

KENTUCKY UTILITIES COMPANY

**Response to 1st Data Request of Commission Staff
Dated November 10, 2005**

Case No. 2005-00405

Question No. 2

Witness: John P. Malloy

- Q-2. Refer to KU's response to Item 1 of the Supplemental Data Request of the Attorney General, dated March 1, 2004, in Case No. 2003-00434.
- a. Provide a complete copy of the referenced Duke Engineering & Services report ("Duke Report").
 - b. Provide an explanation of any economic analysis included in the Duke Report regarding the cost to renovate, rehabilitate, or rebuild the Lock No. 7 facility.
 - c. Provide an explanation of any economic analysis included in the Duke Report regarding the cost to decommission the Lock No. 7 facility.
- A-2.
- a. Copies of the Duke Report are attached.
 - b. The requested explanation is included at Section IV, beginning on page 20, of the March 18, 2002 report.
 - c. The requested explanation is included at Section IV, beginning at page 22, of the March 18, 2002 report.

KENTUCKY UTILITIES COMPANY

**Response to 1st Data Request of Commission Staff
Dated November 10, 2005**

Case No. 2005-00405

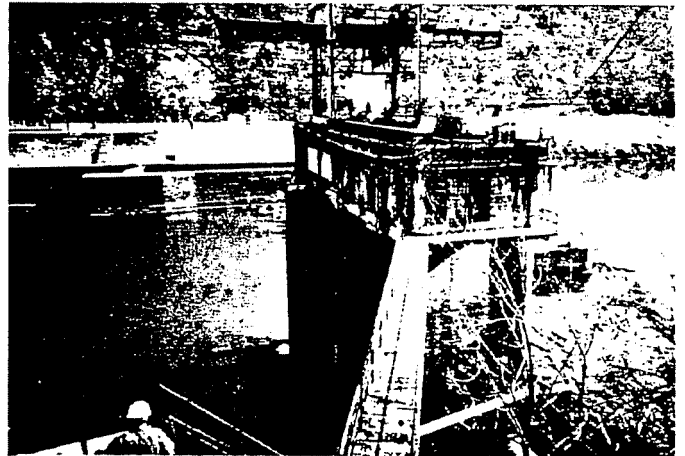
Question No. 2

Witness: John P. Malloy

- Q-2. Refer to KU's response to Item 1 of the Supplemental Data Request of the Attorney General, dated March 1, 2004, in Case No. 2003-00434.
- a. Provide a complete copy of the referenced Duke Engineering & Services report ("Duke Report").
 - b. Provide an explanation of any economic analysis included in the Duke Report regarding the cost to renovate, rehabilitate, or rebuild the Lock No. 7 facility.
 - c. Provide an explanation of any economic analysis included in the Duke Report regarding the cost to decommission the Lock No. 7 facility.
- A-2. a. Copies of the Duke Report are attached.
- b. The requested explanation is included at Section IV, beginning on page 20, of the March 18, 2002 report.
 - c. The requested explanation is included at Section IV, beginning at page 22, of the March 18, 2002 report.

LOCK No. 7

Initial Investigation Report



March 18, 2002

Prepared For :



Energy in Motion

Lock No. 7 Project Assessment

Initial Investigation Report

Prepared By:



March 18, 2002

Table of Contents

I. EXECUTIVE SUMMARY.....	1
II. FIELD INVESTIGATION.....	4
<i>General Description of Plant.....</i>	<i>4</i>
<i>Generators.....</i>	<i>4</i>
<i>Turbines.....</i>	<i>6</i>
<i>Powerhouse.....</i>	<i>8</i>
<i>Electrical Systems.....</i>	<i>10</i>
<i>Powerhouse Gantry Crane.....</i>	<i>11</i>
III. FERC LICENSE REVIEW.....	12
<i>Regulatory History and Project Understanding.....</i>	<i>12</i>
<i>Compliance Responsibilities Under the Existing FERC License.....</i>	<i>13</i>
<i>Options for Surrender of the Project License.....</i>	<i>15</i>
IV. REPAIR OPTIONS AND ECONOMIC EVALUATION.....	20
<i>Estimated Turbine Repair Costs.....</i>	<i>20</i>
<i>Estimated Decommissioning Costs.....</i>	<i>22</i>
<i>Economic Evaluation of Alternatives.....</i>	<i>22</i>
ATTACHMENTS.....	26
Attachment 1 – Turbine and Plant Drawings.....	27
Attachment 2 – Previous Project Estimates.....	28
Attachment 3 – FERC Project License.....	29
Attachment 4 – Annual Generation Data.....	30
Attachment 5 – Additional Photos.....	32

I. EXECUTIVE SUMMARY

DE&S was retained by Kentucky Utilities (KU) to perform an operations review of the Lock No. 7 Hydro Station located near Harrodsburg, KY. This review was intended to 1) evaluate the current condition of the facility and 2) provide input to Kentucky Utilities staff regarding the process for a potential surrender of the FERC license.

This report discusses the current state of operation, maintenance, and financial obligations of KU under the current FERC operating license and how these will likely be expanded once the lock and dam is transferred from the Corps to the State of Kentucky. These items are listed in summary fashion to frame the primary items DE&S recommends KU be prepared to address in any license surrender proposal developed for the project and the subsequent consultation process involving the range of stakeholders. There are several pathways presented to surrender the project and additional information is needed about many of the outstanding obligations in relation to the involved stakeholders in these areas. Estimates for costs and time to complete a surrender have been estimated to support option comparison. Comprehensive estimates will require consultation with KU staff and management and initial agency/stakeholder consultation. Based on DE&S' understanding of KU's present obligations under the FERC license, these costs are not believed to be significant in comparison to the engineering costs framed in this report for either rehabilitating or decommissioning the project. DE&S recommends that careful consideration of the political and public relations aspects of decommissioning the project be completed before consultation with the agencies and other interested parties is initiated to assure better control of the costs of this regulatory process.

