Res can import and export data from the model program, streamlining the process. For example, travel time for flow releases could be generated, which Mike W. noted would be useful for downstream safety warning systems. Bob mentioned that he had some data about downstream flow characteristics, explaining that the dynamics of the river are different between steady operation (such as occurs during a drawdown) and short duration heavy releases. The short-term heavy flows do not stabilize over the downstream stretch of river, and have less impact on rate of rise farther downstream.

Regarding available information created by the model, Randy brought up the need to focus on necessary information for individual points of interest. Mike W. elaborated that generating every possible parameter for every node just because it is possible would bog the process down. It was agreed that information requests needed to be specific to keep the process moving efficiently.

For the generated information, Bud said the groups should provide a frequency of exceeding constraints that was acceptable, as well as a tolerable magnitude of these infringements. He suggested bringing one person from each TWC or RCG as a judge or representative to meet with the operations group for determining a successful level of alternatives.

Items for Moving Forward

Mike will now work to complete the development of the base model, then meet with the TWC again to agree on the final model. Consideration will be given to holding a joint RCG meeting to explain the model setup to all RCG's for general acceptance. A representative from the USGS will be contacted to attend the meeting and validate the information being used in the model. Mike said his target date for completing the model was mid-July.

MEETING NOTES

**SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
OPERATIONS & SAFETY RESOURCE CONSERVATION GROUPS COMBINED MEETING**

**Saluda Shoals Park
April 6, 2006**

5-26-06 final acg

ATTENDEES:

Alan Stuart, Kleinschmidt Associates	Ray Ammarell, SCE&G
Alison Guth, Kleinschmidt Associates	Steve Bell, Lake Watch
Bill Argentieri, SCE&G	Theresa Thom, Congaree National Park
Bret Hoffman, Kleinschmidt Associates	Carvitas Fant, USC
Bud Badr, DNR	Charlene Coleman, American Whitewater
Feleke Arega, DNR	Lee Barber, LMA
Dave Landis, Lake Murray Association	Kenneth Fox, LMA
Karen Kustafik, Columbia Parks and Rec	Ed Schnepel, LMA
Kristina Massey, Kleinschmidt Associates	Jennifer O'Rourke, SC Wildlife Federation
Malcolm Leaphart, Trout Unlimited	Tony Bebbler, SCPRT
Bill Marshall, DNR, LSSRAC	Suzanne Rhodes, SC Wildlife Federation
Gerrit Jobsis, American Rivers	Bill Mathias, LMA, LM Power Squadron
George Duke, LM Homeowners Coalition	Bill Cutler, Lake Watch, LM Homeowners Coalition
Guy Jones, River Runner	
Michael Waddell, TU	
Patrick Moore, SCCCL, Am. Rivers	
Randy Mahan, SCANA Services	

DATE: April 6, 2006

HOMEWORK ITEMS:

Alan Stuart – to research data on fatalities in the Lower Saluda River

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

DISCUSSION

Alan Stuart opened the meeting and the group proceeded through introductions. Alan explained that this meeting was organized at the request of several stakeholders. Steve Bell explained that Lake Watch felt that more information was needed as it applies to Saluda and its uses.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY SALUDA HYDRO PROJECT RELICENSING OPERATIONS & SAFETY RESOURCE CONSERVATION GROUPS COMBINED MEETING

**Saluda Shoals Park
April 6, 2006**

5-26-06 final acg

Alan explained that SCE&G was in the process of developing a presentation on alternative energy sources. Bill Argentieri further explained that they hope to have a presentation ready in June or July that addresses the issues associated with alternative energy sources, energy sources that could replace Saluda, the permitting issues related to replacement energy sources, as well as their environmental impacts. Bill continued to explain that there would also be a dollar analysis that would address capital costs, fuel costs and O&M costs.

Gerrit Jobsis explained that he believed that although it was important to look at reserve, he was concerned with how the Saluda Project operates as it relates to compliance with water quality standards, minimum flow requirements, ESA standards, and recreation and safety needs. He noted that he believed that overall project operations need to be evaluated. Bill Argentieri replied that those issues would be addressed in an upgrade study. He noted that they were looking at runner improvements that would improve the water quality.

Bill Argentieri began to explain how Saluda was used for reserve. He noted that SCE&G started using Saluda to meet reserve requirements in the late 1990's. He noted that this was mainly due to requirement changes of VACAR. Bill informed the group that according to SCE&G's records, SCE&G was called on for reserve capacity by neighboring utilities 22 times since 1998. Bill further clarified that the records did not specify whether it was Saluda that was used to meet the reserve or if another plant was used. It also did not specify how many times Saluda was used for internal reserve needs. It was noted that in the past year SCE&G has been putting out a weekly report that specifies more information on how Saluda is used due in part to a settlement agreement with American Rivers and the South Carolina Coastal Conservation League (SCCCL). Bill explained that it was SCE&G's goal in relicensing to maintain the flexibility to use Saluda for reserve.

Steve Bell and Patrick Moore requested to form a technical committee (TWC) to explore the uses of Saluda. Patrick suggested acquiring USGS data in order to link it to Saluda operations. Charlene Coleman noted that weather patterns may also be needed when evaluating the use of Saluda. Theresa Thom pointed out that it would be difficult to link flow data to operations at Saluda until recently as the reports have been put out in the past year.

Bill Cutler recommended the development of a statistical model that would predict the future use of Saluda by looking at past uses at Saluda as well as other facilities. Randy noted that the group could look at the historical data but it would be difficult to predict the unpredictable need for reserve. Gerrit Jobsis added that he did not believe the information was available at this point to develop a model.

MEETING NOTES

**SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
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**Saluda Shoals Park
April 6, 2006**

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Ray Ammarell explained to the group what information was issued in the weekly generation reports. He noted that dispatch provides any explanations for why Saluda is used and distinguishes if it is used for reserve.

The group briefly reviewed the goal of the proposed TWC. Gerrit noted that he believed the goal of the TWC would be to evaluate operational flexibility at Saluda and understand how it affects other interests. Gerrit further noted that once information is collected on the operations, the group could work towards an agreement on how they would move forward with operations. Steve Bell also added that it was Lake Watch's goal to obtain the operational flexibility information in a physical report form. The group concluded that the new TWC would serve to accomplish the following two goals:

- To better understand Saluda operations
- To review existing operations data
- To develop a process for using input from other RCG's to develop alternatives for operation.

