STATE OF MAINE
BOARD OF ENVIRONMENTAL PROTECTION

IN RE PETITIONS FOR REVOCATION, MODIFICATION OR SUSPENSION OF PERMITS AND WATER QUALITY CERTIFICATIONS FOR THE LOCKWOOD, HYDRO KENNEBEC, SHAWMUT AND WESTON HYDRO PROJECTS

Merimil Limited Partnership Lockwood Hydro Project #L-20218-33-C-N	)))	
Hydro Kennebec Limited Partnership Hydro-Kennebec Project #L-11244-35-A-N	)))	**PRE-FILED REBUTTAL TESTIMONY OF SCOTT R. AULT ON BEHALF OF FPL ENERGY MAINE HYDRO, LLC AND MERIMIL LIMITED PARTNERSHIP (LOCKWOOD, SHAWMUT AND WESTON PROJECTS)**
FPL Energy Maine Hydro, LLC Shawmut Hydro Project #L-19751-33-A-M	)))	
FPL Energy Maine Hydro, LLC Weston Hydro Project #L-17472-33-C-M	)))	

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PRE-FILED REBUTTAL TESTIMONY OF SCOTT R. AULT

- Downstream American eel passage at the Weston, Shawmut, and Lockwood projects.

- The petition for listing of American eel under the Endangered Species Act.

February 7, 2007

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PURPOSE AND SCOPE OF REBUTTAL TESTIMONY

The purpose and scope of this rebuttal testimony is to refute erroneous claims made by FOMB and Douglas Watts in their direct testimony specifically on the subject of American eel passage at the Lockwood, Shawmut, and Weston dams on the Kennebec River and the petition for listing of the American eel under the Endangered Species Act.

SUMMARY OF REBUTTAL TESTIMONY

The pre-filed direct testimony of FOMB and Mr. Watts claim, in brief, that 1) there are significant numbers of eel kills at some of the subject projects, and 2) downstream migrating eels cannot safely pass the dam sites. It is my professional opinion that neither FOMB nor Mr. Watts has presented any credible information meeting their burden of proof that downstream eel passage measures are not adequate, or that the planned effectiveness studies will not provide adequate information to determine if additional passage measures are appropriate at the Weston, Shawmut or Lockwood projects. Further, it is my professional opinion that the January 31, 2007 decision by the USFWS not to list the American eel under the Endangered Species Act is further evidence that there has not been a change in circumstances that would warrant the modification of any of the water quality certifications for the projects to advance the schedule of effectiveness studies or additional passage measures for the projects.

REBUTTAL OF FOMB'S TESTIMONY

FOMB Seeks an Unrealistic Provision.

In their opening statements, FOMB states that it is seeking a water quality certification provision requiring that "*all fish migrating upstream can pass the dam and no fish migrating downstream are killed or injured by the dam.*" (see FOMB Direct, p.1, ¶ 2; Exhibit W/FOMB-1.) This is not a realistic goal, as there is no fish passage technology in the world that can assure 100% passage of all fish at a dam or any other man-made or natural obstruction. Furthermore, the number of fish that are required to pass a dam, and the methods to pass these fish, is by law to be determined by state and federal natural resource agencies entrusted with the management of the nation's aquatic resources. These agencies use many years of professional experience based on science and expertise to develop goals and objectives for fish passage as well as many other variables that may influence management of a species. FOMB does not provide any data or information to demonstrate why fish passage in the Kennebec River should be an exception to this standard practice.

FOMB has Exaggerated the Mortality and Injury Rate of Dams.

FOMB states on page 4 paragraph 6(d) that "*Studies by scientists around the world have established that eel mortality and injury rates from dams can be as high as 100% per dam.*" (see FOMB Direct, p.4, ¶ 6(d).) FOMB neglects to inform the Board that these scientists from "*around the world*" have also established that mortality and injury rates have frequently been shown to be much lower (as low as 6%) (EPRI 2001). More important, however, as I have stated in my direct testimony (see Ault Direct, p.6, ¶ 1), is

the fact that the literature clearly shows mortality rates to be highly variable and often site-specific. Further, it is important to note that FOMB uses the term "dam" to infer that all passage at FPL Energy dams is occurring only through the turbines. This is not the case because downstream eel passage is also being provided at all three projects via the spillways and various spillway gates as indicated in EXHIBIT FPLE-18, 23 and 28.