Based on the license and plant assessment review, the options in order of preference for future action would be as follows:

- 1) **Option 1 - Transfer the license and all project property to another independent plant operator.** This is the least costly and preferable option from all perspectives. This also eliminates future liability. On the downside there are likely to be few potential, qualified buyers that express interest. The likelihood of selling (or giving) the project to another party that FERC would approve is low. There is little out of pocket cost involved with pursuing this option. One quick approach would be an informal survey of known companies that invest in small hydro to measure interest. One way to provide incentive to a perspective buyer would be a guaranteed power purchase agreement with KU agreeing to buy any output from the Lock No. 7 at a premium rate. There is however some risk associated with the Corps completing its transfer of title to the lock and dam to the State of Kentucky (Kentucky River Authority) which would in turn open up the Lock No.7 license to transfer additional responsibility for the dam to KU.
- 2) **Option 2 - Surrender the license, remove the generation equipment and transfer all project property to the Kentucky River Authority (KRA).** This would remove the

potential for future liability associated with the transfer of the dam and additional project responsibility if the Corps transfers title to the lock and dam to the State of Kentucky (Kentucky River Authority). This option requires an agreement with the Kentucky River Authority to accept the property with the superstructure remaining above the waterline.

- 3) **Option 3 - Surrender the license, remove the generation equipment, remove structure to waterline (El 514.60) and transfer all project property to the Kentucky River Authority.** This option has a higher cost than the repair option for one unit. It is the opinion of DE&S that the difference in cost is more than offset by the potential liability and additional support expense on the part of KU staff associated with enlargement of the FERC project boundary associated with the transfer of the dam to the State of Kentucky (Kentucky River Authority).
- 4) **Option 4 – Repair one unit.** This option is less costly than decommissioning with removal down to the waterline but has high future risk associated with the transfer of the dam and additional project responsibility if the Corps transfers title to the lock and dam to the State of Kentucky (Kentucky River Authority). It is the opinion of DE&S that pursuit of this option will eventually lead KU back to decommissioning the plant but under less favorable circumstances and at a higher final cost.
- 5) **Option 5 – “Do nothing”.** This is the second least costly option but has high future risk associated with the transfer of the dam and additional project responsibility. The FERC will require that either KU surrender the license or repair the units for continued operation. FERC has on previous occasions issued a letter to license holders requiring a plan and schedule for returning units to operation. It is the opinion of DE&S that pursuit of this “do nothing” option will eventually lead KU back to decommissioning the plant but under less favorable circumstances and at a higher final cost.
- 6) **Option 6 – Repair two or more units.** Repair of the three units is the most costly option other than total demolition of the Powerhouse superstructure to El 480 and reconstruction back to El 514.6 to match the existing Corps dam. This option has high future risk associated with the transfer of the dam and additional project responsibility. It is the opinion of DE&S that pursuit of this option will eventually lead KU back to decommissioning the plant but under less favorable circumstances and with the significant expenditure of additional funds.

SUMMARY TABLE OF PROJECT OPTIONS

Option	Probability of Success	Estimated Schedule Duration	Estimated Capital Cost in 2001 Dollars	Estimated Cost License / Engineering Support
Option 1 – Sell / give plant and transfer license to a new owner/operator	Low	Minimum 1-4 months for inquiry / bid effort	None	\$15-\$25K license consultant support if a viable bidder comes forward
Option 2 – Surrender license, transfer property to Kentucky River Authority, remove generation equipment	Medium	Overall 10-20 months including engineering, license support and site equipment removal. License agreement is the critical path item.	\$1,274,000	\$20-\$50K license consultant support, engineering \$25-\$40k <i>See Note 1</i>
Option 3 – Surrender license, transfer property to KRA, demolish station down to waterline (El 514.6)	High	Overall 20-24 months including engineering, license support and site demolition. License agreement is the critical path item.	\$3,417,000	\$20-\$50K license support, engineering \$40-\$60k <i>See Note 1</i>
Option 4 – Repair one unit	High	Overall 16-20 months including engineering, manufacturing and site disassembly/reassembly	\$1,614,800	Engineering \$40-\$60k
Option 5 – Do nothing, mothball plant without surrender of license	Very Low <i>See Note 2</i>	None	None	None
Option 6 – Repair two or three units	High	Overall 36-40 months for all 3 units, including engineering, manufacturing and site disassembly/reassembly	Two units \$3,069,000 Three units \$4,454,400	Engineering \$100-\$120k

Notes:

- 1) Does not include license 'exit' cost from settlement agreements with agencies and other stakeholders.
- 2) This strategy is in conflict with FERC license requirement to operate facility for power generation.

II. FIELD INVESTIGATION

Mr. Ed Luttrell, P.E. and Mr. David Summers, P.E. of DE&S conducted an initial general field investigation and data-gathering trip at the Lock No. 7 facility to gather information about the operation of the plant on November 15, 2001. Mr. Tom Moore, Tyrone Plant Manager and Mr. Roy Pulliam, Hydro Maintenance Manager, participated for Kentucky Utilities.

Plant access is limited to a footpath about 0.6 mile long in addition to access from the river. The footpath is unpaved and runs along steep terrain by the riverbank. Immediately upstream of the plant is a municipal park area with parking lot on the west bank of the river. The parking lot also serves a boat landing for a river excursion boat associated with the nearby Shaker Village. The excursion boat operates during the summer tourist season. On the east bank of the river, private riverfront homes are located close to the lock. There is a public road and public picnic area on the east bank of the river associated with the Corps. Lock No. 7.

GENERAL DESCRIPTION OF PLANT

The Lock No. 7 hydroelectric project began initial commercial service in April 1928. The station consists of three (3) vertical fixed blade turbines with AC synchronous generators. The nominal output for each unit at maximum flow and maximum head is approximately 680 kW / unit. The Lock No. 7 hydroelectric project is limited to run of river generation from the Kentucky River.

The project consists of 1) a concrete structure, about 116 feet long, with a 36 foot long solid concrete section and an 80 foot long hollow dam/spillway, containing trashracks, six intake gates, three turbines, and discharge facilities; 2) a 93 foot long, 25 foot wide and 65 foot high superstructure / powerhouse located above the spillway, supported by hollow concrete piers, with three 680 kilowatt generating units having a total capacity of 2,040 kW; 3) a forebay about 120 feet long and 100 feet wide; 4) a substation located on the west bank; 5) a foot bridge, about 85 feet long, connecting the substation with the powerhouse; 6) a trash boom, about 170 feet long; 7) a 34.5 kV, 0.86 mile long transmission line, with a right-of-way ranging from 50 feet to 200 feet wide; and appurtenant facilities.

GENERATORS

General Electric originally supplied the three generators. All three units were rewound in 1980. The thrust bearings are the original GE spring plate bearings. There have been no major generator maintenance problems reported following the rewinds.

