PJM Generator Interconnection Request

Queue #L18

Wind Park Bear Creek 69 kV
(Bear Creek)
(Bald Mountain)

Facilities Study Report

February 2005
#306605

A. Facilities Study Summary

1. Description of Project:

Wind Park Bear Creek, LLC (WPBC) intends to construct a 26 MW wind park, using 13 induction generators. The wind park will be located in Bear Creek Township, Luzerne County, near the town of Bear Creek, PA. The project will be connected to the Harwood-Jenkins #1 69 kV transmission line, by way of the Bear Creek 69 kV Tap. The proposed in-service date for the project is September 15, 2005.

The scope of this study is to determine the direct connect costs and PPL Electric Utilities Corp (PPL EU) network upgrades required to accommodate the WPBC proposed 69 kV interconnection point.

2. Amendments to the Impact Study Report:

The following are changes to statements in the Impact Study report:
The existing direct transfer trip (DTT) communication equipment will be changed to RFL Electronics, Inc. type 9745 (RFL 9745) audio-tone equipment, instead of a radio-based system.
WPBC has decided that an alternate outlet path for its generation will not be needed. Therefore, PPL EU will not design or construct that option. This path would be used during PPL EU line maintenance on the circuit segment located between the L18 substation and Jenkins substation.
PPL EU will design and supply the point-of-delivery metering equipment for a 69 kV installation, which includes the CT/VTs and the associated meters as described in paragraph A5.
PPL EU will not design the following as part of this project, and cost estimates for such services are not included in this report: (a) alternate 12 kV supply to the L18 substation facility, and (b) medium- or low-voltage electrical service for construction activities. If WPBC requires these services, it must place a request directly with the PPL EU Industrial & Commercial Services group at 1-888-220-9991 to get this project into the PPL EU queue.
PPL EU requirements for controlling voltage fluctuations (flicker) are stated in paragraph B8.

The project developer now intends to install the Gamesa 2 MW type G87 turbines. Stability analysis was performed utilizing the Gamesa turbine data, see Attachment #5, and no stability concerns were identified.

3. Milestone Schedule for Interconnection Customer:

PJM and PPL EU currently understand that WPBC has established the following major milestone dates:

- **Transmission Tap Connection; in-service date:** August 1, 2005
- **Substation Project; in-service date:** August 1, 2005
- **Generators; in-service date:** September 15, 2005

4. Scope of Work by Interconnection Customer:

All of the equipment listed below is located at the WPBC site and will be designed, furnished and installed by WPBC, subject to PPL EU approval.

- Install at the WPBC site:
    1. A 69/34 kV substation, including a 69 kV dead-end structure. PPL EU will connect its 69 kV transmission line tap to this dead-end structure.
    2. A 69 kV disconnect switch and a circuit breaker between the WPBC dead-end structure and the WPBC 69/34 kV farm (step-up) transformer. The disconnect switch must be capable of de-energizing the farm step-up transformer.
    3. RFL Equipment to provide DTT facilities to send and receive signals from PPL EU Jenkins 230/69 kV Substation.
    4. Point-of-contact phase fault protection (50P/51P) – separate from the IPR relay.
    5. An Intertie Protective Relay (IPR) cabinet with:
        - Time Delayed Under-voltage (27, 27N)
        - Line protection (21Z1, 27 Gen)
        - Time and Instantaneous Ground Over-current (50N/51N)
        - Over/Under Frequency (81O/U)
        - Instantaneous Over-voltage (59, 59N)
    6. A PPL EU SCADA, per PPL EU specifications, located at the WPBC site. Provide the status of all required breakers to this SCADA, generally, breakers located between the generator and the PPL EU system. This SCADA will also monitor the IPR for alarms as well as the 69 kV circuit breaker. The SCADA will have the capability of tripping at least one (1) breaker to isolate the generation from the PPL EU system, and will provide a "unit shut down" signal to provide a controlled shut-down of the generation.

- Summary of Work to be done in or at the WPBC site, install:
    1. New PPL EU SCADA,
    2. New IPR cabinet,
    3. New DTT equipment, and
    4. Two (2) new dedicated phone lines & phone line protective equipment.

- Major Equipment/Material List for the WPBC site (Equipment to be provided by the WPBC)
    1. 1 set of RFL 9745 DTT equipment, and associated auxiliary relays,
    2. 1 PLC based PPL EU SCADA,
    3. 1 lot inter-tie protective relaying,
    4. 1 lot metering equipment (69 kV)*,
    5. 2 dedicated phone lines and associated protective equipment. (1 SCADA & 1 DTT), and phone line protective equipment,
    6. A shared voice line in the substation for PPL EU use.

    * Metering equipment can be supplied by PPL EU.

- Cost Estimate for the WPBC site interface equipment:

Installation of metering equipment will be by WPBC with the low side connections by PPL EU. There are no other interface cost estimates, and all other interface equipment will be supplied and installed by WPBC.

NOTE: The costs for review of WPBC drawings and project coordination, as well as the field time to commission the IPR, SCADA, and DTT equipment, are accounted for in the estimate for Jenkins substation.

5. Description of Transmission Owner Facilities Included in the Facilities Study:

Direct Connection Work – Transmission: Work activities include the construction of a short length of 69 kV transmission line (tap) from pole 54138-N-39394 to the WPBC substation dead-end structure. WPBC has requested that the transmission line tap be designed according to 69 kV transmission standards in order to meet the project in-service date. WPBC will be responsible for all future costs to convert this tap to 138 kV operation when, and if, this voltage change occurs.

Direct Connection Work – Substation: Work activities include installation of new communication equipment to provide DTT protection at the Jenkins 230/69 kV substation and the Georgetown, East Mountain, Wright and customer-owned GE-Harris/Fairchild Semiconductor distribution 69 kV substations. Specifically, the following will be required:

- **Work at PPL EU Jenkins Substation**:
  Provide DTT facilities between the WPBC and PPL EU Jenkins Substation utilizing RFL 9745 audio-tone communication equipment. This equipment will provide the primary trip signal from PPL EU to the WPBC. A blocking signal from the WPBC is also provided to block reclosing of the 69 kV breaker at Jenkins, in case the WPBC facility does not isolate from the PPL EU system.
  Modify the controls at the Harwood #1 69 kV breaker at Jenkins to include line voltage check and synchronization check functions; a 69 kV VT will be added to provide line voltage for the synchronism check.

- **Work at PPL EU Georgetown, East Mountain, Wright and the customer-owned GE-Harris/Fairchild Semiconductor Distribution Substations**:
  Modify the control schemes at these four 69/12 kV substations that interconnect the Harwood #1 69 kV circuit from Jenkins to the remainder of the PPL EU system by installing synchronism check relays and interlocks on the transformer 12 kV breakers.

- **Work at L18 WPBC Intertie Substation**:
  PPL EU will provide metering as is typically requested to meet PJM IPP requirements:

  Quantity of (2) Landis+Gyr 2510 Revenue Meters, flush mount in short switchboard cases (main plus backup meter) with auxiliary 120 VAC power backup.
  NOTE: PPL EU would need an alternate 120 VAC station service to keep meters on-line for communication if the 69kV breaker is opened for maintenance or some other reasons.

Quantity of (3) Ritz KOTEF 72 Type 3, 69KV Metering Unit (one per phase). These devices are special extended range Metering Units that are accurate for standby-startup low current levels, as well as normal generation up to 50 MW.

PPL EU will provide the metering equipment, and WPBC provides the structure and installation of the equipment.

The following communication and data provisions need to be agreed to by WPBC and PJM.

Normally provided are:
One (1) circuit switch dial-up phone line for revenue metering data acquisition, (2400 baud modem connectivity to meters).
One (1) DATA Port per meter for data feed to PJM. Metering port is DNP 3.0 Level 2 RS- 232 connection to SCADA RTU or ARCOM director type interface provided by customer.
Four (4) KYZ pulse outputs per meter providing (received/delivered) kW-hr energy information. One pair provided to PPL EU SCADA, the other pair to WPBC.

The type of back-up station service, if any, that will be provided at the WPBC site must be determined. If no backup service will exist (AC or DC), then meter data will not be available when the 69 kV tap is open and de-energized.

The cost estimate for providing a 69 kV extended range metering point is stated below in paragraph B7. The cost estimate includes four (4) extended range 69 kV metering units; 3 plus 1 spare.