Charlene Colman suggested that the committee start by obtaining the operations information from the past year. She explained that all the weather events and circumstances were still fresh in everyone's memories, and the occurrence of Katrina would show what would happen under an extreme event. Randy noted that that was agreeable to SCE&G as well.

Alan then asked the group who was interested in being a member of the TWC. The following people volunteered:

Mike Waddell
Steve Bell
Bill Cutler
Jennifer O'Rourke
Theresa Thom
Karen Kustafik
Patrick Moore
Bill Marshall
Bill Argentieri

The group then began to discuss safety on the river and the group collectively brainstormed ideas for the collection of information on this topic. Alan suggested developing a questionnaire that Trout Unlimited could distribute among its members. Tony Bebbler pointed out that the recreation committee would be performing onsite studies, he noted that a few safety questions could be

MEETING NOTES

**SOUTH CAROLINA ELECTRIC & GAS COMPANY
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incorporated as a component of the questionnaire such as “how the individual perceived the water level that day in terms of safe recreation”.

Charlene Colman addressed the issue of safety on the lower Saluda River and noted that even if flow changes are implemented, the limiting factor will still be the responsibility of the public. She explained that people using the river, in majority, do not heed any warning, even personal. Randy Mahan mentioned that he would be in support of legislation that requires individuals who recreate below the hydro to wear a personal floatation device. The group agreed. Gerrit Jobsis added that warnings and operations can be improved and modified to limit unsafe conditions on the river.

Charlene then distributed information to the group addressing flows and recreation (attached below). She explained that the information was approximations made from 14 years of research. She noted that she worked with Bill Marshall and the SCE&G dispatchers to develop the information. Charlene agreed that the most helpful thing in regards to safety is to implement legislation that requires safety vests. She also noted that on May 13th there would be a 10,000 cfs recreation release if an individual wanted to see the effects of this.

Patrick Moore noted that he would be interested in obtaining information on fatalities on the lower Saluda River, he noted that he would be interested to find out if operations was effecting that. Alan Stuart noted that they would look into obtaining that information and that Alan Axson with the Columbia Fire and Rescue may have that information.

In closing Alan noted that the Technical Working Committee would meet directly after in order to quantify what information was needed and proceed with the next steps in data acquisition.

On a different note, Alan noted that Jim Landreth had asked him to note that if any members felt that their questions were not being answered in the group setting that Jim would be happy to talk with them personally.

The group adjourned.

MEETING NOTES

**SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
OPERATIONS & SAFETY RESOURCE CONSERVATION GROUPS COMBINED MEETING**

**Saluda Shoals Park
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Just for info for tomorrow

Flows--safety

250-1000 CFS is wade able but never recommended in rescue venues.

1,000-3,500 CFS an average swimmer stands a chance to get to the bank.

1,000-4,000 Rescue is not a great risk level for the Fire Dept.. Strong swimmers would struggle and most likely swim at least 1/8 of a mile to get to land from the middle of the river.

4,500 + for every 1,000 CFS increment the danger level is increased greatly

12,000 –18,000+ a Raft could get to you, but only by experienced raft paddlers. The Fire Dept Zodiac can't do Mill Race without serious risk and would most likely flip.

Hyperthermia is loss of body heat during a long swim and the Saluda is 50 degrees year round.

It takes the water 2 hours from the tail race to the Zoo. It takes approx 20 mins for water at the warning Float (trigger) for the siren to make it to the zoo.

Flows—Rec—these are approximates but close.

250- 1000 wade fishing is possible.

250-2,000 approx –novice boaters/floaters

2,000+---4,000 intermediate level Boaters.

4,500- 6,000—experienced boaters w/ river knowledge

250—8,000 bank fishing relatively safe

10,000 –release for Canoeing for Kids Fund raiser on the Day before Mother's day

10,000—16,000 Rafting is possible with a guide.

16,000---18,000---rafting is only for the experienced guide on big water rivers.

250—18,000 experienced advanced canoeist and kayakers

8,000—16,000 Bank fishermen are at risk for slipping in the river.

16,000—18,000 nice viewing of skilled boaters at Mill Race.

MEETING NOTES

**SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
GENERATION REVIEW TWC**

**Saluda Shoals Park
April 6, 2006**

5-24-06 final acg

ATTENDEES:

Alan Stuart, Kleinschmidt Associates
Alison Guth, Kleinschmidt Associates
Bill Argentieri, SCE&G
Bill Marshall, DNR, LSSRAC
Michael Waddell, TU
Patrick Moore, SCCCL, Am. Rivers
Steve Bell, Lake Watch

Theresa Thom, Congaree National Park
Jennifer O'Rourke, SC Wildlife Federation
Bill Cutler, Lake Watch, LM Homeowners
Coalition

DATE: April 6, 2006

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

HOMEWORK

Provide response to list of questions from TWC participants
Bill Argentieri

DISCUSSION

After the April 6th Combined Safety and Recreation meeting, the TWC members began the technical meeting. Bill Argentieri opened the meeting by asking what info the group felt that it needed and he would check to see if that information was available. Patrick Moore noted that he would like to see information on the operation of Saluda from a wet year, a dry year, and a normal year. He also noted that it would be beneficial to obtain operations information from a normal, wet, and dry year from the time in which Saluda was used for peaking.

Steve Bell asked if weekly generation reports were available for all plants on SCE&G's system. Bill Argentieri replied that they were available for Saluda because they are being sent out as part of the settlement agreement. Steve further explained that they would like to see reports from the entire system in order to see if Saluda was run for reserve or for some other reason. Patrick further noted that he would like to see if Saluda truly was the last option for reserve. Mike Waddell explained that it was his interest to expand the range of options and to better grasp how the system operates.

