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October 19, 2011

MEMORANDUM

TO: Council members

FROM: Terry Morlan
Director, Power Planning Division

SUBJECT: Contract to enhance the GENESYS model

The GENESYS computer model, developed by the Council in 1999, has proven to be of great value to the Council and to others in the region. Its primary purpose is to assess the adequacy of the Northwest's power supply but it can also provide a detailed analysis of the hydroelectric system. That capability has been instrumental in the development of the Council's fish and wildlife programs and power plans. The model can also provide great insight into the potential effects of climate change.

However, as the region has acquired more variable generation and as summer peak loads have grown significantly, it has become more important to be able to properly analyze hourly operations. Because of that, staff has identified several enhancements that would make GENESYS a better tool for the Council. Major enhancements include:

- Revising the hourly hydro dispatch algorithms. This will fine tune the adequacy assessment and improve our ability to assess wind integration issues.
- Adding to the model, the capability of dynamically calculating the Canadian hydroelectric operation under the Canadian Treaty Agreement. This will allow the Council to analyze various alternatives being discussed in the Canadian Treaty discussions.
- Adding a comprehensive output data file that will be the source for the newly defined *State of the System* report, which will provide a wealth of statistical information regarding the adequacy of the power supply.

Staff is asking the Council to approve a contract with Gwendolyn Shearer (contractor) to aid in upgrading the GENESYS model. The corresponding decision memo is attached.

Attachment

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October 19, 2011

DECISION MEMORANDUM

TO: Council members

FROM: Terry Morlan
Director, Power Planning Division

SUBJECT: Contract to Enhance the GENESYS Model

PROPOSED ACTION: Approve the proposed contract between the Council and Gwendolyn Shearer (Contractor).

SIGNIFICANCE: The GENESYS model has proven to be of great value to the Council and to others in the region. However, in order to better address capacity issues, alternatives to the Canadian Treaty and power supply adequacy, the model will have to be enhanced. Staff has defined specific components of the model that need improvement and are proposing to contract with Gwendolyn Shearer to implement the improvements.

BUDGETARY/ECONOMIC IMPACTS

The budget for this contract is \$60,000, of which the Council will provide \$30,000 and the Bonneville Power Administration will provide \$30,000. The estimated duration of this contract is approximately 11 months (not to extend beyond September 30, 2012).

BACKGROUND

The Council is in the process of revising its power supply adequacy standard. A part of the revision includes the development of a *State of the System* report, which will include statistical information pertaining to the capability and adequacy of the power supply. The GENESYS model must be amended to produce the associated data prior to June of 2012, when the next adequacy assessment is scheduled.

The Council is also entering into the mid-term assessment phase for its 6th power plan. Part of the assessment to date, indicates that better capability in analyzing capacity issues is needed. Several tasks outlined in the statement of work are related to making the hourly simulation in GENESYS more realistic. This will be especially important as we proceed with climate change studies and later the development of the 7th plan.

The Council is also involved in the discussion and analysis of Canadian Treaty operations. The U.S. Entity is considering whether to terminate the treaty, renegotiate or leave it in place. The Council's GENESYS model can provide valuable information to regional entities involved in this process. A recommendation to the Department of State is scheduled to be made in September of 2013, which means that all related analysis must be done well before that date. In order for GENESYS to provide useful information, it must include the ability to assess the operation of the Canadian hydroelectric system in a dynamic fashion.

ANALYSIS

None

ALTERNATIVES

The alternative is for the staff to proceed on its own. This alternative is less costly but would delay the completion date for an enhanced version of this model and would also delay the implementation of related action items in the Council's power plan.

ATTACHMENTS

Sole Source Justification Memorandum

Seven Point Memorandum

Exhibit A: Statement of Work

Exhibit B: Budget

TABLES, GRAPHS, CHARTS, FIGURES, OTHER GRAPHICS

None

STATEMENT OF WORK

Under this contract between the Northwest Power and Conservation Council (Council) and Gwen Shearer (Contractor), the Contractor will complete the tasks identified below, which primarily include enhancements to be made to the Council's GENESYS computer model. The tasks are listed in order of priority and can be modified or deleted with mutual consent from Council staff and the Contractor. The Contractor will also provide the deliverables listed at the end of this document no later than September 30, 2012.

Tasks:

1. **Canadian Hydro Operation:** *Incorporate into the Genesys model, the ability to calculate Canadian hydro operations under the Treaty Storage Regulation (TSR).*

The TSR elevations for Canadian projects are currently calculated in a separate process and are input as a fixed operation into Genesys. Currently, Genesys can only be run in sequential mode for water conditions because the TSR elevations are calculated based on a sequential run. By having Genesys calculate its own TRS values; it will be able to run water conditions in a random mode.

