



1659 Spencer Road, Denton, Texas 76205

**Date:** September 14, 2017

**To:** Mayor Watts and Honorable City Council Members  
Todd Hileman, City Manager  
Bryan Langley, Deputy City Manager/COO  
Stephen Johnson, Interim Executive Manager

**From:** Jessica Rogers, Energy Services Manager

**Subject:** Request for Information Regarding Solar Rebates (*Originally Provided to the PUB*)

### **Executive Summary**

DME's solar rebate program, a part of the City's larger GreenSense Incentive Program, provides cash rebates for customers who install photovoltaic ("solar") panels and systems at their residences or businesses. As recently detailed in a City of Denton press release, there are now over 100 systems interconnected to the Denton grid and producing enough energy to power 73 homes. Denton's solar rebate program is one of the top solar incentive programs in Texas and has distributed over \$1 million in rebates resulting in over 1.7 megawatts of installed or planned capacity at a value of over \$5 million in assets. Important components of Denton's program include an attractive rebate incentive and a rate structure that allows for the buy-back of excess generation. Additionally, Denton's program is the only program in Texas to offer graduated incentives for systems with battery storage equipment.

### **Program History and Current Rebate Program**

The solar rebate program was initially developed and incorporated into the City's GreenSense Incentive Program in 2009. While the program started with only a \$90,000 annual budget and a few small systems, it quickly grew in both scale and funding. From FY 2009 through FY 2016, 84 separate systems were installed with over \$1 million in rebates being distributed.

In FY 2017, the program continued to grow and the annual budget was increased from \$180,000 to \$200,000. Of that, \$127,119 has already been distributed, with the remaining funds committed to customers pending completion of their solar installations. In FY 2017 to date, DME has received 45 applications, with 32 systems having completed the interconnection and installation process.

See **TABLE 1** for additional data regarding the installed systems and value of installations.

The current program guidelines and rebate structure is provided to customers through the GreenSense Program Incentive Manual. The solar program provides cash rebates to participants for qualifying solar equipment. The rebates are offered in the following amounts:

- \$0.75 per alternating current (“AC”) watt up to \$30,000, not to exceed 50% of the total install cost for any system without battery storage.
- \$1.50 per AC watt up to \$30,000, not to exceed 50% of the total install cost for any system with battery storage equipment.

The amount of the rebate is based on the cost of a solar installation, with staff recommending adjustments based on changes in system pricing and market trends. In previous years, the rebate has been set at \$3.00 per watt and \$1.50 per watt. However, as the cost of solar installations has come down, more customers have the ability to afford panels and realize the value of offsetting some of their energy costs. In order to accommodate the growing demand for solar installations, DME has lowered the rebate amounts to correspond to the decreasing price of solar panels. Overall, the cost of solar installations has decreased so significantly that DME continues to receive applications for system interconnections even though all rebate funds for FY 2017 have been exhausted. This indicates that systems are becoming increasingly affordable and accessible even without additional local incentives.

See **TABLE 2** for information on the rebates provided and the cost of solar installations in Denton.

### **How Does Denton Compare to Other Programs in the State?**

Because there is no standard industry format for distributed generation rebate programs, each utility (municipal, cooperative, or investor-owned) can decide if they want to offer a rebate program and how that rebate will be calculated and distributed. As each program is unique, the available information is also specific to each utility. Many programs contain significant details and program parameters specific to that utility’s terms of service or program manual. For any additional information regarding a specific program, please consult that utility’s program handbook or website.

See **TABLE 3** for a sample of the rebates available from other utilities in Texas.

See **TABLE 4** for estimated calculations of the amounts of rebates sample systems would receive.

### **Rate Structure, Billing, and Distributed Generation Purchases**

In addition to the cash rebate, participants are also incentivized by DME’s rate structure, which provides credits for any generation up to their consumption, and an excess generation credit for any energy put back on the DME grid in excess of consumption.

