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U.S. DEPARTMENT OF ENERGY

TDMSB Utility Rate

Time of Day & Seasonal Electric Rate Discussion

U.S. DEPARTMENT OF ENERGY

Manufacturing Service Time of Day and Seasonal Electric Rate Explained

- This presentation explains a complex electric rate for large manufacturing plants
- There are on-peak and off-peak times of the day that shift from winter to summer months
- There are different rates depending of the season of the year
  - Summer
  - Winter
  - Transition (spring & fall)
- Charges are imposed for:
  - Energy
  - Demand
  - Power factor penalties
  - Facility rental
  - Other misc. charges

Eligibility for the Rates

- The Manufacturing Service Rate--Schedule MSB rate schedule shall apply to customers with an onpeak or offpeak *contract demand*, whichever is higher, greater than 5,000 kW, but not more than 15,000 kW
- The Manufacturing Service Rate--Schedule MSC rate schedule shall apply to customers with an onpeak or offpeak *contract demand*, whichever is higher, greater than 15,000 kW, but not more than 25,000 kW
- The Manufacturing Service Rate--Schedule MSD rate schedule shall apply to customers with an onpeak or offpeak *contract demand*, whichever is higher, greater than 25,000 kW

Onpeak and Offpeak Hours

- Except for Saturdays, Sundays, November 1, and the weekdays that are observed as Federal holidays for New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day:
- Onpeak hours for each day shall for purposes of these rate schedules be from 1 p.m. to 7 p.m. during the months of April, May, June, July, August, September and October and from 4 a.m. to 10 a.m. during the months of January, February, March, November, and December.
- For all other hours of each day and all hours of such excepted days shall be offpeak hours. Such times shall be Central Standard Time or Central Daylight Time, whichever is then in effect.
- Said onpeak and offpeak hours are subject to change by TVA. In the event TVA determines that such changed onpeak and offpeak hours are appropriate, it shall so notify Distributor at least 12 months prior to the effective date of such changed hours.

Determination of Seasonal Periods

- Summer Period shall mean the June, July, August, and September billing months.
- Winter Period shall mean the December, January, February, and March billing months.
- Transition Period shall mean the April, May, October, and November billing months.

Character of Service

- Alternating current, single- or three-phase, 60 hertz. Power shall be delivered at a transmission voltage of 161 kV or, if such transmission voltage is not available, at the highest voltage available in the vicinity, unless at the customer's request a lower standard voltage is agreed upon.
- If you receive power at a lower voltage, you will pay an extra facility rental fee.

Facility Rental Charge

- There shall be no facilities rental charge under these rate schedules for delivery at bulk transmission voltage levels of 161 kV or higher.
- For delivery at less than 161 kV, there shall be added to the customer's bill a facilities rental charge:
- This charge shall be 36¢ per kW per month except for delivery at voltages below 46 kV, in which case the charge shall be 93¢ per kW per month for the first 10,000 kW and 73¢ per kW per month for the excess over 10,000 kW.
- Such charge shall be applied to the higher of (1) the highest billing demand established during the latest 12-consecutive-month period or (2) the customer's currently effective onpeak or offpeak contract demand, whichever is higher, and shall be in addition to all other charges under these rate schedules, including minimum bill charges.

Base Charges and Adjustment

- Base Charges
  - The Base Charges for Schedule MSB, Schedule MSC, and Schedule MSD are set forth under the Base Charges Attachment to this Large Manufacturing Service Rate Schedules document. Any references to the Base Charges section of Schedule MSB, Schedule MSC, and Schedule MSD will be deemed to include the Base Charges Attachment.
- Adjustment
  - The base demand and energy charges shall be increased or decreased in accordance with the current Adjustment Addendum published by TVA.
  - Loss adjustments are made to the monthly FCA adjustment under the Adjustment Addendum to recognize additional distribution cost of providing service to the retail customers. The loss factors applied to customers that own the transformation facilities and take service at the bulk transmission of 161 kV or higher shall be set to 0%.

