PACIFICORP

Small Generator Interconnection
Tier 4 Facilities Study Report

Completed for

(“Interconnection Customer”)
TCS-30

Proposed Interconnection
On PacifiCorp’s
Klamath Falls-Fishhole 69 kV transmission line

February 8, 2022

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1.0 DESCRIPTION OF THE PROJECT

The Interconnection Customer has proposed to interconnect 10 MW of new generation to the Transmission Provider's Klamath Falls-Fishhole 69 kV transmission line (Line 9) located in Klamath County, Oregon. The Interconnection Request is proposed to consist of a 12,000 KVA Exergy GEX 1000 organic rankine cycle expander generator for a total output of 10 MW at the Point of Interconnection. The requested commercial operation date is July 1, 2021.

Interconnection Customer will operate this generator as a Qualified Facility as defined by the Public Utility Regulatory Policies Act of 1978 (PURPA).

The Public Utility has assigned the project "TCS-30."

2.0 APPROVAL CRITERIA FOR TIER 4 INTERCONNECTION REVIEW

Pursuant to 860-082-0060(1), a public utility must use the Tier 4 interconnection review procedures for an application to interconnect a small generator facility that meets the following requirements:

(a) The small generator facility does not qualify for or failed to meet Tier 1, Tier 2, or Tier 3 interconnection review requirements; and
(b) The small generator facility must have a nameplate capacity of ten (10) megawatts or less.

3.0 SCOPE OF THE STUDY

Pursuant to 860-082-0060(8) the Facilities Study Report shall consist of:

(a) A detailed scope identifying the interconnection facilities and system upgrades required to safely interconnect the small generator facility including the electrical switching configuration of the equipment, including the transformer, switchgear, meters, and other station equipment as applicable;
(b) A reasonable schedule for completion of the study;
(c) A good-faith, non-binding estimate of the costs for the facilities and upgrades, including equipment, engineering, procurement, and construction costs, and;
(d) A detailed estimate of the time required to procure, construct, and install the required interconnection facilities and system upgrades.

The information contained in this study report is based on preliminary information and not to be used for construction.

4.0 PROPOSED POINT OF INTERCONNECTION

The Interconnection Customer's proposed Small Generator Facility is to be interconnected to the Transmission Provider's Klamath Falls-Fishhole 69 kV transmission line (Line 9) via a new Point of Interconnection substation. The proposed POI is located approximately 5.48 miles from Transmission Provider's Dairy substation and 3.90 miles from Lakeview Junction near structure 7/12. Figure 1 below is a one-line diagram that that illustrates the interconnection of the proposed generating facility to the Public Utility's system.