For any generation delivered by the participant up to the amount of generation delivered by DME to the customer, the customer is credited for the generated energy as follows:

$$\text{Generation Credit} = [(\text{kWh delivered from the Customer's approved system}) \times (\text{Customer's base electric service rate})] + [(\text{kWh delivered from the Customer's approved system}) \times (\text{RCA rate})]$$

For example, if Customer A consumed 1,000 kWh and returned 500 kWh, Customer A would be billed for the 1,000 kWh at the regular residential rate and a credit would be calculated for the 500 kWh as noted above.

For all energy delivered by the participant's system to the DME system that exceeds the amount of energy delivered by DME to the customer, the customer is credited as follows:

$$\text{Excess Generation Credit} = (\text{kWh delivered from the Customer's system}) \times \text{RCA Rate}$$

For example, if Customer B consumed 1,000 kWh and returned 1,500 kWh, Customer B would be billed for the 1,000 kWh. The first 1,000 kWh returned to the grid would be credited at the Generation Credit rate. The additional 500 kWh (the amount of kWh that *exceeds* the customer's consumption) would be credited at the Excess Generation Credit Rate.

In FY 2016, DME purchased 231 MWh from customers at a cost of \$15,028 or \$65.05 per MWh. To put that into perspective, DME purchased just over 1,500,000 MWh for all of FY 2016, making that 231 MWh equal to 0.02% of the total energy purchased. DME expects a similar value for FY 2017.

### **Avoided Costs**

One of the most valuable benefits of installing solar panels is what is called "avoided cost." This is the amount of energy costs that a customer avoids by generating energy and consuming energy at the same time. Another way to think of it is that avoided costs are the charges that a customer would have paid for that same energy if it had been bought from the City. However, because the customer generated that energy themselves, they aren't charged for that energy. Unlike a rebate or tax credit, the avoided costs continue throughout the life of a system and are a big portion of how customers realize a payback from their system.

Because solar systems are installed on the customer's side of the meter, any of the energy that is produced and used by the customer prior to reaching the meter is equivalent to reducing that customer's consumption, and thus the customer's bill, prior to any credits for generation. A challenge of residential solar installations is that the highest periods of production occur when most people are not home and not consuming a lot of energy. Battery storage helps customers increase that avoided cost component by storing the unused energy from the peak production period for use during a peak consumption period. Additionally, this type of "load reduction" helps DME maintain lower costs by reducing the energy demand during the most expensive hours of the day.

See **TABLE 5** for a breakdown of the metering and billing information for 7 sample home solar installations. These are the only 7 installed solar installations which provide DME with complete generation data from the system. For all other systems, DME only has access to the net kilowatt hours returned to the grid, as opposed to the total generated kilowatt hours. Because the data has been available for different amounts of time, data for each system is presented in aggregate for the number of months DME has had access to system data.

**TABLE 1: Solar Installations in Denton and Value**

<b>Fiscal Year</b>	<b>Residential Installs</b>	<b>Average Residential Size (kW)</b>	<b>Total Residential kW Added</b>	<b>Total Residential Value (\$)</b>	<b>Commercial Installs</b>	<b>Average Commercial Size (kW)</b>	<b>Total Commercial kW Added</b>	<b>Total Commercial Value</b>
<b>2005</b>	1	3.4	3.4	N/A	0	0	0	0
<b>2006</b>	0	0	0	N/A	0	0	0	0
<b>2007</b>	1	2.4	2.4	N/A	0	0	0	0
<b>2008</b>	0	0	0	N/A	0	0	0	0
<b>2009</b>	0	0	0	N/A	1	4.30	4.30	N/A
<b>2010</b>	4	3.1	12.3	73,097.23	1	5.00	5.00	\$25,000.00
<b>2011</b>	4	4.6	18.4	101,885.03	3	11.72	35.16	\$176,994.29
<b>2012</b>	9	4.4	39.2	183,524.75	2	4.80	9.60	\$48,532.00
<b>2013</b>	20	4.1	82.9	407,054.41	1	1.98	1.98	\$6,707.60
<b>2014</b>	10	4.8	47.9	235,247.52	3	8.33	24.98	\$107,032.03
<b>2015</b>	6	5.3	31.9	163,500.63	4	19.49	77.94	\$324,212.29
<b>2016</b>	15	7.3	109.0	448,380.89	1	20	20.00	\$67,420.00
<b>2017<sup>1</sup></b>	<b>41</b>	<b>7.2</b>	<b>287.6</b>	<b>1,264,493.05</b>	<b>4</b>	<b>231.41</b>	<b>925.65</b>	<b>1,586,085.33</b>
<b>Total</b>	<b>111</b>	<b>5.8 kW</b>	<b>635.0 kW</b>	<b>\$2,877,183.51</b>	<b>20</b>	<b>55.23 kW</b>	<b>1,104.61 kW</b>	<b>\$2,341,983.54</b>