The generator maintenance records were not available for this review. If KU should decide to continue operations at Lock No. 7 the generators should be inspected to look for loose wedges, waviness in the steel, clogged vents, insulation damage, other signs of deterioration, etc. No coils were noted as being cut out on any unit.

Nameplate information for the generators is as follows:

Table 1 - Lock No. 7 Generator Data	
Number of Units	3
Manufacturer	General Electric
Type of Units	Vertical
Rating KVA	850
KW Output @ 0.8 PF	680
Voltage	2300
Speed (rpm)	150

Picture #1 - View of Generators Looking from Unit 1



TURBINES

Each of the three (3) turbines at the Lock No. 7 hydroelectric project is open flume, fixed blade propeller type turbines with a long turbine shaft - more than 40ft. According to current KU staff, the turbines have never been refurbished or had runner replacements. KU staff indicated that water quality at the Lock No. 7 hydroelectric station is poor with a high level of suspended solids in the river water. The runners were not accessible for inspection. KU staff indicates that weld repairs have been performed (or attempted sometimes with limited success) on all of the existing runners.

Each turbine is controlled by a Woodward gate-shaft, electro-mechanical governor that actuates the operating ring on the turbine. The Woodward governors are obsolete. Woodward Governor (now part of GE Hydro) is discontinuing the supply of spare parts and field service on older governors such as those at Lock No. 7.

The turbine and guide bearings are in very poor condition, which was apparent during field inspection. Field maintenance records were not available from Kentucky Utilities. Unit 3 had shaft movement of approximately 0.250 inch at the turbine guide bearing even with the wicket gates closed due to either 1) severe gate leakage or 2) failure of the operating ring to close the gates. For a normal turbine guide bearing with an 11 inch diameter shaft, the amount of bearing clearance should only be about 0.008 inch diametrical clearance. Replacement of the wicket gates, gate operating ring and gate links is indicated as being required.

Table 2 - Lock No. 7 Turbine Data

Number of Units	3
Type of Units	Vertical fixed blade
Original Manufacturer	Newport News Shipbuilding & Drydock
Design Head (ft)	15
Design Flow (cfs)	743
Max. Turbine Output (kW)	757
Max. Turbine Output (hp)	1000
Speed (rpm)	150
Runner Material	Cast iron

The existing bearing has hedgeapple wood bearing material for the turbine guide (wood) bearing which replaced the original lignum vitae material. The bearing used to have a sealed bearing design but has been modified to be an open seal bearing with turbine lubricating/cooling water being gravity feed on top of the bearing staves. Maintenance staff has added an additional movement restraint on top of the bearing carrier to help control shaft movement. The turbine guide (wood) bearings should be completely overhauled and should include a synthetic material when rehabilitated.

The upper and lower intermediate turbine guide bearings have been modified to grease lubrication. If the turbines are to be overhauled, these bearings should be rebabbitted and restored to oil lubrication. A new oil lubrication system and bearing temperature detection system should be included with rehabilitation.

The unit has an semi-circular external cover at approximate elevation 512 which can be removed, once stop logs are installed, to allow for disassembly/reassembly of the head cover, bottom ring and wicket gates. These items would be removed / installed by a barge with a mobile crane on it. The discharge ring would likely require field machining and weld repair after 75 years of operation to restore critical vertical and horizontal surfaces.

Picture # 2 - Lock No. 7 Unit 3 Turbine Wheelpit

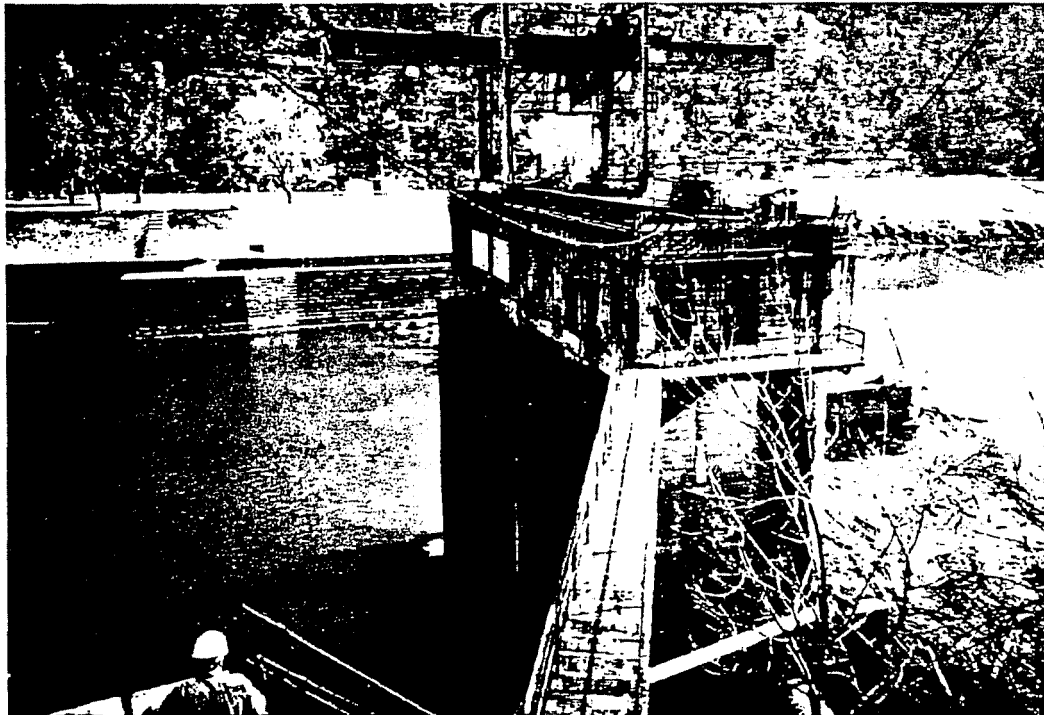


POWERHOUSE

The Lock No. 7 Powerhouse appears to be sound structural condition. The Powerhouse is unusual in that the Powerhouse with generators and electrical equipment is situated on piers. The Powerhouse is elevated well above the river (operating floor El 554 vs. El 514.6 for spillway crest). The Powerhouse was flooded in 1978 (maximum flood of record) leading to subsequent replacement of the majority of the electrical equipment. KU staff did not know of any major problems or significant issues related to the Powerhouse structure itself.

