AMERICAN TRANSMISSION COMPANY	**Business Practice**	**Department:**	**External Affairs**
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Title: **TRANSMISSION RELATED STATION POWER USE AT SUBSTATIONS**		**Issue Date:**	**11-01-2010**
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Contents

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CAUTION: Any hard copy reproductions of this Business Practice should be verified against the on-line system for current revisions.

1 PURPOSE

This Business Practice identifies the cost responsibility for energy consumption at substations by American Transmission Company LLC (ATC). ATC will require electric service installations[1] (alternating current (AC) station power) to transmission facilities and will consume electrical energy to serve transmission specific related equipment located within substations interconnected to the ATC transmission system. Equipment examples are as follows: battery chargers, circuit breakers, transformer auxiliary power and instrument transformers. Energy consumed for lighting, HVAC, and shared DC panels at Local Distribution Company (LDC) owned / ATC occupied control houses is the responsibility of the LDC. The energy consumed by ATC is necessary to serve the operational and reliability needs of the LDC(s) at any given substation and the cost of the energy consumed by ATC will be the financial responsibility of ATC. This Business Practice applies to all existing substations where ATC facilities are present, ATC- Only substations, switchyards, terminals, pumping stations, cathodic protection systems, and any newly constructed substations where ATC facilities are present, unless otherwise agreed to by ATC and the LDC.

2 SCOPE AND APPLICABILITY

This Business Practice is applicable to all substations in which ATC owns energy consuming equipment that has its source from “inside the fence”.

3 ROLES AND RESPONSIBILITIES

Roles and responsibilities have been assigned as designated by position title. Upon any change of staff in the positions cited, the position’s supervisor is charged with ensuring that the duties described are transferred to the new position occupant.

External Affairs Technical Assistant/Facilities Assistant

- Receives invoices through Accounts Payable in Oracle for printing and entering of information (dollar amount and quantity) into the spreadsheet model on a monthly basis
- Prepares annual true up spreadsheets for LDC’s each November.

Customer Relations Regional Manager (as assigned to oversee this process)

- Receives notification of invoice for approval available in Oracle, reviews the invoice in the spreadsheet model, and reassigns the Oracle invoice to the Director Customer Relations Interconnection Services if appropriate.
- Investigates and resolves issues with LDC invoices
- Reviews spreadsheet model monthly to ensure it is up to date and accurate
- Provides budget recommendation for transmission-related station power use expenditures to the Director Customer Relations – Interconnection Services for approval
- Requests and receives reports annually from the Asset Management Applications Specialist
- Coordinates with the Customer Relations Regional Managers to ensure all non-metered substations have transmission equipment is verified to annually to ensure billing accuracy with their assigned LDCs

Director, Customer Relations – Interconnection Services

- Approves monthly electricity invoices > $10,000 upon the recommendation of the Customer Relations Regional Manager assigned to this process or requests further review as appropriate
- Approves five calendar year budget recommendation

Accounts Payable Specialist

- Scans electricity invoices into Oracle and assigns approval to the External Relations Regional Manager

[1] AC Station Power shall be provided consistent with the latest version of the ATC Substation Design Criteria DS000 which is available upon request.

Asset Management Application Specialist

- Annually provides a report of transmission equipment located in each substation by customer

4 PROCESS DETAILS

4.1 New Substations

For new substation construction, a separate AC load center will be installed and metered to provide power to ATC equipment. In the case of significant renovation to an existing substation, ATC and the LDC will enter into the Best Value Planning (BVP) process to determine whether it is appropriate to install and meter a separate load center for ATC equipment. When the BVP process determines that it is appropriate to install a separate load center and associated electrical circuits required to serve the ATC load, ATC will be responsible for the installation cost of those facilities.

