Riverbank Power Corp. / Symbiotics LLC Request to include its Parker Knoll and Swan Lake Pumped Storage Projects in the WECC TEPPC 2011 Study Plan

To: Transmission Expansion Planning Policy Committee (TEPPC); Northern Tier Transmission Group (NTTG); PacifiCorp, Portland General Electric.

From: Symbiotics Energy Corp, a wholly owned subsidiary of Riverbank Power Corp.

Riverbank Power Corp and its subsidiaries, Symbiotics Energy Corp and Symbiotics LLC, are in late stage development of two pumped storage projects, one on the west side and one on the east side of the WECC system, The projects are sized and located to benefit the integration of renewable resources. The 1,380-MW Swan Lake project is located at the head of the Pacific Intertie and the 1,000-MW Parker Knoll project is located in central Utah. Both projects are closed-loop pumped storage (CLPS) projects that increase transfer capabilities, transmission utilization, and regulation on a regional basis. Riverbank requests that these projects are included in TEPPC's 2011 Study Plan to evaluate their individual performances in the 2020 Reference Case and other study plan scenarios. The company is requesting these two projects be included in the WECC/TEPPC 2011 Study Plan to determine their impact on increased wind and solar integration and economic, reliability and ancillary services performance evaluations, both hourly and sub-hourly, with various interconnection scenarios. These projects will benefit both the NTTG on a sub-regional basis as well as WECC. Currently there are four proposed scenarios for the Parker Knoll and Swan Lake pumped storage projects. The options stated below include the addition of the projects with variations on interconnection points and the additional of new transmission in two scenarios. Both projects have an expected Commercial Operations Date (COD) in 2017 and are expected to be online in 2017.

Requested Parker Knoll Study Scenarios

1000-MW Closed Loop Pumped Storage in central Utah with Transmission to Sigurd Substation

Study the addition of a large load area on the east side of the system in the middle of a large load and wind aggregation point. Symbiotics is proposing to permit and construct a new double circuit line to the Sigurd Substation to deliver 1,000 MW of generation, regulation and ancillary services and load onto the existing transmission infrastructure. It is also expected that the study would include planning scenarios with the proposed Gateway South 345-KV intertie at Sigurd.

1000-MW Closed Loop Pumped Storage plus additional new transmission from the Sigurd Substation to the Glen Canyon Substation

This would increase the transfer capability and regulation capacity on and across TOT2B and permit additional wind and solar integration in the SW portion of WECC. It includes the permitting and construction of a new double circuit 230-kV line to deliver power to both the Sigurd and Glen Canyon substations.

1000-MW Closed Loop Pumped Storage with transmission to the Intermountain DC tie

This study would examine possibility of delivering 1000 MW of regulation into California through the DC line at Intermountain. It would include permitting and construction of a new double circuit line to the Intermountain Power DC intertie. This scenario would deliver 1,000 MW of generation, regulation and ancillary services to LADWP.

Requested Swan Lake Study Scenario

1380-MW Closed -Loop Pumped Storage in Southern Oregon with transmission connecting into the Intertie 500 kV grid near the California-Oregon Border

Symbiotics would permit and construct a line to either the Captain Jack, Malin or other nearby substation to deliver 1,380 MW onto the existing Intertie transmission infrastructure.

1.0 Introduction

Riverbank Power Corp. is a developer of pumped storage hydro and generation assets in North America. Symbiotics LLC, a wholly owned subsidiary of Riverbank Power Corp., is the leading developer of new hydroelectric projects in the United States. Since 2008, the company has been granted four new hydro licenses. One project is currently under construction and three are in late stage engineering with construction scheduled in 2011 and COD expected in mid-to late 2012. The company has an additional six run-of-river projects and three pumped storage projects in advanced stages of licensing and permitting for a generation total in excess of 3,600 MW.