FOMB Makes Unsubstantiated Statements about the Extent to Which Eels are Killed in Dam Turbines.

FOMB paragraph 20 states, *"Typically many hydro-electric dams block eel out-migration"* and that *"estimates of eel mortality are as high as 100% per dam."* (see FOMB Direct, p. 9, ¶ 20). However, these comments are clearly contradicted by the historic presence of eels and an eel fishery in the Kennebec River, despite the existence of these dams for nearly 100 years (see Ault Direct, p.5, ¶ 2). As stated in my direct testimony (see Ault Direct, p.6, ¶ 1) and earlier in this rebuttal testimony (see Ault Rebuttal, p.2, ¶ 2), using a value of 100% per dam is misleading because there is substantial scientific evidence that turbine mortality is often less than this, and eels readily pass downstream by exit routes other than turbines (see Ault Direct, p.10, ¶ 1). Further, FOMB provides no documented data to support the notion that these generalizations accurately describe eel passage at the Lockwood, Shawmut, or Weston projects. In fact, data from tailrace searches at the three facilities presented in Mr. Richter's direct testimony (see Richter Direct, p.14, ¶ 1-3), and my direct testimony (see Ault Direct, p.7, ¶ 2-3 and p.8, ¶ 1), provide direct evidence to the contrary.

Additionally, FOMB states in paragraph 20 that, *"The cumulative effects of multiple dams may quickly eliminate the spawning population."* Relative to this statement, it is important to note that on January 31, 2007, the USFWS issued its 12-month finding on the petition to list the American eel as Threatened or Endangered. The final conclusion of the finding is as follows:

> *"In summary, we find that the American eel remains widely distributed over their vast range including most of their historic freshwater habitat, eels are not solely dependant on freshwater habitat to complete their lifecycle utilizing marine and estuarine habitats as well, they remain in the millions, that recruitment trends appear variable but stable, and that threats acting individually or in combination do not threaten the species at a population level. On the basis of the best available scientific and commercial information, we conclude that the American eel is not likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range and is not in danger of extinction throughout all or a significant portion of its range. Therefore, listing of the American eel as threatened or endangered under the Act is not warranted."* (Emphasis added.)

This finding clearly illustrates that, based on a 12-month review and analysis of the best available science, the cumulative effects of multiple dams will not quickly eliminate the spawning population as FOMB asserts.

FOMB Misleadingly Presents Information from the USFWS 90-Day Finding Relative to Eel Status as Threatened or Endangered.

FOMB uses an excerpt from the USFWS's 90-day finding out of context to emphasize their point that mortality due to hydropower turbines is impacting American eel (see FOMB Direct, p. 9, ¶ 21). However, FOMB fails to point out that the 90-day finding (Exhibit W/FOMB-5) **also** states that;

> "*Factors that may contribute to a possible population decline are habitat loss and degradation, over harvest, disease, structures impeding upstream and downstream migration, contaminants, and variable oceanic conditions*."

Presentation of information in this manner is biased and inappropriately isolates only one factor potentially affecting the population. Further, after an extensive evaluation of the available data, the USFWS in their 12-month finding (issued January 31, 2007) concluded the following in relation to the effect of turbine passage mortality on the America eel population:

> *". . . turbines are responsible for decreases in abundance on a local or regional scale, but turbine mortality is not a significant threat to the American eel at a population level."*

This finding illustrates that FOMB is attempting to place undo importance on a factor that the USFWS has determined is not a significant threat to the American eel population.

FOMB Mischaracterizes and Overstates the Effect of Turbines on Eels Based on the McCleave Study.

