D C POWER PLANTS

1. General

1.1 This addendum is issued to change and/or supplement the information contained in BR 790-100-654, DC Plants. This is a merged practice (MP), and provides standards for Southwestern Bell, Pacific Bell, Nevada Bell, Ameritech and Southern New England Telephone (SNET).

2. Engineering Guidelines for -48 Volt Rectified Power Plants

2.1 **Initial and Ultimate Plant Sizing**
The SBC LEC Power Equipment Engineer shall use the following information to determine the sizing of new DC Power Plants as well as to provide appropriate power plant augmentations.

2.1.1 Make a list of all the equipment loads to be served by the Power Plant being engineered (i.e. converter plants, switching systems, transmissions systems, inverters, DC fans, etc.).

2.1.2 Determine the normal and emergency DC voltage limits of the equipment. The required emergency DC voltage limits shall follow the outline in BSP 790-100-655MP.

2.1.3 Determine the List 1 current drains of all equipment to be served. In central office applications that may be up to 10 years. In RT power applications that shall be the ultimate size of the power plant.

2.1.4 The requirements for power plant capacity are based upon the busy hour load (BHL), power fail load (PFL) and whether it is a new installation or an existing power plant augmentation.

INITIAL POWER PLANT INSTALLATIONS

- Rectifiers: For the initial installation of a power plant the load used to size rectifier capacity shall be the BHL plus 2 years expected growth. The rectifier plant shall be sized so that the calculated load does not exceed 60% of the rectifier capacity without the maintenance spare.
- Batteries: The PFL, as defined in BSP 790-100-652MP, shall be used to determine battery reserve capacity. The required reserve hours for a particular situation is outlined in BSP 790-100-655MP.

EXISTING POWER PLANT AUGMENTATIONS

- Rectifiers: The rectifier plant shall be sized so that the BHL shall not exceed 80% of the rectifier capacity without the maintenance spare.

- Batteries: The battery reserve time shall be sized to meet the PFL for the required number of hours for that office, as outlined in BSP 790-100-655 MP.

2.1.4 In general, a busbar plant will be used if the ultimate sizing of the plant is or will be above 4000 Amps.

2.1.5 As required by SBC NEBS requirements, all network equipment shall withstand voltages down to 0 volts without suffering damage. The equipment shall restart and operate normally without manual intervention when the voltage returns to normal operating levels. The majority of the network equipment stops operating at or below 42 volts, the drain on the batteries is greatly reduced.

2.2 Layout and Building Requirements

2.2.1 The SBC LEC Power Equipment Engineer shall determine the layout of the ultimate power plant and capacity. The CSPEC floor space planner shall assign the actual location.

2.2.2 The SBC LEC Power Equipment Engineer shall request the necessary reserved floor space required for the ultimate growth layout of the power plant from the CSPEC planner. The requirements for forecasting depend on the region. The SBC LEC Power Equipment Engineer shall work with CSPEC planner to determine the optimal location for the power plant.

2.2.3 The SBC LEC Power Equipment Engineer shall request all necessary building studies from Corporate Real Estate Management (CRE). These building studies may be necessary to ensure proper floor loading, minimum number of air exchanges per hour, proper disposal of asbestos or heat dissipation evaluation, as well as others.

2.2.4 The SBC LEC Power Equipment Engineer shall be responsible for adherence to all local, state and federal codes that apply to that office. The SBC LEC Power Equipment Engineer shall verify and meet all necessary requirements for acid spill containment, hazardous material management, and fire codes. This effort should be coordinated through CRE.

3. Power Plant Component Requirements

3.1 Rectifier Plant Requirements

3.1.1 The SBC LEC Power Equipment Engineer shall use the connected-equipment List 1 BHL to calculate the base number 'N' of required rectifiers.

3.1.2 The SBC LEC Power Equipment Engineer shall provide a minimum of N+1 rectifiers. 'N' representing the minimum number of rectifiers necessary to carry the load and the additional +1 rectifier being the maintenance spare. The maintenance spare is a working rectifier intended to insure that the failure of any one rectifier will not cause batteries to go on discharge. The maintenance spare shall be the largest size rectifier deployed within that plant.

3.1.3 The SBC LEC Power Equipment Engineer shall calculate the rectifier requirement base upon a 1.4 recharge factor. The maintenance spare shall be included in the 40% additional charging capacity. At no time will a cumulative interpretation of this calculation exceed the 1.4 rating. The factor of 1.4 will ensure that the batteries will be capable of recharge within a 24-hour period to a minimum of 95% to protect against a subsequent power outage.