6. Total Cost of Transmission Owner Facilities Included in the Facilities Study:

The estimated total cost for the facilities needed for the PPL EU portion of the L18 project is $547,394. The direct and indirect material and labor costs, with carrying charges, licensing, and siting fees, are summarized in the table below. A detailed breakdown of costs for each PPL EU substation and the transmission line tap are shown in tables under paragraph B7.

Description	Project Totals
Direct Material Costs	$112,537
Indirect Material Costs	$18,098
Direct Labor Costs	$232,087
Indirect Labor Costs	$178,531
Sub-Total Costs; Mat'l & Labor	$541,253
Carrying Charges	$3,583
Licensing and/or Siting Fees *(t)*	$2,558
Total Costs; PPL EU Project	$547,394

Federal taxes and PA sales taxes that PPL EU would be obligated to pay are not included in the above total cost of the PPL EU portion of this project. If, at a future date, the IRS or state deems federal taxes or PA sales taxes necessary, then WPBC shall reimburse PJM and PPL EU for such taxes.

7. Summary of Milestone Schedules for Completion of Transmission Owner Work Included in Facilities Study:

- Facilities Design: 05/31/04 – 01/31/05
- Material Procurement: 02/15/05 – 09/15/05[1]
- Transmission Line Construction Work: 04/01/05 – 08/01/05
- Substation Construction Work: 04/01/05 – 08/01/05
- Acceptance Testing: 07/01/05 – 09/15/05

B. Transmission Owner Facilities Study Results

1. Transmission Lines- New:

- **Purpose and Necessity:** Design and construct two new spans of single-circuit, 69kV line, approximately 165 feet in total length. This short tap, located near existing structure 54138-N-39394, will connect the PPL EU Bear Creek 69 kV Tap onto the WPBC dead-end structure. This tap will provide a transmission outlet for the WPBC generation. The PPL EU Harwood – Jenkins #1 69kV line serves Bear Creek Tap. The transmission work includes siting, right-of-way acquisition, design and construction.
- **Description of Proposed Route:** The 69 kV tap does not exist to connect this wind park facility onto the PPL EU network. This project consists of constructing 165 feet of new overhead transmission line and terminating the tap onto the new dead-end structure located in the WPBC substation yard. The 165-ft tap will be routed in the shape of an "L", tapping the Bear Creek Tap, turning northwest, and dropping into the dead-end structure.
- **Ratings/Design Criteria:** The single-circuit tap, for 69 kV operation, will be built using three 556 kcmil, 24/7 strand, ACSR conductors and one-3/8 inch high-strength steel OHGW. Between the last transmission pole and the substation dead-end structure, two OHGWs will be installed.
- **Permits/Approvals Required:** Refer to paragraph B6 for licensing fee to use Pennsylvania Game Lands and the waiver filing for the 69 kV transmission tap.
- **Major Equipment/Material List:**
  Long lead-time equipment for this project will include:
  - transmission equipment – none; custom designed steel poles are not needed.

[1] Does not include long lead-time materials that have been ordered under the Interim agreement; provided that L18 decides by Feb 7 on metering equipment option; and provided that Interconnection Service Agreement is signed prior to March 1, 2005.

2. Transmission Lines - Upgrades:

- None Required.

3. Substation / Switchyard Facilities - New:

- None Required.

4. Substation / Switchyard Facilities - Upgrades:

Jenkins, Georgetown, East Mountain, Wright, and the customer-owned GE-Harris/Fairchild Semiconductor Substations

- **Purpose and Necessity:** Modify the control circuits of the Jenkins 69 kV line terminals and install DTT facilities to allow connection of the WPBC generation. Modify control schemes on the power transformer CBs at Georgetown, East Mountain, Wright and the customer-owned GE-Harris/Fairchild Semiconductor.
- **One-Line Diagram:** See Attachment #1.
- **Engineering Drawings List:** The drawings (revised or new) for Jenkins, Georgetown, East Mountain, Wright, and the customer-owned GE-Harris/Fairchild Semiconductor substations are listed in Attachment #5.

- **Electrical Design Description:**

  Jenkins Substation:

  INSTALL:

  Install an audio tone, dual channel, bi-directional DTT system using RFL 9745 equipment at Jenkins substation with a matching set at the customer's site. This scheme will provide a trip signal to the WPBC for any line fault, or any other condition that will cause the PPL EU breaker at Jenkins substation to trip. This is the primary trip signal to the WPBC. This DTT scheme will provide a block-closing signal to the 69 kV breaker at Jenkins from the WPBC. All automatic reclosing of the PPL EU breakers will be blocked whenever the WPBC 69 kV breaker is closed, and the WPBC generation is on-line.

  At the PPL EU Jenkins substation, add an auxiliary relay and a synchronization check relay (ABB type 25V), and a 69 kV potential device.

  REMOVE:

  No equipment to be removed.

  TEST:

  Testing will be completed after installation of the above equipment at Jenkins substation, and after installation of the required protection equipment at the WPBC site.

  MAINTENANCE:

  Will be performed as required.

PROTECTIVE RELAYING, METERING, INSTRUMENTATION AND CONTROL:

At Jenkins substation all of the protective relaying and control modifications and new equipment have been described above.

MAJOR EQUIPMENT/MATERIAL LIST:

- 1 set of RFL 9745 DTT equipment, and associated auxiliary relays, in a cabinet.
- 1 auxiliary relay and 1 synchronism check relay (ABB type 25V).
- 1 dedicated phone line and associated protective equipment.
- 1 69 kV potential transformer.

Georgetown, East Mountain, Wright and the customer-owned GE-Harris/Fairchild Semiconductor Distribution Substations:

INSTALL:

Install a synchronism check relay for each transformer 12 kV circuit breaker and modify the breaker controls to prevent automatic breaker closing if the 69 kV line is energized only by the WPBC.

REMOVE:

No equipment to be removed.

TEST:

Testing will be completed after installation of the above equipment at the various substations, and after installation of the required protection equipment at the WPBC site.

MAINTENANCE:

Will be performed as required.

PROTECTIVE RELAYING, METERING, INSTRUMENTATION AND CONTROL:

At these four 69/12 kV substations, all of the protective relaying and control modifications and new equipment have been described above.

MAJOR EQUIPMENT/MATERIAL LIST:

- 2 synchronism check relays (ABB type 25V), mounted in a cabinet, per substation.

5. Metering & Communications:

Metering and communications issues are described in section A4, A5, and B4 of this study. If WPBC supplies the metering equipment, the total project cost of $547,394 would be reduced by $57,000. The Combined 69 kV Metering Unit (CT/VT) has a 15 to 17 week lead time. PPL EU will need to order this device as a long lead-time item and submit the purchase order by February 15, 2005. If L18 supplies the CT/VT, then PPL EU will need to approve the type and the accuracy of the device because the same device(s) will be used to measure energy supplied by PPL EU to the wind park during times of start-up and standby operation.

6. Environmental, Real Estate, and Permitting Issues:

Environmental, real estate, and permitting issues were reviewed for this facilities study.
PPL EU had acquired and has maintained a valid and active license with the Pennsylvania Game Commission, through an annual license fee since 2002. That license allows PPL EU to construct, operate, maintain, and remove a transmission tap on an easement area of 110 ft by 100 ft between Bear Creek Tap and the former Global Wind Harvest substation site. Prior to the start of construction activity, PPL EU must reconfirm its license with the local Land Management Officer. The PPL EU license is an agreement between only PPL EU and the Game Commission. The license does not refer to Global Wind Harvest or the WPBC developer and does not apply to the substation site.

WPBC will need to contact the Game Commission to determine the status of its license**.**

PPL EU has reviewed the proposed modification of the Bear Creek 138/69 kV Tap with the Chief Counsel of the PA PUC, through a waiver filing. The opinion of counsel is that the proposed 69 kV tap into the intertie substation is outside the intended scope of Chapter 57 of the Pennsylvania Code.

PPL EU does not expect any right-of-way (r/w) easements will be needed to route the 69 kV tap. Should r/w be needed, and subsequently acquired, those r/w costs will be in addition to the total project costs identified in paragraph A6.

No other environmental, real estate, or permitting issues were identified for this project.

