

**Dominion Energy
American Eel Working Group
2 February 2022**

Virtual Conference Call Scheduled from 0900-1200
FINAL MEETING MINUTES

Present (Conference Call Attendees):

Dominion Energy – Peter Sturke, Corey Chamberlain, Olivia Ambuehl, Ben Rice, Taylor Allen, Paul Vidonic, John Swenarton, Caleb Gaston, Susan Gonzalez
NMFS - Twyla Cheatwood, Fritz Rohde, Kevin Mack, Bjorn Lake
USFWS - John Ellis
NCWRC – Jeremy McCargo, Katy Potoka, David Belkoski, Kirk Rundle
NCDMF – Todd Mathes, Holly White, Josh Winger
VDWR – Scott Smith
Alumnus – Bob Graham, Wilson Laney (NCSU)
AKRF – Justin Krebs, Carlos Lozano, Chris Manhard

Welcome and Introductions

Pete welcomed the group and had everyone go through introductions including their affiliation. He reviewed the agenda which included the below items:

1. Welcome and Introductions
2. Review agenda and any additions
3. Roanoke Rapids
 - a. Eelways 2021 and 2022
 - b. Bypass Resident Fish and Mussel reports 2022 – **Due to FERC 30 June 2022**
4. Gaston
 - a. Eelway construction and operations
 - b. Record Drawings due to FERC April 2022
 - c. Tour February 22. Ability and availability for travel?
 - d. Gaston Eelway Effectiveness Report 2022 – **Due to FERC 30 June 2022**
5. Downstream Eel Passage at Rapids
 - a. Eel Population and Movement Study
 - i. Status for 2021-22 outmigrants
 - ii. Eel Population surveys from May – October 2022 and 2023
 - iii. Year 3 Report due to **FERC 30 June 2022**
 - b. Fish Friendlier Turbine Replacement
 - i. Engineering design
 - ii. Timeline for Agency review
 - c. Discussion about compliance with Art 401 license requirement

As Pete went through the agenda he mentioned that there are several reports due to FERC in June of 2022 as outlined above. He also mentioned that Susan Gonzalez and Taylor Allen will be leading the charge on the Bypass Resident Fish Report and the Gaston Eelway Effectiveness Reports for 2022, respectively. He added that with those reports, Dominion will be asking for the DFRTAC to review and provide comments. Pete finished by noting that the reviews by this group are always incredibly insightful and helpful because of the varying perspectives so Dominion appreciates the efforts.

Roanoke Rapids Eelways 2021 and 2022

The first topic that was covered was the finish of the Roanoke Rapids Eel run from 2021. The total catch was 10,186 with 14 mortalities associated with passage. He noted that the South bypass skimmer gate failed/broke in 2021 so there was very little flow being released from the south bypass which may have affected the attraction flow to the South Rapids Bypass Eelway.

Bob Graham asked if there was any flow at all. Pete mentioned that there is little flow but the skimmer is not functioning and delivering flow like it has in years past. Bob noted that there was a large difference in catch rates compared to historical catches. Pete showed google earth for the group to see the skimmer gate and where the flows are realized in the bypass reach.

Carlos asked if anyone is measuring larval ingress at Albemarle Sound and curious if the hurricane seasons or offshore currents have seen any changes that could explain the discrepancy in catches.

Pete followed up and mentioned that hypothesis has been brought up in the past with this very group and we don't have a clear definitive answer. Fritz noted that they have data from Beaufort inlet.

Todd mentioned the same and that the data may be available if we inquired. He also noted that there would, indeed, be a lag from larval fish ingress to the response seen at the eel traps at Roanoke Rapids.

Pete and Bob both agreed that the average age of the elvers, to the best of their memory, is about 2 years old when Dominion captures them at Roanoke Rapids. This was based on the research that Dr. Jesse Fischer was doing at NCSU but this group never received a final report or publication of those data beyond the 2018 AFS presentation.