2. **Hourly Hydro Dispatch:** *Improve the hourly hydro simulation algorithms in Genesys.*

To the extent possible, develop ways to better match real hourly hydro operations. Review and improve the look-ahead logic. Rewrite the hydro shaping routine so that minimum generation limits are implemented in a better way. When purchase-ahead market resources are used, add logic to attempt to uniform any remaining deficits. Investigate the possibility of prorating monthly hydro energy into weekly shapes to reflect natural variations in river flows. The objective is to reduce or eliminate, if possible, the occurrence of false peak curtailments and missing peak curtailments.

3. **Thermal Commitment Logic:** *Add logic to Genesys that better simulates the dispatch of thermal resources.*

The Council will provide resource ramp up and ramp down data. The objective is to make the simulated thermal resource dispatch as realistic as possible. This will make both adequacy and oversupply analyses better.

4. **Peak vs. Energy Relationship:** *Develop a method to extrapolate the peak vs. energy curves for the lowest and highest water conditions.*

Genesys uses the relationship between sustained peak capability and monthly energy to approximate the hourly hydro dispatch. The peak vs. energy data is developed by running an hourly hydro model that simulates the operation of individual hydro projects. That model simulates the hourly hydro operation over 70 different water conditions. To simplify the

logic in Genesys, that data is broken into quintiles and Genesys interpolates between the quintile points to get the peak capability for specific monthly energies. The problem is that Genesys currently does not extrapolate when the monthly energy is below the bottom quintile or above the top quintile.

5. **State of the System Data Output:** *Create new output files for Genesys that include all necessary data to produce the newly defined “State of the System” report.*

The *State of the System* report includes calculations of various adequacy metrics, including the loss of load probability (LOLP) and the Conditional Value at Risk (CVaR). It also includes a monthly breakdown of potential problems and statistical information regarding curtailment events. The Contractor will work with Council and BPA staff in the development of this data.

6. **Provide Consulting and Debugging:** *Aid in the investigation of anomalous results and make appropriate code changes. The first priority would be identifying and finalizing changes for a production version of Genesys.*
7. **Documentation:** *Complete all documentation of changes made to the GENESYS model. In particular, describe in detail any new algorithms that are added.*

Deliverables: (due by September 30, 2012)

- The source code and associated data files for a production level version of the GENESYS model (not including the user interface), which includes all of the enhancements identified in the tasks above.
- A report documenting all modifications made to GENESYS subroutines and modules.
- An updated version of the “Final Genesys Documentation” dated September 20th, 2011.

EXHIBIT B

BUDGET

Provider	Hourly Rate	Max Hours	Total Budget
Gwendolyn Shearer	\$150.00	400	\$60,000.00

Note: The hourly rate assumes that the Contractor will perform the tasks outlined in the statement of work (Exhibit A) offsite, using her own computer and facilities. Also, the Council has committed \$30,000 toward funding this contract with the remainder (\$30,000) coming from the Bonneville Power Administration.

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October 12, 2011

MEMORANDUM

TO: Steve Crow
Sharon Ossmann

FROM: John Fazio

SUBJECT: Seven-Point Memorandum - Gwen Shearer Contract

1-PURPOSE

The purpose of this contract is to obtain help in upgrading the Council's GENESYS computer model, which among other things is used to assess resource adequacy. The specified tasks focus on the hourly resource dispatch algorithms and are aimed at improving the Council's ability to assess capacity issues, in particular wind integration and other related issues outlined in the Sixth Power Plan action items. One of the tasks focuses solely on incorporating the ability to dynamically simulate the Canadian hydroelectric system into the model. Other tasks are designed to make the model more versatile and robust. The Bonneville Power Administration, which also uses this model, has pledged to provide a part of the funding for this contract (see Exhibit B – Budget).

2-SPECIFIC PROBLEMS

The major tasks associated with this project are listed below (see Exhibit A – Statement of Work for more details).

- Incorporate into the Genesys model, the ability to calculate Canadian hydro operations under the Treaty Storage Regulation (TSR).
- Improve the hourly hydro simulation algorithms in Genesys.
- Add logic to Genesys that better simulates the dispatch of thermal resources.
- Develop a method to extrapolate the peak vs. energy curves for the lowest and highest water conditions.
- Create new output files for Genesys that include all necessary data to produce the newly defined "State of the System" report.
- Aid in the investigation of anomalous results and make appropriate code changes.
- Provide complete documentation of all changes made to the GENESYS model.

