

Guidance for completing the '[PEER performance for DES](#)' Calculator.

This guidance is for LEED project teams attempting the LEED Pilot Credit: BD+C v4 District Energy, for completing the 'PEER points for DES performance' Calculator. The 'PEER points for DES performance calculator' is used for determining the performance improvement percentages above the benchmark of the DES project for the following parameters: System Energy Efficiency (SEE), Source Energy Intensity (SEI) and Air Emissions (CO₂, NO_x, and SO₂). The percentage improvement values determined by using this calculator should then be input into the "LEED District Energy Points Calculator O+M" or LEED District Energy Points Calculator D+C" as applicable.

Step by Step Guidance:

If the project is having its own custom values (Source Energy Factors, COP, Air Emissions Intensities) then fill the information in tab "PEER_DES Calculator – Custom ". If not fill the information in tab "PEER_DES Calculator ".

Step 1: Select project location (USA, Canada or other countries)

Step 2: Select how the energy is supplied to the project. The options are whether the energy is supplied by a Utility OR Utility and locally generated OR if it is only Locally Generated.

Utility: Project's energy (electricity, heating, and cooling) is supplied by a single utility or multiple municipal or private utilities.

Local Generation: Project's energy (electricity, heating, and cooling) is generated and supplied by sources within the LEED project and/or campus boundary (CHP, diesel generators, natural gas generators, etc.). Note that electricity generated by On- Site Renewables (local renewables), within the LEED project boundary must be excluded from the calculations.

Utility & Local Generation: Project's energy (electricity, heating, and cooling) is supplied by both Utility, and Local generation. Note that electricity generated by On- Site Renewables (local renewables), within the LEED project boundary must be excluded from the calculations.

Step 3: Select the fuel used for generating project's energy (for electricity, heating, and cooling).

Step 4: Enter the project information as required in the "Project Inputs" section. (For "PEER_DES Calculator – Custom "also enter the custom values).

Step 5: Enter the Percentage improvement for SEE, SEI and Air Emissions into the "LEED District Energy Points Calculator O+M" or "LEED District Energy Points Calculator D+C"

Examples

Case 1: Energy for the project is supplied by a utility and local generation.

Project Location: Austin, Texas, USA

Project Description: Electricity for the project's load is supplied by Austin Energy utility and by local generation (natural gas-fired generator). Chilled water is produced from high-efficiency electric chillers.

As per the annual billing and/or metering values, project's energy purchased / consumption values are as follows:

- Annual Customer Electricity Consumption = 349,900 MWh
- Annual Electricity Purchased from Local Utility = 104,966 MWh - (Utility Name – Austin Energy)
- Annual Local Electricity Generated = 244,934 MWh – (Generator fired by Natural Gas)
- Annual Customer Cooling load = 1,739,654 MMBtu
- Total Fuel Purchased = 1,510,000 MMBtu - (Utility Name –Texas Gas Service)
- Transmission and Distribution losses = 6.6 %

As per the onsite emissions testing (Stack Emissions Testing), project's local generation air emission intensities (CO₂, NO_x, and SO₂) are as follows.

- CO₂= 1000 lbs/MWh
- NO_x = 0.20 lbs/MWh
- SO₂ = 0.005 lbs/MWh

Steps to enter the information in the calculator:

1. Based on the information above, enter the location (USA), Energy supplied by (Utility & Locally Generated), and fuel type (Natural Gas) of the project. As soon as you enter this information, the values in the 'Default Values' section will get populated.

PEER Points for DES Performance

Project Location
USA

Energy Supplied by
Utility & Local Generation

Fuel Type for Local Generation
Natural Gas

Austin,Texas,USA

Legend	
Project Input	
Default Value	
Calculated	

Default Values dependent on
- Project Location
- Energy Supplied
- Fuel Type local generation

Default Values

Source Energy Factors	Purchased Cooling	0.67
	Purchased Heating	1.67
	Electric	2.80
	Fuel	1.05
COP	Cooling	4.18
	Heating	0.63
Air Emissions Intensities	Electric	CO ₂ , lbs/MWh 1,324
		NO _x , lbs/MWh 1.26
		SO ₂ , lbs/MWh 2.08
	Heating	CO ₂ , lbs/MMBtu heating output 448.60
		NO _x , lbs/MMBtu heating output 0.41
		SO ₂ , lbs/MMBtu heating output 0.59

2. Next, enter information in the 'Project Load Information' section for Customer Loads, Purchased energy, SEI, and T & D (Transmission & Distribution) Losses.