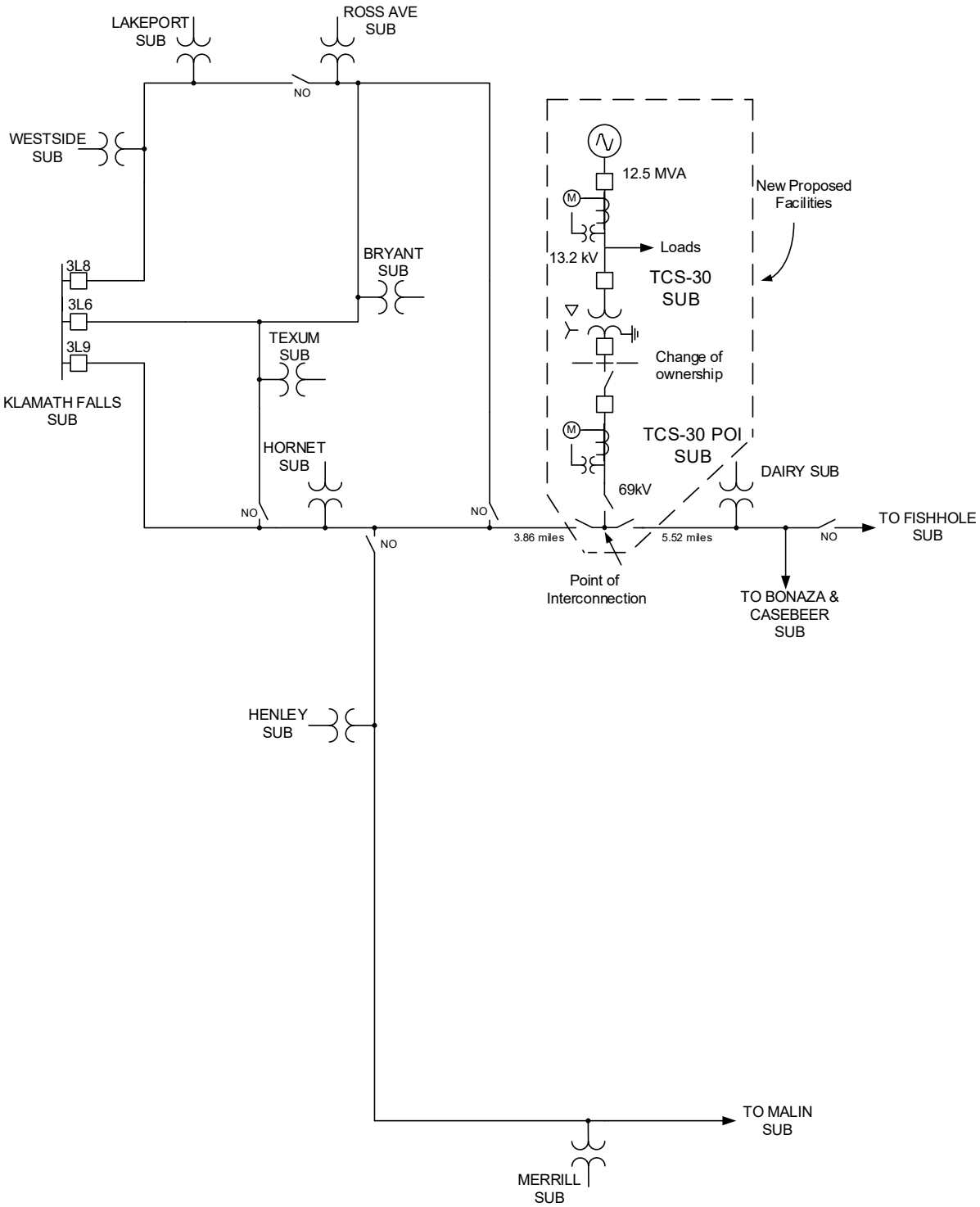

Figure 1: System One Line Diagram

5.0 STUDY ASSUMPTIONS

- All active higher priority transmission service and/or generator interconnection requests will be considered in this study and are listed in Appendix 1. If any of these requests are withdrawn,

the Public Utility reserves the right to restudy this request, as the results and conclusions contained within this study could significantly change.

- For study purposes there are two separate queues:
  - Transmission Service Queue: to the extent practical, all network upgrades that are required to accommodate active transmission service requests and are expected to be in-service on or after the Interconnection Customer's requested in-service date for the Project will be modeled in this study.
  - Generation Interconnection Queue: when relevant, interconnection facilities associated with higher queue interconnection requests will be modeled in this study. However, no generation will be simulated from any higher queued project unless a commitment has been made to obtain transmission service.
- The Interconnection Customer's request for interconnection service in and of itself does not convey transmission service.
- This study assumes the Project will be integrated into Public Utility's system at the agreed upon and/or proposed point of interconnection.
- The Interconnection Customer will construct and own the facilities required between the point of interconnection and the Project.
- Generator tripping may be required for certain outages.
- All facilities will meet or exceed the minimum WECC, NERC, and Public Utility performance and design standards.
- The technical analysis modeled the TCS-30 generating plant with a maximum nameplate generating capability of 10 MW and with 2.56 MW of total plant-side loads. However, the scope of this study does not address load service requirements associated with the Interconnection Customer's site loads. A separate request needs to be submitted to the Transmission Provider through a separate load interconnection process.
- The Transmission Provider assumes that it can obtain approval from the Federal Aviation Administration ("FAA") to construct a microwave tower in the new POI substation to support communications requirements. If unable to obtain approval, the Transmission Provider will need to install fiber optic cable which will change the scope and costs summarized in this report.
- This report is based on information available at the time of the study. It is the Interconnection Customer's responsibility to check the Public Utility's web site regularly for transmission system updates (http://www.pacificorp.com/tran.html)