In addition to the powerhouse superstructure, the Lock No. 7 civil components include the hollow dam section containing the turbines and supporting the powerhouse piers as well as a short solid-concrete overflow section tying the powerhouse to the left bank. These concrete structures were in good condition as visible above the waterline. The maximum height section from the foundation to the overflow crest elevation is approximately 33 feet as shown on the project license drawings.

Picture # 3 - Powerhouse Viewed from West Bank Walkway (Note - Lock No. 7 in Background)



The project is not classified as high hazard and thus does not fall under the FERC Part 12 Independent Consultant process. No stability or project safety issues are known to exist and no mention of such items was noted in recent FERC operational inspection reports. As discussed in section III of this report, if the lock reverts to state control, the lock and dam section will become part of the project. These structures appear to be in good condition but their maintenance would

become part of the Lock No. 7 program in the event of their inclusion in the FERC licensed project.

The Powerhouse has been vandalized on occasion without damage to equipment but resulting in the loss of tools and maintenance equipment. It is possible for people to walk across the dam from the lock side to the Powerhouse during dry, low water periods.

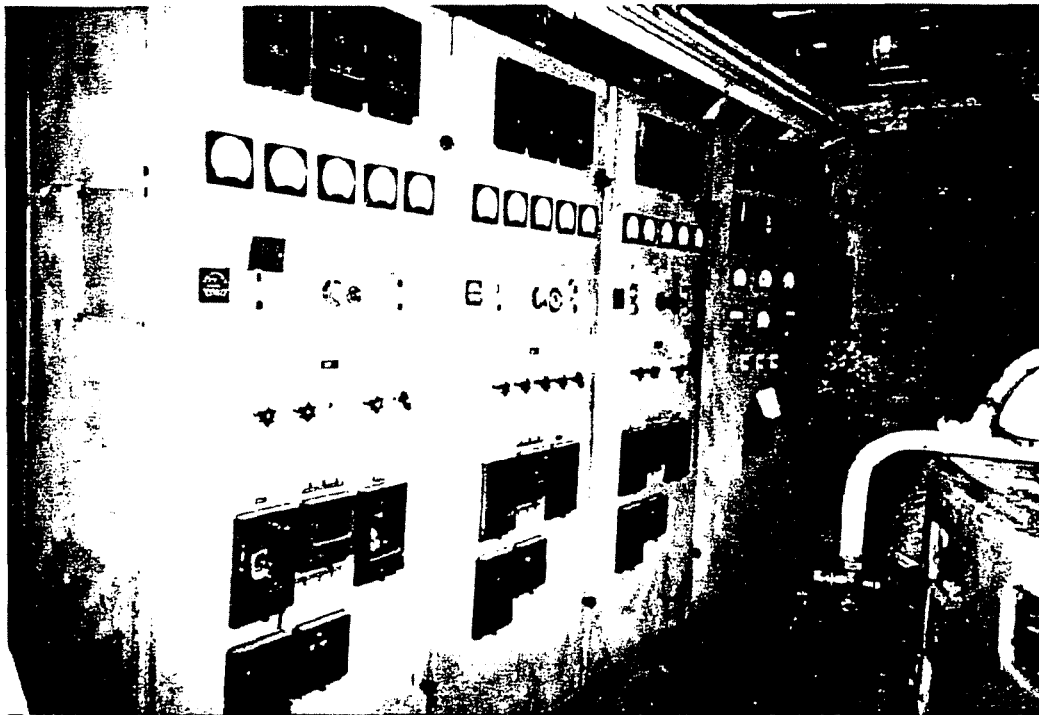
No environmental surveys were available for review by DE&S for the Lock No. 7 site. Due to the age of the facility there may be some asbestos present on site in the form of cable insulation or electrical separator panels. Lead paint would almost certainly be present. Solid lead used as a material filler may be present in the headcover and may be present in the existing guide bearing babbitt.

ELECTRICAL SYSTEMS

The plant controls including the unit synchronizers were updated during the generator rewinds in 1980. The plant is capable of remote operation and monitoring from the E.W. Brown Station. The turbines use water level detection to automatically shut off the units. During the plant visit, no issues were reported regarding electrical equipment.

There are four step-up transformers 2.3 kV/ 34.5 kV on the west bank that were upgraded in 1980. The transformers are believed to be free of PCB's by KU staff. If no PCB tests have been performed, consideration should be given to doing so. Consideration could also be given to taking the opportunity to verify condition of the oil and/or Doble test the transformer should KU decide to continue operations. Other items such as breakers may be due for replacement if they have not been replaced already during the 1980 upgrade (this item was not inspected)

Picture 4 - Picture of Electrical Unit and Station Control Cabinets



POWERHOUSE GANTRY CRANE

The original powerhouse gantry crane is still in place and is used for removal of debris with a clamshell. The crane dating back to 1927-28 has not been upgraded according to plant personnel except for a new cable. The last extensive utilization of the gantry crane was during the generator rewinds in 1980 for all three units.

Due to very limited usage, the station crane would be expected to be in good structural condition. However due to the age of the crane, particularly the motors and controls, DE&S would recommend that further investigation of the crane be performed if Kentucky Utilities should decide to proceed with unit upgrades. DE&S would not recommend any heavy lifting with this crane if possible until such a review by a competent crane inspector has been performed. The crane should be 100% load tested before any major lift involving disassembly of the generating equipment.

Picture 5 - Gantry Crane



III. FERC LICENSE REVIEW

REGULATORY HISTORY AND PROJECT UNDERSTANDING

Kentucky Utilities' Lock No. 7 Project is currently operated under a license issued by the Federal Energy Regulatory Commission (FERC) on May 26, 1992 (59 FERC 62,186). The license was issued for a term of 30 years (effective on May 1, 1992) and expires on May 1, 2022. The Project uses water power from the U.S. Army Corps of Engineers' (Corps) Kentucky Lock and Dam No. 7 and the Kentucky River is considered navigable in this location.

The original license for the project was issued to the Kentucky Hydro Electric Company on August 19, 1926, project construction was completed in April 1928, and the license transferred to KU on December 31, 1928. This original license expired on August 18, 1976 and KU operated the Project under annual license until the current license was issued in 1992. Less than one acre of Federal lands owned by the Corps of Engineers is included within the project boundary.