Symbiotics' pumped storage projects are designed to facilitate the addition of variable resources, such as wind and solar, to the grid in a manner that enhances the utilization and value of existing and proposed transmission. Symbiotics is developing a number of closed-loop pumped storage (CLPS) projects within the Western Electricity Coordinating Council (WECC), including the Parker Knoll Pumped Storage Project (Parker Knoll) in Utah and the Swan Lake Pumped Storage Project in Oregon. By eliminating the need for an existing aquatic resource, Symbiotics has been able to site its CLPS projects where they can provide maximum transmission benefits. Avoiding the use of existing aquatic resource has also allowed Symbiotics to expedite the licensing and permitting processes. The flexible siting process of CLPS projects provides a unique opportunity to develop large-scale storage projects in locations where they are most needed to support transmission the WECC.

As variable generation resources such as wind and solar become an increasing part of the generation mix, balancing areas and transmission providers face additional challenges and complexities in terms of dispatch and renewables integration. Adding variable generation to a transmission system does not increase the need for transmission capacity which is dependent on load. However, it may change the capacity required to include more flexible generation with the ability to ramp faster and have lower turn down rates. CLPS not only provides fast ramping capabilities, it also can reduce capacity requirements by serving as immediately available load. CLPS can increase the utilization and efficiency of both existing and proposed transmission

projects, and increase dynamic transfer capabilities at key congestion points. CLPS projects can be used for shaping and load following, maintaining frequency and VAR support, and provide reserves and capacity to a system. Grid-scale storage like the Parker Knoll project could change current and future reliability practices within several major balancing areas in the WECC.

2.0 Project Description

2.1 Parker Knoll

The Parker Knoll project is a 1,000-MW large-scale CLPS project that could meet the needs of a number of balancing authorities in the WECC. In addition to development of the project, Symbiotics is evaluating the permitting of approximately 150 miles of new transmission to optimize the Parker Knoll's function and value in the WECC.

The Parker Knoll project is located in Piute County, Utah. It has an approximate average gross head of 1,938 feet and has been sized at 1,000 MW. The project is a closed-loop system with two reservoirs designed outside of existing aquatic systems. The total length of the water conduit between the upper and lower reservoir is approximately 13,000 feet. Approximately 6,354 acre-feet of water will be required for the initial fill, and an additional 426 acre-feet a year is estimated for replacement of evaporative losses. The project is located 38 miles south of the Sigurd Substation in Sevier County, Utah and 83 miles north of the Glen Canyon generating station at Glen Canyon Dam in Arizona. It is also approximately 113 miles south of the Intermountain Power Project. Symbiotics is considering the possibility of building transmission to connect the Parker Knoll project to both Glen Canyon Dam and Intermountain Power.

Within the proposed power plant, four 250-MW reversible turbines will be used to generate and pump. At least two of the proposed turbines will be state-of-the-art, variable-speed turbine units. The other two may be single-speed turbines, pending final design. Within the underground powerhouse a substation will be constructed within the proposed transformer gallery where the energy will be stepped up to 345 kV. Symbiotics will permit and construct transmission lines to connect the project to existing substations and utilities.

The project is currently in the Traditional Licensing Process (TLP). To date, Symbiotics has filed the Preliminary Application Document (PAD), Proposed Study Plan and conducted the majority of the field studies required to file a Draft License Application (DLA). The DLA is scheduled to be filed with the FERC in the spring of 2011 with the Final License Application (FLA) being filed late summer of 2011. It is anticipated it will take approximately 18 months for the FERC to complete its environmental analysis, with a federal license being granted in 2013 and a COD expected in 2017.

The project has been designed to generate for eight hours per day with two hours of reserve capacity available. In pumping mode, the reversible turbines can soak energy for up to 12 to 14 hours per day at its rated capacity. However, operation of a pumped storage facility is driven by the needs of balancing areas; the pumped storage facility can generate, pull load, provide a complete complement of ancillary services, and control with rapid response times.