FOMB claims that the study by Dr. McCleave (Exhibit W/FOMB-6) "*established*" that eel mortality and injury rates can be as high as 100% per dam (see FOMB Direct, p.10, ¶ 22, citing *Simulation of the Impact of Dams and Fishing Weirs on Reproductive Potential of Silver-Phase American Eels in the Kennebec River Basin, Maine, North American Journal of Fisheries Management*, 21:592-93 (2001)). This is not correct. Dr. McCleave did not "establish" (through scientific testing and research) that eel mortality and injury can be as high as 100%. He merely presented data from his review of the literature on the subject, yet FOMB makes it appear like he derived this value from his own scientific work. Dr. McCleave also presented data from his review that injury and mortality rates are as low as 6%; however, FOMB did not report this information.

The purpose of Dr. McCleave's paper was to present the results of a mathematical modeling exercise that was conducted to provide insight into research needs for determining the impacts of a number of variables on American eel production and reproductive potential. Model results for the Kennebec River indicated that the number of downstream migrating adults reaching the sea is influenced substantially by commercial eel weir harvest, upstream passage of juveniles (i.e. how many adults there are in upstream habitats before downstream migration begins) as well as turbine mortality; not just turbine passage mortality alone. By citing Dr. McCleave's work outside of this context, FOMB makes an erroneous conclusion about Dr. McCleave's study.

FOMB Overstates the Significance of the 2002 DMR Eel Study at Lockwood.

In paragraph 23 FOMB states, "…that despite the presence of a bypass, two of five radio-tagged eels migrated through the turbines "and were presumed to be injured or dead" (see FOMB Direct, p.10, ¶ 23). Using the information from a pilot study conducted at Lockwood in this context places undo importance on the results of that effort. As described in Mr. Richter's direct testimony (see Richter Direct, p.12, ¶ 2), the 2002 downstream eel passage study at Lockwood was circumstantially limited to a small number of fish – five to be exact. Few, if any, scientists would agree that such a small sample size is statistically meaningful because a single fish represents 20% of ALL the data. Given the many variables that go into such a study, it is normal for one or two fish to go astray, or for a transmitter to fail during the normal course of the field work. In such cases, the results are normally considered inconclusive. Most quantitative fish

passage studies therefore rely on much larger sample sizes, so that statistical significance can be established and the effects of field variability do not cloud results. Also in this DMR study, the fate of the two fish that passed via the turbine could not be confirmed so it was assumed that mortality *may have* occurred. The KHDG consultation process with the resource agencies already has identified the limitations of this study, and this is a key reason why FPLE and the agencies have committed to conduct further studies with numerous refinements, including an adequate sample size. As such, it is inappropriate and misleading for FOMB to portray the information from the Lockwood pilot study as if they were conclusive findings.

FOMB Provides an Exhibit Showing Dead Eels Photographed at Shawmut, but Fails to Make the Connection between These Dead Eels and FOMB's Conclusions.

FOMB presents Exhibit W/FOMB-10 showing dead eels photographed at Shawmut, but fails to demonstrate how photographs of dead eels indicates that significant mortalities have occurred. As discussed in Mr. Richter's direct testimony (see Richter Direct, p.13, ¶ 1), systematic monitoring by FPLE has documented some eel mortalities below Shawmut. Continuous monitoring has further revealed that this is neither a chronic nor widespread condition at this site. The FOMB photograph of dead eels at Shawmut presented in Exhibit FOMB-10 does not establish a record of any significance. In fact, as detailed in Mr. Richter's rebuttal testimony (see Richter Rebuttal, p.6, ¶ 1), Mr. Nate Gray, one of the individuals in the photograph, has investigated the Shawmut tailrace on at least one occasion and has not reported any significant number of eel mortalities.

FOMB Fails to Demonstrate the Relevance to the Lockwood, Shawmut, and Weston Projects of Various Engineering Solutions that Have Been Attempted at Other Hydro Projects.

On page 14 of their testimony, FOMB provides a number of examples of engineering solutions to preclude the entry of eels into turbine intakes (see FOMB Direct, p.14, ¶ 32). As my pre-filed direct testimony describes (see Ault Direct, p.10, ¶ 1-2 and p.11, ¶ 1-2), the need for and measures appropriate for downstream passage of American eel varies substantially from one site to another. Although FOMB recites a variety of engineered solutions from other locations, and in some cases makes unsubstantiated assertions of the success of those engineered solutions, the fact remains that the need for additional solutions specifically at the Lockwood, Shawmut, and Weston projects has not even been established. Thus, it would be scientifically unsupportable to adopt these solutions for either the FPLE or Merimil sites without additional study and analyses. It is important to remember that the very studies to address the need and appropriate means for permanent eel passage are scheduled to occur through the KHDG process in 2007 and 2008 (see Richter Direct, p.14, ¶ 4 and p. 15, ¶ 2).