7. Information Required for Interconnection Service Agreement (ISA):

Cost Estimates[2,3]:
Breakdown, by substation and transmission line, of the estimated costs for the PPL EU portion of the L18 WPBC project are:

Description	Transmission Line Tap	Jenkins Substation	Georgetown Substation
Direct Material Costs	$10,360	$29,150	$4,319
Indirect Material Costs	$1,440	$4,505	$668
Direct Labor Costs	$74,870	$49,194	$25,719
Indirect Labor Costs	$80,962	$54,270	$10,201
Total Costs	$167,632	$137,119	$40,907
Carrying Charges	$0	$2,075	$379
Total Costs & Carrying Charges	$167,632	$139,194	$41,286

[2] PA sales tax not reflected in this cost estimate table.
[3] Because costs associated with this project will be invoiced monthly, carrying charges are anticipated to be zero.

Description	East Mountain Substation	Wright Substation	GE/Harris Substation
Direct Material Costs	$4,319	$4,099	$4,319
Indirect Material Costs	$668	$634	$668
Direct Labor Costs	$18,277	$25,718	$34,581
Indirect Labor Costs	$9,382	$8,835	$11,973
Total Costs	$32,646	$39,286	$51,541
Carrying Charges	$339	$348	$442
Total Costs & Carrying Charges	$32,985	$39,634	$51,983

Description	Metering @ L18 Substation	Siting and/or Licensing Fees	Totals; Verification
Direct Material Costs	$55,971		$112,537
Indirect Material Costs	$9,515		$18,098
Direct Labor Costs	$3,728		$232,087
Indirect Labor Costs	$2,908		$178,531
Total Costs	$72,122	$2,558	$543,811
Carrying Charges			$3,583
Total Costs & Carrying Charges	$72,122	$2,558	$547,394

Summary of the estimated total costs involved in the PPL EU portion of the L18 WPBC project are:

Description	Totals for the PPL EU Portion of the Project
Direct Material Costs	$112,537
Indirect Material Costs	$18,098
Direct Labor Costs	$232,087
Indirect Labor Costs	$178,531
Sub-Total Costs; Mat'l & Labor	$541,253
Carrying Charges	$3,583
Siting and/or Licensing Fees	$2,558
Total Costs; PPL EU Project	$547,394

Schedules:

Summary of the engineering and construction schedule for the PPL EU portion of the L18 WPBC project:

Description	Transmission Line Tap		Jenkins Regional & Four Distribution Substations	
	Start	**Finish**	**Start**	**Finish**
Facilities Design	6/29/2004	1/29/2005	5/31/2004	1/31/2005
R/W Acquisition	Not Required		Not Applicable	
Material Procurement	3/1/2005	8/1/2005	2/15/2005	9/15/2005
Transmission Construction	4/1/2005	8/1/2005	Not Applicable	
Substation Construction	Not Applicable		4/1/2005	8/1/2005
Acceptance Testing	8/1/2005	9/15/2005	7/1/2005	9/15/2005

Assumptions in the Cost and Schedule Tables:

- Material delivery is based on ISA contract being signed by March 1, 2005.
- The WPBC must complete staking of its 69 kV dead-end structure by March 4, 2005, to allow PPL EU to meet the connection schedule.
- Cost estimate assumes PPL EU work will be performed during normal weekdays with no overtime.
- Schedule assumes one crew working at Jenkins, Georgetown, East Mountain, Wright and the customer-owned GE-Harris/Fairchild Semiconductor Distribution Substations.
- GE-Harris substation cannot be supplied with single-circuit 69 kV during the lightning season, which places restraints on when the relay & control modifications can be made to that substation.
- Custom-designed steel poles will not needed.
- WPBC substation is located at the former Global Wind Harvest IPP site.

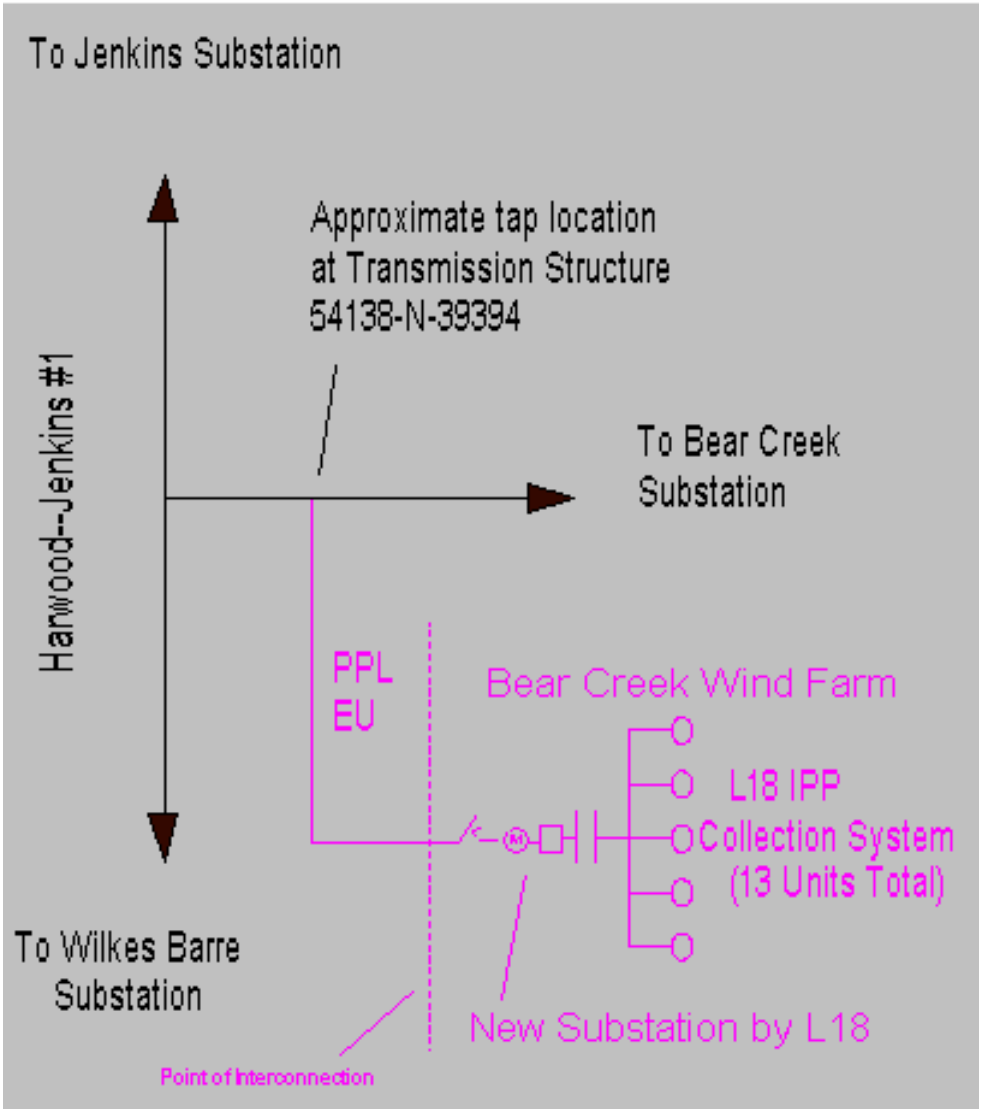
8. Transmission Owner Requirements for Voltage Fluctuations:

The PPL EU guidelines for controlling voltage fluctuations on its network lines are contained in – "Voltage Fluctuation and Flicker Guideline, SPR-640." (available upon request)

- In order to mitigate potential voltage flicker problems at the 69 kV point of interconnection, L18 IPP equipment must have a fast response, automatic, power factor controller. This controller must respond to the MW fluctuations caused by typical, gusty winds acting on the wind turbine blades, producing 69kv voltage fluctuations or flicker. The above analysis assumes L18 IPP has a fast response, automatic, power factor controller. Any further analysis will require IPP technical details of its proposed automatic controller.