In order to determine the SEI value for purchased electricity refer to the “**EP_State Suppliers Tab**” and filter for **state** and corresponding **utility** name (Texas - Austin Energy - Z 2983).

- SEI for the purchased electricity = 11.2

- Annual Customer Electricity
 - Annual Customer Cooling
 - No Customer Heating load

Project Load Information		Input
Customer Loads	Electric, MWh	3,49,900
	Cooling, MMBtu	17,39,654
	Heating, MMBtu	-
Energy Delivered to Customers, MMBtu		29,33,513
Purchased Energy	Electricity, MWh	1,04,966
	Cooling, MMBtu	-
	Heating, MMBtu	-
	Fuel, MMBtu	15,10,000
SEI, Purchased Electricity, MMBtu/MWh		11.20
T&D Losses, %		6.60%
Source Energy Consumed by Project, MMBtu		29,01,371

SORT ON STATE, THEN OWNER		ADJUSTED FOR GRID LOSSES & METHANE				
State	Owner	SEI (mmBTU/MWh)	CO2 (lb/MWh)	NOx (lb/MWh)	SO2 (lb/MWh)	Water (gal/MWh)
TX	AES LLC	0.4	84	0.0	0.3	12
TX	Air Liquide	4.9	657	0.2	0.0	160
TX	Air Products LLC	10.9	1,478	0.9	0.0	160
TX	Alcoa US	5.9	792	0.9	0.0	160
TX	Ascend Performance Materials LLC	7.1	955	0.5	0.0	160
TX	Austin Energy	11.2	1,354	0.6	0.1	445
TX	BASF	9.8	1,309	0.9	0.0	160
TX	Bastrop Energy Partners, LP	8.2	1,111	0.2	0.0	107

Refer to the “**EP_State Suppliers Tab**” for SEI Information –Texas
 Austin Energy – Column Z

3. Next enter information in the ‘Project Air Emissions Information’ section for Local Electricity Generated, Purchased Air Emissions, and Local Generation Air Emissions.

In order to determine the purchased electricity air emission intensities (CO2, NOx, and SO2), refer to the “**EP_State Suppliers Tab**” and filter for **state** and corresponding **utility** name (Texas - Austin Energy – AA, AB, AC). The emission intensities are as follows.

- CO2= 1354 lbs/MWh
- NOx = 0.6 lbs/MWh
- SO2 = 0.1 lbs/MWh

Project Air Emissions Information			Input
Local Electricity Generation, MWh			2,44,923
Fuel for Heat Production, MMBtu			-
Fuel for Chilled Water Production, MMBtu			-
Air Emissions Intensities from Purchased Energy	Purchased Electricity	CO2, lbs/MWh	1,354
		NOx, lbs/MWh	0.60
		SO2, lbs/MWh	0.10
	Purchased Cooling	CO2, lbs/MMBtu	-
		NOx, lbs/MMBtu	-
		SO2, lbs/MMBtu	-
	Purchased Heat	CO2, lbs/MMBtu	-
		NOx, lbs/MMBtu	-
		SO2, lbs/MMBtu	-
Air Emissions from Fuel Burned	Local Generation	CO2, lbs/MWh	1,000
		NOx, lbs/MWh	0.20
		SO2, lbs/MWh	0.005
	Heating	CO2, lbs/MMBtu fuel in	-
		NOx, lbs/MMBtu fuel in	-
		SO2, lbs/MMBtu fuel in	-
	Cooling	CO2, lbs/MMBtu fuel in	-
		NOx, lbs/MMBtu fuel in	-
		SO2, lbs/MMBtu fuel in	-

Electricity Generated by Natural Gas Generator.