FOMB Makes the Unsubstantiated Claim that Eels will More Likely Find and Use Deep Gates or Openings in Dams with Minimal Delay is Not Supported by Any Direct and Specific Evidence.

FOMB states without any authority or support, that *"Eels are Benthic in nature and so it is generally assumed that a deep gate or opening in the dam is more likely to be found and used with minimal delay."* (see FOMB Direct, p.15, ¶ 32) There is an abundance of information based on research that demonstrates that American eels do not necessarily migrate only along the river bottom. In my direct testimony (see Ault Direct, p.10, ¶ 1), I

noted that downstream migrating eels have been shown to use all portions of the water column and to search rather extensively when encountering an obstacle such as a dam. In Exhibit W/FOMB-18 (p. 147), Dr. James McCleave summarizes research that describes the behavior of downstream migrating eels in several studies:

> *"Contrary to conventional 'wisdom,' migrating silver eels are not bottom-dwelling fish. Telemetry studies in a European river, a New Zealand hydro reservoir, and by my group in the Penobscot Estuary and in coastal waters of the North Sea all demonstrated that eels swam or drifted downstream in the upper few meters of the water column. Vertical movements were common in some studies, but most of the travel occurred near the surface. Trawling in a large hydro reservoir on the St. Lawrence River yielded more migrant eels at the intermediate depths, but also caught eels near the surface; sample size of captured eels was small."*

I participated in the St. Lawrence River study cited by Dr. McCleave as well as a number of other studies on the St. Lawrence River to investigate the behavior of downstream migrating eels. In my experience on the St. Lawrence River, when telemetered eels encountered the Moses-Saunders Dam, most of them searched up and down in the water column and back and forth across the dam before passing downstream. This occurred despite the fact that the dam had no trash racks on the turbine intakes to deter downstream movement and each hydroelectric units passed up to 9,000 cubic feet of water per second.[1] Winter, *et al.* (2006) also reported "searching" by eels rather than remaining on the bottom, and studies by the USGS Conte Anadromous Fish Research Laboratory also confirmed these migratory behaviors in downstream migrating eels (Haro 2000).

[1] The Lockwood, Shawmut, and Weston projects all have trash racks in front of the intakes for the turbines. These racks consist of vertical bars spaced 1.5 to 4 inches apart, depending on the project and unit and have the potential to deter entry into the turbine intake.

It is my professional opinion that because eels tend to search and often travel near the surface during migration, bottom gates may not necessarily be the best route for eel passage at a particular dam. Passage routes at dams are entirely site-specific and dependent on factors such as configuration of the dam and powerhouse, orientation of the powerhouse to major river currents, and hydraulic capacity of the powerhouse in relation to river discharge when eels are migrating. This is why it is vitally important to conduct site-specific studies in order to determine specific migration behavior at each facility.

REBUTTAL OF DOUGLAS WATTS' TESTIMONY

Watts' Use of a Downstream Cease and Desist Order from Maine DEP to CHI Concerning Downstream Operation of American Tissue Dam is Taken Out of Context and is Inappropriate Given Developments in the Understanding of Eel Migration Behavior.

Watts includes a cease and desist order from the Maine DEP to CHI that addresses operation of American Tissue Dam on the Cobbosseecontee Stream in relation to downstream passage of American eel. The first paragraph (see Watts Direct, p.10, ¶ 1) of that order discusses actions that CHI has taken as follows, …*"It is also my understanding that today CHI installed two metal plates, each several feet high, at the base of the trash screens that will physically block eels from swimming along the bottom and into the influent to the turbines. Because eels typically travel along the bottom, hopefully this will prove to be an effective deterrent."* This letter was written on October 10, 2002 and at that time many scientists believed that because eels are bottom oriented fish during a large portion of their life cycle, they also migrate downstream at or near the bottom. As demonstrated in my direct testimony (see Ault Direct, p.10, ¶ 1) and in my rebuttal to FOMB direct testimony (see Ault Rebuttal, p.9, ¶ 1), the scientific community now

recognizes that downstream migrating eels use all portions of the water column and often are surface oriented when migrating downstream. Therefore, Watts' use of this information and the implication that a bottom oriented protection device would protect eels from turbine entrainment is inappropriate.