Todd followed and said that the larval ingress data from Beaufort are actually processed elsewhere and there is about a 2 year delay for those data to be available. Fritz mentioned that he could get the Beaufort data from his landlord. Pete noted that would be very much appreciated.

Wilson added [discussing later with Pete and Taylor] that there may be other larval ingress data from the east coast, maybe Ken Able, VIMS, North Inlet, SC, and Little Egg Harbor, NJ but not sure of the continuity of those datasets. Pete, Taylor, and Wilson also discussed that he heard reports from folks at Conowingo that they had a record catch of eels in 2021. Wilson noted the amount of data from the RR traps would be useful to publications.

[added from the ASWG meeting the afternoon of 2 February 2022

Pete asked Twyla and Kevin about the upcoming upstream eel migration publication. Kevin and Twyla said that it has been modified and submitted to a journal and they should be hearing back very soon. There were some critiques early on about the narrative being more focused on Roanoke Rapids so there were tweaks to make it a more coast wide assessment for a broader application.]

Action Item: Fritz to request larval ingress data from Beaufort Inlet.

Pete finished the Roanoke Rapids Eelway update by saying that some of the equipment at the eelways was broken towards the end of the year but everything is on pace to be repaired so that everything is ready for operations to begin the first week of March 2022.

Roanoke Rapids Bypass Resident Fish 2021

Susan Gonzalez presented on the bypass resident fish studies. These are a license requirement associated with Article 413 of the License and are to be completed every 5 years since 2006 with reports to be submitted to FERC the following year. She reviewed the methods and the Backpack Electrofishing stations in the upper, middle, and lower sections of the bypass.

She presented a table of catches from the previous year surveys and noted that the 2016 and 2021 catches were very similar and made special note of the Catch Per Unit Effort (CPUE) similarity between those two years. She also mentioned that the species composition was similar with some exciting first observations of Golden Redhorse and Shorthead Redhorse.

She noted that the sampling station CPUE comparison showed some differences between the years which may have been attributable to skimmer function or normal variability in distribution of stream fishes. She noted that the eels were consistent between sampling stations and sampling years.

Bob made a comment that the 2011 numbers were lower because the low flows could not be maintained during sampling that year. Pete brought up the 2012 report which indicated that the minimum flow (325 cfs) for sampling could not be reached in the summer of 2011 which, indeed, may have influenced the catches.

Fritz asked why the table included species where no catches were included. Pete and Bob agreed that this is a table of all species that have been caught in bypass sampling which may have included gillnet sampling from early on in the relicensing.

Pete noted that the 2021 sampling included a particularly large Bowfin and that the redhorses (*Moxostoma* spp) were identified in the lab by Dr. Steve McIninch.

Bob asked if the community indices could be used to show fish are using the bypass under sustained flow. Susan agreed and will investigate that. Pete followed and said that the report addresses individual, population, and community health as an effort to show the success of rewatering the bypassed reach.

Susan closed out this report and noted that the bypass report is due in June 2022 and will keep the DFRTAC in the loop for review in advance of those submittals to FERC.

Gaston Eel Passage

Pete introduced the Gaston passage update. He showed photos of the new facilities and he explained the points where the eels would enter the ramps as well as the location for the pump intakes associated with the water needs at each site. He noted that the North Gaston Eelway is now complete and the photos are from the construction crew. He explained the location along the training wall and the passage of eels up the ramp. Pete noted that the construction team moved the dock to a northern cove on Roanoke Rapids Lake, out of the way of the wave action should Gaston spill water again. He is planning a trip there soon and will get better pictures at that time. He finished by saying that this project has been through the ringer for changes and challenges and appreciates the patience of the DFRTAC throughout and is excited to get the season underway.

The next slide, Pete asked who can attend the Gaston Eelway tour on February 22nd. He noted that Dominion can ensure everyone stays outside. NMFS reported their attendance is subject to approvals but a daytrip may be possible. John Ellis (USFWS), Jeremy McCargo (NCWRC), Todd Mathes (NCDMF), Scott Smith (VDWR) all seemed to think that travel is possible and the day trip will work.