MEETING NOTES

**SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
GENERATION REVIEW TWC**

**Saluda Shoals Park
April 6, 2006**

5-24-06 final acg

The group began discussing what date ranges of information was needed. Mike Waddell suggested that the group begin by looking at information from January of 2005 to the following January, with the understanding that there may be more questions once the group is able to look at the information. Bill Argentieri explained that the generation reports alone would not explain why other plants were or were not operated. The group began to go over options for deciphering why a particular plant was run. Mike Waddell suggested looking at Broad River flows in order to see how many times it was flowing over 40,000 cfs.

Steve Bell noted that his goal for the committee would be to have a specific report that was part of the record and that other groups could refer to. The group also requested a round table discussion with Lee Xanthakos to discuss in more detail how he uses Saluda as well as the other facilities.

Bill Marshall mentioned that he also would be interested in learning different scenarios for the use of Saluda and Fairfield and asked if that would be a part of what was brought to the table in an alternatives analysis. Bill Argentieri replied that it was not a part of the alternative analysis which would look at the alternatives for replacing Saluda all together.

The group continued to discuss the uses of Saluda and Fairfield. Patrick Moore requested to see information on rate ranges for the purchase of power. Alan noted that this information could not be disseminated in the presence of Lee Xanthakos according to FERC guidelines.

Steve Bell noted that he would also like to see information on the drawdowns for hurricane season. He continued to explain that he would be interested to see what time of day or month SCE&G began to take the lake down, and to what level. Steve also asked what was done if there was an emergency downstream where someone's life was at risk, and if they could stop generation in that case. Bill Argentieri replied that they have received a call of that nature before and the generation was shut down.

After more brief discussion on the use of Saluda the group compiled a list of requested information. Bill noted that he would meet with Lee Xanthakos in order to compile the answers to these questions.

List of Requested Information:

- Weekly generation reports for all plants on SCE&G's system between January and December of 2005 (The group will start this process by looking at one weeks worth or information and decide what more is needed)

MEETING NOTES

**SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
GENERATION REVIEW TWC**

***Saluda Shoals Park
April 6, 2006***

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- Reasons why certain plants on the system were operated.
- Time periods during which Broad River flows were greater than 40,000 cfs
- How and when the gas turbines are used on the system
- How Fairfield is used
- Ranges of costs for the purchase of megawatt hours.
- Reserves that were requested in 2005 by other utilities and the amounts of megawatts that were called upon.
- How is it determined when and at what rate Lake Murray is lowered during the annual drawdown.

MEETING NOTES

**SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
OPERATIONS RESOURCE CONSERVATION GROUP**

**SCE&G Training Center
January 26, 2006**

ATTENDEES:

Alan Stuart, Kleinschmidt Associates
Alison Guth, Kleinschmidt Associates
Amanda Hill, USFWS
Bill Argentieri, SCE&G
Bill Hulslander, Congaree National Park
Bret Hoffman, Kleinschmidt Associates
Bud Badr, DNR
Dave Landis, Lake Murray Association
Dick Christie, SCDNR
Gina Kirkland, SCDHEC
Joy Downs, LMA
Kristina Massey, Kleinschmidt Associates

Michael Waddell, TU
Mike Schimpff, Kleinschmidt Associates
Mike Summer, SCE&G
Patrick Moore, SCCCL, Am. Rivers
Randy Mahan, SCANA Services
Ray Ammarell, SCE&G
Steve Bell, Lake Watch
Straud Armstrong, SCDNR
Theresa Thom, Congaree National Park
Tom Eppink, SCANA Services
Tom Ruple, Lake Murray Association

DATE: January 26, 2006

AGENDA TOPICS FOR NEXT MEETING:

Presentation (as described in minutes and requested by Patrick Moore, Michael Waddell, and Steve Bell) or TWC to present specific cost analysis for different methods of meeting reserve beyond what was explained in the Operations presentation, in order to effectively balance that cost with project impacts.

DATE OF NEXT MEETING: TBD after the TWC has had time to start developing a model.

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.

DISCUSSION

Mike Schimpff introduced himself and noted that the purpose of the day's discussion was not to inform the group as to which model he believed they should choose, but to give some understanding

MEETING NOTES

**SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
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January 26, 2006**

as to what is available. Mike noted that there were hydraulic models, hydrologic models, economic models and WQ models and that these models could be combined.

Mike began to discuss some of the model uses that were identified at the previous Operations Meeting. These included lake levels, LSR minimum flows, inflows, generation, storage and graphic ability. Gina Kirkland also noted that water quality needs should be included as well when developing the model.

Mike briefly discussed a few models that were widely used. These included HEC-5, Oasis, CHEOPS, MIKE Basins, WMS and Decision Support Programs. Bud Badr asked Mike to explain a little about a Decision Support Model.

Gina noted that DHEC would like to have access to the model in order to run scenarios and verify the baseline settings. Mike Schimpff noted that it depended on which model was used because some models had proprietary constraints. Alan asked Gina if a DHEC representative could be present while they were running scenarios if a model with proprietary constraints was chosen. Gina noted she would discuss this with some individuals at DHEC, but the important thing would be that DHEC would need to feel like they are participating in the inputs. Bill Argentieri further noted that the objective was not to prevent agencies from using it, but to avoid breaking any proprietary laws.

Bud Badr shared a little about his experience with modeling to the group. He noted that when he and Larry Turner (DHEC) worked with Duke they used CHEOPS. He noted that an agreement was signed that allowed use of the model by agencies, but only for that particular project. Bud mentioned that one way to address water quality in the operations model was to address it using flows.

The group then began to discuss the Oasis Model. Mike explained that Oasis operates as a shell that programs can run inside of. Mike continued to explain that a benefit of Oasis is that it can interface with other models and run them simultaneously.

CHEOPS was the next model that the group discussed. Mike explained that it was private domain software that focuses on hydroelectric optimization. Bud Badr added that one of the deficiencies with CHEOPS in this situation was that it was 100 percent tilted toward hydroelectric generation and runs in 15 minute segments. He explained that this would make it difficult to sort through 50 years of data.

In a discussion on SCE&G's current flow forecasting model it was noted that it provided a good source for historical inflow data. Bud Badr also noted that the flow forecasting model dealt with tributaries as well.