<sup>1</sup> 2017 includes both installed and planned installations.

<b>Fiscal Year</b>	<b>Total System Installs</b>	<b>Total System kW Added</b>	<b>Total Value (\$)</b>
<b>2005</b>	1	3.4	N/A
<b>2006</b>	0	0	N/A
<b>2007</b>	1	2.4	N/A
<b>2008</b>	0	0	N/A
<b>2009</b>	1	4.3	N/A
<b>2010</b>	5	17.3	98,097.23
<b>2011</b>	7	53.56	278,879.32
<b>2012</b>	11	48.8	232,056.75
<b>2013</b>	21	84.88	413,762.01
<b>2014</b>	13	72.88	342,279.55
<b>2015</b>	10	109.84	487,712.92
<b>2016</b>	16	129	515,800.89
<b>2017<sup>1</sup></b>	<b>45</b>	<b>1,213.25</b>	<b>2,850,578.38</b>
<b>Total</b>	<b>131</b>	<b>1,739.61</b>	<b>\$5,219,167.05</b>

TABLE 2: Comparison of Average Rebate to System Cost (Installed Systems Only)							
Fiscal Year	Total Residential Rebates (\$)	Average Residential Rebate (\$)	Average Residential System Cost (\$)²	Total Commercial Rebates (\$)	Average Commercial Rebate (\$)	Average Commercial System Cost (\$)	Average Cost Per kW <sub>AC</sub> (\$)³
2009	0	0	0	15,000	15,000	N/A	N/A
2010	33,848	8,462	24,366	15,000	15,000	25,000	23,241
2011	54,371	13,593	25,471	45,000	15,000	58,998	5,582
2012	118,389	13,154	20,391	29,685	14,843	24,266	4,706
2013	224,567	11,228	20,352	4,695	4,695	6,708	7,343
2014	100,767	12,596	28,062	44,612	14,871	35,677	4,924
2015	48,247	9,649	31,100	104,358	26,090	81,053	7,964
2016	143,127	11,010	30,895	30,000	30,000	67,420	4,115
2017¹	113,884	5,423	31,031	13,325	6,617	29,673	4,498
Total	\$852,200			\$301,675			

**TOTAL REBATES DISTRIBUTED: \$1,138,875**

¹ Only includes installed systems for which DME has final system and rebate information.

² Average system cost has grown over time, primarily due to an increase in the system sizes. The cost for a system installation can be affected by a number of things, including size of system, make/model of associated equipment, “make-ready” costs, time/labor of installation.

³ Although the cost of residential systems has gone up, the average cost per kW has decreased over time. This has led to an increase in the average size of systems installed (TABLE 1) and in an increase in larger commercial installations.