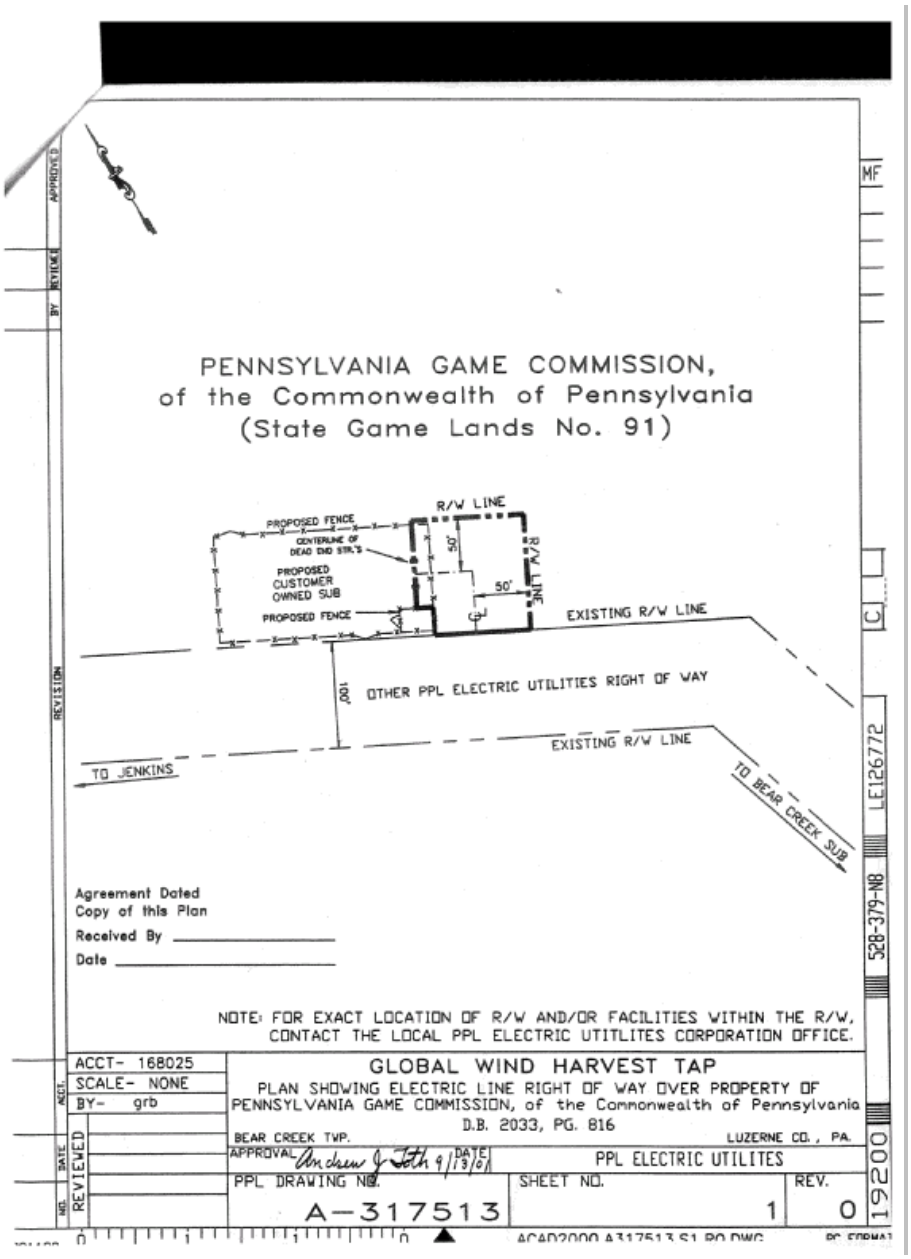
If the proposed auto-regulators at the L18 wind park are too slow to respond to wind gusts, voltage flicker may result due to the time lag inherent in switched-capacitor action. WPBC will be expected to mitigate flicker to levels deemed acceptable by PPL EU.

Attachment #1



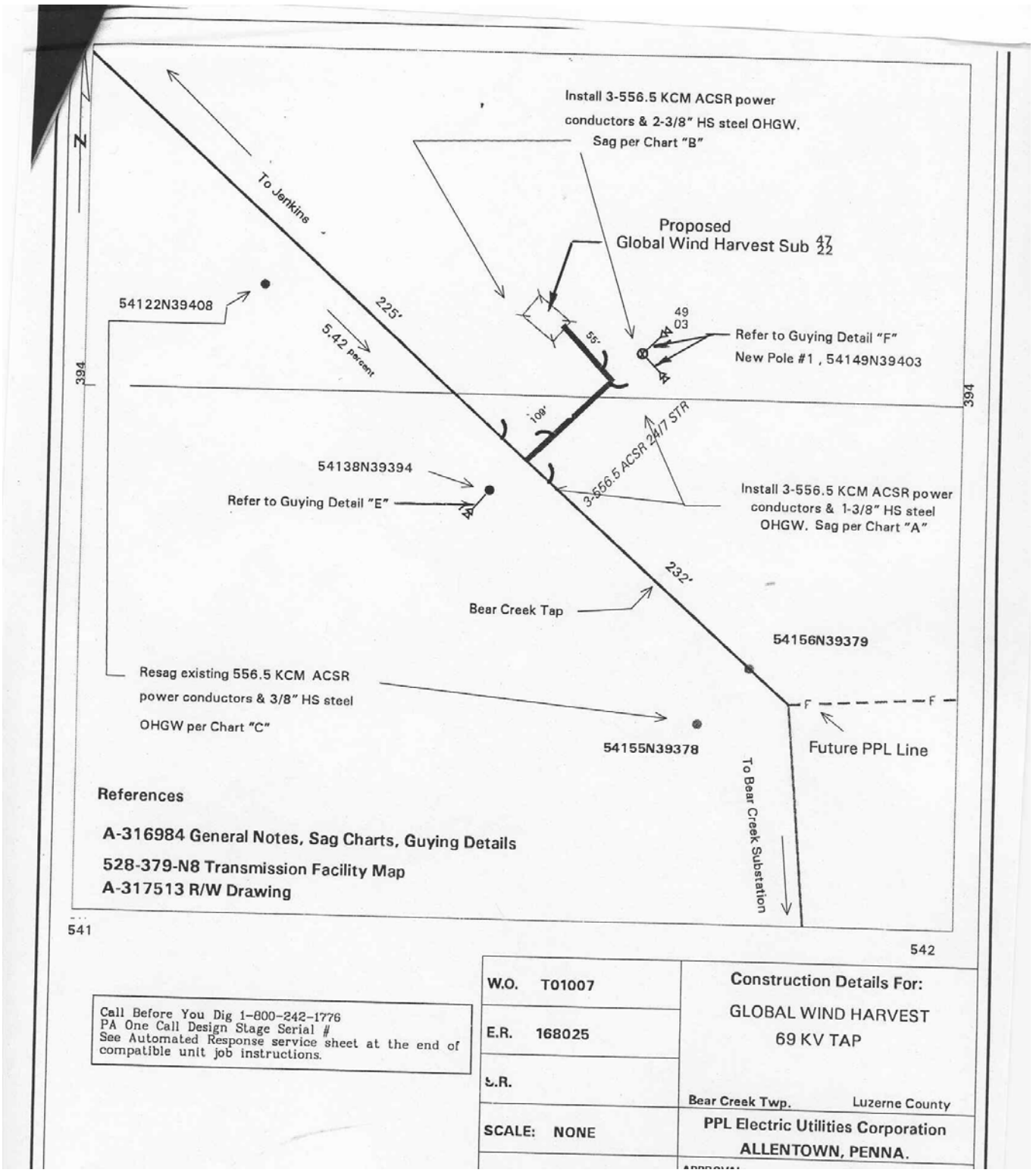
Attachment #2

PPL EU Drawing Prepared for PA Game Commission License Agreement



Attachment #3

PPL EU Drawing Showing Proposed 69 kV Tap into the Wind Park Substation



Attachment #4

IPP L18 Bear Creek Wind Farm Detailed Timeline and Milestones

In an effort to provide IPP L18 with the expectations of PPL EU regarding the technical issues and interfaces required for this project, critical issues and milestones are documented below, along with a defined timeline in order to meet the requested in service date of 1 September, 2005 for turbine-generator testing. This timeline assumes that all the necessary contractual documents will be executed by 1 March 2005, allowing PPL EU to proceed with construction and drawing review activities on 2 March 2005.

With regard to the Intertie Substation technical issues, PPL EU must receive a complete set of drawings showing the:

- station grounding,
- station physical layout,
- dead-end design & location,
- protection and control elementaries,
- potential elementaries,
- current elementaries,
- DC supply systems,
- phone line protection drawings,
- panel or cabinet front view, etc.