Reactive Demand Charges (Power Factor)

- If the reactive demand (in kVAR) is lagging during the 30-consecutive-minute period beginning or ending on a clock hour of the month in which the customer's highest metered demand occurs,
- there shall be added to the customer's bill a reactive charge of $1.46 per kVAR of the amount, if any, by which the reactive demand exceeds 33 percent of such metered demand.
- If the reactive demand (in kVAR) is leading during the 30-consecutive-minute period beginning or ending on a clock hour of the month in which the customer's lowest metered demand (excluding any metered demands which are less than 25 percent of the highest metered demand) occurs, there shall be added to the customer's bill a reactive charge of $1.14 per kVAR of the amount of reactive demand.
- Such charges shall be in addition to all other charges under these rate schedules, including minimum bill charges.

Determination of Onpeak and Offpeak Energy Amounts

- The onpeak and offpeak kWh for any month shall be the energy amounts taken during the respective hours of the month designated under these rate schedules as onpeak and offpeak hours.
- Provided, however, the offpeak energy amount for any month shall in no case be less than the product of (1) the offpeak billing demand as determined in this rate and (2) 110 hours (reflecting a 15 percent load factor applied to the average number of hours in a month).

Determination of Onpeak, Offpeak and Maximum Demands

- Distributor shall meter the onpeak and offpeak demands in kW of all customers taking service under these rate schedules.
- The onpeak metered demand and offpeak metered demand for any month shall be determined separately for the respective hours of the month designated under these rate schedules as onpeak and offpeak hours and, in each case, shall be the highest average during any 30-consecutive-minute period beginning or ending on a clock hour.
- Except as provided below, (1) the onpeak billing demand shall be the highest onpeak metered demand in the month, (2) the offpeak billing demand shall be the highest offpeak metered demand in the month, and (3) the maximum billing demand shall be the higher of the onpeak billing demand or offpeak billing demand in the month.

Determination of Minimum Onpeak Demand

- The onpeak billing demand shall in no case be less than the sum of
  - (1) 30 percent of the first 5,000 kW,
  - (2) 40 percent of the next 20,000 kW,
  - (3) 50 percent of the next 25,000 kW,
  - (4) 60 percent of the next 50,000 kW,
  - (5) 70 percent of the next 100,000 kW,
  - (6) 80 percent of the next 150,000 kW, and
  - (7) 85 percent of all kW in excess of 350,000 kW
  - of the higher of the currently effective onpeak contract demand or the highest onpeak billing demand established during the preceding 12 months.
  - For example: Onpeak contract demand is 9,000 kW
    - Minimum onpeak billing demand is 5,000 kW x 0.3 + 4,000 x 0.4 = 3,100 kW

Determination of Minimum Offpeak Demand

- The offpeak billing demand shall in no case be less than the sum of
  - (1) 30 percent of the first 5,000 kW,
  - (2) 40 percent of the next 20,000 kW,
  - (3) 50 percent of the next 25,000 kW,
  - (4) 60 percent of the next 50,000 kW,
  - (5) 70 percent of the next 100,000 kW,
  - (6) 80 percent of the next 150,000 kW, and
  - (7) 85 percent of all kW in excess of 350,000 kW
  - of the higher of the currently effective offpeak contract demand or the highest offpeak billing demand established during the preceding 12 months.

Determination of the Minimum Bill

- The monthly bill, excluding any facilities rental charges and any reactive charges, shall not be less than the sum of
  - (1) the base service charge and administrative charge,
  - (2) the portion of the base demand charge, as adjusted, applicable to onpeak billing demand applied to the customer's onpeak billing demand,
  - (3) the portion of the base demand charge, as adjusted, applicable to maximum billing demand applied to the to the customer's maximum billing demand,
  - (4) the base onpeak energy charge, as adjusted, applied to the customer's onpeak energy takings, and
  - (5) the base offpeak energy charge, as adjusted, applied to the higher of customer's actual offpeak energy takings or the minimum offpeak energy takings amount provided for in the first paragraph of the section of these rate schedules entitled “Determination of Onpeak and Offpeak Demands, Maximum Metered Demand, and Energy Amounts.” Notwithstanding the foregoing, amounts calculated under any fuel cost adjustment that is included in the Adjustment Addendum shall not be applied to any billed offpeak energy that exceeds the metered offpeak energy. Excess demand charges are excluded from this calculation. Distributor may require minimum bills higher than those stated above, including, without limitation, charges to cover any additional metering and related costs.