<b>TABLE 3: Solar Rebate Program Summaries</b>				
<b>Utility</b>	<b>Type</b>	<b>Program Basics</b>	<b>Caps/Restrictions</b>	<b>Program Budget</b>
DME	MOU	<ul style="list-style-type: none"> <li>• \$0.75 per watt (without battery)</li> <li>• \$1.50 per watt (with battery)</li> </ul>	<ul style="list-style-type: none"> <li>• Cap at \$30,000</li> <li>• Rebate cannot exceed 50% of project cost</li> <li>• No cap on system size</li> </ul>	\$200,000
Austin Energy	MOU	<ul style="list-style-type: none"> <li>• Tiered rebate structure</li> <li>• \$0.50 to \$1.00 per watt</li> </ul>	<ul style="list-style-type: none"> <li>• System cannot produce more than 100% of on-site consumption</li> <li>• Incentive capped at first 10 kW<sub>AC</sub></li> <li>• Incentive cannot exceed 50% of invoiced costs</li> <li>• Battery storage costs cannot be included</li> <li>• Systems must carry warranty</li> </ul>	\$6,100,000
CPS	MOU	<ul style="list-style-type: none"> <li>• Up to \$0.70 per watt for locally manufactured components</li> <li>• \$0.60 per watt base incentive</li> <li>• \$0.08 per watt for local modules</li> <li>• \$0.02 per watt for local inverters</li> <li>• \$0.45 per watt for non-local installers (both commercial and residential)</li> </ul>	<ul style="list-style-type: none"> <li>• Cap at \$25,000 for residential projects</li> <li>• Cap at \$80,000 for commercial projects</li> <li>• Cap at 50% of project costs</li> <li>• Projects must be priced at \$4.00 per watt or less</li> </ul>	\$15 million (total) Commercial: \$6 million Residential: \$9 million
GP&L	MOU	<ul style="list-style-type: none"> <li>• Utility bill credit</li> <li>• \$0.75 per watt</li> </ul>	<ul style="list-style-type: none"> <li>• Cap at \$5,000</li> <li>• Systems must carry warranty</li> <li>• Systems must be 4kW to qualify for credit</li> </ul>	\$70,000
New Braunfels	MOU	<ul style="list-style-type: none"> <li>• \$0.50 per watt</li> </ul>	<ul style="list-style-type: none"> <li>• Cap at \$3,000</li> <li>• System must carry warranty</li> </ul>	Not available
San Marcos	MOU	<ul style="list-style-type: none"> <li>• \$2.00 per watt</li> </ul>	<ul style="list-style-type: none"> <li>• Cap at \$5,000</li> <li>• Rebate cannot exceed 50% of installation costs</li> <li>• Customer billed at pro-rate amounts if systems are removed</li> <li>• System must carry warranty</li> <li>• Rebate does not include battery storage</li> </ul>	\$43,000

TABLE 3: Solar Rebate Program Summaries (cont.)				
Bryan (BTU)	MOU	<ul style="list-style-type: none"> <li>No program</li> </ul>	<ul style="list-style-type: none"> <li>No program</li> </ul>	Not applicable
College Station	MOU	<ul style="list-style-type: none"> <li>No program</li> </ul>	<ul style="list-style-type: none"> <li>No program</li> </ul>	Not applicable
Georgetown (GUS)	MOU	<ul style="list-style-type: none"> <li>No program</li> </ul>	<ul style="list-style-type: none"> <li>No program</li> </ul>	Not applicable
Lubbock (LP&L)	MOU	<ul style="list-style-type: none"> <li>No program</li> </ul>	<ul style="list-style-type: none"> <li>No program</li> </ul>	Not applicable
Greenville	MOU	<ul style="list-style-type: none"> <li>No program</li> </ul>	<ul style="list-style-type: none"> <li>No program</li> </ul>	Not applicable
AEP North Texas	IOU	<ul style="list-style-type: none"> <li>Residential program: \$0.80 per watt</li> <li>Commercial program: \$0.80 per watt (0-10 kW); \$0.60 per watt (10-30 kW); \$0.25 per watt (30-100 kW)</li> </ul>	<ul style="list-style-type: none"> <li>Cap at 10 kW<sub>DC</sub> system and \$8,000 for residential</li> <li>Cap at 100 kW<sub>DC</sub> system and \$37,500 for commercial</li> </ul>	\$162,900 (total) Residential: \$90,000 Commercial: \$72,900
AEP Texas Central	IOU	<ul style="list-style-type: none"> <li>Residential program: \$0.80 per watt</li> <li>Commercial program: \$0.80 per watt (0-10 kW); \$0.60 per watt (10-30 kW); \$0.25 per watt (30-100 kW)</li> </ul>	<ul style="list-style-type: none"> <li>Cap at 10 kW<sub>DC</sub> system and \$8,000 for residential</li> <li>Cap at 100 kW<sub>DC</sub> system and \$37,500 for commercial</li> </ul>	\$360,000 (total) Residential: \$180,000 Commercial: \$180,000
Oncor	IOU	<ul style="list-style-type: none"> <li>One-time payment of \$538.53 per kW \$0.2519 per kWh</li> </ul>	<ul style="list-style-type: none"> <li>Cap at 20% of most recent funding allocation</li> <li>System must be 1 kW or larger</li> <li>Maximum size is 15 kW</li> <li>System cannot produce energy in excess of on-site consumption</li> </ul>	\$4,052,220 Residential: \$1,479,380 Commercial: \$2,572,840
Sharyland	IOU	<ul style="list-style-type: none"> <li>Residential: \$278/kW reduction; \$0.10/kWh saved</li> <li>Hard to Reach: \$477/kW reduction; \$0.16/kWh saved</li> </ul>	<ul style="list-style-type: none"> <li>Cap at 20% of the total budget of project</li> <li>Qualifying panels must be tested and meet the label specifications</li> </ul>	\$216,388 (total) Residential: \$158,569 Hard to Reach: \$57,819
CoServ	Coop	<ul style="list-style-type: none"> <li>\$350 per kW<sub>AC</sub> rebate</li> </ul>	<ul style="list-style-type: none"> <li>System must be 1 kW but not exceed 7.5 kW<sub>AC</sub></li> <li>Application must be received within 90 days of interconnection</li> </ul>	\$450,000

