

**Southern California Edison Unit Cost Guide dated March 30, 2019**  
**In accordance with Attachment A to Decision D16-06-052, the Unit Cost Guide represents facilities generally required for interconnection. Unit Cost Guide is not binding for actual facility costs and is provided only for additional cost transparency and developer reference. For reference, Ft = Per Foot**

**Category 1 - 12/16kV 480 volt transformer - includes 100' Sec. cable length**

Item #	Equipment	Unit Cost	Notes
1			
2	300kva & Sec. Cable	\$36,000	
3	500kva & Sec. Cable	\$46,000	
4	750kva & Sec. Cable	\$53,000	
5	1000kva & Sec. Cable	\$68,000	
6	1500kva, Sec. Cable & fuse cabinet	\$94,000	
7	2500kva, Sec. Cable & fuse cabinet (Fuseing); Used with an External Fuse Cabinet	\$178,000	

**Category 2 - Overhead to Underground (UG)- Set Pole and make up Cable**

#	Equipment	Unit Cost	Notes
1	Pri 1/O Cable from New Pole 200'	\$31,000	
2	Pri 350 Cable from New Pole 200'	\$35,000	
3	Pri 1000 Cable from New Pole 200'	\$41,000	

**Category 3 - Overhead (OH) Service**

#	Equipment	Unit Cost	Notes
1	OH Primary Service	\$16,000	
2	New Conductor Extension from POI to PCC	\$120/ft	

**Category 4 - Underground to Underground - Cable with Terminators**

#	Equipment	Unit Cost	Notes
1	Pri Low Ampacity Cable undg feed 400'	\$16,000	1/O XLP
2	Pri High Ampacity Cable undg feed 400'	\$35,000	350XLP
3	Pri High Ampacity Cable undg feed 400'	\$37,000	1000XLP
4			
5			
6			
7	New underground cable and connections (ft)	\$25/ft	1/O XLP
8	New underground cable and connections (ft)	\$50/ft	350XLP - 1000XLP

**Category 5 - Metering**

#	Equipment	Unit Cost	Notes
1	Secondary Metering	\$5,300	
2	12KV/16KV - 50/400 Amp Demand	\$15,000	
3	33kV Pole Top Mtrg - Transformer rack configuration	\$110,000	
4	Single Phase, self-contained meter (600 V)	\$1,100	

**Southern California Edison Unit Cost Guide dated March 30, 2019**  
**In accordance with Attachment A to Decision D16-06-052, the Unit Cost Guide represents facilities generally required for interconnection. Unit Cost Guide is not binding for actual facility costs and is provided only for additional cost transparency and developer reference. For reference, Ft = Per Foot**

5	Transformer-rated meter (600 V)	\$6,000	3000/5 CT
6	Primary Transformer-rated meter (5 kV)	\$12,000	4 kV Meter
7	Primary Transformer-rated meter (15 kV)	\$13,000	Indoor type
8	Primary Transformer-rated meter (25 kV) - Existing single pole	\$48,000	33 kV pole mounted

**Category 6 - Telemetry**

#	Equipment	Unit Cost	Notes
1	33kV Automatic Recloser	\$135,000	Used for Interconnection switch and not used for telemetry
2	12/16kV-Gas switch with Automation	\$57,000	Used for Interconnection switch and not used for telemetry
3	Centralized Remote Terminal Unit	\$6,100	0.99 MVA-9.99 MVA
4	Dedicated Remote Terminal Unit	\$144,000	Greater than 9.9 MVA
5	Bi-directional watt transducer	\$50,000	
6	Data Point addition and existing HMI	\$9,500	
7			

**Category 7 - System Equipment**

#	Equipment	Unit Cost	Notes
1	12 & 16kv Omni Pole Switch (switch itself and handle)	\$13,500	
2	Padmounted Gas Switch (without SCADA)	\$50,000	
3	12/16kV 1200 KVAR Capacitor Bank & Pole	\$33,000	
4	12/16KV 1200 KVAR Capacitor Bank on Pad	\$56,000	
5	12/16kV regulator 3-228s	\$185,000	
6	33kV Regulator 3-690/722	\$282,000	
7			
8	Pole Mounted 12kV Grd detector	\$31,000	Average of Padmount and Overhead
9	Ground Bank	\$61,000	Average of small and large
10	Reconductor (Per ft) - OH - Urban	\$180/ft	
11	Reconductor (Per ft) - OH - Rural	\$130/ft	
12	Reconductor (Per ft) - UG	\$80/ft	

<b>Southern California Edison Unit Cost Guide dated March 30, 2019</b> <b>In accordance with Attachment A to Decision D16-06-052, the Unit Cost Guide represents facilities generally required for interconnection. Unit Cost Guide is not binding for actual facility costs and is provided only for additional cost transparency and developer reference. For reference, Ft = Per Foot</b>		
13		
14		
15	Overhead Fuse Replacement	\$3,500
16		
17	Relocate Capacitor Bank	\$19,000
18		
19	Relocate Voltage Regulator	\$44,000
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		

Note: For overall IOU line consistency, facilities not commonly used for SCE interconnection have been placed in gray.