3.1.4 When the valve regulated lead acid (VRLA) type battery cells are used, **NO** recharge factor will be used at any time. Excess charge capacity is a significant contributor to the risk and severity of thermal runaway.

3.1.5 The SBC LEC Power Equipment Engineer shall engineer the power plant in a manner that no single rectifier is greater than 2/3 of the discharge load as measured at float voltage.

3.1.6 The SBC LEC Power Equipment Engineer shall provision all new power plants with rectifiers of the same capacity, manufacturer and type. It is recommended that whenever possible that augments to existing plants also maintain the same integrity.

3.1.7 The SBC LEC Power Equipment Engineer shall provision all new power plants with controllers and rectifiers of the same manufacturer. When adding controllers to existing plants the manufacturer of the present rectifiers shall determine the manufacturer of the controller.

3.1.8 Low Voltage Disconnects **SHALL NOT** be deployed to any SBC power plant.

3.2 Converter Plants

3.2.1 A converter plant shall be used for non-standard voltage needs with total loads of 100A and under. When dealing with loads greater than 100A an economic study should be done to determine whether a converter or battery plant is the most cost effective configuration for the particular application.

3.2.2 When placed outside of the traditional Power Plant footprint, it is recommended that the SBC LEC Power Equipment Engineer feed converter plants from secondary distribution. A BDFB located within the equipment line-up holding the equipment they are to serve. Locating converters closer to the equipment saves on the cable required and reduces voltage drop. Feeding them from the BDFB cleans up the primary power board and reduces the number of primary feeds.

3.2.3 The SBC LEC Power Equipment Engineer shall size converter plants based upon the connected equipment’s peak current drains. Converter plants do not have short term overload capability. Converter plants can not perform under any over current situation therefor therefore plant capacity must be provided for possible short-term peaks.

Converter plants shall be sized in the following manner:

- List all of the equipment that will draw power form the converter plant.
- Determine normal and emergency DC voltage limits of the equipment.
- Determine and total peak current drains.
- Determine maximum growth for the estimation period.
- Determine initial and ultimate plant necessary capacity.
- Determine initial and ultimate plant layout.

3.2.4 The SBC LEC Power Equipment Engineer shall provision N + 1 converters for the plant. ‘N’ being the minimum number of converters necessary to hold the load and an additional +1 converter as maintenance spare.

3.2.5 The SBC LEC Power Equipment Engineer shall size the converter plant with the connected load being no more than 80% of ‘N’ converters.

3.2.6 When a converter plant is installed to replace an existing battery plant, the SBC LEC Power Equipment Engineer shall insure that all discharge fuses are appropriately sized.. Unlike battery plants, converter plants have limited output energy available for clearing short-circuit faults. If the load fuses and/or circuit breakers are of too large amperage (individually or cumulatively) with respect to the total available plant output capacity, the plant may be unable to clear short-circuit faults. This could cause the plant to shut down due to low output voltage. No discharge fuses and/or circuit breaker larger than the installed converter capacity less one working spare will be used.

3.3 Ringing Plants

3.3.1 When placed outside of the traditional Power Plant footprint, the SBC LEC Power Equipment Engineer shall feed any new ringing plants with secondary feeds. It is recommended that the plant be located with the equipment line up that it serves and feed by the nearest BDFB.

3.3.2 The ring and tone plant shall provide output fused distribution and equipment local and remote alarms.

3.4 Inverter Plants

3.4.1 There are two configurations available when installing an inverter plant, on-line and stand-by. The preferred is the on-line method. There may be circumstances where the stand-by inverter is needed; however under normal conditions inverters shall be set up in the on-line configuration. These two configurations are defines as follows;

A. On-line Inverter: An on-line inverter provides a continuous AC supply to the load equipment during normal operation, as well as, during commercial interruptions. In this configuration the commercial power is used as a back up in the event of an inverter failure. In the event of a commercial failure, the equipment does not see the power disturbance even momentarily.

B. Stand-by inverter: A stand-by inverter provides an AC supply during commercial power interruptions. When a stand-by inverter is used the load equipment is susceptible to commercial power transients and brown outs. In this set up the preferred power source is the commercial AC and the inverted power is there only in the event of an outage. The transfer from commercial to inverted power is transparent to the load, 5 milliseconds or less. This configuration will add load to the power plant in power fail situations only.

3.4.2 Inverter plants shall not be configured with redundancy.