MEETING NOTES

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There was some discussion on Water Quality issues and how they would be tied into the model. Dick Christie noted that outputs from the water quality model would be developed within the Water Quality RCG.

Mike Schimpff continued to discuss HEC versions with the group (HEC-5, HEC-RES-SIM).

After lunch the groups then began to define the constraints needed in the model. Bud explained that the model needed to be calibrated for high flow and low flow conditions. He noted that the longer the period of record that was available, the better. He explained that this was because it could include both the dry cycles and wet cycles. Bud added that a modeler did not want extreme events like a drought to run the model. He noted that those events should be considered outliers and dealt with in a low flow protocol.

In continued discussion on constraints Bud pointed out that in an Operations Model, constraints had to be related to lake elevations or downstream flows in some fashion. Mike gave the example that water quality in the Lake could be related to Lake levels.

Constraints (with Tasks to Resource Group):

- Instream flows and downstream water quality (Fish & Wildlife RCG)
- Spring spawning levels in the lake (Fish & Wildlife RCG)
- Public water withdrawals
- Drought Management
- Recreational lake levels (Recreation RCG)
- Recreational releases (Recreation RCG)
- Lake level stabilization – Winter drawdown issues (Lake and Land Mgmt RCG)
- Navigation flows (Recreation RCG, Fish & Wildlife RCG)
- Flood plain inundations – timing, frequency, magnitude (Fish & Wildlife RCG)
- Safety flows (Safety RCG)
- Reserve generation

Dick Christie noted that navigation flows were very important to DNR and pointed out that DNR policy requires them to recommend the highest flow that meets water quality, navigation and habitat criteria.

The QA/QC process was discussed with respect to input data to the Operations model. The group concurred that quality data is of the utmost concern and will be dealt with by the TWC. Anecdotal data would be evaluated on a case-by-case basis by the TWC.

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Mike Schimpff concluded from the list of constraints that all of the issues could be boiled down to lake levels and minimum flows. Bud added that the model has to be able to provide downstream flows at different sites. The group concurred.

Looking at the issues, Mike Schimpff pointed out that they could be effectively modeled in an Excel spreadsheet, in HEC-5 and Oasis. The group agreed that CHEOPS would not be ideal because it looked at data every 15 minutes. Ray Ammarell noted that Oasis has the most flexibility and HEC-5 is developed around reservoir system modeling but might work well also. Gina asked if Oasis would interface well with models that were developed in other RCG's. Mike indicated that it would.

Bud explained that the HEC-5 and Oasis inputs are similar. However, he pointed out that HEC-5 is a public domain model. He also added that a benefit of HEC-5 was the HEC Support Center. Bud noted that a sophisticated model was not needed for a lake such as Lake Murray.

Alan noted that from a cost perspective, you would have to consider that a lot of upfront work may need to be done with HEC-5.

Bill Argentieri noted that if there were no objections, SCE&G would go ahead with Oasis, Oasis Lite or HEC-5. The group concurred as long as the chosen model would get the job done.

The discussion turned to developing a TWC. Mike Schimpff indicated that very technically skilled people are needed to run the models. Bud concurred that Mike should take the lead and the TWC serve as an advisory committee.

Patrick Moore stated the operations group needed to look at the specifics on reserve capacity options in order for the stakeholders to gauge the reasonableness of their requests. Patrick Moore continued to note the following, "There needs to be some quantifiable value on current operations. We heard a general discussion of alternatives from Lee with general descriptions of the logistical challenges of some alternatives. For example, gas turbines were stated to be about 50% reliable. Promotional materials from General Electric advertising 90% reliability, provided by Trout Unlimited, were referenced as an example of a possibility that could be explored at the next meeting or in a TWC. At other RCGs, reserve requirement issues significantly relating to safety, recreation, and water quality, are reserved for the Operations RCG. Options for meeting these reserves should

MEETING NOTES

**SOUTH CAROLINA ELECTRIC & GAS COMPANY
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be specifically evaluated in preparing the Protection, Mitigation & Enhancement agreement.” He requested that SCE&G provide this information to stakeholders at the next Operations meeting.¹

Tom Eppink noted that while he didn't think there would be a problem in SCE&G doing this, he wasn't sure it could be developed by the next meeting. This due in part to the uncertainty of who within SCE&G could/would give the presentation and could not make the commitment on someone else's behalf. However, he added that they would begin the process of lining this up for the future.

TWC Members:

- Mike Schimpff
- Bud Badr
- Larry Turner
- NHI Representative
- Ray Ammarell
- Mike Waddell (Observer)

Mike would prepare a draft study with an outline of the model with a schedule and submit it to the TWC for review.

Meeting adjourned.

¹ Although Meeting Notes are not intended to be transcripts of the meeting, Mr. Moore requested that this paragraph be included in the notes after the meeting for clarification purposes.

MEETING NOTES

**SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
OPERATIONS RESOURCE CONSERVATION GROUP**

**SCE&G Training Center
January 26, 2006**

**Saluda Hydro Relicensing
Operations Resource Conservation Group**

Meeting Agenda

**January 26, 2006
9:30 AM**

Saluda Shoals Park – Rivers Conference Center – SE Freight Room

- **9:30 to 12:00** Hydrologic Models Presentation and Question Session
 - **12:00 to 12:30** Lunch
 - **12:30 to 2:30** Interactive Discussion on Model Inputs and Sources
 - **2:30 to 3:00** Develop List of Homework Assignments, Develop Agenda for Next Meeting, and Set Meeting Date
- Adjourn



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MEETING NOTES

**SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
OPERATIONS RESOURCE GROUP**

**SCE&G Training Center
December 6, 2005**

Final 2-17 ACG

ATTENDEES:

Alan Stuart, Kleinschmidt Associates
Alison Guth, Kleinschmidt Associates
Ray Ammarell, SCE&G
Bill Argentieri, SCE&G
Gina Kirkland, SCDHEC
Mike Summer, SCE&G
Randy Mahan, SCANA Services
Kristina Massey, Kleinschmidt Associates
Steve Bell, Lake Murray Watch
Amanda Hill, USFWS
Joy Downs, LMA
Tom Ruple, LMA
Bud Badr, SCDNR

Parkin Hunter, Columbia Audubon
George Duke, LMHOC
Bill Hulslander, Congaree National Park
Patrick Moore, SCCCL\Am. Rivers
Jeff Duncan, NPS
Michael Waddell, TU
Bill Cutler, Lake Watch

DATE: December 6, 2005

ACTION ITEMS:

- Hydrologic Model Presentation
SCE&G\Kleinschmidt Associates

HOMEWORK ITEMS:

- Think about what information needs to be presented in this group for educational purposes

AGENDA TOPICS FOR NEXT MEETING:

- Presentation on Hydrologic Models
- Discussion

DATE OF NEXT MEETING: January 26, 2006 at 9:30 a.m.