***Southern California Edison Unit Cost Table - September 21, 2019 - Acronym Table***

<u>Acronym</u>	<u>Description</u>	<u>IOU (if used)</u>
ITCC	Income Tax Component of Construction	All
CICA	Contributions in Aid of Construction	All
IF	Interconnection Facilities	All
PCC	Point of Common Coupling	All
POI	Point of Interconnection	All
ESR	Electrical Service Requirements	SCE
UG	Under Ground	All
OH, OVH	Over Head	All
DER	Distributed Energy Resource	All
DG	Distributed Generation	All
IC	Interconnection Customer	All
SLD	Single Line Diagram	All
ROW	Right of Way	All
BLM	Bureau of Land Management	All
AFUCD	Allowance of Funds Used During Construction	SDGE
CNF	Cleveland National Forest	SDGE
SCADA	Supervisory Control and Data Acquisition	All
RTU	Remote Terminal Unit	All
GS	Gas Switch	All
PME	Pad Mount Equipment	All
COO	Cost of Ownership	PGE

**Southern California Edison Cost Table Assumptions**

General labor overtime: based on 6-10 work schedule.
General contingency factor: 35% - SCE Standard Contingency Policy used for preliminary project estimating based on AACE guidelines.
Unit cost guide assumes facilities are constructed under an Engineer, Procurement and Construction (EPC) agreement. All facilities are owned by SCE.
Unit costs exclude generator's responsibility for Income Tax Component of Contribution (ITCC), (these will be added to total cost estimates, if required) along with O&M Replacement (both discussed under example assumptions)
Unit costs exclude environmental monitoring, licensing and mitigations.
Unit cost are given w/out the benefit of any preliminary & final engineering. Unforeseen conflicts and/or scope will increase costs. These unit costs do not include: right-of-way & easements requirements, environmental engineering/mitigation, GO 131-D engineering /permitting, other permitting, associated SCE/3rd Party under-build work, etc. A signed Interconnection Agreement is required before final design/engineering can start. Construction will not commence until all of the above conditions have been addressed.
Unit costs do not include the construction of UG ducts and structures (civil construction).

**Southern California Edison Unit Cost Guide Variability Illustrative Discussion**

The impacts identified below are only examples of items based upon historic experience. While effort has been made to include numerous examples, this list is not meant to be viewed as all inclusive and is for illustrative purposes only. Impacts are not always known in advance and final estimates are driven by project specific conditions as reviewed during the system review process.

**Examples of Potential Factors Effecting Rule 21 Estimated or Actual Costs**

1	<b><u>3rd Party or Multi-Party Easements</u></b>  Example: Roof top solar project on leased building. Significant added coordination to obtain easements. Leasing tenant and/or developer failed to engage building owner of need for interconnection facilities in advance of proceeding with project. This issue is compounded when the site plans and drawings provided do not include surveyed property lines. Even with approval, 3rd party easements require additional document preparation, review and processing.
2	<b><u>City Restrictions</u></b> Example: Traffic control in a school area limited work to 9:00 AM to 2:00, doubled project duration (days) of project, impacted efficiency and doubled traffic control and number of resource mobilizations (Road moratorium, customer research)
3	<b><u>Local Jurisdiction Improvements</u></b> Example: Long term city plan for road widening. Required existing pole to be set back to get jurisdictional permits. Critical that customer communicate plans with city well in advance to determine required upgrades or improvements.
4	<b><u>Outage Coordination</u></b> Utilities make best efforts to balance impacts to all customer when taking outages. Multiple customer needs must be considered. While there is obligation to get service connected impact to existing customer(s) must be considered.
5	<b><u>Pole Height Restrictions</u></b> Deteriorated pole condition requires a replacement. Under build requires pole change and taller pole is restricted by view or other issues. Local airport restrictions on pole height.
6	<b><u>Underground Impairments &amp; Structure Limits</u></b> Errors in customer base map for underground. Mapping can not forecast underground structure volume available for new facilities. Overcrowded structures can be an issue.
7	<b><u>Undisturbed Grounds</u></b> Customer environmental survey work does not take into account potential utility work.
8	<b><u>Customer Base Map Quality</u></b> Low quality customer base maps requiring field visits, surveying and multiple back and forth communication to get correct details. Often causes months of delay to project construction.
9	<b><u>Neighboring Customer Impacts</u></b> Customer on circuit with seasonal operation would be excessively impacted by outage. Circuit with high level of critical care customers. Generator required to support outage. Construction anticipated in winter months or during storm season.
10	<b><u>Topology</u></b> What appeared to be "drainage channel" was classified as waterway and required long span crossing
11	<b><u>Customer Civil Work</u></b> A high number of projects see delays in start and completion of customer civil work that extends project duration and can result in added crew trips to site for re-starts. Heavily impacts crew scheduling.
12	<b><u>Requested Project Timing</u></b> Construction anticipated in winter months or during storm season.