When the new license was issued in 1992, the lock and dam had been determined by the Corps to be excess property and had been referred to the General Services Administration for disposal under applicable law. The State of Kentucky had already been negotiating with the Corps to purchase these facilities in 1992 and has been leasing the lock from the Corps pending resolution of the transfer negotiations. The lock is currently leased by Kentucky and operated by the Kentucky River Authority during the recreation season. When the transfer of the lock and dam to Kentucky (or any other entity) has been completed, the FERC Licensee will be required to acquire all rights necessary to assure continued operation of the Project in conformance with the requirements of the Federal Power Act (FPA) and FERC's compliance standards. The existing FERC license requires in Article 402 that the Licensee file, within a year of a transfer of the lock and dam, an agreement with the new owner of the dam (Kentucky) allowing the Licensee to maintain all water-retaining structures to FERC standards and specifying how the project will operate. Following FERC approval, the Licensee is then required to file an amendment to include the dam and reservoir in the FERC Project boundary. FERC will then likely issue a license amendment that alters the project boundary and attaches the operational agreement as a license condition. Practically, this also means that the Licensee will also be responsible for managing this expanded project area and additional license conditions will also likely be attached to the license at this time¹. A copy of the correct FERC Project license is included as Attachment 3.

DE&S understands that KU's current position is that the project is no longer economical to continue operating due to the cost of needed repairs at the facility in conjunction with the current power market. In addition, KU considers transfer of the Lock No. 7 Project to another entity as not a preferable resolution, due to financial and public relations liability concerns. This report has

¹ License conditions usually applied to other projects that include dams and reservoirs include shoreline management, recreation access, and public safety at a minimum.

been drafted to address the range of options available for the Lock No. 7 Project while considering these concerns and perceptions.

COMPLIANCE RESPONSIBILITIES UNDER THE EXISTING FERC LICENSE

From our review of the FERC record and discussions with KU staff, several programs are currently managed under the terms of the Lock No. 7 FERC license and agreements with the Corps. All these programs will probably need to be addressed in consultation with interested parties during the surrender of the project license. In the event that the license is transferred to another entity rather than surrendered, then the following responsibilities will transfer as well. However, the consultation process to transfer the license may result in additional license compliance requirements, especially once the lock and dam is transferred from the Corps and the project boundary is expanded to include the dam and reservoir.

Potential Sale and Transfer of License

If it were decided to pursue the sale/license transfer option viability further, preliminary calls to a screened lists of potential new owners could be used to “test the water” for this option to determine if sufficient interest did exist for a sale/transfer. This would require no commitment of notification to the FERC or other regulators at this stage. If the option proved viable a suggested path forward is as follows. The process could be stopped at any stage.

- Pre-Qualification – issue a pre-qualification package to potential new owners confirming their interest, financial capability, hydro operation experience and likely acceptability to the FERC.
- Issue Request For Proposal – request proposals for sale/transfer terms. One method to interest new owners in comparable situations is to include a power buy-back offer as part of the transfer.
- Final KU management decision.
- Submit request for transfer of license to the FERC.

Safety Monitoring of Project Facilities

Kentucky Utilities currently monitors seepage related to the project structures in compliance with FERC public safety regulations. Review of the 1999 operational inspection report showed that the seepage reported in the 1992 license is still occurring, and FERC's letter dated May 4, 1999 noted that this monitoring should continue. Although the Corps is currently responsible for safety of the dam and locks (currently not project works), this responsibility will transfer to the Licensee when the lock and dam is transferred to the State of Kentucky and the project the license is amended as required to extend the FERC Boundary to include the lock, dam, and reservoir. Responsibility of the safety and maintenance of all water-retaining structures at the lock and dam

will be transferred to the new owner upon licensing surrender, and KU should be prepared to discuss this issue should it be addressed in surrender consultation process.

USGS Gaging at the Project

FERC License Article 403 directed KU to file a streamflow and reservoir level monitoring plan to document run-of-river requirements specified under Article 401. This plan was filed on August 24, 1992 and approved by FERC on April 4, 1994. Monitoring is accomplished using an existing continuous-recording USGS gage at the project that the Licensee is responsible for funding under the terms of the approved stream gauging plan. Kentucky Utilities staff indicate that KU compensates the USGS for the annual operation, maintenance and repair of this gauging station. If the FERC license is surrendered then consultation will likely be needed to determine whether this gage is still needed and who will assume funding of its operation. Entities that will need to be consulted will include the US Fish and Wildlife Service, the Kentucky Department of Fish and Wildlife, and the USGS at a minimum.

Headwater Benefits

Kentucky Utilities currently pays headwater benefits to the Federal Government related to power benefits derived from storage at the upriver Buckhorn Federal Reservoir in compliance with Article 203. These payments were established on June 15, 1998 in Docket HB-20-85-1-000 (43 FERC 62,376). If the license is surrendered these payments will cease as well. This item will need to be addressed in the surrender application so FERC can adjust their headwater benefits calculations for the Ohio River Basin under this Docket, if necessary.

Payment to the Corps for Utilization of Water Power from a Government Dam

License Article 201(b) requires the Licensee to reimburse the United States for use of water power from the Corps' Lock and Dam No. 7, but it doesn't specify the amount. DE&S has not found any records to date documenting whether this payment has actually been implemented or its amount. In any event, if payments are being made to the government under the current license they will cease upon surrender of the license or in the event that the Lock and Dam No. 7 is transferred to the State of Kentucky prior to license surrender.

Consultation with the Kentucky State Historic Preservation Officer

Article 404 requires the Licensee to consult with the Kentucky State Historic Preservation Officer (SHPO) prior to any land disturbing activities at the Project. In the event that license surrender and decommissioning involve any land disturbances, then consultation with the SHPO will be required in the development of these plans.

DE&S understands that there may be consultation with the SHPO regarding sign-off on the National Register eligibility of the project facilities from the last relicensing. LG&E staff is

currently checking the project records for any relevant documentation. A determination or whether additional SHPO consultation will be needed to decommission the project should be made once this documentation is in hand.

Trash Handling

Kentucky Utilities currently manages all trash handling at the lock and dam using the station gantry crane. DE&S has found nothing in the FERC license that obliges KU to perform this ongoing maintenance and assumes this arrangement may be either informal (due to the fact that they own the equipment used to manage this as part of the project equipment) or part of an operating agreement with the Corps. Assuming there is no written obligation for KU to manage trash under the FERC license, DE&S assumes that trash management at the facility following license surrender will revert to the owner of the lock and dam. If written agreements are in place outside of the FERC license, then these will need to be renegotiated for the license surrender. Additionally, if the gantry crane is critical for trash handling at the lock and dam, keeping and maintaining this structure may need to be part of the decommissioning proposal developed for the project. The results of this consultation with interested parties will largely be driven by the agreements and arrangements currently in place for trash handling at the dam.