MEETING NOTES

**SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
OPERATIONS RESOURCE GROUP**

**SCE&G Training Center
December 6, 2005**

Final 2-17 ACG

Located at the Saluda Shoals Park Rivers Center

DISCUSSION

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.

Alan opened the meeting and introduced Bill Argentieri as the speaker for the presentation on the “Nuts and Bolts of Saluda Operations.” Bill began his presentation, and several questions about definitions came up during the course of the discussion. After a cross-section of a general hydropower plant was shown, several questions arose about the penstocks and the towers. It was noted that the penstocks are the pipes that let the water from the lake flow through the turbines, and the penstocks are inspected on a periodic basis. A question arose on whether or not the towers require maintenance and Bill replied that most of the maintenance on the towers has to do with the mechanical components such as the gates.

Mike Waddell asked how Saluda Hydro efficiency is affected by lake levels. Kristina replied that as the Lake drops the efficiency drops as well. There was some discussion on the water intake from the towers and the restrictions associated with Unit 5, including those restrictions caused by the congregation of blueback herring around the Unit 5 tower during certain times of the year. It was noted that SCE&G has hydro-acoustic equipment that monitor the presence of fish in the vicinity of the intake, including the blueback herring.

Bill began to give the group some background on the Project and some of the specifics about the plant were noted. He pointed out that first four units can generate 3000 cfs of water flow per unit at full load and Unit 5, being about twice the size, can generate 6000 cfs at full load. George Duke asked how old the generators were, to which Bill replied that they are 75 years old. From a maintenance standpoint, Mike Summer added that a few of the units have been rewound.

Discussions then turned to turbine venting. Patrick Moore asked if the hub baffles allowed all of the units to be equally effective at venting. Alan Stuart explained that all of the units vent at different efficiencies, with a major contributor to this being the condition of the seals on the units.

The group briefly discussed the maintenance on the units. It was noted that the units are frequently inspected and electrical testing is performed routinely. When asked if there was a life span on the units, Mike Summer noted that it is more cost effective to maintain a unit over a period of time as opposed to replacing the whole unit. Kristina Massey added that units 1-4 had major overhauls in the late 70’s to early 80’s. Bill noted that SCE&G is looking at the potential for upgrading the units

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and KA is doing a study to provide SCE&G with some options for upgrading. Bill added that this study takes into account many issues, including the environmental issues.

Bill began to discuss Unit 5 and noted that because it does not have an isolation valve on the unit itself, the gate has to be closed at the tower. He added that Unit 5 was “bought off of the shelf” in the late 60’s, as opposed to being specifically designed for the location, water flows, head, etc. where it is. It went into operation in ’71.

The group then began to discuss the emergency spillway. Bill explained that in the event that the dam were in danger of being overtopped, the spillway gates could be opened for the emergency release of water, hence the name “emergency spillway.” This is the only operational function of the emergency spillway. Bill pointed out that the spillway channel is not the original Saluda River channel but rather a manmade channel. Amanda Hill asked if the natural streambed was where the powerhouse is now. Bill replied that it was between the towers and the spillway. There was some discussion on the Probable Maximum Flood and also on the black start capabilities of the plant. Bill noted that if there were a blackout, Saluda was one of the few plants on SCE&G’s system that could start from scratch. The group also briefly discussed the Flow Forecasting Model.

Mike Waddell asked what SCE&G uses for reserves if they were running Saluda due to rainfall. Bill replied that they either use another plant, such as the Monticello Pumped Storage Project, or they buy power from another system. One group member inquired as to whether SCE&G anticipated Lake Murray being required to operate as a flood control lake and how that might impact inundation at the Congaree National Park. Randy noted that he believed it was imprudent for anyone to count on Saluda for flood control when 2/3 of the flow into the Congaree comes from the Broad rather than the Saluda.

The group began to discuss the operational warning sirens on the LSR, as well as the sirens that are activated in the event of a dam failure. Bill noted that emergency action brochures that explain what people should do should they be alerted to a potential dam failure are mailed out to those individuals who reside in the zip code areas below the dam and drills are performed on a regular basis.

Discussions began to center around the maintenance work on the dam and the upcoming placement of rip-rap on the upstream face of the dam. Bill noted that they were waiting until the north bound lanes were complete so that traffic could be re-routed, otherwise the existing south bound lane section of Hwy 6 would have to be shut down.

Bill concluded his presentation and the group began to discuss the mission statement. It was agreed that the goal of the group would be to develop a hydrologic operations model.

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The group began to discuss what they would like to see come out of a model. It was discussed that the model needs to be user friendly. There were several models that were mentioned, including Hec 5 and Oasis. Bill Hulslander noted that it was important to make sure the model was able to take inputs or outputs from other RCGs. Bud Badr explained his view that the model would actually be a water allocation model that would take into account how much water was in the Lake, how much water was coming into the Lake and how much water was flowing out of the Lake. He noted that it would look at what the interests would be upstream, as well as downstream interests and SCE&G's interests. Bud continued to explain that each interest would be converted into a number value and while the system is being run it will show how many times a certain interest is infringed upon during different scenarios. He noted that the model can be worked to show how many interests "violations" will occur over a span of time. Bud mentioned that everyone is given equal consideration in the model.

Patrick Moore noted that a few years ago American Rivers and the National Heritage Institute started to model the entire Santee Basin. He added that this model would be ready in the next few months. Bud noted that it was a very good model but that it did not substitute for the model that was needed here.