3-RECOMMENDED ACTION

Staff recommends that the Council contract with Gwendolyn Shearer to perform the tasks identified in Exhibit A. The budget is \$60,000 (of which the Council will provide \$30,000 and the Bonneville Power Administration will provide \$30,000) and the estimated duration of this contract is approximately 11 months (not to extend beyond September 30, 2012).

4-SUMMARY OF RELATED ACTIONS

Council staff is currently in the process of updating the data and procedures required to implement action items in the Council's Sixth Power Plan. The Genesys model is a key tool used to implement those action items. Genesys provides data required by other Council computer models used to forecast electricity prices and to develop resource acquisition strategies. Genesys is also the tool used by the Council and the Northwest Resource Adequacy Forum to assess the adequacy of the region's power supply. The model can also be used to investigate the impacts of various alternatives pertaining to the termination of the Canadian Treaty.

5-ALTERNATIVES

One alternative is for the staff to proceed on its own. This alternative is less costly but would delay the completion date for an enhanced version of this model and would also delay the implementation of related action items in the Council's Sixth Power Plan. A second alternative is to use a competitive bidding process to choose a contractor for this work. This alternative would not necessarily be less costly and will certainly delay the completion of the specified tasks.

6-IMPACT ON STAFF AND FACILITIES

The impact to staff would be minimal. Some time would be required to discuss changes being made to the model and to review the Contractor's work. Choosing a contractor that is unfamiliar with these models would increase staff time requirements significantly.

7-CERTIFICATION

By this request, I certify that the proposed acquisition is appropriate and desirable for the Council. I understand that the necessary funding is available for the acquisition in this fiscal year for the Power Planning Division under the Systems Analysis category.

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October 12, 2011

MEMORANDUM

TO: Steve Crow
Sharon Ossmann

FROM: John Fazio

SUBJECT: Sole-Source Justification - Gwendolyn Shearer Contract

RECOMMENDATION

We recommend that negotiations be conducted only with Gwendolyn Shearer for the services described herein.

SERVICES TO BE ACQUIRED

See attached seven-point memorandum for more detailed discussion of the work involved.

PROCUREMENT HISTORY

The problem is quite specialized; in that it requires a detailed knowledge of the operation of the Northwest hydro system and of the algorithms in the GENESYS model that simulate that operation. Due to the timetable that staff has to implement the enhancements; the contractor must already be familiar with the use of the model and its role in the decision-making process. Because the contractor has worked with the Council and Bonneville on similar issues, she is the only person who could accomplish the tasks outlined in the statement of work in the specified time period.

ESTIMATED COST

The budget for this contract is \$60,000, of which \$30,000 will be funded by the Council (Power Division) and the remaining \$30,000 will be funded by the Bonneville Power Administration.

SCHEDULE REQUIREMENTS

The Council is in the process of revising its power supply adequacy standard. A part of the revision includes the development of a *State of the System* report, which will include statistical information pertaining to the capability and adequacy of the power supply. The GENESYS model must be amended to produce the associated data prior to May of 2012, when the next adequacy assessment is scheduled.

The Council is also entering into the mid-term assessment phase for its Sixth Power Plan. Part of the assessment to date, indicates that better capability in analyzing capacity issues is needed. Several tasks outlined in the statement of work are related to making the hourly simulation in GENESYS more realistic. This will be especially important as we proceed with climate change studies and later the development of the 7th plan.

The Council is also involved in the discussion and analysis of Canadian Treaty operations. The U.S. Entity is considering whether to terminate the treaty, renegotiate or leave it in place. The Council's GENESYS model can provide valuable information to regional entities involved in this process. A recommendation to the Department of State is scheduled to be made in September of 2013, which means that all related analysis must be done well before that date. In order for GENESYS to provide useful information, it must include the ability to assess the operation of the Canadian hydroelectric system in a dynamic fashion.

EXCLUSIVE CAPABILITY

Both Council and Bonneville staff (Bonneville is funding a portion of this contract) believe that only Gwendolyn Shearer has the capability to complete the enhancements to the GENESYS model (see Exhibit A) within the required time frame. Gwen has worked for the Bonneville Power Administration, Power Systems Research, Inc. and since 2008, with Council staff on the GENESYS model, specifically focusing on resource adequacy analysis. Because of this experience, she has an intimate knowledge of the GENESYS model and has significant experience with Pacific Northwest power operations. There is no other contractor who could take this project on without first going through a long learning-curve period that would consume a significant amount of staff time. Thus, in staff's opinion, using a different contractor would not be cost effective and would raise the risk of not completing all tasks within this fiscal year.

Approved:

Administrative Officer

Date

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