Further, it should be noted that the American Tissue Dam is much smaller in comparison to the Weston, Shawmut, or Lockwood hydro projects and has a different configuration. These differences may also result in different behavior patterns exhibited by eels as they approach each of the dams (see Ault Direct, p.10, ¶ 1). Therefore, assuming that what might work at the American Tissue Dam would also work at Weston, Shawmut, or Lockwood is also inappropriate.

Watts' Discussion of Downstream Passage of American Eel at the Benton Falls Project is Largely Irrelevant because Watts has not Established that the Same Conditions Exist at the Lockwood, Shawmut or Weston Hydro Projects.

In his direct testimony at paragraph 31 (see Watts Direct, p.14, ¶ 31), Watts discusses radiotelemetry studies and eel mortalities at the Benton Falls Dam. This information is largely irrelevant however because the number of American eel mortalities observed at this site have not been detected at the Lockwood, Shawmut, or Weston projects, despite the systematic monitoring program discussed in Mr. Richter's direct testimony (see Richter Direct, p.13, ¶ 3 and p.14, ¶ 1-3) and my direct testimony (see Ault Direct, p.7, ¶ 3 and p.8, ¶ 1). The fact that dedicated monitoring at the Kennebec sites demonstrates only limited and occasional eel passage mortality underscores the fact that eel passage

and mortality is highly site-specific, and observations made at a site on one river are not automatically transferable to other sites.

Based on Watts' documentation and Maine DMR observations, it is clear that a number of eels were killed at Benton Falls on at least one occasion. Watts alleges that installation of a protective screen provided a successful measure at this site. This screening solution cited by Watts may or may not be needed or even work at Kennebec River sites because eel passage dynamics, hydraulics, and station configurations differ among sites (see Ault Direct, p.10, ¶ 1). It is premature to decide what additional measures may be effective at any given site until the planned effectiveness studies are conducted.

Watts also overstates the significance of a radio-tracking study of adult American eels conducted at the Lockwood dam. He states that the study "*<u>suggests</u> that 40% or more of the adult American eel . . . are entrained and killed in the turbines each year*" (emphasis added) (see Watts Direct, p.14 second paragraph of ¶ 31). However, this study was only a pilot study and should not be considered representative of the downstream eel population (see also Ault Rebuttal, p.6, ¶ 2).

Watts' Use of Correspondence from Maine DMR and the USFWS is Taken Out of Context.

In his direct testimony at paragraph 47 (see Watts Direct, p.21, ¶ 47), Watts uses correspondence from Maine DMR as expert testimony that Weston, Shawmut, and Lockwood "*. . . fail to provide immediate, safe and effective passage for downstream migrating adult American eels.*" The use of this correspondence is out of context and

places undue importance on a theoretical discussion offered by Maine DMR. For example, the second paragraph of the Maine DMR letter states, "*If migrating eels are randomly distributed in the river, then eels will pass through the turbines at Weston and Shawmut 85-95% of the time and through the turbines at Lockwood 50-60% of the time.*" (See Watts Direct, p.21, second ¶ of Maine DMR letter.) This statement is based on a DMR review of river flow that is greater than each dam's hydraulic capacity, and the simplistic assumption that eels are unable to freely search and swim throughout the water column for gated openings and spillway passage. As I have stated before in direct testimony (see Ault Direct, p.10, ¶ 1) and in rebuttal testimony (see Ault Rebuttal, p.8, ¶ 2), there is ample research showing downstream migration behavior of eels includes searching throughout the water as well as travel near the surface. In other words, eels are not "randomly" distributed, and can search for openings such as gates and sluices that are passing water. The proportion of the migrating population using each of the various passage routes at the FPLE and Merimil sites must be assessed through studies so that intelligent decisions on any additional passage measures can be made.

