

All costs are \$x1,000

2019 Final GridLiance Generator Interconnection Unit Cost Guide		"Voltages"	230 kV	Notes/Comments:
Revised as of: 01/19/2019				
Equipment Categories	Units			GLW does not currently have 138 kV nor 500 kV facilities on their system. These connections will be estimated on an as-needed basis.
New Substation Equipment Complete 3-CB ring bus Substation, equipped with one line position to terminate a single gen-tie with as many as (2) outgoing lines.			8,440	
New Substation Equipment Transformer Banks:				Unit cost of transformer banks reflects cost of a 100 MVA rated transformer for the given voltage. Includes disconnects and additional relaying.
	230/138 kV	per unit		
	(Add additional options)			
Line Positions to terminate gen-ties and Transformer Bank positions				Position cost estimate includes cost of any related disconnect switches and protection equipment located within the position
	Single Breaker (add third breaker to breaker and a half)	per unit	800	
	Breaker and a half (2CB)	per unit	1,600	
	Breaker and a half (3CB)	per unit	2,400	
	Double Breaker (2CB, double bus)	per unit	1,700	
	Double Operating Bus Sections - 2 new buses, spanning 2 positions	per unit	1,350	Typical configuration includes "pair" of N/S or E/W buses
	Double Operating Bus Sections - 2 new buses, spanning 4 positions	per unit	2,700	Typical configuration includes "pair" of N/S or E/W buses
	Sectionalizing Breaker	per unit		
	Shunt Capacitors	per unit		If required these items will be estimated as a lump sum
Miscellaneous Equipment (see comments)				If required these items will be estimated as a lump sum.
	Bus Tie (1CB)	lump sum		
	Shunt Reactors	lump sum		
	Phase Shifter	lump sum		
	Ground Bank	lump sum		
	Series Capacitors	lump sum		
	Static VAR Compensator (SVC)	lump sum		
	Tertiary Reactors (1 reactor, 1 bay)	lump sum		
	Gas Insulated Substation (in lieu of open air construction)	lump sum		Not typical, would be estimated as a Lump sum, if GIS required.
Replacement Substation Equipment				
	Line drops (Tie Downs)- 3 phases	lump sum		
	Circuit Breakers (including replacement of foundation)	per unit	400	
	Circuit Breakers (without TRV caps)	lump sum		
	Transient recovery voltage capacitors (set of 3, separate from CBs)	lump sum		
	Disconnect switches (incl. steel structures and foundations)	per unit	75	
	Line protection relays (other end of line)	per set		
	Wave Trap - 1 phase only	lump sum		
	Wave Trap removal	lump sum		
New Protection Equipment				Will be estimated as needed.
	New SPS	lump sum		
	SPS Relays	lump sum		
	Additional set of bushing current transformers (3) at existing CBs	lump sum		
Information Technology (IT) Equipment				Will be estimated as needed.
IT interface equipment - Control Rooms				
	Communication rack placed in existing B station MEER bldg	per set		
	Comm. Rack with own environmental enclosure	per set		
	Full Comm. package for AA or A stations	per set		
	Prefab communications building	per unit		
	48V DC power supply for comm. equipment	per set		
	100' self-supporting comm. tower (3 legs)	per unit		
	120' self-supporting comm. tower (4 legs)	per unit		
IT interface equipment - miscellaneous equipment				
	Lightwave terminal	per unit		
	Microwave terminal and dish antennas	per set		
	Dehydrator for microwave antennas	per unit		
	Channel bank	per unit		
	Digital Access Cross Connect (DACS)	per unit		
	Network synchronization equipment (BITS clock)	per unit		
	Large router for network access to work bases	per unit		
	Small router for equipment monitoring, "data beyond SCADA"	per unit		
	T1 cross connect	per unit		
	Fiber to Telco connection (high voltage protected)	per unit		
	Satellite Terminal for "RTU only" locations	per unit		
IT interface equipment - T/L				
	Fiber optic cable on existing poles	per mile		
	Fiber optic cable on new poles	per mile		
New HV Transmission Line				Assumes no environmental, permitting or ROW acquisition.
	Double Circuit, Strung on both sides, Tubular Steel Pole	per mile	1,925	
	Single Circuit, Tubular Steel Pole	per mile	1,350	
SubTransmission Line (Overhead Facilities)				SubTransmission not typical to the VEA system.
SubTransmission Line (Underground Facilities)				
Removal of HV Transmission Line (complete tear down)				Assumes removal of old poles.
	Double Circuit	per mile	250	
	Single Circuit	per mile	150	
Reconductor/Upgrade Transmission Line				Assumes removal of existing conductor and installation of new.
	Double Circuit, Strung on both sides, Tubular Steel Pole	per mile	785	
	Single Circuit, Tubular Steel Pole	per mile	550	
Metering				
	Upgrade of existing RTUs	lump sum		
Lump Sum costs below are in addition to per-unit or lump-sum costs listed above:				
	Engineering costs	lump sum		Will be estimated as needed.
	Capitalized Licensing and Permitting Costs, including mitigation measures, FAA permits, etc.	lump sum		
	Civil work: Site Preparation including site grading, ground grid, and walls/fencing/containment	lump sum		
	General Facilities: station light & power, backup generator, station utilities (water, gas, etc. if manned substation)	lump sum		

All costs are \$x1,000

2019 Final GridLiance Generator Interconnection Unit Cost Guide	"Voltages"		230 kV	
	Revised as of: 01/19/2019			

Notes/Comments:

Equipment Categories	Units
-----------------------------	--------------

Substation Control (MEER) Buildings	lump sum
Incremental cost for transmission line crossings (roads, streams, rail, highway, other TL)	lump sum
Land cost for substations and T/L ROW	lump sum
Incremental cost of soil/geotechnical mitigation measures	lump sum
Incremental environmental monitoring and mitigations	lump sum
Corporate Overheads (A&G, P&B, and AFUDC)	lump sum
Income Tax Component of Contribution (ITCC)	lump sum

GLW does not currently have 138 kV nor 500 kV facilities on their system. These connections will be estimated on an as-needed basis.

ESCALATION OVERVIEW :

GWT cost estimating is done in 2018 constant dollars and then escalated over the years during which the project will be constructed, arriving at project costs in 2018 Constant Dollars Escalated to OD Year.

DEFINITIONS :

Project Cost in 2019 Constant Dollars represents the cost of the Project if all costs were paid for in 2019.

Project Cost Escalated to OD Year represents the cost of the Project if all costs were paid for in the OD Year.

Mathematical formula: Constant Dollars Escalated to OD Year

= Cost in Constant Dollars + Escalation to OD Year

= Cost in Constant Dollars x Escalation Factor

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Escalation Rate	2.72%	2.44%	2.35%	2.08%	2.21%	2.19%	2.22%	2.18%	2.25%	2.00%	2.14%
Escalation Factors	1.0000	1.0244	1.0485	1.0703	1.0940	1.1179	1.1428	1.1677	1.1939	1.2178	1.2439