Please note that per PJM requirements (section 82.1.2), a registered professional engineer must sign all of the drawings and elementaries. Documentation that explains the operation of the Intertie Substation and a general description of operation of the facility will be required in order for PPL EU to assess the operational impact to the PPL EU system. This document must describe:

- aspects of the Intertie protective relaying,
- the three pole interrupting devices that the protective relaying will trip,
- what devices will reclose,
- what interlocks will exist,
- how they are intended to operate,
- what equipment and/or alarms will be monitored, and
- how these devices and/or alarms will be monitored.

Section 4 of the " Relay and Control Requirements for Parallel Operation of Generation" will clarify our drawing requirements.

The operation of the voltage regulation at zero generation, 10% generation, and levels above 25% generation are to be detailed. Previous drawings seem to indicate that approximately **50,000 feet of cable** (3 phase) will be installed for the collector system. This will represent a substantial capacitor bank action when the wind turbines are not generating. Preliminary calculations indicate 1 MVAr to 7.5 MVAr depending on cable. IPP L18 must provide detailed calculations of the **NET Var flow** when all generation is off, as well as the loading point where the generators will be able to control the power factor of the facility.

Past experience of PPL EU suggests that the Intertie protective scheme development and review process can span several months. IPP L18 is requested to carefully review section 5 of the PPL EU Interconnection Requirements document that details the items of interest. To ensure that the project moves forward in an orderly fashion and in order to meet the requested 1 September 2005

in-service date (for turbine-generator testing), PPL EU will require that IPP L18 consulting engineer(s) achieve the following milestone dates:

[A minimum of 3 copies of all drawings should be supplied to avoid delays caused by drawing reproduction time.]

1) By 7 Feb 2005, IPP L18 must decide who (L18 or PPL EU) will provide the revenue metering equipment (CT/VTs, Revenue Meter, associated equipment). If PPL EU supplies the metering equipment, that metering material and equipment must be ordered by 15 Feb 2005.

2) By the first week in March (or earlier), the IPP L18 must have its 69 kV dead-end structure and substation staked. Also, scaled drawings showing the layout of the substation and the dead-end structure with references to PPL EU transmission line facilities must be made available. In addition, a copy of the land rights that have been secured for the area of the 69 kV tap will be made available for PPL EU review.

3) In early March 2005 IPP L18 has ordered the SCADA, DTT, and voice phone lines for the IPP substation. Note: these phone lines tend to be long lead time items, and all of these lines must be in place and operational before the first generator is allowed to parallel to the PPL EU system. Also, PPL EU has been approved to order long lead metering material, which has an estimated 17-week lead-time.

4) By the first week in February 2005 IPP L18 must provide the technical contact for the project. PPL EU believes this is critical so that an exchange of engineering information can begin. PPL EU will have to provide IPP L18 with certain information regarding the DTT scheme, and the proposed PPL EU 69 kV tap. This information will be critical to IPP L18 for completion of the facility design.

5) By 15 March 2005 IPP L18 should provide PPL EU with a set of *conceptual drawings* for the Intertie protection of this facility, as well as the DTT scheme. The PPL EU intent is to review the drawings and provide preliminary approval prior to IPP L18 beginning fabrication of the Intertie protective relay cabinet or ordering major Intertie protection equipment. PPL EU will comment on any gross errors in the conceptual design.

6) By 1 April 2005 IPP L18 must provide the first set of "for approval" drawings that contain a single line, three line, final system layout, potential elementaries, current elementaries and control elementaries for the Intertie substation. Phasing (both for PPL EU and IPP L18) MUST be shown on the three line, current and potential drawings. In addition, a draft description of operation for the facility and equipment specifications will be required.

7) By 15 April 2005 PPL EU will complete its review of all the drawings provided by IPP L18. PPL EU will issue comments and request IPP L18 to make any necessary changes. PPL EU expects to provide preliminary approval for the material and relaying associated with the DTT protection equipment and the Intertie Protective Relay cabinet. If IPP L18 elects to have PPL EU provide the revenue metering, PPL EU will also provide additional information on that equipment at this time. NOTE: PPL EU requires CT and PT information at this time as well as ALL of the SCADA design drawings in order to complete the design of database changes for this facility.

8) By 1 May 2005 IPP L18 is expected to provide revised drawings for the facility, incorporating PPL EU comments. If IPP L18 consulting engineers have rebuttals to PPL EU comments or were requested by PPL EU to provide additional information, that should be submitted at this time.

9) By 15 May 2005 PPL EU will complete the second review of submitted drawings, with the intent of providing final drawing approval. PPL EU would expect to establish a dialog with IPP L18 consulting engineers regarding the preliminary Intertie protective relay settings, CT ratios and any other items of interest or concern. NOTE: if there are still significant errors or areas of concern with the drawings at this time, the in service date of the project will be in jeopardy.

10) During the period of 15 May to 15 June 2005, any drawings and associated documentation regarding the Intertie protection portion of the project are exchanged as necessary to complete the design of the IPP L18 Intertie protection facilities.

11) By 15 June 2005 PPL EU expects IPP L18 to provide a ***complete final set of signed*** design basis drawings. The IPP L18 generation and protection equipment should be nearing completion for filed checkout and acceptance testing. Scheduling of PPL EU personnel to test IPR equipment and provide acceptance tests for certain substation equipment should be arranged at this time.

12) By 1 July 2005 the IPP L18 facility should be essentially complete and ready for field checkout of equipment. Equipment at the facility should be operational, but de-energized. All DTT and phone line communication equipment should be installed. The Intertie protection DC supply system should be available. In addition, IPP L18 field support personnel must be available for assistance in the checkout and testing of the Intertie equipment.

13) By 1 July 2005, PPL EU starts testing of the IPR (Intertie Protective Relaying) and controls and interlocks. This will include the PPL EU SCADA and the DTT equipment.

14) By 1 August 2005, all Intertie Protective relaying and controls are complete and ready for functional testing the next two days. The IPP has requested 69 kV service by August 1, 2005.

15) By 1 September 2005, all PPL EU testing is completed. The IPP places the first generator in service.

16) By 15 September 2005 the IPP L18 facility is placed in service.

17) By 1 October 2005 IPP L18 provides PPL EU with any field revisions and a complete set of "as built" drawings. These drawings will become the official "Drawings of Record" for this facility.

This timeline should serve as a framework for successful completion of the project. It should be recognized that deviations from the above timetable would place this project in jeopardy and negatively impact the requested in-service date. Delays in submission of required documentation will most likely delay the required in-service date by a similar period of time. Note however, that delays beyond a certain point are no longer a day for day delay. Once this point is reached, a delay of several months may occur due to outage restrictions.

If the IPP L18 fails to meet these deadlines, the in-service date will be impacted. PPL EU expects that its field personnel will be working in a safe environment at all times and will not compromise the reliability of the PPL EU electric delivery system. To this end, PPL EU will not place its field personnel in dangerous situations due to the lack of complete design information from the IPP, incomplete facilities in the field, or to meet an unrealistic in service date. Further, during the testing phase, PPL EU will stop work when developer-based errors are found, and will resume work when these errors are corrected by the IPP. The time lost due to these errors will not be made up by compressing the remaining work beyond good utility work practices. If necessary, the in service date will slip to maintain a safe working environment.

The above schedule has a significant amount of work occurring during the period in time that PPL EU typically has very limited resources. There are also holidays during this period of time that also limit available manpower. The IPP may incur overtime rates at double normal pay rates during this time period.