Pete passed the control to Taylor to deliver the update on the Gaston effectiveness thus far. Taylor covered the catches for the 2021 year which included passing 4,472 eels into Lake Gaston. Of those, 3,857 received Coded Wire Tags. The average total length of those fish was 181.7mm TL (n=884) and ranged from 114-400 mm TL. For comparison, he informed the group that the mean and range for 2019 was 156.5 mm TL (105-253 mm) and 2020 was 164.5 mm TL (107-292 mm). It was interesting that the total length increased over the last few years. Taylor made special note that it was encouraging to see that the South Gaston Eelway caught more than a few eels over 300mm this year which seems to indicate that the substrate is not limiting larger eels from utilizing the eelway.

Justin asked about the effectiveness of the substrate and if there was a potential for the traps to catch eels that would be caught in the eel pots as part of the downstream population surveys. Taylor said the substrate isn't limiting and the eel pots should be catching eels over 300mm so there is some overlap but noted that there haven't been any PIT tagged eels caught at the South Gaston Eelway yet.

Taylor also noted that there were 4 mortalities in 2021 associated with passage which may have occurred during the high catch days and he recalled that the 4 mortalities fell victim to a crowded bucket. He also informed the group that the new eelways have flowmeters on the attraction flow which were about 135 gallons/minute for the entire season.

Taylor moved onto the next slide which showed the monthly catches of the Gaston Eelways. He noted that the fall catches from September through December were the highest on record. This may have been because Gaston was in an outage status and there was a lack of flow along the southern side of Roanoke Rapids Lake where the tailrace for Gaston Dam is located along with the South Eelway. The monthly catch in October 2021 was the highest on record for a single month with 2,095 eels captured and passed into Lake Gaston. He noted that the Gaston Eelway was turned off for the season after the eel catch dropped off in mid-December but the trap still caught 205 eels in December which was also a record high.

The next slide, Taylor covered the upstream eel passage studies associated with the Gaston Eelways. He mentioned that the Operations and Maintenance manual for the Rapids and Gaston eelways is currently in development and should be ready for submittal to FERC in April of 2022. As for the effectiveness studies, the 2nd of 4 (maximum) reports is due to FERC by 30 June 2022. He reminded the group that the studies posed three questions to determine effectiveness of the new Gaston Eelways. The first is "what is the proportion of eels in RRL that find and enter the eelways?" which was going to be tested by observing the total catch for each trap increase compared to historical catches. Taylor recalled the first few slides where the South Gaston Eelway alone caught more eels in 2021 than any year previously. The second test of effectiveness is "are eels being passed safely?" Taylor mentioned that in 2021, the 4 mortalities associated with passage represents less than 0.01% of the total eels passed so it seems to be safe. Lastly, the third question for effectiveness is the proportion of eels that experience fallback into Roanoke Rapids Lake after transport upstream into Lake Gaston. Taylor informed the group that there have been 6 recaptures of CWT eels at the South Gaston ramp (4 of which were in 2021). There are currently 8,395 CWT eels in Lake Gaston and 6 out of that population is less than 0.01% of the total passed. He finished this section by saying that, right now, the South Gaston Eelway seems to be more

effective than the previous eel trap that was present on the site but he is similarly excited to see the North Gaston Eelway start up this spring. He noted that the 2nd report is due to FERC in June of 2022 and he will be soliciting a review from the DFRTAC before submittal. These reports will likely continue until the final report in 2024 in order to have 2 complete seasons of the North Gaston Eelway in operation.

Downstream Eel Passage at Roanoke Rapids

Justin began covering the trapping study. Water temps on the bottom were around 18 C and the team tagged approximately 142 eels total in 2021. There are 271 total adult eels with a PIT tag for the study since 2019 but we didn't start catching eels until 2020. The population estimate of potentially outmigrating eels (eels over 300mm TL) has been refined after the October 2021 population survey to 2,775, with a 95% Confidence Interval of 2,050 to 4,294. Most of the lengths are > 300mm with most between 400 and 700mm TL.