2.2 Swan Lake

The Swan Lake project is a 1,380-MW large-scale CLPS project that could meet the needs of a number of balancing authorities in the WECC. In addition to development of the project, Symbiotics is evaluating the permitting of approximately 23 miles of new transmission lines to optimize Swan Lake's functionality and value in the WECC.

The Swan Lake project will be built in Klamath County, approximately 12 miles northeast of Klamath Falls. This will be a closed-loop system, with two new reservoirs constructed for the project. Approximately 12,230 acre-feet of water will be exchanged between the two reservoirs on daily basis. A powerhouse will contain four reversible pump-turbine units and have the capacity to deliver 1,380 MW of electricity for up to 10 hours a day. Approximately 23 miles of transmission line will be constructed to connect the project to the existing Captain Jack Substation. The project will require an initial fill of 13,935 acre-feet of water and approximately 1,574 acre-feet of water each year to replace evaporation losses. Symbiotics is considering additional point of interconnection (POI) alternatives to the Captain Jack Substation, including the California Pacific Intertie.

Within the proposed power plant, four 345-MW reversible turbines will be used to pump water and generate electricity. At least two of the proposed turbines will be state-of-the-art variable-speed turbine units. The other two turbines may be single speed, pending final design. Within the underground powerhouse a substation will be constructed within the proposed transformer gallery where the energy will be stepped up to 345 kV. Symbiotics will permit and construct transmission lines to connect the project to existing substations and utilities.

The project is currently in the Traditional Licensing Process (TLP). To date, Symbiotics has filed the Preliminary Application Document (PAD). The Proposed Study Plan and field studies required to file a Draft License Application (DLA) will be completed by the fall of 2011. The DLA is scheduled to be filed with the FERC in the winter of 2011 with the Final License Application (FLA) being filed in the first quarter of 2012. It is anticipated it will take approximately 18 months for the FERC to complete its environmental analysis, with a federal license being granted in 2014 and a COD in 2017.

The project has been designed to generate for eight hours per day with two hours of reserve capacity available. In pumping mode, the reversible turbines can soak energy for up to 12 to 14 hours per day at its rated capacity. However, operation of a pumped storage facility is driven by the needs of balancing areas; the pumped storage facility can generate, pull load, provide a complete complement of ancillary services, and control with rapid response times.

3.0 Associated Information

3.1 Fuel cost

There is no fuel cost associated with a pumped storage hydro project. Off-peak energy can be utilized from various fleet resources to refill reservoirs. Additionally, pumped hydro can pull load during off-peak hours to reduce up- and down-ramping from other resources such as variable generation resources.

3.2 Ramp Rates/ Soak Rates

Typical performance characteristics of modern pumped storage projects using variable speed turbines are as follows:

Load Ramping in Generating Mode:

- Shutdown to on-line 60-90 seconds
- Online to full load generating 5-15 seconds
- Spinning in air to full load generating 5-15 seconds
- Black Start < 10 minutes

Load Ramping in Pumping Mode

- Shutdown to normal pumping 6 minutes
- Spinning in air to full load generating 60 seconds

4.0 Benefits Summary

Transmission systems are designed with the goal of delivering stable, regulated energy to load centers. In the face of Renewable Portfolio Standards, variable renewable energy development will continue to increase and this goal will become more challenging. The two CLPS projects, Parker Knoll and Swan Lake will increase the flexibility and efficiency of the energy delivery system, make use of previously unused or curtailed energy, and reduce the need for expensive transmission expansion while alleviating chronic, recurrent, and conditional congestion. The inclusion of the Parker Knoll and Swan Lake CLPS projects into TEPPC's study process for scenario planning will provide valuable findings for the strategic location of pumped storage on the Western system.