Attachment #5

PPL EU Substation & Transmission Drawings, Including the GE/Harris Substation

Wright Sub; Relay & Control

DRAWING NUMBER	SHEET NUMBER	REV	ADDITIONAL DRAWING INFORMATION
A318020	8-11	0	RELAY AND CONTROL BILL OF MATERIAL
LD76706	1	10	TRANSFORMER 1 12KV CB BAY 6 ELEMENTARY AND WIRING DIAGRAMS
LD76707	1	9	TRANSFORMER 1 12KV CB BAY 6 WIRING DIAGRAM
LD76709	1	10	TRANSFORMER 2 12KV CB BAY 1 ELEMENTARY AND WIRING DIAGRAMS
LD76710	1	10	TRANSFORMER 2 12KV CB BAY 1 WIRING DIAGRAM
D318051	1	0	SYNCRONIZING CHECK RELAY CABINET FRONT VIEW AND WIRING DIAGRAM
E152441	1	4	POTENTIAL ELEMENTARY
E318015	1	2	SCADA CABINET WITH METERS PC10 48V DC WIRING DIAGRAM
JobName: WRIGHT 69-12KV SUBSTATION; Description: ADD SYNCHROCHECK RELAYS			

Wright Sub, Physical-Electrical

DRAWING NUMBER	SHEET NUMBER	REV	ADDITIONAL DRAWING INFORMATION
LA43850	90	0	BILL OF MATERIAL
LA43850	91	0	BILL OF MATERIAL
LB76713	8	1	CABLE LIST
D318054	1	1	CONTROL CUBICLE ELECTRICAL ARRANGEMENT
LE43853	1	9	12KV ELECTRICAL ARRANGEMENT
LE43854	1	16	CABLE, GROUNDING & LIGHTING PLAN AC & DC WIRING
JobName: WRIGHT 69-12KV SUBSTATION; Description: ADD EQUIPMENT FOR IPP WIND TURBINE PROJECT			

GE/Harris Sub; Relay & Control

DRAWING NUMBER	SHEET NUMBER	REV	ADDITIONAL DRAWING INFORMATION
A211356	4	0	BILL OF MATERIAL
A211356	5	0	BILL OF MATERIAL
A211356	6	0	BILL OF MATERIAL
A211356	7	0	BILL OF MATERIAL
A211356	8	0	BILL OF MATERIAL
A211356	9	0	BILL OF MATERIAL
A211356	10	0	BILL OF MATERIAL
B329054	1	0	TRANS 1 AND 2 12KV POTENTIAL JUNCTION BOX FRONT VIEW AND WIRING
D242698	1	1	HARRIS SEMICONDUCTOR 69KV 12KV SUBSTATION 12KV TRANSFORMER 1 CIRCUIT BREAKER BAY 1L CONTROL ELEMENTARY

D242699	1	1	HARRIS SEMICONDUCTOR 69KV 12KV SUBSTATION 12KV TRANSFORMER 2 CIRCUIT BREAKER BAY 1R CONTROL ELEMENTARY
D242710	1	1	HARRIS SEMICONDUCTOR 69KV 12KV SUBSTATION POTENTIAL AND CURRENT JUNCTION BOX 1L FRONT VIEW AND WIRING DIAGRAM
D242711	1	1	HARRIS SEMICONDUCTOR 69KV 12KV SUBSTATION POTENTIAL AND CURRENT JUNCTION BOX 2R FRONT VIEW AND WIRING DIAGRAM
D242713	1	1	HARRIS SEMICONDUCTOR 69KV 12KV SUBSTATION TRANSFORMER 1 CIRCUIT BREAKER BAY 1L RELAY CABINET WIRING DIAGRAM
D242716	1	1	HARRIS SEMICONDUCTOR 69KV 12KV SUBSTATION TRANSFORMER 2 CIRCUIT BREAKER BAY 1R RELAY CABINET WIRING DIAGRAM
D329052	1	0	SYNCRONIZING CHECK RELAY CABINET WIRING DIAGRAM AND FRONT VIEW
E242691	1	1	HARRIS SEMICONDUCTOR 69KV 12KV SUBSTATION POTENTIAL ELEMENTARY
JobName: HARRIS SEMICONDUCTOR 69-12KV SUBSTA; Description: ADD SYNC CHECK RELAYS			

GE/Harris Sub; Structural

DRAWING NUMBER	SHEET NUMBER	REV	ADDITIONAL DRAWING INFORMATION
A329067	1	0	BILL OF MATERIAL
D204977	1	6	MOUNTING FOR CABINETS
D210927	2	2	12KV TRANSFORMER/BUS SECTIONALIZING BAY
JobName: HARRIS SEMICONDUCTOR 69-12KV SUBSTA; Description: 12KV TRANSFORMER/BUS SECT.			

GE/Harris Sub, Physical-Electrical

DRAWING NUMBER	SHEET NUMBER	REV	ADDITIONAL DRAWING INFORMATION
A210944	13	0	BILL OF MATERIAL
A210944	14	0	BILL OF MATERIAL
A243393	5	0	CABLE LIST
B210947	1	3	HARRIS SEMICONDUCTOR 69KV 12KV SUBSTATION SECONDARY SCHEMATIC DIAGRAM AC STATION SERVICE
B210947	2	3	HARRIS SEMICONDUCTOR 69KV 12KV SUBSTATION SECONDARY SCHEMATIC DIAGRAM AC STATION SERVICE
D210937	1	4	CABLE CONDUIT AND LIGHTING PLAN
D210940	3	1	HARRIS SEMICONDUCTOR 69KV 12KV SUBSTATION 12KV TRANSFORMER BUS SECTION BAY ELECTRICAL ARRANGEMENT
D242677	1	1	AC SUPPLY BOXES 1L AND 2R AND TRANSFER SWITCH CABINET ELECTRICAL ARRANGEMENT
D242679	1	1	AC AND DC STATION SERVICE AND TRANSFER SWITCH WIRING DIAGRAM
JobName: HARRIS SEMICONDUCTOR 69-12KV SUBSTA; Description: INSTALL IPP EQUIPMENT			

Georgetown Sub; Relay & Control

DRAWING NUMBER	SHEET NUMBER	REV	ADDITIONAL DRAWING INFORMATION
A190601	9	0	BILL OF MATERIAL
A190601	10	0	BILL OF MATERIAL
A190601	11	0	BILL OF MATERIAL

D318099	1	0	SYNCRONIZING CHECK RELAY CABINET FRONT VIEW AND WIRING DIAGRAM
LE73365	1	12	LINE TIE CB BAY 6 ELEMENTARY AND WIRING DIAGRAM
E156188	1	6	TRANSFORMER 1 CB BAY 2 RELAY CABINET FRONT VIEW AND WIRING DIAGRAM
E156189	1	8	TRANSFORMER 2 CB BAY 10 RELAY CABINET FRONT VIEW AND WIRING DIAGRAM
E156193	1	4	POTENTIAL ELEMENTARY WIRING DIAGRAM X/NFM3/LIB/ELECTRIC UTILITIES/ARCHIVE
E156194	1	5	12KV CIRCUIT BREAKER BAY 2 AND 10 CONTROL ELEMENTARIES
E231797	1	4	SCADA CABINET PC10 WIRING DIAGRAM X/NFM3/LIB/ELECTRIC UTILITIES/ARCHIVE
E231797	2	4	SCADA CABINET PC10 WIRING DIAGRAM X/NFM3/LIB/ELECTRIC UTILITIES/ARCHIVE
JobName: GEORGETOWN 69-12KV SUBSTATION; Description: ADD SYNCROCHECK RELAYS			

Georgetown Sub, Physical-Electrical

DRAWING NUMBER	SHEET NUMBER	REV	ADDITIONAL DRAWING INFORMATION
LA73348	66	0	BILL OF MATERIAL
LA73348	67	0	BILL OF MATERIAL
LA73348	68	0	BILL OF MATERIAL
LA73352	1	6	12KV ELEC ARRGT BAY #2
LA73352	9	4	12KV ELEC ARRGT BAY #10
LB73360	18	2	CABLE AND CONDUIT LIST 246 TO 253
LE73351	1	17	CABLE GROUNDING AND LIGHTING PLAN AC AND DC WIRING DIAGRAMS X/NFM3/LIB/ELECTRIC UTILITIES/ARCHIVE
LE73353	1	10	CONTROL CUBICLE ELECTRICAL ARRANGEMENT X/NFM3/LIB/ELECTRIC UTILITIES/ARCHIVE
JobName: GEORGETOWN 69-12KV SUBSTATION; Description: ADDED SYNC CHECK REL CAB			