Pete mentions Dr. Jesse Fischer's work indicated that the eel length is around 300mm when they sexual differentiate. Pete noted they probably would not leave right after that but with eels you never know.

Bob G mentions for the manuscripts, suggest get a handle on minimum size eel the traps will retain. That would, in turn, help to better define what the size range of eels for the population estimate.

Justin replied that he thinks it's critical to understand that so we know how many other (smaller) eels might be contributing to the total eel population in the Lake. AKRF should be able to get a handle on the numbers of smaller eels in the Lake using the eelway data for the numbers added to the population. Justin also notes, on a related note, when we update the population estimate at the end of this year, we may calculate based on 2021 and 2022 data and exclude 2020 mark-recapture data to reduce the effects of outmigrating eels. The longer the time series of mark-recapture data, the more eels will be leaving the population, which would seem to cause a more severe violation of the closed population assumption.

Chris Manhard suggested we could also look into reducing the size of the marked population during each sampling interval to account for eels that have outmigrated. We would need to develop an estimate of the proportion of the population that outmigrates during each interval to do that.

Bob G. says Justin and Chris, that sounds good. My primary idea was to put a more definitive lower bound on the size of eels you are making the pop estimates for. Not sure how well can estimate the number of smaller eels, given no data on natural mortality (i.e., predation or disease (*A. crassus*)). A simple study where you put a variety of sized eels in a trap, submerge the trap in an aerated container, and see which get out may suffice. Justin says Bob, would it be as simple as saying that the smallest eel collected in the traps over 4 years of sampling is the smallest size retained by the traps? Bob G and Justin agree.

Justin covered the receiver downloads. The detection of 4 eels is listed on the slide but Justin thinks we may have 2 more. Pete will check.

Wilson asked if we have noticed any weather around the migrations, Justin answered we have not outside of the model inputs but agrees it's a good idea and will explore that.

Justin notes that we have seen eels in January/Feb so if we download in March we should be able to bookend the year.

Justin will finalize the report in April and will begin trapping in May. Pete added that we are extending the study out until December of 2023 and included a note that the team intends to publish the results in 2023. AKRF and Dominion will try to complete this in 2023.

Wilson again mentioned the importance in having the work published in a peer reviewed publication and excited the company is on board.

Fish Friendly Turbine Update

Pete started the fish friendly update. The team is now working on getting a 30% design complete using Stantec. The end goal is to select one turbine runner and create a design package for EPC contractor for installation in 2024. Some vendors include GE, Voith and Alden. He also said that the Stantec team along with Dominion will develop updated eel survival estimates based on new information from AKRF, the turbine designs, and ultimately the 30% turbine design. Seemingly everything after the 30% design phase is more detailed engineering.

Pete mentioned specifically to Bjorn and John Ellis (and future USFWS fishway engineer) that a two-week timeline for review would be ideal. Bjorn asked for clarification on review time. Pete mentioned that we could adjust if necessary but must plan for everyone. Bjorn states that he needs lead time to block off hours for a review, the more the better. Pete noted that the timeline for development of the matrix right now looks like the beginning to middle of April but we'll know more once the team hears back from the turbine runner vendors.

Pete mentions this team delayed the decision on downstream passage to June of 2023 to increase our understanding of the population which is what AKRF is currently working in tandem with the fish friendly turbine project. The current goal is to get the decision on the method for passage to FERC by June 2022 as that works best for the station timelines. The immediate schedule moving forward will be to have the DFRTAC review the turbine runner selection matrix in April of 2022.

Pete noted that after the DFRTAC meets, discusses, and concurs with the turbine runner selection in April, that the Dominion team will be working on a downstream eel passage selection memo that will justify the selection of the fish friendly turbine and put the targeted nightly shutdown option on the shelf for now. The operational environment for hydropower has changed with the increase in solar.

Fritz mentioned that its acceptable to prioritize the turbine replacement but nightly shutdowns need to be an option if the turbines don't work out.