OPTIONS FOR SURRENDER OF THE PROJECT LICENSE

As noted earlier in this report, transfer of the license and Project to another entity is not currently considered a reasonable option by KU based on concerns about the potential for both financial and public relations liabilities should the new owner be unable to meet their operational and maintenance obligations under the FERC license². Furthermore, given the looming specter of a much greater compliance obligation to manage the reservoir shoreline and the safety/adequacy of the dam itself when the lock and dam is transferred from the Corps to the State of Kentucky, DE&S does not believe that it will be economically feasible to continue operation by any other party, especially given the physical repairs needed to restore generation as discussed in other sections of this report. Therefore, this report focuses its assessment on options and pathways to surrender the license and decommission the facilities in a cost-effective manner.

Project Decommissioning Options

The first thing KU needs to do is to determine how they would prefer to actually decommission the project and what their next best preferred alternatives are in the event the proposed plan is opposed during consultation. There are a range of ways that hydro projects can be decommissioned, but in the case of Lock No. 7 Project these are limited by the very strong chance that all the parties will support maintaining the dam and reservoir. The fact that KU is not currently responsible for maintaining the entire Lock and Dam may simplify the decommissioning process. However, it appears that parts of the water-retaining structure are part of the FERC

² Article 402 of the Project license

License and these will need to be transferred to the entity that ends up owning the lock and dam as part of the surrender process. Furthermore, given that the lock and dam are in the process of being transferred to the state and that the license currently mandates that the FERC Project Boundary be extended around the dam and reservoir once the transfer from the Corps is completed could complicate consultation on the proposed decommissioning.

Decommissioning options generally involve any combination of the following options with the associated public safety issues resolved:

- Leaving the facilities in place and removing equipment / cutting leads to assure that no further generation will occur;
- Leaving the major buildings in place, removing major pieces of equipment and pouring concrete to stabilize the water-retaining structures;
- Partial removal of the project structures; and
- Complete removal of the project structures and ancillary equipment.

The engineering analysis section of this report examines the range of options for physically decommissioning the project.

The FERC License Surrender Process

FERC regulations generally framing the surrender of hydropower licenses are located in 18 CFR Part 6. In general, these dictate that KU must consult with the interested parties and prepare an application to surrender the license that discusses how the following issues will be addressed:

- Why the project is no longer economical to operate;
- How the project will be decommissioned (there are a range of options here that are discussed below);
- What the environmental and social impacts of decommissioning, if any, are predicted to be;
- How the predicted impacts will be addressed; and
- Documentation of consultation with the interested parties.

The process of surrendering the project is very similar to relicensing it, and involves the same 3-staged consultation process dictated by FERC regulations at 18 CFR 16.8. However, the content of the application itself is not nearly as rigorously defined as that for relicensing in that the applicant only needs to submit the environmental exhibits (Exhibit E) that are relevant to the specific surrender proposal. The consultation requirements are likewise defined quite broadly and FERC has accepted a wide range of application content for surrenders in the past. Generally speaking, the application must address the issues raised by the participants during consultation. Since project decommissioning that does not involve dam removal or impacts to the reservoir itself is almost always unopposed, consultation and the subsequent application may well be a very streamlined process for the Lock No. 7 Project.

Kentucky Utilities will generally have to follow these steps to surrender the project license:

- Identify the interested parties that should be consulted during the surrender process (both agencies and the public);
- Prepare and distribute an Initial Consultation Document that discusses why the project is being surrendered, plans for surrendering, environmental issues identified, and studies/mitigation proposed (if any) to determine and resolve impacts predicted from the decommissioning (the list of issues framed above in Section 2 describing current license compliance activities should be thought through in developing the ICD);
- Hold a meeting with the agencies and public to discuss the ICD and proposed resolution of decommissioning issues;
- Conduct and report on any studies resulting from the consultation process (if any are needed);
- Prepare and file a license surrender application documenting resolution on issues raised in the ICD;
- File the draft surrender application with the involved parties for review and comment; and
- Address any comments received and include in the final surrender application.

One caveat that must be noted here is that FERC is often reluctant to let a project they believe may be of interest to other parties leave their jurisdiction and cease generation. In the event that they determine (after reviewing the ICD) that the project may be economical and of interest to other parties, they have the option of noticing that the license is available and solicit other parties to apply to assume the existing project license, effectively stalling the surrender process until a determination is made on whether there are any other parties interested in studying assuming the license. If KU is adamant that the preference is to have the project decommissioned and not transferred, then a compelling argument must be made in the ICD why this is not feasible or a settlement agreement to decommission the project in place prior to filing the ICD. In addition to the lost generation associated with surrender of the Lock 7 project Kentucky Utilities should address replacement of the ancillary benefits that were detailed in the license for 1) black start power for the KU system control center and 2) backup power for the High Bridge Substation. These items are addressed in Section 15 (a) (2) (E) of the FPA referenced in license.

After FERC receives the final surrender application it usually prepares an Environmental Assessment (EA) to evaluate the impacts of the surrender proposal to satisfy the requirements of the National Environmental Protection Act (NEPA). The FERC NEPA process may or may not involve public hearings. Whether or not meetings are required is usually determined by the amount of controversy documented in comments submitted by participants and within the surrender application itself. After FERC completes its NEPA review and issues the Final EA it will issue a surrender order that will include conditions that must be met before the license can be surrendered. Once the surrender order terms and conditions are met FERC will issue an order terminating the license and its jurisdiction over the remaining facilities.

Strategies and Options for Efficiently Completing the Regulatory Process

There are a variety of ways a Licensee can prepare for the successful decommissioning of a FERC-jurisdictional hydro project. The applicability and potential success of any of these options is highly dependent on the parties involved in the surrender process and their interests, as well as the specific features and resources associated with the project itself. Since we don't have enough information on these factors at this time, we only list these options generally in this section for further consideration.

- Consult with the primary stakeholders to get them to agree to your approach before filing the ICD and "formally" starting the surrender/decommissioning process.