<b>TABLE 4: Estimated Rebate Amounts (Residential PV System)</b>								
<b>Utility</b>	<b>4.5 kW<sub>AC</sub> System No Battery</b>		<b>4.5 kW<sub>AC</sub> System With Battery</b>		<b>9.0 kW<sub>AC</sub> System No Battery</b>		<b>9.0 kW<sub>AC</sub> System With Battery</b>	
	<b>Amount</b>	<b>Rank</b>	<b>Amount</b>	<b>Rank</b>	<b>Amount</b>	<b>Rank</b>	<b>Amount</b>	<b>Rank</b>
DME	\$3,375	3 (tied)	\$6,750	1	\$6,750	2 (tied)	\$13,500	1
Austin Energy <sup>1</sup>	\$2,700	4 (tied)	\$2,700	5 (tied)	\$5,400	3 (tied)	\$5,400	4 (tied)
San Antonio (CPS) <sup>2</sup>	\$2,700	4 (tied)	\$2,700	5 (tied)	\$5,400	3 (tied)	\$5,400	4 (tied)
Garland (GP&L)	\$3,375	3 (tied)	\$3,375	4	\$6,750	2 (tied)	\$6,750	3
New Braunfels	\$2,250	6	\$2,250	7	\$3,000	6	\$3,000	7
San Marcos	\$5,000	1	\$5,000	2	\$5,000	4	\$5,000	5
Bryan (BTU) <sup>3</sup>	\$0	N/A	\$0	N/A	\$0	N/A	\$0	N/A
College Station <sup>3</sup>	\$0	N/A	\$0	N/A	\$0	N/A	\$0	N/A
Georgetown (GUS) <sup>3</sup>	\$0	N/A	\$0	N/A	\$0	N/A	\$0	N/A
Lubbock (LP&L) <sup>3</sup>	\$0	N/A	\$0	N/A	\$0	N/A	\$0	N/A
Greenville <sup>3</sup>	\$0	N/A	\$0	N/A	\$0	N/A	\$0	N/A
AEP North Texas	\$3,600	2 (tied)	\$3,600	3 (tied)	\$7,200	1 (tied)	\$7,200	2 (tied)
AEP Texas Central	\$3,600	2 (tied)	\$3,600	3 (tied)	\$7,200	1 (tied)	\$7,200	2 (tied)
Oncor	\$2,429	5	\$2,429	6	\$4,858	5	\$4,858	6
Sharyland	\$1,251	8	\$1,251	9	\$2,502	8	\$2,502	9
CoServ	\$1,575	7	\$1,575	8	\$2,625	7	\$2,625	8
<b>DME RANK</b>	<b>3<sup>rd</sup> Highest Available (tied)</b>		<b>Highest Available</b>		<b>2<sup>nd</sup> Highest Available (tied)</b>		<b>Highest Available</b>	

<sup>1</sup> Austin Energy calculation includes rebates at the \$0.60 tier level.