Pete says Dominion will determine success of the turbine by monitoring the survival as the project moves forward. Pete also mentioned that the current plan for the station is to have the other turbines replaced with fish friendly turbines assuming the first unit replacement is effective and successful for operations. He noted that this plan could definitely change due to a multitude of variables but for now the eventual plan is to replace all 4 turbine runners with a fish friendlier version.

Ben R. mentioned that Dominion is excited to be the first to install a FFT for eels and we have a unique opportunity to generate and share that data with region, other hydropower operators, and resource agencies.

Fritz is also excited and hopeful that the FFT will work but wants to keep the nightly shutdowns on the table just in case.

Ben R. mentioned that we are only required by the license to implement a solution up to the cost of a submerged light array but ultimately decided against that based on current research on its effectiveness for guidance.

Fritz is appreciative of how Dominion is moving and likes the research on the FFT but also noted the need to have alternatives such as shutdowns or other options if the FFT is not effective. Pete mentioned that long-term goal is to get the eels out of the system. Determining the effectiveness of the FFT can wait until we are done with the install however it's up to the DFRTAC to make that determination to complete the license condition. Pete mentioned that unlike the upstream eel passage license requirements, there are no requirements for effectiveness testing for downstream eel survival and Dominion would like to ensure that the solution is deemed effective to complete this license requirement. He noted to the group that, right now, the how and when this group can make that determination is up in the air.

Ben would like to memorialize no nightly shutdowns until the study is complete. No shutdowns until 2030 for example. That would allow enough time for the station to complete the replacement of all 4 runners and have a final picture of what eel survival looks like.

Pete said investing resources (time and money) to study the nightly turbine shutdowns and/or excess spill is not warranted right now if the path forward is the FFT. If the FFT is not effective then we can revisit other options but the complexity of the nightly shutdowns may get into other license conditions like operational availability that may not be as easy as we think. He noted that Dominion is committed to the FFT project and would like the DFRTAC concurrence on the current path forward fully aware that we will continue to monitor the situation until the group agrees that the passage solutions in place are protective and effective for downstream migrating eels.

Fritz thinks that we are committed to FFT and only need a couple years to study effectiveness. We are not taking anything else off the table in the future. John Ellis agrees with this approach. John also asked about the license condition that prevented nightly shutdowns. Ben mentions the ramp down procedure would not allow a shutdown while at higher flows. Bob G says that would counteract our requirement to do the ramp down by the nightly shutdown. Pete says Nightly shutdowns is a totally different approach that would be sticky with balancing the effects of changes to operational and grid reliability/availability. That's more applicable during high flows where spill would also be high.

John Ellis thanked the group for the clarification and that the nightly shutdowns would remain an option where, if we have to, we can tackle the details when the time comes.

Ben R. noted that we need to deliver this in a way that show FFT is the primary solution to downstream eel passage. Fritz thinks the bullets on the slide do that (inserted below)

1. 2024 Unit 1 replacement with fish friendlier turbine runner. Prioritize U1 operation during outmigration season

2. 2024 biological testing if installed before outmigration season
3. DFRTAC to discuss and revisit survival estimates
4. 2024-2028 station plans for other turbine runner replacement and biological studies
5. IF after all physical measures are completed at Rapids, survival is determined to be insufficient – other methods will be investigated

Pete noted that he thinks the minutes to this meeting may be sufficient documentation to pair with the future selection memo. Pete says for the short term it seems that everyone is on the same page with the FFT as the primary path forward for increasing downstream eel survival.

Wilson is on board with FFT and capacity and understands Fritz and John are as well. Fritz and John agreed.

Wilson asked if shutdowns were implemented would that mean no mortality. Ben answers no, there are structures that could cause injuries that may lead to mortality. Wilson says that even if we keep the nightly shutdown (and spill the water through the bypass) in the mix that don't mean zero mortalities. He understands the different factors at play (such as solar, etc) and would love as much information as possible. Pete mentioned that the Alden 2018 Report had survival at 99% out of the bypass.