6.0 REQUIREMENTS

6.1 SMALL GENERATOR FACILITY REQUIREMENTS

The following outlines the design, procurement, construction, installation, and ownership of equipment at the Interconnection Customer's Small Generation Facility.

6.1.1 INTERCONNECTION CUSTOMER TO BE RESPONSIBLE FOR

- Procure all necessary permits, lands, rights of way and easements required for the construction and continued maintenance of the TCS-30 Small Generator Facility and collector substation.

- Design, procure, construct, own and maintain the Interconnection Customer's Small Generator Facility and associated collector substation.
- Operate the Small Generating Facility under constant power factor mode with a unity power factor setting unless specifically requested otherwise by the Transmission Provider.
- Design and operate the Small Generating Facility such that is does not participate in active voltage regulation of the Transmission Provider's system unless authorized by the Transmission Provider.
- Design the Small Generating Facility with sufficient reactive capacity to enable the delivery of 100 percent of the output to the POI at unity power factor measured at 1.0 per unit voltage under steady state conditions.
- Operate the Small Generating Facility so as to maintain the voltage at the POI between 1.01 pu to 1.04 pu unless authorized to adjust these values by the Transmission Provider.
- Equip the Small Generator Facility with automatic voltage-control equipment and operate with the voltage regulation control mode enabled unless explicitly authorized to operate another control mode by the Public Utility.
- Operate the Small Generator Facility with a voltage droop..
- Meet all NERC and WECC low voltage ride-through requirements.
- Provide the Public Utility a standard model from the WECC Approved Dynamic Model Library.
- Design the Generating Facility control system such that it can receive an analog output from the Transmission Provider for setpoint control and provide an analog input back to the Transmission Provider on the status of the setpoint.
- Install a protective relaying system that will detect faults in the Interconnection Customer's 69/12.5 kV transformer in two cycles or less.
- Design and construct the collector substation such that the ground grid can be connected to the POI substation ground grid to support the installation of a Transmission Provider owned and maintained bus differential scheme. The Interconnection Customer is responsible to ensure the ground grid design supports safe step and touch potentials.
- Design, provide and install conduits between the Interconnection Customer collector substation and the marshalling cabinet to be installed just inside the fence of the POI substation to support copper circuits installed between the facilities.
- Provide and install a set of current transformers to be fed into the bus differential relays with a maximum current transformer ratio matching the maximum CT ratio of the breaker at the POI substation. Provide

and install conduit and cabling to the POI substation marshalling cabinet with these outputs.

- Perform a CDEGS grounding analysis of the Interconnection Customer collector substation location and provide results to the Transmission Provider.
- Design, provide and install control cabling (number and size TBD) and hard wire the Interconnection Customer's source devices to the marshalling cabinet. Replicated values are not acceptable.
- Provide the following data points from the collector substation via hardwire to the marshalling cabinet located in the POI substation. Please note that these points are based on the most recent design information provided by the Interconnection Customer and could change based on final design:

  Analogs:
  - 13.2 kV A phase voltage
  - 13.2 kV B phase voltage
  - 13.2 kV C phase voltage
  - Real power MW (generator)
  - Reactive power MVAR (generator)
  - Energy Register KWH
  - Energy Register KVARH
  - Unit GEN Setpoint MW (send/receive)