Parkin Hunter asked if the model would be stochastic. Bud replied that it would be deterministic because it is going to use actual measurements and limitations from the Lake.

In a further explanation of his expectations for the model, Bud noted that the first step would be to get the inflows for an extended period of time. He then explained that you need such data as daily rainfall and the daily capacity to develop the baseline. He pointed out that the modeler has to establish relationships between certain demands and interests and lake level elevations. Bud added that evaporation also has to be considered. With respect to downstream interests, he noted that water quality can be reflected in terms of a certain flow or height. He added that the same idea applies to fisheries and navigation. He explained that the modeler will run the scenario and the baseflow for the last fifty years or so. Bud noted that once the model has been built, it will be a tool to mimic the real system, and can be calibrated for high flow, average flow and low flow.

There was some discussion on how floods and droughts would be incorporated into the model. It was noted that the model was going to be calibrated to the last 30 years of climate data. Bud noted that in 2002 there was a very extreme drought and added that he did not believe that extreme drought events, such as that one, should drive the allocations of the model. He pointed out that that event should probably be excluded and put under a low flow protocol. George Duke inquired that if the model was going to exclude the extreme drought cases, then shouldn't it exclude the extreme flooding cases as well. Bud replied that problems arose when there was not enough water in the

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Lake, such as in drought situations, and too much water was not a worry in regards to water allocations.

The group decided that at the next meeting SCE&G would give a presentation on potential models that could be used for Lake Murray and that also could interface into SCE&G's computer system. George Duke suggested that it may be good to show the presentation to the other groups as well so that they will know what is needed from them. Alan agreed.

Bud noted that it would be beneficial to the state agencies to have access to the model and noted that they could sign a contract stating that they would not share it with any outside groups.

Through an interactive discussion the group gave suggestions as to what they would like the model outputs to be; they are listed below:

Outputs of the model

Lake Levels

LSR Flows

Inflows

Generation

Lake Capacity, storage

Frequency, magnitude and duration of demand satisfaction

Graphic Ability

Interactive Model Front

The group then agreed on the mission statement, which is listed below.

“The Mission of the Operations Resource Conservation Group (ORCG) is to oversee the development of a robust hydrologic model for the Saluda Project which will establish a baseline of current hydrologic, hydraulic, and operational conditions, and aid in analyzing and understanding the potential upstream and downstream effects of potential changes to project operations, in support of the missions and goals of all other Saluda Hydroelectric Relicensing RCGs. The objective is to fairly consider those impacts, to include low-flow conditions as a part of developing consensus-based, operations focused recommendations for the FERC license application. Model results are to be presented in readily understandable terms and format. A key measure of success in achieving the mission and goals will be a published Protection, Mitigation, and Enhancement (PM&E) Agreement.”

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The group decided that the next meeting would occur on January 26 at 9:30. The training center was booked for that date but after the meeting Alison was able to secure a room at the Saluda Shoals Park Rivers Center for the meeting location.

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ATTENDEES:

Alan Stuart, Kleinschmidt Associates
Alison Guth, Kleinschmidt Associates
Ray Ammarell, SCE&G
Bill Argentieri, SCE&G
Lee Xanthakos, SCE&G
Gina Kirkland, SCDHEC
Mike Summer, SCE&G
Sally Wofford, SCE&G
Randy Mahan, SCANA Services
Kristina Massey, Kleinschmidt Associates
Steve Bell, Lake Murray Watch
Mark Leao, USFWS
Joy Downs, LMA
Tom Ruple, LMA

Dick Christie, SCDNR
Bud Badr, SCDNR
Parkin Hunter, Columbia Audubon
Bill Marshall, LSSRAC
George Duke, LMHOC
Bill Hulslander, Congaree National Park
Patrick Moore, SCCCL/Am. Rivers

DATE: November 1, 2005

ACTION ITEMS:

- Draft Mission Statement:
Randy Mahan

HOMEWORK ITEMS:

- Review ICD and Study Requests
- Think about what information needs to be presented in this group for educational purposes

AGENDA TOPICS FOR NEXT MEETING:

- Develop mission statement
- Discussion on the content of a Model
- Review of stakeholder interests
- Presentation on Saluda
- Review of requested studies and a determination of what information already exists

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DATE OF NEXT MEETING: **December 6, 2005 at 9:30 a.m.**
Located at the Lake Murray Training Center

INTRODUCTIONS AND PURPOSE

Alan Stuart opened the meeting and everyone introduced themselves.

He introduced Lee Xanthakos as the presentation speaker and noted that the purpose of the RCG would be to try to identify resource specific issues. Alan noted that because SCE&G was using the TLP it would be a cooperative process. He mentioned that the difference between cooperative and collaborative had been a topic of confusion.

DISCUSSION

Lee began his presentation on how and why Saluda Hydro operates the way it does.

He noted that he manages the system control room in the Palmetto center downtown.

Lee began to discuss the grid and noted that it was a constant balancing act and they had to work together with other utilities. He mentioned that what SCE&G does is very important to other power companies and vice versa. Lee explained that an example of the grid was the large towers with power lines that you see crossing the highway. He explained that electricity travels at the speed of light and noted that if you have a "hiccup" in power anywhere in the country, SCE&G feels it.

Lee presented a map representing the NERC (North American Electric Reliability Council) and noted that each company connects to one another which, in turn, provides a balance of authority.

Lee showed that SCE&G was connected to 5 other control areas.

Bud Badr asked: "How are you connected"?

Lee replied: "Our plants are connected directly to their plant by lines."

Lee began to explain how the grid works. He noted that when customers turn on their appliances, and a demand surfaces, it is important for SCE&G to supply the power. He noted that there were three ways to supply power:

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- Fossil fuel plants
- Nuclear power plants
- Hydro – noted that there is Fairfield Pumped Storage, Saluda, and a few run of the river plants such as Parr and Neal Shoals

George Duke asked what the capacity of Fairfield was.

Lee explained that it was 560 MW. Lee began to explain the meaning of peak demand. He noted that in the summer the peak is late in the day and in the winter the peak is in the morning. In the summer you pump in the early morning. In the winter you pump at noon, although it varies from day to day.