Bjorn thinks we should use all data to make the decision and if we don't have the data we should get it and not guess. Pete mentioned we have taken our time with these decisions and would like to keep with tradition and gain more information before a decision is made. He also mentioned that there is no requirement percentage for survival at RR and there will eventually be a passage requirement to tackle at Gaston. So, what do we want the survival estimate to look like? AKRF has the population at about 4,000 or so eels potentially outmigrating each year and 5% of those is about +/- 200 per year.

Fritz mentioned survival rates for salmon out west are high, 95-98%, he doesn't necessarily want those applied here. The group mentioned the salmon is easier to get out given their size and that they don't wiggle nearly as much.

Pete mentioned of the acoustic tagged eels that left, some are still pinging in the tailrace. He noted that the route selection for downstream migrating eels is important but not necessarily critical if the turbine runners are effective.

Scott noted that passage eventually will not just be one dam but it will include passage through Gaston and Kerr. So, 50% at RR is added on at Gaston and Kerr. So percent survival maybe higher because it's a cumulative passage survival.

Ben and Wilson mentioned Kerr would be a hard sell for passage. Wilson noted that if the eels showed at Kerr we would discuss. Todd says the Corp does what they want to do. Wilson says keep in mind that the FFT at RR will pave the way for other facilities, and this may lead the ACOE to want to improve that image. Fritz thinks Wilson is optimistic, Wilson says it's necessary these days!

Pete says the data will be valuable with FFT install and ask FERC to delay determination of a successful solution until the DFRTAC can come to a consensus. Pete says we need to think of the energy stored up in the adult eels is very valuable as well in the big picture of the population. Pete asked if everyone is ok with adjusting the timeline on the Article 401 compliance schedule and moving to a future date with reference to the other turbine installs.

Fritz thinks we should have studies to test survival with the first install, start immediately.

Pete asks Ben about timeline and Ben thought the replacement would take at least 6 months for the completion at the earliest so maybe testing in 2025 for operations during the eel outmigration season. Bob G mentioned that the gold standard is a balloon tag study on live specimens and said if balloon studies can be completed at any time, not just the winter, we really only look at the strikes and their effects.

Bjorn says the trap eels could be used to study to FFT, and acoustics are expensive so he suggested a mark recapture study but we would need to discuss population size and the required number of test specimens that we would need to return an accurate survival estimate.

Pete asks about eels and turbines and how do you ensure they enter the turbine you want to test.

Bjorn said you need to directly inject them into the turbine. Bob G says you have to engineer that into the station and not just release in front of the gate. Bjorn says a pipe can be used to release in a hydraulic area to that would cause the eels to go through. Ben says the current configuration is good for that. Pete mentions the current holding facilities are equipped for this and assessing latent mortality. He also noted the current survival and the size relationship our range in around the 400-700 mm TL for testing.

Fritz said we should use the winter window for testing survival. Pete asked if there's any effect of water density since the water is colder. Bjorn said the metabolic rate of the eels may be at play but not density necessarily.

Pete mentioned the schedule for FERC submittals in June and the AKRF movement study update in 2022 and the necessity of the DFRTAC review on each of those. Also, he made mention of the April review timeline for the FFT runner selection as well as the May selection memo for incorporation into the June 2022 submittal to FERC. He also said that in 2023 we may be able to start thinking about the testing methods and schedule as well as the publications from the team. Bjorn said 2023/24 should be ample time to get ready for testing when the time comes.

Pete asks if everyone is good with the schedule and adjusting the Article 401 schedule to be essentially adaptive management but the focus is on FFT replacement for downstream migrating eels.

Fritz is good with it. John was absent. NCWRC, NCDMF, VDWR folks agreed.

Action Item: Dominion to adjust Article 401 schedule and incorporate changes listed above, circulate for DFRTAC review, and submit to FERC.

Pete recaps the morning agenda.

Wilson asked about the data that Tom Kwak was providing and would like to get a report to see other eel activity. Wilson and Pete to talk offline.

Pete provides a quick summary to what Wilson missed.
Pete updated Wilson on the morning 9-10 info.