Single Point of Delivery

- The charges under these rate schedules are based upon the supply of service through a single delivery and metering point, and at a single voltage. If service is supplied to the same customer through more than one point of delivery or at different voltages, the supply of service at each delivery and metering point and at each different voltage shall be separately metered and billed.

Service and Administrative Charges

	Schedule MSB	Schedule MSC	Schedule MSD	
Service Charge	$2,000	$2,000	$2,000	per delivery point per month
Administrative Charge	$350	$350	$350	per delivery point per month

Demand Charges

		Schedule MSB ($/kW)	Schedule MSC ($/kW)	Schedule MSD ($/kW)	
Summer Period	Onpeak Demand	10.24	10.24	10.24	per month of onpeak billing demand
	Maximum Demand	2.43	2.43	2.42	per month of maximum billing demand
	Excess Demand	10.24	10.24	10.24	per month of the amount, if any, by which (1) the customer's onpeak billing demand exceeds its onpeak contract demand or (2) the customer's offpeak billing demand exceeds its offpeak contract demand, whichever is higher.
Winter Period	Onpeak Demand	9.27	9.27	9.27	per month of onpeak billing demand
	Maximum Demand	2.43	2.43	2.42	per month of maximum billing demand
	Excess Demand	9.27	9.27	9.27	per month of the amount, if any, by which (1) the customer's onpeak billing demand exceeds its onpeak contract demand or (2) the customer's offpeak billing demand exceeds its offpeak contract demand, whichever is higher.
Transition Period	Onpeak Demand	9.27	9.27	9.27	per month of onpeak billing demand
	Maximum Demand	2.43	2.43	2.42	per month of maximum billing demand
	Excess Demand	9.27	9.27	9.27	per month of the amount, if any, by which (1) the customer's onpeak billing demand exceeds its onpeak contract demand or (2) the customer's offpeak billing demand exceeds its offpeak contract demand, whichever is higher.

Energy Charges – Summer Period

		Schedule MSB (¢/kWh)	Schedule MSC (¢/kWh)	Schedule MSD (¢/kWh)	
Summer Period	Onpeak hours	7.089	6.977	6.750	per month for all metered onpeak kWh
	Offpeak hours Block 1	4.589	4.476	4.249	per month for the first 200 hours use of metered onpeak demand multiplied by the ratio of offpeak energy to total energy
	Offpeak hours Block 2	1.620	1.761	1.592	per month for the next 200 hours use of metered onpeak demand multiplied by the ratio of offpeak energy to total energy
	Offpeak Hours Block 3	1.365	1.761	1.533	per month for the hours use of metered onpeak demand in excess of 400 hours multiplied by the ratio of offpeak energy to total energy
	Minimum offpeak energy	4.589	4.476	4.249	per month shall be applied to the portion, if any, of the minimum offpeak energy takings amount that is greater than the metered energy.

Energy Charges – Winter Period

		Schedule MSB (¢/kWh)	Schedule MSC (¢/kWh)	Schedule MSD (¢/kWh)	
Winter Period	Onpeak hours	5.949	5.836	5.608	per month for all metered onpeak kWh
	Offpeak hours Block 1	4.812	4.698	4.471	per month for the first 200 hours use of metered onpeak demand multiplied by the ratio of offpeak energy to total energy
	Offpeak hours Block 2	1.620	1.761	1.592	per month for the next 200 hours use of metered onpeak demand multiplied by the ratio of offpeak energy to total energy
	Offpeak Hours Block 3	1.365	1.761	1.533	per month for the hours use of metered onpeak demand in excess of 400 hours multiplied by the ratio of offpeak energy to total energy
	Minimum offpeak energy	4.812	4.698	4.471	per month shall be applied to the portion, if any, of the minimum offpeak energy takings amount that is greater than the metered energy.