5.0 Maps

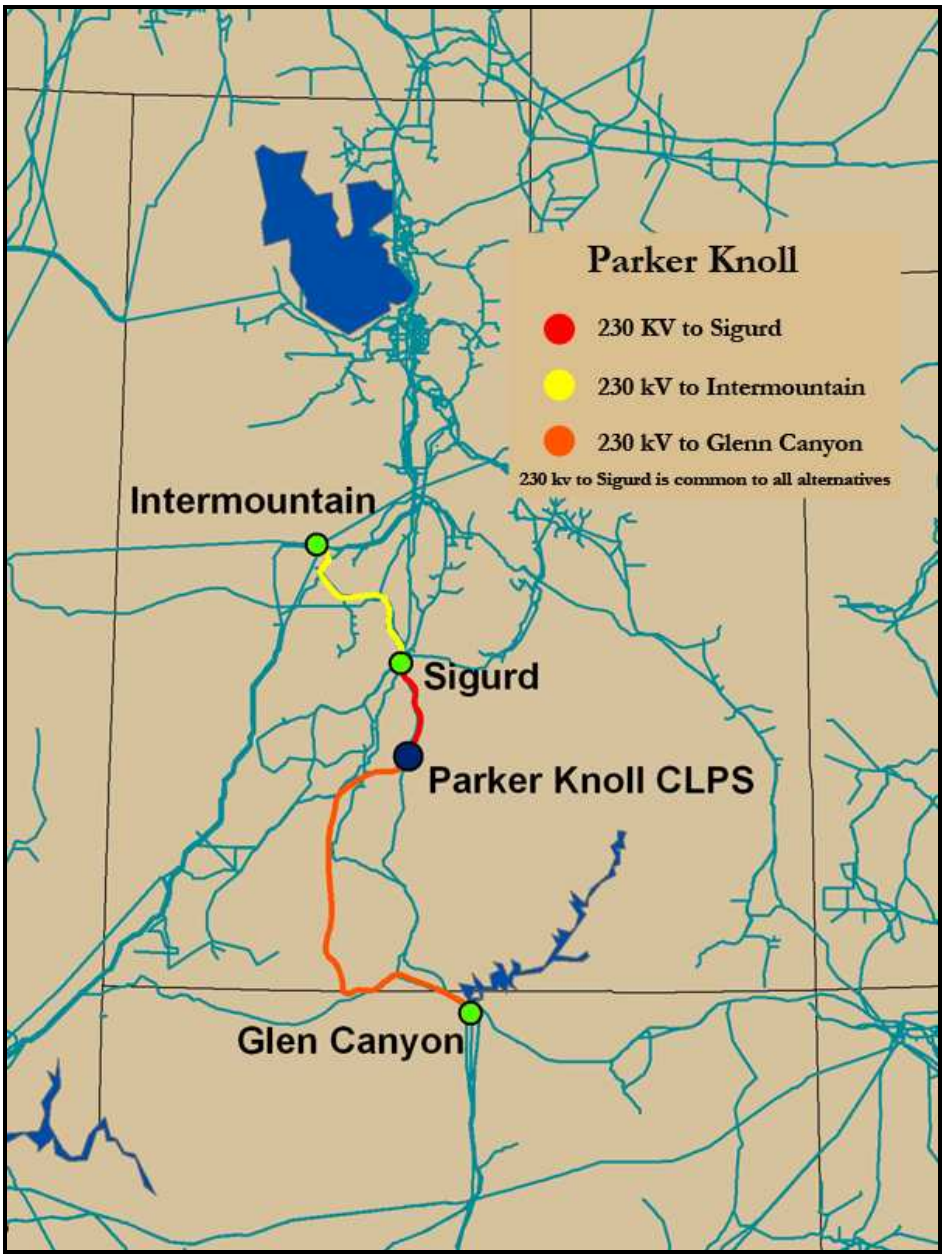

Figure 1. General location map of interconnection points for Parker Knoll.