George asked if this depended on weather cycles and Lee replied: “Very much, if there is flooding we cannot run Fairfield.” He noted that it was a license requirement that Fairfield cannot generate if the river flow is over 40,000 cfs.

Lee continued to discuss balancing the grid and noted that balance means that there is enough electricity flowing from the generators to meet the Customer’s demand. He noted that balance was measured in real time. He pointed out that if SCE&G is over-generating they will call a plant and tell them to cut back and vice versa. He noted that there was a certain order in which plants were taken off and online.

George Duke asked: “When you are over-generating where does it go?”

Lee explained that in a situation where demand is 4000 and generation is 4000 MW SCE&G is balanced and there is no energy flowing across the lines. If demand is greater than generation, for example, if they did not plan well that morning or a plant went offline, SCE&G will take in electricity from neighboring utilities.

Lee noted that they have a meter called “inadvertent” and they try to keep it as close to zero as possible. He noted that if they see they have a negative number of inadvertent they will pump more on the grid...to bring it back to zero. He pointed out that it was called “payback in kind”. He noted that if you had everyone putting out or taking in you have a problem.

Lee noted that an ACE stood for Area Control Error. He noted that a lack of balance causes flow between control areas.

George Duke asked: “When you plan do you plan at some percent capacity?.”

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Lee Xanthakos replied: "If a plant is on line we get a report on dependable capability, and we run at that number. If you have a problem then you have contingency reserves. And Saluda is an important reserve."

Lee continued to explain that not all power plants are the same. The nuclear plant is on all the time, if it trips it comes on at 1MW a min, and it would take an hour for it to get to 60MW. Natural gas is the same way because it needs to warm up. Lee mentioned that Parr Gas Turbines can come on quickly but can not always reliably do so in the time required to serve reserves. Lee explained that another option was to buy power.

Lee noted that the energy from Saluda stays on the grid. He explained that Saluda stays offline until an emergency, In order to be considered reserves it has to be offline and ready. During unbalanced short periods of time other systems supply deficiency in generations.

Steve Bell asked, "Are TVA and Corps lakes tied to you?"

Lee replied, "TVA and Corps lakes are not directly connected to us but are connected to SEPA SOCO, etc, our VACAR partners."

Lee explained that imbalances in the system are caused by such things like power plants breaking down, fuel problems, power line problems etc. He noted that SCE&G could return balance by increasing generation or reducing demand by approved programs.

Reducing demand could include a load curtailment program, can choose a plan depending on the scenario.

Scenario 1 – Tomorrow is going to be cold and a large number of plants are offline, SCE&G would do public appeals through the media, large industrial customers will come offline that SCE&G has interruptible service contracts with.

Scenario 2 – The grid is balanced, but a nuclear station comes offline, He noted that then there is a voltage reduction.

Joy Downs asked, "What if we didn't have Saluda, what would we do?"

Lee responded that there were several ways to do this, you could use Fairfield Pumped Storage, but it has limitations...they could keep all the coal fired plants at a reduced load. They could find alternate generation which would require them to build some other sort of quick start plant.

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Gina Kirkland pointed out that hydro was one of the cleanest powers you could have in terms of what is good for the environment.

Lee began to discuss the rules that they operate by. He pointed out that it could be broken down into the NERC, the SERC and then finally VACAR. Lee continued to discuss the grid rules as presented in the presentation. He noted in order for each utility to avoid carrying 1000 MW in reserve, which is what SCE&G would have to do to stay in compliance with BAL-002-0, which is their most severe single contingency (loss of a nuclear unit), SCE&G joined with other utilities to form a reserve sharing group. SCE&G's requirement is thus to carry 200 MW.

He pointed out that just because Saluda is running doesn't mean that SCE&G directly needs the power; it could mean another member of their reserve sharing group had an outage. He noted that for their problems they usually call Duke because they have hydro and that is the most reliable.

He noted that in the VACAR contract, if they have to call on another company for reserves we pay the price to generate the power +10%.

Joy Downs – “How can you be sure that they actually have an emergency and they are not just buying the power off of the grid?”

Lee Xanthakos - we write up compliance reports and Duke, or the power plant that we receive power from, also writes up report and compliance is reported quarterly to SERC .

Lee went through a few examples with the group.

Lee began to explain why Saluda was used for reserves.

He noted that they don't always just use Saluda, but may use Fairfield if it is available. If you don't have hydro you have to have other options like turbine farms that are loud, expensive, and only 50 percent reliable, so you have to have reserves for your reserves.

Saluda is the reliable solution for keeping the system online.

Parkin Hunter asked, “Have you ever had the instance of drought, and the lake is down and you cannot generate?”

Lee replied, “No because even with an hour of generation, it won't affect level of lake very much.”

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Randy Mahan noted that one of the reasons why SCE&G needs to have the minimum lake level of 345' in the license is because SCE&G needs to be able to bring it down to 345' for maintenance of the dam.

Dick Christie asked if you could re-agree with VACAR that you would only carry 100 MW in reserves instead of 200.

Lee replied that, "We need VACAR as much as they need us, they may find another partner if they are unhappy with us, it is a load/generation ratio, as we grow; the collective ratio grows as well."

Gina Kirkland asked, "I know SRS is not available, but is there actually thought to use it?"

Randy Mahan responded that there are thoughts toward that, but that is still not solving the contingency reserve issue that you need Saluda for.

George Duke noted that he had a completely different perspective about Saluda coming into this meeting than he has after hearing the presentation. He noted that he had always assumed that SCE&G used Saluda to supply low cost power that they in turn sold high, which is absolutely not the case.

Lee concluded the presentation and the group then began to discuss the mission statement.

Randy Mahan pointed out that there were a lot of ways to develop mission statement, they could be worked on separately and melded together or they could brainstorm as a group.

Patrick Moore noted that many stakeholders have addressed the formation of a process group.

Randy Mahan replied, "I don't think that is necessary, if there is a procedural issue that needs to be resolved, we will create an ad hoc group. But I believe that creating one now is a solution waiting for a problem."

Joy Downs noted that LMA does not necessarily see that there is a need for a procedural group but there are some questions that LMA has.