  Status:
  - 69 kV customer breaker
  - 13.2 kV customer breaker (transformer)
  - 13.2 kV customer breaker (generator)
- Provide and install conductor, shield wire and line hardware in sufficient quantities to allow the Transmission Provider to terminate the segment running from the collector substation deadend structure into the POI substation deadend structure. The last segment will be owned by the Transmission Provider.
- Procure and install a Transmission Provider approved weather proof enclosure for the Transmission Provider's generation metering equipment. Provide the Transmission Provider the necessary easement for the enclosure as well as unrestricted access to the enclosure location.
- Coordinate with the Transmission Provider to install cable from the metering equipment to the POI substation fence line.
- Arrange for and provide permanent retail service for power that will flow from the Transmission Provider's system when the Project is not generating with the Transmission Provider's retail business unit. This arrangement must be in place prior to approval for backfeed.
- Provide any construction or backup retail service necessary for the Project.

6.1.2 PUBLIC UTILITY TO BE RESPONSIBLE FOR

- Provide the Interconnection Customer the necessary specifications to allow the ground grid of the Interconnection Customer's collector substation and the POI substation to be tied together.
- Provide the Interconnection Customer the necessary specifications for the bus between the Interconnection Customer's collector substation and the new POI substation to be connected.
- Coordinate with Interconnection Customer on the location, size, and types of conduits and control cables between the POI substation and the collector substation.
- Provide the Interconnection Customer the specifications for the weatherproof enclosure for the Transmission Provider metering equipment.
- Procure and install 13.2 kV metering equipment including two (2) revenue quality meters, test switch, instrument transformers, metering panels, junction box and secondary metering wire.
- Coordinate with the Interconnection Customer to install cable from the metering equipment to the POI substation fence line.

6.2 POINT OF INTERCONNECTION

The following outlines the design, procurement, construction, installation, and ownership of equipment at the Point of Interconnection.

6.2.1 PUBLIC UTILITY TO BE RESPONSIBLE FOR

- Procure the necessary permits and property rights required in order to construct and own the new POI substation including a microwave system.
- Design, procure and construct, own and maintain a new 69 kV, single breaker substation which will include the following major pieces of equipment:
  - (1) 69 kV Circuit Breaker
  - (2) 69 kV group operated switches
  - (3) CT/VT metering units
  - Control Building
- Perform a CDEGS grounding analysis of the POI substation location.
- Terminate the last bus/line segment running from the Interconnection Customer's collector substation deadend structure into the POI substation deadend structure using Interconnection Customer provided and installed conductor, shield wire and line hardware.
- Terminate the transmission lines running from the Klamath Falls and Fishhole substations.
- Design, procure and install a marshalling cabinet near the Interconnection Customer's collector substation shared fence line.

- Provide and install conduit and control cabling between the marshalling cabinet and the control building.
- Design, procure and install a bus differential relay system for the connection to the Interconnection Customer's collector substation.
- Procure and install a relay for under/over voltage and over/under frequency protection of the system.
- Procure and install a protective relay system to detect faults on the Transmission Provider's 69 kV transmission system and to receive transfer trips signals.
- Procure and install a remote terminal unit ("RTU") and associated communications equipment.
- Include the following data points from the new POI substation into the new substation RTU:
  Analogs:
  - 69 kV A phase voltage
  - 69 kV B phase voltage
  - 69 kV C phase voltage
  - Real power MW
  - Reactive power MVAR
  - Energy Register KWH
  - Energy Register KVARH
- Design and construct a microwave system including a self-supporting tower, antenna and additional supportive communications equipment. The microwave will be designed to develop a link with the Transmission Provider's existing Hamaker Mountain communications site.
- Design, procure and install 69 kV revenue metering equipment for the Project including two (2) revenue quality meters, test switch, instrument transformers, metering panels, junction box and secondary metering wire.
- Provide and install an Ethernet connection for retail sales and generation accounting via the MV-90 translation system.

6.3 OTHER

The following outlines the design, procurement, construction, installation, and ownership of equipment beyond the Point of Interconnection.

6.3.1 PUBLIC UTILITY TO BE RESPONSIBLE FOR

- Fishhole-Klamath Falls Transmission Line
  - Loop the transmission line in/out of the new POI substation which will require a minimum of one new structure and the replacement of two existing structures along with conductor to the deadend structures in the substation.