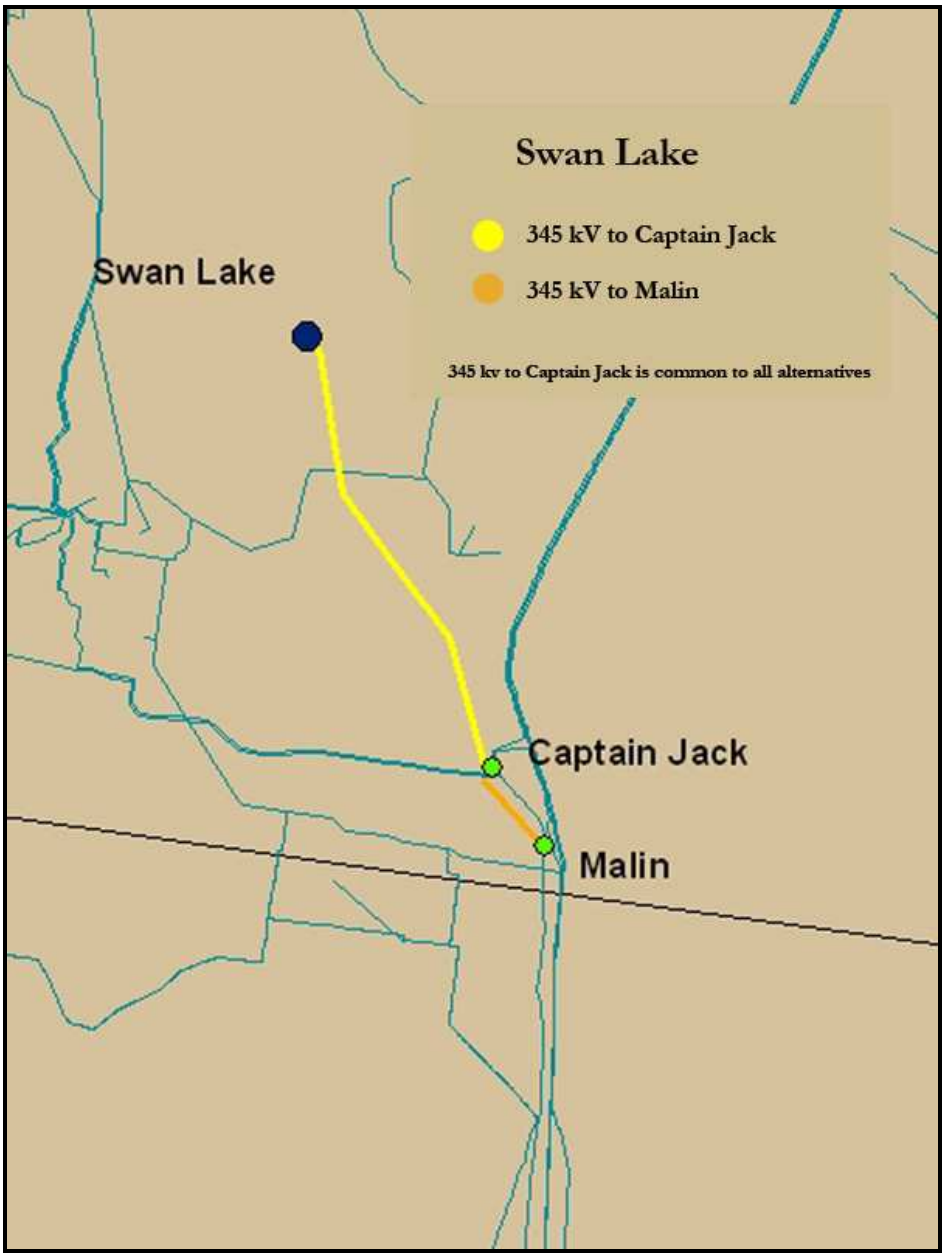

Figure 2. General location map of interconnection points for Swan Lake.