4.1.1 Existing Substations

In the case of existing substations, (without AC panel metering) ATC's energy use will be estimated. Monthly kWh's invoiced will be taken from Appendix B "Energy Estimation Methods for Non-Metered Substations" ATC provides LDC's with a listing of non-metered substations, transmission equipment located at the substation, and monthly kWh's to be billed

5 COST RESPONSIBILITY

5.1 Source of Power

If the source of station power for transmission related equipment originates from the distribution system outside of the substation, ATC will pay for the energy consumed (See Appendix A for a listing of different station power sources and a description of the cost responsibility for the energy consumed.) If there are instances where metering is not in place and is not feasible, ATC's energy consumption will be estimated using the same estimating method used for power derived within the substation. Appendix B defines the energy consumption estimates for various substation equipment.

5.2 LDC electric service rate

The default electric service rate to be charged under this Business Practice will be the appropriate LDC small commercial, energy-only, non-time-of-use electric service rate, as agreed upon by the LDC and ATC. For substations interconnecting legacy (i.e. pre-ATC) generation resources to the ATC transmission system, the electric service rate to be used is to be jointly determined by both ATC and the LDC in accordance with the Generation – Transmission Interconnection Agreement between the parties.

5.3 Non Metered Electricity

Non-Metered substation electricity will be billed using Appendix B "Energy Estimation Methods for Non-Metered Substations. Previously issued bills will not be adjusted to reflect this new information. In addition, the ATC owned equipment list at estimated substations will be reviewed by ATC in November of each calendar year. Equipment changes will be communicated to the appropriate LDC in December of each calendar year to be used in the following year's invoicing.
The invoicing for station power usage will be through the LDC's electric service billing system, unless otherwise agreed to by ATC and the LDC.

6 ADDITIONAL INFORMATION

Each LDC will be responsible for cooperating with ATC to provide station power to ATC's transmission related equipment in the substations where they co-exist. In the event that more than one LDC is present in any given substation, ATC and the associated LDCs will agree on:

- which LDC provides the station power,
- the appropriate billing and billing methods for the electric energy consumed by ATC.

7 DOCUMENT REVIEW

This document will be reviewed and revised as necessary no less than every three years.

8 RECORDS RETENTION

Documents are maintained per the Records Retention Schedule.

Records Management Index System (RMIS)

Records Management Policy #2002-2 Revision Information

9 REVISION INFORMATION

Version	Author	Date	Section	Description
0.0	Mike Burow	11-01-2010	All	New
1.0	Kurt Hendrickson	09-05-2017		Updated to current Business Practice template Added Appendix B

APPENDIX A – Energy Cost Responsibility Associated with Various Energy Sources

SCENARIO	#1	#2	#3	#4	#5
	Station Power source supplied from transmission bus (from any device deriving power from the transmission bus, such as power transformer tertiary or power potential transformer)	**Station Power source supplied from distribution bus internal to substation**	**Station Power source supplied from distribution source external to substation**	**LDC installs new station power at request of ATC for transmission use**	**LDC increases station power capacity at the request of ATC**
Metered	ATC will be billed for actual energy consumed	ATC will be billed for actual energy consumed	ATC will be billed for actual energy consumed	ATC pays for the cost of installation according to LDC business practices, and is billed for actual energy consumed	ATC pays for the cost of the capacity increase / upgrade according to LDC business practices, and is billed for actual energy consumed
Un-Metered	ATC will be billed for energy consumed, based on estimate	ATC will be billed for energy consumed, based on estimate	ATC will be billed for energy consumed, based on estimate	ATC pays for the cost of installation according to LDC business practices, and is billed for energy consumed, based on estimate	ATC pays for the cost of the capacity increase / upgrade according to LDC business practices, and is billed for energy consumed, based on estimate