- Klamath Falls Substation
  - Reconfigure the controls for breakers 3L6 and 3L9 to send a transfer trip signal any time the breaker opens when the breaker is the source to the Small Generating Facility location.

- Malin Substation
  - Reconfigure the controls for breakers 3L179 to send a transfer trip signal any time the breaker opens when the breaker is the source to the Small Generating Facility location.

- Hamaker Mountain Communications Site
  - Install communications equipment to develop a link with the microwave system in the POI substation.

- Operational Developments
  - Develop and implement a transfer trip scheme to disconnect the Interconnection Customer's Small Generating Facility whenever the source circuit breaker in either Klamath Falls or Malin substation opens.
  - Develop and implement operational procedures to curtail the Small Generating Facility when the Transmission Provider's transmission system is in an abnormal configuration.

- System Operations Centers
  - Update databases to include the Large Generating Facility, Interconnection Facilities and Network Upgrades.

7.0 COST ESTIMATE

The following estimate represents only scopes of work that will be performed by the Public Utility. Costs for any work being performed by the Interconnection Customer are not included.

TCS-30 Generation Site $90,000
Metering

POI substation $2,100,000
Construct new single breaker 72.5 kV substation with line termination and metering

Klamath Falls-Fishhole Transmission Line $390,000
Loop in/out of POI substation

Hamaker Mountain Communication Site $60,000
Communication upgrades

Klamath Falls substation $20,000
Relay upgrades

Total: $2,660,000

*Any distribution line modifications identified in this report will require a field visit analysis in order to obtain a more thorough understanding of the specific requirements. The estimate provided above for this work could change substantially based on the results of this analysis. Until this field analysis is performed the Transmission Provider must develop the project schedule using conservative assumptions. The Interconnection Customer may request that the Transmission Provider perform this field analysis, at the Interconnection Customer's expense, prior to the execution of an Interconnection Agreement in order to obtain more cost and schedule certainty.

Note: Costs for any excavation, duct installation and easements shall be borne by the Interconnection Customer and are not included in this estimate. This estimate approximates the costs incurred by the Public Utility to interconnect this Small Generator Facility to the Public Utility's electrical distribution or transmission system based upon the level of study completed to-date. The Interconnection Customer will be responsible for all actual costs, regardless of the estimated costs communicated to or approved by the Interconnection Customer.

8.0 SCHEDULE

Execute Interconnection Agreement	April 1, 2022
Provision of First Progress Payment	April 18, 2022
*Interconnection Customer Initial Design Package Provided	May 20, 2022
Transmission Provider Engineering & Procurement Commences	June 6, 2022
Interconnection Customer EIM Modeling Data Submittal	July 1, 2022
Interconnection Customer Property/Permits/ROW Procured	September 2, 2022
Transmission Provider Property/Permits/ROW Procured	February 10, 2023
*Interconnection Customer Final Design Package Provided	March 10, 2023
Transmission Provider Engineering Design Complete	June 16, 2023
Transmission Provider Construction Commences	August 7, 2023
Interconnection Customer Maintenance and Commissioning Plans Provided	September 1, 2023
Interconnection Customer and Transmission Provider Construction Complete	December 8, 2023
Transmission Provider Commissioning Activities Complete	January 19, 2024

Transmission Provider Commissioning Document Review Complete	January 29, 2024
Interconnection Customer's Facilities Receive Backfeed Power	January 30, 2024
Initial Synchronization/Generation Testing	February 5, 2024
Commercial Operation	March 5, 2024

*Interconnection Customer initial design package shall include final generating facility location, inverter/turbine selection, basic protection package, tie line route and collector system locations and data as applicable. Interconnection Customer final design package shall include PE stamped issued for construction ("IFC") drawings for generating facility, collector substation, tie line as well as an updated PSS/e model and updated WECC approved model, electromagnetic transient ("EMT") model and a detailed short circuit model of its generation system using the ASPEN OneLine short circuit simulation program as applicable. The WECC model parameters must be adjusted to reflect the plant's actual anticipated performance. The plant controller must be included in the model. If there is to be coordination between facilities or a master VAR controller, this must be included in the detailed WECC dynamic model, as well as in the PSS/e user-written model.