Project Examples - Southern California Edison Unit Cost Table; examples provided below are for illustrative purposes only and are not binding for actual facility costs

Scenarios < 1MW:

Scenario 1

Interconnection Facilities

500 kVA trans /cable  
480V metering  
Riser w/cable

Unit	Quantity	Cost (\$)
EA	1	\$44,000
EA	1	\$5,000
EA	1	\$30,000
Project Total:		\$79,000

(1)  
(5)  
(2)

Tax Component (if applied/see assumption 1)  
Monthly Interconnection Facilities Charge  
(see assumption 2/Replacement with Additional Cost)

\$27,650  
\$300

This is a 0.380 MW, 480V solar generator interconnecting to an OH service located on a low DG penetration 12 kV circuit. Based on the size of the project, standard Interconnection Facilities are required: new riser pole, primary cable, new padmount transformer secondary metering cable. The main feeder did not require any Distribution Upgrades.

Scenario 2

Interconnection Facilities

750 kVA w/cable  
Ground Detector  
1/0 Primary cable  
480V meter

Unit	Quantity	Cost (\$)
EA	1	\$51,000
EA	1	\$30,000
FT	400	\$34,000
EA	1	\$5,000
Total		\$120,000

(1)  
(7)  
(4)  
(5)

Tax Component (if applied/see assumption 1)  
Monthly Interconnection Facilities Charge  
(see assumption 2/20 Year Replacement and No Additional Cost)

\$42,000  
\$480

This is a 0.675 MW, 480V induction generator interconnecting to an existing underground service located on a low DG penetration 12 kV circuit. Based on the size of the project, standard Interconnection Facilities are required: primary cable, new padmount transformer, padmount ground detector and secondary metering and cable. The main feeder did not require any Distribution Upgrades.

Scenarios ≥ 1MW:

Scenario 3

Interconnection Facilities

Pad G.S. w/automation  
1500 kVA w/cable  
PME-5 w/cable  
480V meter  
Riser w/cable  
Centralized RTU

Unit	Quantity	Cost (\$)
EA	1	\$56,000
EA	1	\$92,000
EA	1	\$26,000
EA	1	\$5,000
EA	1	\$30,000
EA	1	\$6,100
Total		\$215,100

(6)  
(1)  
(7)  
(5)  
(2)  
(6)

Distribution Upgrades  
Voltage Regulator

EA	1	\$180,000
Total		\$180,000

(7)

This is a 1.5 MW, 480V solar generator interconnecting downstream of an existing Automatic Recloser on a 12 kV circuit. Based on the size of the project, standard Interconnection Facilities are required: riser pole, primary cable, padmount gas switch, padmount PME switch, padmount transformer, secondary metering and cable. Since this project is ≥ 1 MW but <10MW telemetry is required. In addition, the solar project triggers a high voltage condition on the circuit. As a result, a Voltage Regulator is install to mitigate the high voltage condition.

Scenario 4

Interconnection Facilities

Pad G.S. w/auto  
350 Cable  
12 kV meter  
Centralized RTU

Unit	Quantity	Cost (\$)
EA	1	\$56,000
EA	1	\$34,000
EA	1	\$14,000
EA	1	\$6,100
Total		\$110,100

(6)  
(2)  
(5)  
(6)

Distribution Upgrades

Reconductor 1500 of OH to 336 ACSR

EA	1	\$195,000
Total		\$195,000

(7)

This is a 2.0 MW, 12 kV solar project interconnecting to an existing underground service located on a high penetration DG, 12 kV circuit. Based on the size of the project, standard Interconnection Facilities are required. Primary cable, padmount gas switch, Remote Control Switch for automation, an primary metering. The addition of the generator triggered a thermal overload on the feeder. Thus, a line reconductoring is necessary to alleviate the thermal overload.