APPENDIX B –Energy Estimation Methods for Non-Metered Substations

Equipment Type	Formula to determine non metered Monthly kWh usage	ATC Calculated Monthly kWh
Battery Chargers (ATC DC Load at WE Subs)	kWh = 0.59 kW [Avg ATC DC Load] x 1.2 [Charger Efficiency] x 24 hr/day x 365 days/yr ÷ 12 months/yr	**515.7**
Battery Charger (ATC DC Load at WPS Subs)	kWh = 0.4 kW [Avg ATC DC Load] x 1.2 [Charger Efficiency] x 24 hr/day x 365 days/yr ÷ 12 months/yr	**348.7**
Battery Chargers (ATC DC Load at Alliant Subs)	kWh = 0.6 kW [Avg ATC DC Load] x 1.2 [Charger Efficiency] x 24 hr/day x 365 days/yr ÷ 12 months/yr	**529.6**
Battery Chargers (ATC DC Load at MG&E Subs)	kWh = 1.101 kW [Avg ATC DC Load] x 1.2 [Charger Efficiency] x 24 hr/day x 365 days/yr ÷ 12 months/yr	**964.9**
Battery Chargers (ATC DC Load at UPPCO Subs)	kWh = 0.43 kW [Avg ATC DC Load] x 1.2 [Charger Efficiency] x 24 hr/day x 365 days/yr ÷ 12 months/yr	**376.9**
Motor Operators	kWH = 0.07 kW [Heater Wattage] x 1.2 [Heater Efficiency] x 24 hr/day x 365 days/yr ÷ 12 months/yr	**62**
Pump House	kWh= ((3 hp x 0.75 kW/hp x 2 pumps/house x 2hr/day x 1.15 efficiency)pump + (0.476 kW x 0.0984 hr/day)lighting + (0.3 kW x 1.97 hr/day)exhaust + (4 kW x 2 hr/day)heating) x 365 days/yr ÷ 12 months/yr	**577.5**
Cathodic Protection - Resistor Type	kWh = 0.4 kw [Resistor Type Draw] x 1.2 efficiency x 24 hr/day x 365 days/yr ÷ 12 months/yr	**350.4**
Cathodic Protection - Impressed Current Type	kWh = 2 kw [rectifier draw] x 1.05 efficiency x 24 hr/day x 365 days/yr ÷ 12 months/yr	**1533**

Assumptions

Battery Charger: Wattage value is based on average float current plus the standard deviation, thus getting the high end of the average, 80% efficiency assumed as worse case, 24 hour operation. RTU, Router, & Relay loads covered.

Motor Operator: 80% efficiency assumed per worse case, 24 hour operation

Pump Houses: 2 pumps per house, only running 2 hours per day, pump efficiency factor (assumed 85% efficient) covers any additional electronics in the house

Pumping Console: Not reviewed, assumed to be included with the pump house charge above.

Cathodic Protection: See side descriptions for assumptions.

Equipment Type	Formula to determine non metered Monthly kWh usage	ATC Calculated Monthly kWh
Reactor Oil Filled	(1.0 x (0.1 kW x 24 hours/day)heater + (0.2 kW x 24 hours/day)controls) x 30.5 days/month	**219.6**
LTC Transformers	(1.0 x ((1.2 kW x 24 hours/day)controls + (0.24 kW x 24 hours/day)LTC controls) + 0.0274 x (8.8 kW x 24 hours/day)fans) x 30.5 days/month	**1230.6**
Non LTC Transformers	(1.0 x (1.2 kW x 24 hours/day)controls + 0.0274 x (8.8 kW x 24 hours/day)fans) x 30.5 days/month	**1054.9**
Coupling Capacitor Voltage Xfmr	(1.0 x (0.01 kW x 24 hours/day)heater) x 30.5 days/month	**7.3**
Line Tuner	(1.0 x (0.01 kW x 24 hours/day)heater + (0.1 kW x 24 hours/day)tuner) x 30.5 days/month	**80.5**
Voltage Transformer	(1.0 x (0.01 kW x 24 hours/day)heater) x 30.5 days/month	**7.3**

Estimate of annual power consumption

Instrument Transformer Heater = 10 watts / rf = 1.0 (continuous operation)
Shunt Reactor Heater = 100 watts / rf = 1.0 (continuous operation)
Shunt Reactor Controls = 200 watts / rf = 1.0 (continuous operation)
Tuner = 100 watts / rf = 1.0 (continuous operation)
Transformer Control Losses = 1200 watts / rf = 1.0 (continuous operation)
Fans = 8800 watts / rf=0.0274 (operate 10 days per year)
LTC Control Losses = 240 watts / rf = 1.0 (continuous operation)