East Mountain Sub; Relay & Control

DRAWING NUMBER	SHEET NUMBER	REV	ADDITIONAL DRAWING INFORMATION
A232910	1	2	DESCRIPTION OF RELAYING AND CONTROL
A328124	1 THRU 3	0	RELAY AND CONTROL BILL OF MATERIAL
C317994	1	1	SYNCHRONIZING CHECK RELAY CABINET FRONT VIEW AND WIRING DIAGRAM G:\DOCUMENT MANAGEMENT\DMS_ARCHIVE\F200E_W_C317994_S1_R0.DWG
D232388	1	4	POTENTIAL AND CURRENT JUNCTION BOX 2 FRONT VIEW AND WIRING DIAGRAM DEVELOPED FROM D208583 REVISION 8 X/NFM3/LIB/ELECTRIC UTILITIES/ARCHIVE
D232389	1	4	POTENTIAL AND CURRENT JUNCTION BOX 1 FRONT VIEW AND WIRING DIAGRAM DEVELOPED FROM D208583 REVISION 8 X/NFM3/LIB/ELECTRIC UTILITIES/ARCHIVE
D232391	1	4	TRANSFORMER 2 CB BAY 1R RELAY CABINET WIRING DIAGRAM X/NFM3/LIB/ELECTRIC UTILITIES/ARCHIVE
D232415	1	4	TRANSFORMER 1 CB BAY 1L RELAY CABINET WIRING DIAGRAM X/NFM3/LIB/ELECTRIC UTILITIES/ARCHIVE
D232426	1	3	12KV TRANSFORMER 2 CB BAY 1R CONTROL ELEMENTARY X/NFM3/LIB/ELECTRIC UTILITIES/ARCHIVE
D232427	1	3	12KV TRANSFORMER 1 CB BAY 1L CONTROL ELEMENTARY X/NFM3/LIB/ELECTRIC UTILITIES/ARCHIVE

E232381	1	4	POTENTIAL ELEMENTARY X/NFM3/LIB/ELECTRIC UTILITIES/ARCHIVE
JobName: EAST MOUNTAIN 69-12KV SUBSTATION; Description: ADD SYNCHRONIZING CHECK RELAY CABINET			

East Mountain Sub, Physical-Electrical

DRAWING NUMBER	SHEET NUMBER	REV	ADDITIONAL DRAWING INFORMATION
A231990	33	1	BILL OF MATERIAL ITEMS 800 THRU 2143H REQUIRED TO ADD A SYNCHRONIZING CHECK RELAYING CABINET
A231990	34	1	BILL OF MATERIAL ITEM 2326 REQUIRED TO ADD A SYNCHRONIZING CHECK RELAYING CABINET
B231991	7	4	CABLE LIST 161 TO 192 X/NFM3/LIB/ELECTRIC UTILITIES/ARCHIVE
D231995	1	6	CABLE CONDUIT AND LIGHTING PLAN X/NFM3/LIB/ELECTRIC UTILITIES/ARCHIVE
D231995	2	6	CABLE CONDUIT AND LIGHTING PLAN X/NFM3/LIB/ELECTRIC UTILITIES/ARCHIVE
D232002	1	3	CONTROL CUBICLE ELECTRICAL ARRANGEMENT X/NFM3/LIB/ELECTRIC UTILITIES/ARCHIVE
JobName: EAST MOUNTAIN 69-12KV SUBSTATION; Description: REINSTALLED IPP PROJECT			

Jenkins Sub; Relay & Control

DRAWING NUMBER	SHEET NUMBER	REV	ADDITIONAL DRAWING INFORMATION
A181967	59-63	0	RELAY & CONTROL BILL OF MATERIAL
B329026	1	0	HARWOOD 1 69KV LINE A PH POTENTIAL TRANSFORMER SWITCHBOX FRONT VIEW AND WIRING DIAGRAM
C222374	822	0	24 IN. 9W) X 8 IN.(H) PANEL PLATE ITEM 8000A - SYNCHRONIZING FOR M3 & M4 SWITCHBOARDS PUNCHING & DRILLING DETAIL
LD70426	1	14	69KV CIRCUIT BREAKER BAY 3 CURRENT AND CONTROL ELEMENTARY
D175360	1	7	69KV CB BAY 3 WIRING DIAGRAM
D329027	1	0	BEAR CREEK WIND FARM DTT TONE TRANSMIT AND RECEIVER PERMISSIVE CONTROL ELEMENTARY
D329028	1	0	BEAR CREEK WIND FARM DTT TONE CABINET CABINET ARRANGEMENT
D329029	1	0	BEAR CREEK WIND FARM DTT TONE CABINET WIRING DIAGRAM
LF70432	1	27	69KV POTENTIAL ELEMENTARY DIAGRAM
LF70432	2	2	69KV POTENTIAL ELEMENTARY DIAGRAM
LF70439	1	25	ANNUNCIATOR AND ALARM CIRCUITS ELEMENTARY DIAGRAM
LF70465	1	23	PANEL 6C WIRING DIAGRAM

LF70469	1	30	PANEL 8C WIRING DIAGRAM
LF70470	1	16	69KV PANEL 8R WIRING DIAGRAM
LF70471	1	31	PANEL 10C WIRING DIAGRAM
LF70472	1	30	PANEL 10R WIRING DIAGRAM
LE70477	2	29	69KV CONTROL PANELS FRONT VIEWS
LE70478	2	21	69KV RELAY PANELS 4R TO 11R FRONT VIEWS
LF85301	1	12	CIRCULATING CURRENT METHOD TRANSFORMER T.C.U.L. VOLTAGE & PARALLELING CONTROL WIRING DIAGRAM
LE95418	2	14	PANEL 14C SCADA WIRING DIAGRAM
E178253	1	13	69KV BUS 2 BREAKER FAILURE ELEMENTARY
E210288	1	5	MOBILE TRANSFORMER INSTALLATION ANNUNCIATOR AND ALARM ELEMENTARY
JobName: JENKINS 230-69KV SUBSTATION; Description: BEAR CREEK WIND FARM DTT			

Jenkins Sub, Physical-Electrical

DRAWING NUMBER	**SHEET NUMBER**	**REV**	**ADDITIONAL DRAWING INFORMATION**
LA70407	184	0	BILL OF MATERIAL
LA70407	185	0	BILL OF MATERIAL
LA70407	186	0	BILL OF MATERIAL
LA70407	187	0	BILL OF MATERIAL
LA70407	188	0	BILL OF MATERIAL
LA70407	189	0	BILL OF MATERIAL
LB70408	50	6	CABLE LIST
LB70408	51	2	CABLE LIST
B127651	2	10	69KV PRIMARY DIAGRAM ONE LINE DIAGRAM
LD70401	1	11	ELECTRICAL 69KV SWITCHYARD BAY 1 2 AND 3 SECTIONS
LD70401	5	2	JENKINS 230KV 69KV SUBSTATION 69KV SWITCHYARD SECTIONS ELECTRICAL ARRANGEMENT
LD70406	1	23	CONTROL CUBICLE ELECTRICAL ARRANGEMENT
LD70406	2	9	CONTROL CUBICLE ELECTRICAL ARRANGEMENT
LD70419	1	19	COMMERCIAL TELEPHONE FACILITIES AND WIRING DIAGRAM ARRANGEMENT
LF70404	1	11	ELECTRICAL 230KV AND 69KV SWITCHYARD GROUNDING PLAN
LF70405	1	21	ELECTRICAL 230KV 69KV SWITCHYARD CONDUIT AND LIGHTING PLAN
E155603	2	8	69KV SWITCHYARD BAYS 1 2 3 AND 4 THREE LINE DIAGRAM
JobName: JENKINS 230-69KV SUBSTATION; Description: ADD EQUIP. TO SUPPORT IPP WIND TURBINE PROJECT			

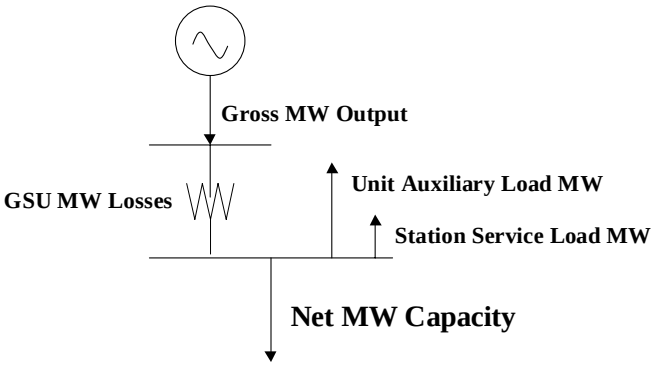
Transmission Line Tap, Physical-Electrical & Structural

DRAWING NUMBER	SHEET NUMBER	REV	ADDITIONAL DRAWING INFORMATION
A316984_S001.DOC	1	1	Index Sheet & References
A316984_S002.DWG	2	-	General Notes
A316984_S003.DWG	3	-	General Notes
A316984_S004.DWG	4	-	Sag Charts
A316984_S005.DWG	5	-	Phasing & Guying Details
A316984_S006.DWG	6	-	Phasing & Guying Details
A316984_S007.DWG	7	-	Jumper Loop Arrangement
		-	
528-379-N8		-	Transmission Facility Map
LE-126772		-	Bear Creek 138/69 kV Tap
A-317513		-	R/W Drawing

JobName: BC Wind Farm Tap; Description: Tap the existing Bear Creek 138/69 kV tap, extend s/c 69 kV line for 165 ft.