Energy Charges – Transition Period

		Schedule MSB (¢/kWh)	Schedule MSC (¢/kWh)	Schedule MSD (¢/kWh)	
Transition Period	Onpeak hours	4.899	4.786	4.558	per month for all metered onpeak kWh
	Offpeak hours Block 1	4.899	4.786	4.558	per month for the first 200 hours use of metered onpeak demand multiplied by the ratio of offpeak energy to total energy
	Offpeak hours Block 2	1.620	1.761	1.592	per month for the next 200 hours use of metered onpeak demand multiplied by the ratio of offpeak energy to total energy
	Offpeak Hours Block 3	1.365	1.761	1.533	per month for the hours use of metered onpeak demand in excess of 400 hours multiplied by the ratio of offpeak energy to total energy
	Minimum offpeak energy	4.899	4.786	4.558	per month shall be applied to the portion, if any, of the minimum offpeak energy takings amount that is greater than the metered energy.

Electric Bill – May 2020

CUSTOMER ID:	7426	ACCOUNT NUMBER:	286103001
CLASS:	26	SIC:	3253
METER READ DATE:	05/31/20	CONTRACT DATE:	10/01/2018
ONPEAK ENERGY:	834853.0	OFFPEAK ENERGY:	3879361.0
		TOTAL ENERGY:	4714214.0
ONPEAK FIRM CONTRACT DEMAND:	9000.000	OFFPEAK FIRM CONTRACT DEMAND:	9000.000
ONPEAK INTER. CONTRACT DEMAND:	0.000	OFFPEAK INTER. CONTRACT DEMAND:	0.000
ONPEAK METERED DEMAND:	8336.000	OFFPEAK METERED DEMAND:	8292.000
ONPEAK BILLING DEMAND:	8336.000	OFFPEAK BILLING DEMAND:	8292.000
ONPEAK EXCESS DEMAND:	0.000	OFFPEAK EXCESS DEMAND:	0.000
ONPEAK POWER FACTOR:	94.90%	OFFPEAK POWER FACTOR:	95.44%
ONPEAK KVA:	8784.180	OFFPEAK KVA:	8688.000
ONPEAK KVAR AT PEAK KW:	2770.000	OFFPEAK KVAR AT PEAK KW:	0.000
ONPEAK KVAR AT MINIMUM KW:	280.000	OFFPEAK KVAR AT MINIMUM KW:	0.000
ONPEAK HIGHEST DEMAND IN PRECEDING 12 MOS:	8346.000	OFFPEAK HIGHEST DEMAND IN PRECEDING 12 MOS:	8362.000
ONPEAK HIGHEST DEMAND IN LATEST 12 MOS:	8346.000	OFFPEAK HIGHEST DEMAND IN LATEST 12 MOS:	8362.000

Electric Demand

DETERMINATION OF CURRENT MONTH ON PEAK BILLING DEMAND: HIGHER OF 1) OR 2)	
1) METERED KW	8336.000
2) 30% OF FIRST 5000 kW + 40% OF ADDITIONAL kW OF HIGHER OF CONTRACT kW OR PRECEDING HIGH kW	3100.000
ON PEAK BILLED DEMAND:	8336.000
DETERMINATION OF CURRENT MONTH OFF PEAK BILLING DEMAND: HIGHER OF 1) OR 2)	
1) METERED KW	8292.000
2) 30% OF FIRST 5000 kW + 40% OF ADDITIONAL kW OF HIGHER OF CONTRACT kW OR PRECEDING HIGH kW	3100.000
OFF PEAK BILLED DEMAND:	8292.000

Customer, Administrative and Energy Charges

CUSTOMER CHARGE			$1,500.00
ADMINISTRATIVE CHARGE			$350.00
ENERGY CHARGES:			
ONPEAK	834853 x 0.03589/kWh	$29,962.87	
OFFPEAK			
First 200	1667200 x 0.8229073 x 0.03589/kWh	$49,239.32	
Next 200	1667200 x 0.8229073 x 0.0031/kWh	$4,253.05	
Over 400	1379814 x 0.8229073 x 0.00055/kWh	$624.50	
FCA CHARGES:			
ONPEAK	834853 x 0.01433/kWh	$11,963.44	
OFFPEAK	3879361 x 0.01433/kWh	$55,591.24	
TOTAL ENERGY CHARGES:			$151,634.42