Refer to the “EP_State Suppliers Tab” for SEI Information – Austin Energy – Column AA,AB,AC

Measured Emissions from Natural Gas Generator

4. Based on the default values, project load information, and project air emissions information the benchmark values are automatically populated.

Benchmark values:

Benchmarks		
Benchmark Energy Delivered to Project, MMBtu		45,08,123
Modified Energy Delivered to Project, MMBtu		25,88,303
Total Air Emissions Produced	CO2, lbs	66,59,99,500
	NOx, lbs	6,33,806
	SO2, lbs	10,46,283

5. The following are the results for SEE, SEI and Air Emissions. Enter the Percentage improvement for SEE, SEI and Air Emissions into the “LEED District Energy Points Calculator O+M” or LEED District Energy Points Calculator D+C”.

Results:

SEE Results	
System Energy Efficiency (SEE)	101.1%
Benchmark SEE	65.1%
Percentage improved above benchmark	55.4%

Percentage of Improvement - SEE

SEI Results	
Source Energy Intensity (SEI), MMBtu/MWh	7.40
Benchmark SEI	12.88
Percentage SEI LEED improved above benchmark	74.2%

Percentage of Improvement - SEI

Air Emissions Results		
Total Air Emissions Produced	CO ₂ , lbs	39,64,27,146
	NO _x , lbs	1,16,121
	SO ₂ , lbs	12,413.99
Overall Air Emissions	CO ₂ , lbs/MMBtu	135.1
	NO _x , lbs/MMBtu	0.04
	SO ₂ , lbs/MMBtu	0.00423
Benchmark Air Emissions Intensities	CO ₂ , lbs/MMBtu	227.03
	NO _x , lbs/MMBtu	0.22
	SO ₂ , lbs/MMBtu	0.36
Percentage improved above benchmark	CO ₂	40.5%
	NO _x	81.7%
	SO ₂	98.8%
Air Emissions Index (AEI)	CO ₂ Weighting	50%
	NO _x Weighting	25%
	SO ₂ Weighting	25%
Percentage improved above benchmark, Weighted		65.4%

Percentage of Improvement – Air Emissions

Case 2: Energy for the entire project is supplied by local generation.

Project Location: Montreal, Quebec, Canada

Project Description:

Project's central plant produces and supplies electric power to the entire campus and includes facilities for producing steam and chilled water. All chilled water is produced from high-efficiency electric chillers.

Only fuel (natural gas) is purchased from the local natural gas utility *Energir*.

As per the metering values, project's energy consumption values are the following:

- Annual Customer Electricity consumption = 245,923 MWh
- Annual Local Electricity Generated = 348,900 MWh – (CHP)
- Annual Customer Chilled water consumption = 1,739,654 MMBtu
- Annual Customer Steam Consumption = 851,400 MMBtu
- Total Fuel Purchased = 3,970,896 MMBtu - (Utility Name – *energir*)
- Fuel for Heat (Steam) Production = 1,051,060 MMBtu
- Transmission and Distribution Losses = 0 (No Electricity is purchased)
- SEI for the Purchased Electricity = 0 (No Electricity is purchased)

As per the onsite emissions testing (stack emissions testing), the project's local generation (Combustion Gas Turbine) air emission intensities (CO₂, NO_x, and SO₂) are as follows.

- CO₂ = 982 lbs/MWh
- NO_x = 1.44 lbs/MWh
- SO₂ = 0.0004 lbs/MWh

As per the onsite emissions testing (stack emissions testing), the project's boiler air emission intensities (CO₂, NO_x, and SO₂) produced from the fuel burned for heating (for generating steam for buildings and steam turbines) are as follows.

- CO₂ = 118 lbs/MMBtu
- NO_x = 0.0306 lbs/MMBtu
- SO₂ = 0.0001 lbs/MMBtu

Steps to enter the information in the calculator:

1. Based on the information above, enter the location (Canada), Energy supplied by (Local Generation), and fuel type for local generation (Natural Gas) of the project. As soon as you enter this information, the values in the 'Default Values' section will get populated.