Watts Overstates Agency Positions Regarding Downstream Eel Passage at the Lockwood, Shawmut and Weston Projects.

In Paragraph 52 of Watts' pre-filed direct testimony, Watts states that "*not a single expert fisheries agency has stated the four dams now provide safe downstream passage for American eel. Instead all fisheries experts say the dams do not provide safe downstream passage for American eel.*" (See Watts Direct, p.24, ¶ 52.) This is an overstatement of the agency positions regarding the Lockwood, Shawmut and Weston projects. The agency representatives have merely stated their preliminary conservative

assumptions, but have not relied on any direct observations of significant mortalities or issues at these sites. These same agencies are in fact participating with FPLE and Merimil in conducting the studies we have earlier described in order to determine the proportion of the migrating population using the various exit routes at each of the facilities under a variety of conditions. The agencies have concurred with, approved, or acknowledged the study plans, and the subsequent studies and agency consultation will provide the necessary data for informed decision making.

Watts' Paragraph 61 Mischaracterizes the FPLE and Merimil Eel Passage Studies.

In the second part of paragraph 61 of Watts' pre-filed direct testimony, Watts states that *"The FPL studies Mr. Murch describes above do absolutely nothing to provide safe passage for American eels."* This is not an accurate statement. First, it presupposes that effective passage is not currently being provided. This is not an accurate conclusion for these projects given the limited eel mortalities observed below the dams. Furthermore, as I have discussed in my direct testimony (see Ault Direct, p.10, ¶ 1) and earlier in my rebuttal testimony (see Ault Rebuttal, p.8, ¶ 2), eel behavior and downstream passage is variable and site-specific. Therefore, it would be scientifically indefensible to recommend or implement additional downstream fish passage measure for eels without prior site-specific scientific information.

Watts Incorrectly Reports What the Maine Department of Marine Resources and the USFWS Have Told Maine DEP Regarding Eel Passage at FPL Dams.

In paragraph 74 of Watts' pre-filed direct testimony, Watts states that, *"the Maine Dept of Marine Resources and the U.S. Fish & Wildlife Service inform the Maine DEP that the*

status quo for the four Kennebec River dams are causing and will continue to cause the death of most adult American eels trying to migrate past the dams . . . ." (see Watts Direct, p.34, ¶ 74.) The letters from Maine DMR and USFWS do not state this. These letters simply speculate about potential impacts and possible alternatives, based on general assumptions. These are conservative assumptions made necessary in the absence of the very scientific data that FPLE and Merimil, through the KHDG process, are endeavoring to gather. Further, these letters do not state that the dams are killing "*most*" eels. The Maine DMR letter only acknowledges that it has observed some mortalities below the Shawmut dam, which, as discussed earlier, involved relatively few fish.

CONCLUSION

FOMB and Watts' claims that 1) there are significant numbers of eel kills at some of the subject projects, and 2) downstream migrating eels cannot safely pass the dam sites, are unsupported and inaccurate based on the available information. It is my professional opinion that neither FOMB nor Watts have presented any credible information meeting their burden of proof that operation of any of the three facilities is resulting in eel mortalities of the magnitude portrayed by the petitioners, or that the planned effectiveness studies will not provide adequate information to determine if additional passage measures are appropriate at the Weston, Shawmut or Lockwood projects. Further, it is my professional opinion that the January 31, 2007 decision by the USFWS not to list the American eel under the Endangered Species Act is further evidence that there has not been a change in circumstances that would warrant the modification of any of the water quality certifications for the projects to advance the schedule of effectiveness

studies or additional passage measures for the projects. Therefore, the Board should dismiss or deny the pending petitions.

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Dated: 2/2/07

Scott R. Ault

STATE OF Pennsylvania
COUNTY OF Lancaster

Personally appeared before me the above-named Scott R. Ault and made oath that the foregoing is true and accurate to the best of his knowledge and belief.

Dated: 2/2/07

Lori K Rineer
Notary Public
My Commission Expires:

COMMONWEALTH OF PENNSYLVANIA
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Strasburg Boro, Lancaster County
My Commission Expires June 15, 2010
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