The advantage here is that if successful, you have a better chance of streamlining your surrender process by better understanding the issues of importance to these participants. Adapting your initial approach to avoid protracted disagreements about affected resources generally saves time and effort. The potential downside is that you alert these folks to your plans and allow them additional time to prepare to respond to the ICD than if you didn't consult with them first. The primary party DE&S assumes may have issues with the proposed license surrender is the Kentucky River Authority who is actively negotiating with the Corps to assume ownership and operational responsibility for the dam and lock. Since Article 402 mandates that an agreement be worked out with the new owners should the dam be transferred within a year of transfer, this mechanism may be an important part of their plans for long-term funding and operation of the non-generating portions of the project.

Another angle that may work well with the Lock No. 7 Project is to discuss with the state that decommissioning the project will completely remove the project from Federal control once transfer is completed. Once FERC jurisdiction is expanded to include the lock, dam and reservoir active Federal control will be extended over a wider area and will bring along mandates for shoreline management and public access. However, this is another potential pitfall that should be carefully examined in light of current political situation since it may actually appeal to the state if funds for such development and management are in short supply.

- Resolution of the Historic Status of the Project Facilities prior to Initiating Consultation

If SHPO correspondence from the last relicensing can be found that clearly determines that the Project facilities are not National Register eligible then decommissioning planning can probably proceed without further SHPO consultation and this documentation attached to the surrender application when filed. If no documentation exists or if the facility's NRHP status is not clearly agreed to by the SHPO office, then an historic preservation specialist should visit the facility to make an independent assessment. Consultation with the SHPO office can then occur to obtain concurrence on the NRHP determination, the proposed decommissioning plan and any needed mitigation for the identified impacts.

If the facility is indeed eligible for protection under the NRHP then it will likely be required to either be mothballed and preserved in some manner under a management program in the event the powerhouse isn't removed, or documented to National Park Service's Historic American Engineering Record (HAER) standards prior to demolition. Both these results will add cost and complexity to the decommissioning process. DE&S believes it will be important to get an independent opinion on the eligibility of this facility before initiating consultation with the SHPO in order to better control this aspect of the consultation process.

IV. Repair Options and Economic Evaluation

ESTIMATED TURBINE REPAIR COSTS

During the site inspection at Lock 7 all three units were inoperable. Two units were inoperable due to mechanical vibration problems and the third unit had a bad motor starter on the governor pumping unit.

Site staff indicated that the generators and electrical systems do not have any known major operational problems. Re-wedging and cleaning of the generators would likely be justified during rehabilitation but are not major cost items.

During a 1993 study, repair estimates were obtained from various turbine companies for replacement parts, turbine rehabilitation and field service. In order to provide a reasonable estimate of costs in 2001 without resoliciting bids, the American Hydro estimate was selected as the most complete proposal. One item was deleted from the previous list while several new items were added. The deleted item was a new turbine shaft, which should have a relatively low probability of requiring replacement (<20%). Costs from the 1993 American Hydro proposal have escalated by 5% per annum. Several additional repair items were added to the summary included in this report which in the DE&S engineer's opinion were not addressed in the original request for quote in 1993.

Turbine generator alignment may be a major issue during any turbine rehabilitation. The turbine shafts are very long and there is potential that the Powerhouse has shifted. This may require re-centering the turbine shaft center to the stator center, re-leveling the generator sole plate and re-doweling the stator to the sole plate once both these steps are completed.

Table 4 - Unit and Station Repair Cost Estimate in 2001 Dollars

	1993 Estimate American Hydro	2001 Estimate
Unit Turbine Costs		
Replacement headcover	\$105,000	\$155,100
Wicket gate, gate arms, pins, links, gate operating ring	\$165,000	\$243,800
New runner, mild steel hub and stainless steel blades	\$170,000	\$251,200
Turbine guide bearing housing and shaft seal	\$90,000	\$133,000
Turbine disassembly & reassembly	\$280,000	\$413,700
Additional scope items per DE&S		
Shaft repairs, check straightness, coupling face runout		\$10,000
Replace shaft sleeve CA6NM		\$12,000
New bottom ring		\$20,000
Synthetic turbine guide (wood) bearing material (Thordon)		\$7,500
Guide bearing rebabbitt and rebore (2 bearings)		\$25,000
New turbine hardware		\$7,500
Governor recondition, new oil pump and motor		\$15,000
Field machine discharge ring vertical and horizontal surfaces. Weld repair.		\$70,000
Install greaseless bushing for wicket gates		\$24,000
Restore oil piping system for bearings, add motor driven oil pumping unit		\$27,000
Estimated turbine repair cost per unit		\$1,414,800
Additional unit risk items		
Thrust bearing replacement		\$70,000
Re-center and re-dowel stator		\$ 8,000
Guide bearing replacement		\$30,000
Total governor replacement (3 units) – 3 digital governors, 2 HPUs, 3 servos		\$200,000
Station repair items		
Water system upgrades, new pumps, strainer, piping, controls		\$60,000
Crane recondition and repair to current OSHA standards prior to first unit turbine repair		\$100,000
Owners Cost Per Unit (Bidding, Contract Admin, Safety, Oversight)		\$40,000
Total for 3 units including station (but without risk items)		\$4,454,400

ESTIMATED DECOMMISSIONING COSTS

A cost estimate was prepared by 3D Enterprises Construction Management Corporation in 1997 for Kentucky Utilities on the Lock No. 7 project. The costs from the 1997 3D quote have been escalated at 5% per annum to account for inflation. Additional quotes were not solicited due to time limitations. Kentucky Utilities indicates that 3D is an experienced contractor who has performed work for KU in the past. This study appears to have been thorough and comprehensive.

Table 6 - Station Decommissioning Cost Estimate in 2001 Dollars

	1997 Estimate 3D Enterprises	2001 Estimate
Option 1 remove all generation equipment leave structure	\$1,012,000	\$1,274,600
Option 2 remove all generation equipment and structure down to the waterline at elevation 514.6.	\$2,760,000	\$3,417,200
Option 3 remove all generation equipment and structure below the waterline to elevation 480 and reconstruct this portion of the wing wall to match the existing Corps dam.	\$20,000,000	\$24,480,000

For Options 1 and 2 a lump sum of \$40k has been added to cover Owner’s cost for KU in regulatory interface, bidding / awarding / administering the decommissioning construction contract. For Option 3 a lump sum of \$80k has been added to cover these costs.