PEER Points for DES Performance

Project Location	Canada
------------------	--------

Energy Supplied by	Local Generation
--------------------	------------------

Fuel Type for Local Generation	Natural Gas
--------------------------------	-------------

Montreal, Quebec, Canada

Legend
Project Input
Default Value
Calculated

Default Values dependent on

- Project Location
- Energy Supplied
- Fuel Type local generation

Default Values

Source Energy Factors		Purchased Cooling	0.47
		Purchased Heating	1.60
		Electric	1.96
		Fuel	1.01
COP		Cooling	4.18
		Heating	0.63
Air Emissions Intensities	Electric	CO ₂ , lbs/MWh	1,324
		NO _x , lbs/MWh	1.26
		SO ₂ , lbs/MWh	2.08
	Heating	CO ₂ , lbs/MMBtu heating output	448.60
		NO _x , lbs/MMBtu heating output	0.41
		SO ₂ , lbs/MMBtu heating output	0.59

2. Next, enter information in the 'Project Load Information' section for Customer Loads, and Purchased energy.

- Annual Customer Electricity
- Annual Customer Chilled water
- Annual Customer Steam water
- Annual Purchased Fuel

Project Load Information		Input
Customer Loads	Electric, MWh	3,45,923
	Cooling, MMBtu	17,38,500
	Heating, MMBtu	8,51,400
Energy Delivered to Customers, MMBtu		37,70,189
Purchased Energy	Electricity, MWh	-
	Cooling, MMBtu	-
	Heating, MMBtu	-
	Fuel, MMBtu	39,70,896
SEI, Purchased Electricity, MMBtu/MWh		-
T&D Losses, %		0.00%
Source Energy Consumed by Project, MMBtu		40,10,605

As project is not purchasing any electricity so SEI, T&D Losses shall be zero.

3. Next enter information in the 'Project Air Emissions Information' section for Local Electricity Generated, Fuel for Heat Production, and Local Generation Air Emissions.

Project Air Emissions Information			Input
Local Electricity Generation, MWh			3,48,900
Fuel for Heat Production, MMBtu			10,51,060
Fuel for Chilled Water Production, MMBtu			-
Air Emissions Intensities from Purchased Energy	Purchased Electricity	CO ₂ , lbs/MWh	-
		NO _x , lbs/MWh	-
		SO ₂ , lbs/MWh	-
	Purchased Cooling	CO ₂ , lbs/MMBtu	-
		NO _x , lbs/MMBtu	-
		SO ₂ , lbs/MMBtu	-
	Purchased Heat	CO ₂ , lbs/MMBtu	-
		NO _x , lbs/MMBtu	-
		SO ₂ , lbs/MMBtu	-
Air Emissions from Fuel Burned	Local Generation	CO ₂ , lbs/MWh	982
		NO _x , lbs/MWh	1.44
		SO ₂ , lbs/MWh	0.0004
	Heating	CO ₂ , lbs/MMBtu fuel in	118
		NO _x , lbs/MMBtu fuel in	0.0306
		SO ₂ , lbs/MMBtu fuel in	0.0001
	Cooling	CO ₂ , lbs/MMBtu fuel in	-
		NO _x , lbs/MMBtu fuel in	-
		SO ₂ , lbs/MMBtu fuel in	-

- Electricity Generated by CHP
- Fuel used for producing steam

Measured Emissions from Combustion Gas Turbine.

Measured Emissions from Boilers

4. Based on the default values, project load information, and project air emissions information the benchmark values are automatically populated.

Benchmark values:

Benchmarks		
Benchmark Energy Delivered to Project, MMBtu		44,93,492
Modified Energy Delivered to Project, MMBtu		40,10,605
Total Air Emissions Produced	CO2, lbs	1,22,56,43,189
	NOx, lbs	11,48,943
	SO2, lbs	17,73,109

5. The following are the results for SEE, SEI and Air Emissions. Enter the Percentage improvement for SEE, SEI and Air Emissions into the “LEED District Energy Points Calculator O+M” or LEED District Energy Points Calculator D+C”.