Scenario 5

Interconnection Facilities

Pad G.S. w/auto  
1/0 Primary cable  
16 kV meter  
Centralized RTU

Unit	Quantity	Cost (\$)
EA	1	\$56,000
EA	1	\$15,000
EA	1	\$14,000
EA	1	\$6,100
Total		\$91,100

(6)  
(4)  
(5)  
(6)

Distribution Upgrades

Remote Automatic Recloser  
Bi-directional Watt transducer  
Data point addition to HMI

EA	1	\$96,000
EA	1	\$49,300
EA	1	\$9,500
Total		\$154,800

(6)  
(6)

This is a 3.0 MW, 16 kV solar generator interconnecting at the end of the line on an existing overhead service. Base on the size of the project new Interconnection Facilities are triggered: riser pole, primary cable, padmount gas switch, Remote Control Switch for automation, primary metering and associated wiring and telemetry. The addition of the generator triggers the installation of an Automatic Recloser to detect end of line faults. It also triggers reverse power flow back (MW/MVAR) at the SCE substation. As a result, a transducer and data point addition to an existing RTU is required to monitor watts and reactive power.

4  
5  
6  
7  
8

**Project Examples - Southern California Edison Unit Cost Table; examples provided below are for illustrative purposes only and are not binding for actual facility costs**

**Scenario 6**

Interconnection Facilities

Pad G.S. w/auto  
Ground Bank  
Riser w/cable  
16 kV meter  
Centralized RTU

EA	1	\$56,000
EA	1	\$63,000
EA	1	\$40,000
EA	1	\$14,000
EA	1	\$6,100
Total		\$179,100

(6)  
(7)  
(2)  
(5)  
(6)

This is a >1 MW, 16 kV synchronous generator interconnecting to an existing overhead service. Based on the size of the project, standard Interconnection Facilities are required: riser pole, padmount gas switch, Remote Control Switch for automation, ground detector and primary metering. The ground bank would be dependent on the grounding configuration of the Generating Facility. If the step transformer is connected Delta/Y-grounded (Delta on the gen side), then the ground bank would not be required.

**Scenario 7**

Interconnection Facilities

33 kV RAR  
9000' 336 ACSR  
33 kV OH meter  
Dedicated RTU

EA	1	\$131,000
EA	1	\$1,170,000
EA	1	\$108,000
EA	1	\$140,000
Total		\$1,549,000

(6)  
(7)  
(5)  
(6)

This is >10 MW, 33 kV solar generator interconnecting to an existing overhead service. Based on the size of the project, new Interconnection Facilities are required: pole line extension, Automatic Recloser and 33 kV poletop metering and a Dedicated Remote Terminal Unit. The main feeder experience a high voltage condition and a line recoductor is required to mitigate the voltage.

Distribution Upgrades

1000' of 4/0 to 750 cable upgrade

EA	1	\$30,000
Total		\$30,000

(7)

**EXAMPLE DEVELOPMENT ASSUMPTIONS:**

1. ITCC (Income Tax Component of the Contribution): For purposes of the example assumptions, the ITCC rate is assumed to be at 35% (based upon standard depreciation)
2. The Interconnection Facilities Charge (O&M) is determined in accordance with GRC Authorization Provided in Rule 2.H (2015 Southern California Edison General Rate Case, 15-11-021 authorized rate from January 1, 2016). Please note that the rate is subject to change based on future filings. For the Interconnection Facilities Charge Replacement Options, Interconnection Applicant would pay the following as provided in Examples 1 and 2: Customer Financed with Replacement at Additional Cost = 0.38%, With Replacement for 20 yrs at No Additional Cost = 0.40%
3. Removal Costs are case dependent and determined based upon actual costs and are not prepared utilizing a proxy percentage.
4. ITCC and Interconnection Facilities Charge are reflected in examples 1 and 2; same methodology can be utilized in other shown examples.



**SCE Escalation Factor - Unit Cost Guide**

**ESCALATION OVERVIEW :**

Current SCE Unit Cost Guide Escalation Factors (consistent with CAISO) is in 2019 Constant Dollars.

SCE's cost estimating is done in 2019 constant dollars and then escalated over the years during which the project will be constructed, arriving at project costs in 2016 Constant Dollars Escalated to OD Year.

Current escalation rates used to arrive at escalated dollars are derived as follows:

- ▶ 2015-2025 - Q3 2015 IHS Global Insight Forecast of Transmission Capital escalation for the Pacific region (JUEPT@PCF)

**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 x Escalation Factor to OD year

**CURRENT SCE ESCALATION RATES :**

	2019	2020	2021	2022	2023	2024
<b>Escalation Rate</b>	<b>2.72%</b>	<b>2.44%</b>	<b>2.35%</b>	<b>2.08%</b>	<b>2.21%</b>	<b>2.19%</b>
<b>Escalation Factors</b>	<b>1.0000</b>	<b>1.0244</b>	<b>1.0485</b>	<b>1.0703</b>	<b>1.0940</b>	<b>1.1179</b>

Factors listed above consistent with CAISO unit cost guide.