Steve Bell noted that if some individuals feel that they need to meet aside, informally, they could do so to develop recommendations.

Randy Mahan replied, "I think we tried to make it clear that if you have recommendations you can submit them; however, Saluda Relicensing is not a democratic process, it is a cooperative process."

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Gina Kirkland noted that not everyone is going to be completely happy, but you have to come to a consensus as a group.

Randy Mahan noted that SCE&G has a responsibility to take a recommendation and try to achieve consensus on a topic. He also noted that anyone can submit comments to the FERC on their own, as well.

Dick Christie pointed out that consensus is a decision that everyone can live with. It may benefit one individual more than another but it is a decision that most people can live with.

Gina Kirkland added that there is always someone who is not happy and cannot live with it, there are extremes that are unhappy but you can usually get consensus from “almost everyone”.

Steve Bell asked, “What happens if the group agreed, for example, that the lake levels should be a certain height.”

Randy replied that a consensus guides what SCE&G puts in the application packet and in turn goes to the FERC. If a consensus is reached and SCE&G disagrees, then SCE&G states that they disagree and why they do so, then the FERC will decide the outcome. He noted that individuals also have the option of filing a comment on this separately.

Alan noted that if everyone came to an agreement that a settlement agreement would be the end result.

Dick Christie noted that as far as communication between the groups goes, in other processes they have combined meetings and issues when facilitators decided to do so.

Alan Stuart noted that if this presents itself, they may see the need to combine a meeting.

Bud Badr noted that he believed the function of an Operations RCG would be to get with the other RCGs, take what everyone wants, balance input and needs, and develop a model. Bud continued to note that he has hired 2 more individuals to work primarily with the FERC relicensing issues and will be able to help SCE&G when they need something from DNR.

Alan began to discuss the issue of the “Parking Lot” as presented in the operating procedures. He noted that from a few comments that he has read that he believes there is a misunderstanding about the “Parking Lot”. He noted that the parking lot is used for items that are irrelevant to the topic at

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hand and disrupt the flow of the agenda. He noted that that particular item would then be placed in the parking lot to be discussed at the end of the meeting or placed on the next meetings agenda.

Randy Mahan then discussed the evolution of an issue. He gave Recreational Flows as an example and noted that you need to first decide what you need to know in order to discuss whether recreational flows are going to occur. Then you take the information and decide whether or not and how to address the issues. Then you decide what info is needed to address the issue, and what you need to know in order to make a reasonable recommendation.

Bud Badr pointed out that you need to make sure you support your issue.

Randy continued to note that they want decisions to be scientifically driven. He also noted that disagreement may arise on whether or not a study needs to be done because there may already be information available. It was also noted that some studies may be combined in order to answer as many questions as possible with one study.

On the topic of a mission statement, Gina Kirkland noted that she thought that a scope of the group needed to be better defined. She noted that she felt that a group could potentially get bogged down with issues that belong in other groups. She pointed out that maybe KA or SCE&G could offer a draft starting point and let the group put meat to it.

The group decided that SCE&G would develop a "strawman" before the next meeting and then discuss it from there.

Alan noted that a homework item would be to take the study requests, read through them, and make recommendations from there.

Randy noted that the long, in-depth studies need to be flushed out first, as they will take more time to accomplish.

Bill Hulslander asked, "Who will conduct the studies and who will decide who will conduct the studies."

Randy replied that the RCG will develop the scope and the TWC will determine the best way to conduct a study.

Alan then brought up the subject of the media; He noted that there was a rule in the operating procedures that a person who is an active member of the media cannot be an active member of an RCG. He noted that there were some individuals who were contributing writers to various

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newspapers and if there were problems where information came up in the media, then it will be dealt with. He noted that people need to be able to express themselves without being afraid that what they say will be written about. He noted that if you want to speak to the media afterwards, please do not say that you represent the RCG. However, you may represent your own agency or NGO.

Steve Bell asked if they could have closed meetings.

Randy replied that nothing should arise that would warrant a closed meeting.

Alan noted that they would be taking the operating procedures and revising them per comments submitted.

The group began to discuss homework items. Alan noted that one item for the group to think about would be what sort of presentation or information needed to be presented to the group.

Dick Christie noted that they needed to give thought to the product they would like from a meeting. He noted that different needs could arise and the group should try to pin them down. He continued to note that products are items needed to address in the model, low inflow protocol, operations protocol. He noted that he thought that they needed to make a decision on how recommendations were used.

The group began to discuss the use of the hydraulic model and Bud Badr noted that he would be able to help with this model and give information. He noted that this model would help to make value judgments.

Ray Ammarell noted that he would like to see a presentation that discusses operational requirements, system requirements and such. It was also mentioned that information on the flow forecasting model and Probable Maximum Flood was needed.

Steve Bell asked about standard license articles and Alan noted that he would find these and send them to Steve.

The group closed by outlining the agenda for the next meeting.

In closing, Bill Marshall asked the group if a compromise time could be established, possibly halfway through the day in order to benefit those who are working.

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Gina Kirkland responded that an occasional group meeting with all the resource groups in the evening would be okay.

Bill noted that his suggestion would be that they start around 3:00

The group noted that this was a difficult issue. It was discussed that an occasional evening meeting may be okay, however if they started at 3:00 in the afternoon the meeting may last until late at night.

Dick Christie noted that in his experience there will be a critical mass of people who are essential to the meeting. He noted that he doesn't mind going from around 1:00 to 7:00 if those individuals who you would be meeting later for could come every time.

Alan Stuart noted that it may be best that Bill Marshall meet separately with those individuals who cannot attend and keep them up to speed. He noted that he plans to have updates at quarterly Public Meetings.

Bill Argentieri asked if it would be beneficial to start at 1:00 in the afternoon.

Gina Kirkland responded that it would not be beneficial if they wanted to get through all of the agenda items. She noted that if the group is going to cover a lot of stuff and you are resource limited then the group needs to try to get as much accomplished at one meeting as possible.

It was also noted that if the meeting was started later in the afternoon, those traveling from out of town would have to drive back late as well.

The group concluded to keep the next meeting at the 9:30 schedule.