6.0 TEPPC Protocol Prioritization Questions

6.1 Parker Knoll CLPS

1. What portion of the interconnection will be considered by the study?

The Parker Knoll CLPS project is sized and located to benefit both WECC regional and WestConnect and NTTG sub-regional areas.

2. Does the request raise fundamental design issues of interest to multiple parties?

Yes, Parker Knoll will have a significant impact on the WECC and will provide integration and regulation of east side wind and solar renewables. Connected at Sigurd, it will alleviate congestion and allow more renewables on the grid for movement through Glen Canyon. It could also enhance regulation and provide ancillary services directly to CA. Storage has the capability to function as both generation and load. In addition, there are numerous auxiliary services which can provide additional stability to the transmission infrastructure.

3. Does the request raise policy issues of national, regional, or state interest; for example, access to renewable power, location of both conventional and renewable resources, consideration of state policies, and environmental factors?

Yes, the project can provide needed load control and ancillary services for a number of balancing authorities in the WECC facing the addition of large amounts of renewables. The project will facilitate the addition of significant amounts of wind and solar energy while reducing integration expenses**.**

4. Can the objectives of a particular study request be met by other studies by clustering or combination?

No, the Parker Knoll Pumped Storage project is unique with its location within the WECC.

5. Will the study provide information of broad value to customers, regulators, Transmission Providers, etc.?

Yes

6. Can multiple requests for studies or scenarios be represented generically if the projects are generally electrically equivalent?

Not applicable

7. Can requests be aggregated into energy or load aggregation zones with generic transmission expansion between?

Yes

8. Does the study request require the use of production cost simulation as generally employed by TEPPC or can it be better addressed through technical studies such as power flow and stability analysis?

Both

9. Is the requested study necessary to meet a member Transmission Provider's compliance with its OATT, Attachment K.?

No, however grid-sized storage such as the Parker Knoll project will have a positively profound effect for other transmission assets. The project will maximize regional benefits while making efficient use of the existing transmission system and help refine the 10-year planning process for regional transmission assets.

6.2 Swan Lake CLPS

1. *What portion of the interconnection will be considered by the study?*

   Swan Lake CLPS is sized and located to benefit both WECC regional and California and NW sub-regional areas.

2. *Does the request raise fundamental design issues of interest to multiple parties?*

   Yes, Swan Lake will have a significant impact on the WECC. It should be able to increase the utilization and dynamic transfer capabilities of the Intertie at the California Oregon Border and would provide regulation, ancillary services, firming and shaping services, capacity, and load. As mentioned previously, storage has the ability to serve as generation and load. In addition there are numerous auxiliary services which can provide additional stability to the transmission infrastructure.

3. *Does the request raise policy issues of national, regional, or state interest; for example, access to renewable power, location of both conventional and renewable resources, consideration of state policies, and environmental factors?*

Yes, the project can provide load control and ancillary services at Captain Jack and Malin, increase dynamic transfer capabilities and facilitate the addition of significant amounts of wind and solar energy while reducing integration expenses.

4. *Can the objectives of a particular study request be met by other studies by clustering or combination?*

   No, the Swan Lake location is unique with its location within the WECC.

5. *Will the study provide information of broad value to customers, regulators, Transmission Providers, etc.?*

   Yes

6. *Can multiple requests for studies or scenarios be represented generically if the projects are generally electrically equivalent?*

   Not applicable

7. *Can requests be aggregated into energy or load aggregation zones with generic transmission expansion between?*

   Yes

8. *Does the study request require the use of production cost simulation as generally employed by TEPPC or can it be better addressed through technical studies such as power flow and stability analysis?*

   Both

9. *Is the requested study necessary to meet a member Transmission Provider's compliance with its OATT, Attachment K.?*

   No, however grid-sized storage such as the Swan Lake project will have a positively profound effect for other transmission assets. The project will maximize regional benefits while making efficient use of the existing transmission system and help refine the 10-year planning process for regional transmission assets.