<sup>2</sup> CPS calculation includes only base incentive level at \$0.60 per watt.

<sup>3</sup> Bryan, College Station, Georgetown, Lubbock, and Greenville do not offer solar rebates or incentives at this time.



<b>TABLE 5: Sample PV System Billing and Generation Data<sup>1</sup></b>							
	<b>System Number</b>						
<b>System</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
Home Size	2,046 sf	3,748 sf	2,006 sf	1,910 sf	7,188 sf	2,559 sf	2,650 sf
System kW Size	8.58	7.95	3.7	5.3	15	9.54	3.5
System Cost	\$26,684	\$33,948	\$13,319	\$18,900	\$48,916	\$34,344	\$15,300
DME Rebate	\$11,942	\$10,856	\$5,066	\$0	\$18,000	\$6,514	\$2,533
Estimated Tax Credit	\$8,005	\$10,184	\$3,996	\$5,670	\$14,675	\$10,303	\$4,590
Estimated Out of Pocket Cost	\$6,737	\$12,907	\$4,257	\$13,230	\$16,241	\$17,527	\$8,177
Number of Months of System Data Available	12	10	10	8	8	5	4
Aggregate Billed kWh	10,633	8,524	3,655	7,161	17,413	2,946	2,200
Aggregate Return kWh	5,188	3,962	3,048	2,252	2,548	2,717	563
Aggregate Generation kWh	11,244	7,278	4,486	4,808	9,552	5,506	1,280
Aggregate Estimated Avoided Usage	6,056	3,316	1,438	2,556	7,004	2,789	717
Aggregate Billed Amount	\$625	\$504	\$181	\$541	\$1,336	\$140	\$210
Aggregate Estimated Avoided Cost	\$525	\$602	\$142	\$218	\$584	\$310	\$90

<sup>1</sup>See definitions on next page for additional information.

**Definitions:**

Home/Structure Size	The square footage of the home as reported to Denton Central Appraisal District.
System kW Size	The maximum kilowatt (kW) direct current (DC) the system can generate at any given point.
System Cost	The total cost of the system, including installation and equipment.
DME Rebate	The total solar rebate incentive provided to customer by DME.
Estimated Tax Credit	The estimated amount of federal tax credit that the customer can qualify for under the Solar Investment Tax Credit (ITC).
Estimated Out of Pocket Cost	Estimated remaining balance of customer cost after receiving the DME rebate and tax credit.
Number of Months of Data	The number of months DME has access to generation data on the example PV systems. All of the data presented in “aggregate” are summations of the data points for the number of months available for that customer.
Billed kWh	The kilowatt-hours (kWh) consumed by the customer during a billing cycle. This unit of measurement is recorded by the meter. The Aggregate Billed kWh represents total of the data available for that customer.
Return kWh	The kilowatt-hours (kWh) generated by the customer’s system and put back on the grid during a billing cycle. This unit of measurement is recorded by the meter. The Aggregate Returned kWh represents total of the data available for that customer.
Generation kWh	The generated kilowatt-hours (kWh) generated by the customer’s system. This measurement is <b>NOT</b> captured by the meter. DME must ask for this information. The Aggregate Generation kWh represents total of the data available for that customer.
Estimated Avoided Usage	The generated kilowatt-hours (kWh) consumed by the customer before it is measured at the meter. DME can estimate this number by subtracting the returned kWh from the generation kWh. The Aggregate Estimated Avoided Usage represents total of the data available for that customer.
Billed Amount	The total electric cost to be paid by the customer after billed kWh is charged and return kWh is credited. The Aggregate Billed Amount represents total of the data available for that customer.
Estimated Avoided Cost	The estimated cost of avoided usage had there been no generation kWh. The Aggregate Avoided Cost represents total of the data available for that customer.