The 3D study noted that the substation would be removed by Kentucky Utilities. Additionally the 34.5 transmission line to the site should be removed. These costs should be included by Kentucky Utilities in its review.

ECONOMIC EVALUATION OF ALTERNATIVES

This section includes economic screening evaluation for repair options. This analysis should be supplemented with more detailed analysis by Kentucky Utilities staff. The main options in regard with the Lock No. 7 property are as follows:

- 1) Repair 1, 2 or 3 units and continue operations
- 2) Surrender license and remove equipment but leave the structure
- 3) Surrender license and remove equipment but remove the structure
- 4) Sell or give the structure away and transfer the license

There is an additional option to do nothing but KU staff indicates that they do not wish to select this option for various reasons including liability, public relations, etc.

Analysis Inputs

The existing Lock No. 7 license expires in 2022; the evaluation period was selected to be 20 years in all cases. Discount rates of 5% and 10% were used for the Net Present Value (NPV) evaluation. As of the date of this report current money rates are approximately 5.14% for 10 year US Treasury bonds, 6.90% for 10 year and longer high grade corporate bonds. The tax rate used is a combined 35% for state and local taxes. Depreciation is based on 20 year straight line.

Capital Costs

The repair costs are based on the unit repair costs summarized in Table 4 of this report. The capital cost includes \$40,000 per unit for KU to cover contracting, safety and other oversight costs. The capital cost includes upgrades to the station service water system and the station gantry crane. The Woodward governors are obsolete. Replacement of the pumps and motors plus governor service (tune up) is included. Total governor replacement is another option but at additional expense. For economic analysis regarding rehabilitation of the turbines, a three unit overhaul is assumed to take four (4) years total with one (1) year to order / manufacture the turbine equipment and one (1) year to complete each outage. A normal turbine outage for this size unit would be expected to take approximately 24 weeks.

Table 7 - Station Repair Cost Estimate in 2001 Dollars

Evaluation Case	Station Output (MWHrs)	Total Capital Cost
No Repairs	0	\$0
1 Unit Repaired	2750	\$1,614,800
2 Unit Repaired	5500	\$3,069,600
3 Unit Repaired	8200	\$4,454,400

Value of Future Power

The Lock No. 7 project is limited to run of river operation, which results in mainly off peak generation. The project is located in a very low cost power region with ample reserves. DE&S would therefore project that the levelized value of the power output would be less than \$20 / MWH during the remaining license period between 2002 and 2022. Three values for the levelized value of the generation output were used in the economic analysis - \$15 / MWH, \$20 / MWH and \$25 / MWH. Current representative electricity prices are provided in Table 8 below.

The first unit repaired would have the greatest generation value with the second and third units having successively lesser value due to decreased water availability and run time. For the purposes of the simple analysis provided with this report, the generation values are approximately equal for all three units. A more detailed analysis could address these differences. A maximum station output of 8,200 MWH per year was used following rehabilitation of all three units. This value is in agreement with the last license application.

Table 8 - Representative Regional and National Power Prices as of December 13, 2001

Reference Power Index	\$ / MWH	Pricing
Dow Jones – Cinergy control area	\$17.89	Firm - On Peak
Mirant East Power Index	\$19.40	Firm - On Peak
Mirant National Power Index	\$22.42	Firm - On Peak

Annual O&M Expenses

Tom Moore of KU provided an estimate of operating and maintenance costs for the Lock No. 7 project to DE&S. The majority of costs are labor costs associated with debris removal. The labor expenditure for debris removal is reported to be more than 1,100 hours per year involving 2-3 people to visit the site twice a week. These costs are summarized in the table below. For the purposes of the economic evaluation, an annual O & M cost of \$60k was assumed with annual escalation of 3.5% per year.

Table 9 - Annual Operating & Maintenance Expenses at Lock No. 7 per Tom Moore

Expense Item	Amount Spent in 2001
Site Labor Costs – majority of labor is for handling removal trash at intake	\$40,000 (estimated)
USGS monitoring fee	\$12,000-13,000 (estimated)
FERC annual license fee	\$ 8,101 (actual)
Headwater Benefit Payments	\$ 518 (actual)
Property Taxes	\$ 214 (actual)
Total in 2001	\$60,833 - 61,833

Summary of Economic Evaluation

Based on the inputs described above a simple spreadsheet was developed for economic evaluation of the alternatives. An example is included in Attachment 6 for information. A four (4) year rehabilitation schedule is used when considering the three (3) unit rehabilitation.

Due to the high capital investment and low recovery rate, the project does not produce an IRR unless the power value value increases well above the \$25 / MWH value. The breakeven energy value from this analysis for three units overhauled is approximately \$45 / MWH with a discount rate of 5%. A sensitivity case was used to evaluate higher output from the plant at 10,000 MWH annual production level as compared to 8,200 MWH annual production level which was the base case. Assuming a 5% discount rate and \$20 / MWH as the levelized price, the NPV was -\$2,991,213 for 10,000 MWH annual generation as compared to an NPV of -\$3,372,175 for 8,200 MWH of annual generation. While the assumption of higher generation will reduce the net loss it will not alter the basic economics of the project.

Table 10 - Preliminary Economic Analysis for the Three Repair Options

Analysis Cases		1 Unit Repaired		2 Units Repaired		3 Units Repaired	
Discount Rate for NPV	Power Value	NPV	IRR	NPV	IRR	NPV	IRR
5%	\$15/ MWH	-\$2,063,344	NA	-\$2,945,469	NA	-\$3,807,700	NA
5%	\$20/ MWH	-\$1,905,804	NA	-\$2,641,421	NA	-\$3,372,175	NA
5%	\$25/ MWH	-\$1,746,823	NA	-\$2,337,372	NA	-\$2,936,650	NA
10%	\$15/ MWH	-\$1,804,319	NA	-\$2,726,989	NA	-\$3,575,874	NA
10%	\$20/ MWH	-\$1,699,757	NA	-\$2,529,229	NA	-\$3,296,754	NA
10%	\$25/ MWH	-\$1,595,196	NA	-\$2,331,470	NA	-\$3,017,634	NA

Conclusion

None of the rehabilitation options have a positive NPV and would not logically be pursued given any better (less costly) economic alternatives. Since all the rehabilitation options have negative NPVs, it would be preferable to surrender the license and decommission or transfer the facility provided that the cost for either of these options is less than the least cost repair option.

ATTACHMENTS

Attachment 1 – Turbine and Plant Drawings