Results:

SEE Results	
System Energy Efficiency (SEE)	94.0%
Benchmark SEE	83.9%
Percentage improved above benchmark	12.0%

Percentage of Improvement - SEE

SEI Results	
Source Energy Intensity (SEI), MMBtu/MWh	11.59
Benchmark SEI	12.99
Percentage SEI LEED improved above benchmark	12.0%

Percentage of Improvement -SEI

Air Emissions Results		
Total Air Emissions Produced	CO2, lbs	46,66,44,880
	NOx, lbs	5,34,578
	SO2, lbs	209.60
Overall Air Emissions	CO2, lbs/MMBtu	123.8
	NOx, lbs/MMBtu	0.14
	SO2, lbs/MMBtu	0.00006
Benchmark Air Emissions Intensities	CO2, lbs/MMBtu	325.09
	NOx, lbs/MMBtu	0.30
	SO2, lbs/MMBtu	0.47
Percentage improved above benchmark	CO2	61.9%
	NOx	53.5%
	SO2	100.0%
Air Emissions Index (AEI)	CO2 Weighting	50%
	NOx Weighting	25%
	SO2 Weighting	25%
Percentage improved above benchmark, Weighted		69.3%

Percentage of Improvement – Air Emissions

Case 3: Energy for the project is supplied by Utility.

Project Location: Montreal, Quebec, Canada

Project Description: Electricity for the project's load is supplied by Hydro Quebec. Vapor and Cooling for the project is supplied by a district energy plant located outside the LEED Boundary (natural gas CHP).

As per the annual billing and/or metering values, project's energy purchased / consumption values are as follows:

- Annual Customer Electricity Consumption = Annual Electricity Purchased from utility = 349,900 MWh - (Utility Name – Hydro Quebec)
- Annual Local Electricity Generated = 0
- Annual Customer Cooling load = Annual purchased Cooling Load = 1,739,654 MMBtu (Purchased from Public District Energy System)
- Annual Customer Heating Load = Annual purchased heating load (Vapour)= 851,400 MMBtu (Purchased from Public District Energy System)
- Total Fuel Purchased = 0 MMBtu
- Transmission and Distribution losses = 6.6 %

As per emissions testing (Stack Emissions Testing) conducted by the Public District Energy System, air emission intensities (CO₂, NO_x, and SO₂) are as follows – (Both for Purchased Heating and Cooling - As the same fuel is used for both cooling and heating)

- CO₂ = 1000 lbs/MMBtu
- NO_x = 0.20 lbs/MMBtu
- SO₂ = 0.005 lbs/MMBtu

Steps to enter the information in the calculator:

1. Based on the information above, enter the location (Canada), Energy supplied by (Utility), and fuel type (Not Available) of the project. As soon as you enter this information, the values in the 'Default Values' section will get populated.

PEER Points for DES Performance

Project Location	Canada
------------------	--------

Energy Supplied by	Utility
--------------------	---------

Fuel Type for Local Generation	Not Available
--------------------------------	---------------

Montreal, Quebec, Canada

Legend
Project Input
Default Value
Calculated

Default Values dependent on

- Project Location
- Energy Supplied
- Fuel Type local generation

Default Values

Source Energy Factors	Purchased Cooling		0.47
	Purchased Heating		1.67
	Electric		1.96
	Fuel		1.05
COP	Cooling		4.18
	Heating		0.63
Air Emissions Intensities	Electric	CO ₂ , lbs/MWh	1,324
		NO _x , lbs/MWh	1.26
		SO ₂ , lbs/MWh	2.08
	Heating	CO ₂ , lbs/MMBtu heating output	448.60
		NO _x , lbs/MMBtu heating output	0.41
		SO ₂ , lbs/MMBtu heating output	0.59

2. Next, enter information in the 'Project Load Information' section for Customer Loads, Purchased energy, SEI (Refer below), and T & D (Transmission & Distribution) Losses.

The purchased electricity SEI[#] value is **0.06** (Utility Name- **Hydro Quebec**)

[#] Air Emissions intensity values and SEI are based on online research done by GBCI.