- Offpeak Energy
  - Block 1:
    - 200 hrs x 8336 kW = 1667200 kWh
    - (3879361.0/4714214.0) = 0.8229073
    - Block 1 cost = 1667200 x 0.8229073 x $0.03589 = $49,239.32
  - Block 2:
    - Block 2 cost = 1667200 x 0.8229073 x $0.00310 = $4,253.05
  - Block 3:
    - Block 3 cost: ((3879361.0 – 2 x (1667200 x 0.8229073)) x $0.00055 = $624.50

Demand, Reactive Demand & Facility Charges

DEMAND CHARGES:			
MAXIMUM	8336.000 x 3.760/kW	$31,343.36	
ONPEAK	8336.000 x 9.270/kW	$77,274.72	
TOTAL DEMAND CHARGES:			$108,618.08
FACILITIES RENTAL CHARGES:			
LESS THAN 46 kV: (HIGHEST OF CURRENT 12 MONTHS DEMAND OR TOTAL CONTRACT DEMAND)			
FIRST 10,000 kW @ 0.93/kW + OVER 10,000 kW @ 0.73/kW			$8,370.00
REACTIVE DEMAND CHARGES:			
LAGGING: [(2770.000) - (0.33 x 8336.0)] x $1.46/kVar:			$27.92
LEADING: 280.000 @ $1.14/kVar:			$.00
TOTAL MONTHLY RATE SCHEDULE REVENUE			$270,500.42
VII CREDIT			-$20,242.00
STATE TAX			$3,748.62

Shift 500 kW Load from Onpeak to Offpeak

- Have a 500 kW load that operates 4 hours/day during the onpeak period 365 days per year
- Calculate savings for moving the load to offpeak times
- Assume the offpeak energy is priced from Block 2 offpeak energy
  - Energy savings
    - Summer: (0.07087 – 0.0162) $/kWh x 243,333 kWh = $13,303
    - Winter: (0.05749 – 0.0162) $/kWh x 243,333 kWh = $10,047
    - Transition: (0.04899 – 0.0162) $/kWh x 243,333 kWh = $ 7,979
    - Total energy savings: $ 31,329
  - Demand savings
    - Summer: ($10.24 - $2.43)/kW x 500 kW x 4 mos = $ 15,620
    - Winter: ($9.27 - $2.43)/kW x 500 kW x 4 mos = $ 13,680
    - Transition: ($9.27 - $2.43)/kW x 500 kW x 4 mos= $ 13,680
    - Total demand savings: $42,980
- Total savings = $74,309/year

Take Power at Highest Local Voltage

- If power is taken at the 161 kV, or the highest local voltage, there is no Facility Rental Charge charged
- The Facility Rental Charge is based on the higher of:
  - The contract demand
  - The highest monthly demand recorded during the past 12-months (12-month rachet clause)
- For example, a company has a contract demand of 9000 kW and this is higher than their peak recorded demand for the past 12-months
- Their Facility Rental Charge is:
  - 9000 kW x $0.93/kW-mo x 12 mo/yr = $100,440/year

Install Capacitors to Improve Power Factor

- For the monthly bill shown earlier in this presentation the maximum demand was onpeak at 8336 kW
- Let's assume the power factor recorded at that peak was 72.3%
- Then, the apparent power would have been 8336/0.723 = 11529.7 kVA
- From the power triangle the reactive power is 7965.3 kVAR
- The allowable kVAR before penalty is 8336 kW x 0.33 = 2750.9
- The power factor penalty threshold is 95% on this rate
- The amount of kVAR in penalty is 7965.3 – 2750.9 = 5214.4 kVAR
- The penalty amount per month is 5214.4 kVAR x $1.46/kVAR = $7,613/mo
- The annual penalty if all months were identical is $91,356/year
- Need 5500 kVAR of capacitors costing about $60/kVAR = $330,000
- Simple payback = $330,000/$91,356 = 3.6 years

The End for Complex Utility Rates