Equipment Type	Formula to determine non metered Monthly kWh usage	ATC Calculated Monthly kWh
ATC Only Control Houses	kWh= ((0.476 kW x 0.0984 hr/day)lighting + (4 kW x 2 hr/day)heating) x 365 days/yr ÷ 12 months/yr	**488**
69kV Oil Breaker	(0.35kW x 24 hr/day + 0.7kW x 13.2 hr/day + .622 kW x 0.3278 hr/day) x (30.5days/mo)	**544.2**
115kV Oil Breaker	(0.35kW x 24 hr/day + 1.05kW x 13.2 hr/day + .622 kW x 0.3278 hr/day) x (30.5days/mo)	**685.1**
138kV Oil Breaker	(0.35kW x 24 hr/day + 1.05kW x 13.2 hr/day + .622 kW x 0.3278 hr/day) x (30.5days/mo)	**685.1**
345kV Oil Breaker	(0.35kW x 24 hr/day + 1.05kW x 13.2 hr/day + .622 kW x 0.3278 hr/day) x (30.5days/mo)	**685.1**
69kV SF6 Gas Breaker	(0.19kW x 24 hr/day +0.19kW x 8.9 hr/day + 1.2 kW x 0.000091 hr/day + 1.5 kW x 1.8 hr/day) x (30.5days/mo)	**273.0**
115kV SF6 Gas Breaker	(0.25kW x 24 hr/day +0.25kW x 8.9 hr/day + 1.2 kW x 0.000091 hr/day + 1.5 kW x 1.8 hr/day) x (30.5days/mo)	**333.2**
138kV SF6 Gas Breaker	(0.25kW x 24 hr/day +0.25kW x 8.9 hr/day + 1.2 kW x 0.000091 hr/day + 1.5 kW x 1.8 hr/day) x (30.5days/mo)	**333.2**
161kV SF6 Gas Breaker	(0.25kW x 24 hr/day +0.25kW x 8.9 hr/day + 1.2 kW x 0.000091 hr/day + 2.4 kW x 1.8 hr/day) x (30.5days/mo)	**382.6**
230kV SF6 Gas Breaker	(0.30kW x 24 hr/day +0.30kW x 8.9 hr/day + 1.2 kW x 0.000091 hr/day + 2.4 kW x 1.8 hr/day) x (30.5days/mo)	**432.8**
345kV SF6 Gas Breaker	(0.8kW x 24 hr/day +0.65kW x 8.9 hr/day + 3.6 kW x 0.000091 hr/day + 3.6 kW x 1.8 hr/day) x (30.5days/mo)	**959.7**
69 Cap Switchers	(0.32kW x 23.9 hr/day + 0.7 kW x 0.000091 hr/day) x (30.5days/mo)	**233.3**
138 Cap Switchers	(0.56kW x **24** hr/day + +0.08 kW x **24** hr/day + 0.7 kW x 0.000091 hr/day) x (30.5days/mo)	**395.8**
S&C Circuit Switchers	(0.1kW x 23.9 hr/day + 0.7 kW x 0.000091 hr/day) x (30.5days/mo)	**72.9**
RTU	The RTU, router and relay loads are covered with the battery charger usage	

Estimate of ckt bkr annual power consumption

Control cabinet heater, first stage = GCB/OCB watts (continuous operation)
Control cabinet heater, second stage = GCB/OCB watts (thermostatically controlled, activated at 30F / 40F (GCB/OCB))
Tank heater = watts by tank size (thermostatically controlled, activated at 5 deg F)
Op Mech energy storage = GCB: watts by mech type (time duration of 10 sec, 1 oper per month), OCB: 1200 watts (time duration of 10 hrs per month)
Ckt Bkr Usage = Ctl Cab htr stage 1 + Ctl Cab htr stage 2 + Op Mech energy + Tank Htr (if GCB)
Ckt Sw Usage = Ctl Cab htr stage 1 + Ctl Cab htr stage 2 (if provided) + Op Mech energy