Please note, the time required to perform the scope of work identified in this report does not support the Interconnection Customer's requested commercial operation date of July 1, 2021.

9.0 PARTICIPATION BY AFFECTED SYSTEMS

Public Utility has identified the following Affected Systems: None

10.0 APPENDICES

Appendix 1: Higher Priority Requests
Appendix 2: Property Requirements

10.1 APPENDIX A: HIGHER PRIORITY REQUESTS

All active higher priority transmission service and/or generator interconnection requests will be considered in this study and are identified below. If any of these requests are withdrawn, the Public Utility reserves the right to restudy this request, as the results and conclusions contained within this study could significantly change.

Transmission/Generation Interconnection Queue Requests considered:

GI Queue	Size (MW)
687	415.8
721	55
741	40
757	20
806	20
825	10
826	10
827	10
829	10
830	10
849	100
905	50
906	80
907	80

10.2 APPENDIX B: PROPERTY REQUIREMENTS

Requirements for rights of way easements

Rights of way easements will be acquired by the Interconnection Customer in the Public Utility's name for the construction, reconstruction, operation, maintenance, repair, replacement and removal of Public Utility's Interconnection Facilities that will be owned and operated by PacifiCorp. Interconnection Customer will acquire all necessary permits for the project and will obtain rights of way easements for the project on Public Utility's easement form.

Real Property Requirements for Point of Interconnection Substation

Real property for a point of interconnection substation will be acquired by an Interconnection Customer to accommodate the Interconnection Customer's project. The real property must be acceptable to Public Utility. Interconnection Customer will acquire fee ownership for interconnection substation unless Public Utility determines that other than fee ownership is acceptable; however, the form and instrument of such rights will be at Public Utility's sole discretion. Any land rights that Interconnection Customer is planning to retain as part of a fee property conveyance will be identified in advance to Public Utility and are subject to the Public Utility's approval.

The Interconnection Customer must obtain all permits required by all relevant jurisdictions for the planned use including but not limited to conditional use permits, Certificates of Public Convenience and Necessity, California Environmental Quality Act, as well as all construction permits for the project.

Interconnection Customer will not be reimbursed through network upgrades for more than the market value of the property.

As a minimum, real property must be environmentally, physically, and operationally acceptable to Public Utility. The real property shall be a permitted or permittable use in all zoning districts. The Interconnection Customer shall provide Public Utility with a title report and shall transfer property without any material defects of title or other encumbrances that are not acceptable to Public Utility. Property lines shall be surveyed and show all encumbrances, encroachments, and roads.

Examples of potentially unacceptable environmental, physical, or operational conditions could include but are not limited to:

- Environmental: known contamination of site; evidence of environmental contamination by any dangerous, hazardous or toxic materials as defined by any governmental agency; violation of building, health, safety, environmental, fire, land use, zoning or other such regulation; violation of ordinances or statutes of any governmental entities having jurisdiction over the property; underground or above ground storage tanks in area; known remediation sites on property; ongoing mitigation activities or monitoring activities; asbestos; lead-based paint, etc. A phase I environmental study is required for land being acquired in fee by the Public Utility unless waived by Public Utility.

- Physical: inadequate site drainage; proximity to flood zone; erosion issues; wetland overlays; threatened and endangered species; archeological or culturally sensitive areas; inadequate sub-surface elements, etc. Public Utility may require Interconnection Customer to procure various studies and surveys as determined necessary by Public Utility.

- Operational: inadequate access for Public Utility's equipment and vehicles; existing structures on land that require removal prior to building of substation; ongoing maintenance for landscaping or extensive landscape requirements; ongoing homeowner's or other requirements or restrictions (e.g., Covenants, Codes and Restrictions, deed restrictions, etc.) on property which are not acceptable to the Public Utility.