ATTACHMENT #5

Unit Capability Data



Net MW Capacity = (Gross MW Output - GSU MW Losses* – Unit Auxiliary Load MW - Station Service Load MW)

Queue Letter/Position/Unit ID: _____ L18

Primary Fuel Type: _____ Wind

Maximum Summer (92º F ambient air temp.) Net MW Output**:_____1.96/turbine

Maximum Summer (92º F ambient air temp.) Gross MW Output: _____ 2/turbine

Minimum Summer (92º F ambient air temp.) Gross MW Output: _____ 0

Maximum Winter (30º F ambient air temp.) Gross MW Output: _____ 2

Minimum Winter (30º F ambient air temp.) Gross MW Output: _____ 0

Gross Reactive Power Capability at Maximum Gross MW Output – Please include Reactive Capability Curve (Leading and Lagging): _____ 0

Individual Unit Auxiliary Load at Maximum Summer MW Output (MW/MVAR): _____ N/A

Individual Unit Auxiliary Load at Minimum Summer MW Output (MW/MVAR): _____ N/A

Individual Unit Auxiliary Load at Maximum Winter MW Output (MW/MVAR): _____ N/A

Individual Unit Auxiliary Load at Minimum Winter MW Output (MW/MVAR): _____ N/A

Station Service Load (MW/MVAR): _____ N/A

* GSU losses are expected to be minimal.
** Your project's declared MW, as first submitted in Attachment N, and later confirmed or modified by the Impact Study Agreement, should be based on either the 92º F Ambient Air Temperature rating of the unit(s) or, if less, the declared Capacity rating of your project.

Unit Generator Dynamics Data

Queue Letter/Position/Unit ID: L18

MVA Base (upon which all reactances, resistance and inertia are calculated): 2.0

Nominal Power Factor: 1.0

Terminal Voltage (kV): 0.69

Unsaturated Reactances (on MVA Base)

- Direct Axis Synchronous Reactance, $X_{d(i)}$: 7.6
- Direct Axis Transient Reactance, X'd(i): 0.3
- Direct Axis Sub-transient Reactance, X"d(i): 0.3
- Quadrature Axis Synchronous Reactance, Xq(i): N/A
- Quadrature Axis Transient Reactance, X'q(i): N/A
- Quadrature Axis Sub-transient Reactance, X"q(i): N/A
- Stator Leakage Reactance, Xl: 0.467
- Negative Sequence Reactance, X2(i): 0.186
- Zero Sequence Reactance, X0: 0.062

Saturated Sub-transient Reactance, X"d(v) (on MVA Base): 0.27

Armature Resistance, Ra (on MVA Base): 0.01

Time Constants (seconds)

- Direct Axis Transient Open Circuit, T'_{do}: 0.07573
- Direct Axis Sub-transient Open Circuit, $T"_{do}$: 0.07573
- Quadrature Axis Transient Open Circuit, T'_{qo}: N/A
- Quadrature Axis Sub-transient Open Circuit, $T"_{qo}$: N/A
- Inertia, H (kW-sec/kVA, on KVA Base): 0.9132

Speed Damping, D: N/A

Saturation Values at Per-Unit Voltage [S(1.0), S(1.2)]: N/a

Units utilize a *Generator model*

Unit GSU Data

Queue Letter/Position/Unit ID: _____ L18

Generator Step-up Transformer MVA Base: _____ 2.5

Generator Step-up Transformer Impedance (R+jX, or %, on transformer MVA Base): _____ 6%

Generator Step-up Transformer Reactance-to-Resistance Ration (X/R): _____10

Generator Step-up Transformer Rating (MVA): _____ 2.5

Generator Step-up Transformer Low-side Voltage (kV): _____ 0.69

Generator Step-up Transformer High-side Voltage (kV): _____ 34.5

Generator Step-up Transformer Off-nominal Turns Ratio: _____1

Generator Step-up Transformer Number of Taps and Step Size:_____ +/-2.5%, +/-5%

Farm Transformer Data

Queue Letter/Position/Unit ID: _____ L18

Generator Step-up Transformer MVA Base: _____34

Generator Step-up Transformer Impedance (R+jX, or %, on transformer MVA Base): _____ 7%

Generator Step-up Transformer Rating (MVA): _____34

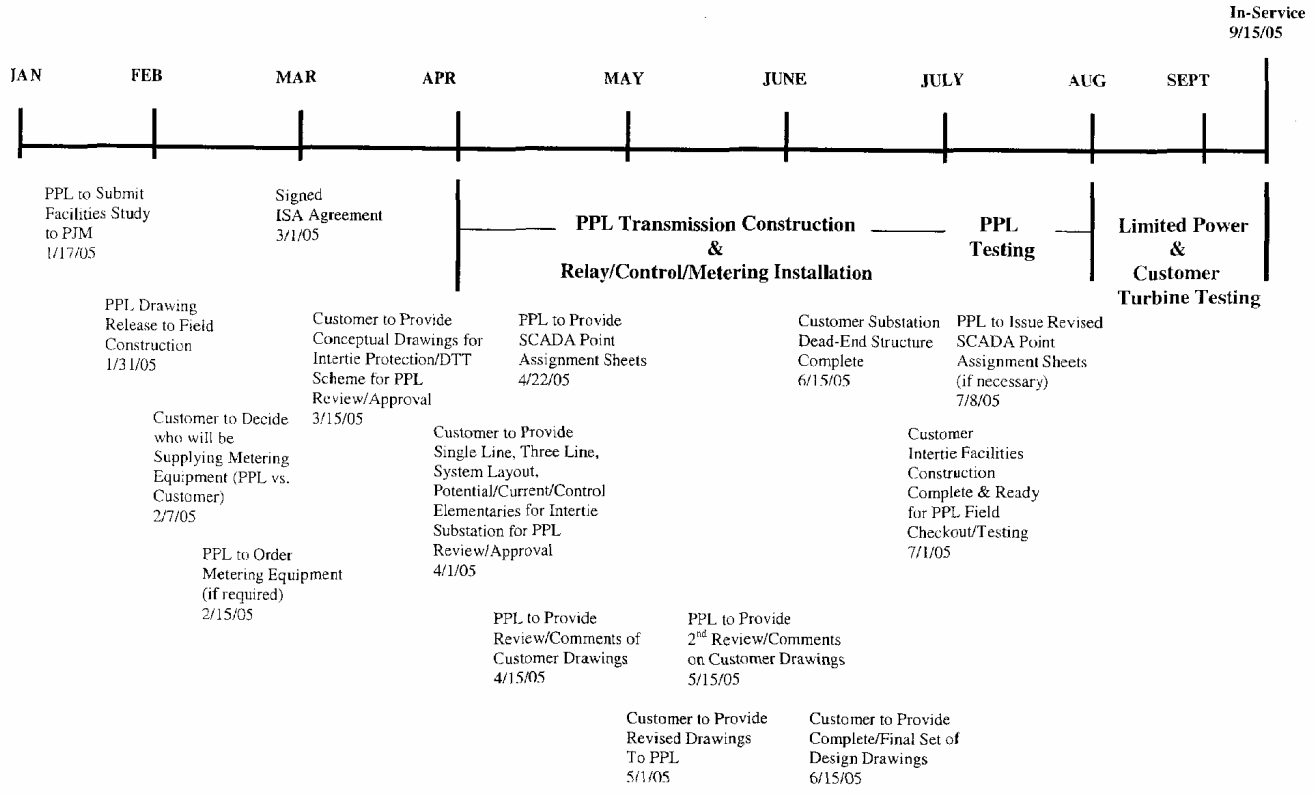
Generator Step-up Transformer Low-side Voltage (kV): _____ 34.5

Generator Step-up Transformer High-side Voltage (kV): _____69

Generator Step-up Transformer Off-nominal Turns Ratio: _____1

Generator Step-up Transformer Number of Taps and Step Size:_____ +/-2.5%

L18 - Bear Creek IPP Schedule



L18 Bear Creek IPP Schedule.doc 01/17/05