- Annual Customer Electricity = Purchased Electricity
- Annual Customer Chilled water = Purchased Cooling
- Annual Customer Steam water = Purchased Vapour

Project Load Information		Input
Customer Loads	Electric, MWh	3,49,900
	Cooling, MMBtu	17,39,654
	Heating, MMBtu	8,51,400
Energy Delivered to Customers, MMBtu		37,84,913
Purchased Energy	Electricity, MWh	3,49,900
	Cooling, MMBtu	17,39,654
	Heating, MMBtu	8,51,400
	Fuel, MMBtu	-
SEI, Purchased Electricity, MMBtu/MWh		0.06
T&D Losses, %		6.60%
Source Energy Consumed by Project, MMBtu		22,56,263

As project is purchasing from Hydro Quebec.

3. Next enter information in the 'Project Air Emissions Information' section for, Local Electricity Generated, Purchased Air Emissions.

The purchased electricity air emission intensities (CO₂, NO_x, and SO₂)[#] for Utility Name – Hydro Quebec are as follows

- CO₂ = 4 lbs/MWh
- NO_x = 0.05 lbs/MWh
- SO₂ = 0.06 lbs/MWh

Project Air Emissions Information			Input
Local Electricity Generation, MWh			-
Fuel for Heat Production, MMBtu			-
Fuel for Chilled Water Production, MMBtu			-
Air Emissions Intensities from Purchased Energy	Purchased Electricity	CO2, lbs/MWh	4
		NOx, lbs/MWh	0.05
		SO2, lbs/MWh	0.06
	Purchased Cooling	CO2, lbs/MMBtu	1,000.00
		NOx, lbs/MMBtu	0.20
		SO2, lbs/MMBtu	0.01
	Purchased Heat	CO2, lbs/MMBtu	-
		NOx, lbs/MMBtu	-
		SO2, lbs/MMBtu	-
Air Emissions from Fuel Burned	Local Generation	CO2, lbs/MWh	-
		NOx, lbs/MWh	-
		SO2, lbs/MWh	-
	Heating	CO2, lbs/MMBtu fuel in	-
		NOx, lbs/MMBtu fuel in	-
		SO2, lbs/MMBtu fuel in	-
	Cooling	CO2, lbs/MMBtu fuel in	-
		NOx, lbs/MMBtu fuel in	-
		SO2, lbs/MMBtu fuel in	-

Hydro Quebec Emissions

Measured Emissions from Public District Energy System

4. Based on the default values, project load information, and project air emissions information the benchmark values are automatically populated.

Benchmark values:

Benchmarks		
Benchmark Energy Delivered to Project, MMBtu		45,74,686
Modified Energy Delivered to Project, MMBtu		45,74,686
Total Air Emissions Produced	CO2, lbs	1,27,22,50,357
	NOx, lbs	11,93,298
	SO2, lbs	18,46,329

5. The following are the results for SEE, SEI and Air Emissions. Enter the Percentage improvement for SEE, SEI and Air Emissions into the “LEED District Energy Points Calculator O+M” or LEED District Energy Points Calculator D+C”.

Results:

SEE Results		
System Energy Efficiency (SEE)		167.8%
Benchmark SEE		82.7%
Percentage improved above benchmark		102.8%
		Percentage of Improvement - SEE
SEI Results		
Source Energy Intensity (SEI), MMBtu/MWh		13.07
Benchmark SEI		13.07
Percentage SEI LEED improved above benchmark		0.0%
		Percentage of Improvement -SEI
Air Emissions Results		
Total Air Emissions Produced	CO ₂ , lbs	1,74,10,75,105
	NO _x , lbs	3,66,207
	SO ₂ , lbs	32,196.85
Overall Air Emissions	CO ₂ , lbs/MMBtu	460.0
	NO _x , lbs/MMBtu	0.10
	SO ₂ , lbs/MMBtu	0.00851
Benchmark Air Emissions Intensities	CO ₂ , lbs/MMBtu	336.14
	NO _x , lbs/MMBtu	0.32
	SO ₂ , lbs/MMBtu	0.49
Percentage improved above benchmark	CO ₂	-36.9%
	NO _x	69.3%
	SO ₂	98.3%
Air Emissions Index (AEI)	CO ₂ Weighting	50%
	NO _x Weighing	25%
	SO ₂ Weighting	25%
Percentage improved above benchmark, Weighted		23.5%
		Percentage of Improvement – Air Emissions