

EPRI RD&D3 Feeder Database User's Guide

(Utility 2)



User's Guide Revision 1

April 25, 2013

This guide is to be used with the EPRI RD&D3 Distribution Feeder Database. The database is in csv format titled EPRI RD&D3 FEEDER DATABASE_Utility2Rev1.csv. This guide should be used as a reference to assist the user in understanding the contents of the feeder database. As the database is updated this guide will be modified to an updated revision to reflect the changes in the database.

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1. REVISION HISTORY

This section will be updated as the database and user's guide gets updated with newer revisions. Notes on the changes to this document and the user's guide will be made in the following sections.

1.1. Revision 0

Date: March 27, 2013

Notes:

- Initial Draft of Database User's Guide for Utility 2
- Paired to *EPRI RD&D3 FEEDER DATABASE_Utility2Rev0.csv*
- Database reflects the contents of a single California Distribution Utility
- 4192 total feeders in database

1.1. Revision 1

Date: April 25, 2013

Notes:

- Paired to *EPRI RD&D3 FEEDER DATABASE_Utility2Rev1.csv*
- Changed name of '*Feeder Peak Load, AMPS*' column to '*Recorded Peak Load, AMPS*' and updated values in that column based on latest data received Utility 2.
- Feeders with less than 6 Total Customers had their value dashed out ('-'). This was done in order to protect customer privacy. (updated 70 feeders)
- Updated definition in User's Guide of '*Number of line voltage regulators*' to clarify that this only includes voltage regulators on the feeder itself and not regulators that may be present at the substation (station LTC voltage regulators).
- Updated definition of Total 3-ph ckt miles, removed references to "backbone" and clarified that it consist of 3 phase taps and laterals.
- 4192 total feeders in database

2. DESCRIPTION OF DATABASE

This database was assembled from participating utilities at the request of EPRI and Sandia National Laboratories with an emphasis on certain key feeder properties to be provided. It is important to note that not all feeder properties of interest were extracted for each utility, which is why some field columns might be blank as this type of data is not currently available. For instance at this time no field column exist for conductor type (1/0, 336.4kcmil, etc.). Due to the differences among each participating utility in reporting feeder data each utility will have a separate database (.csv) and User's Guide (.doc) file.

	A	B	C	D	E	F	G
1	Unique Feeder ID (EPRI)	Primary Voltage	Total 3-Phase miles	Overhead 3 Phase miles	Total 1 & 2 Phase miles	Overhead 1 & 2 Phase miles	SCADA Breaker
2	000000001	4	7.15	3.58	8.93	4.46	No
3	000000002	4	12.92	6.46	3.84	1.77	No
4	000000003	4	23.9	11.95	35.57	17.79	No
5	000000004	12	15.57	7.79	27.36	13.68	No

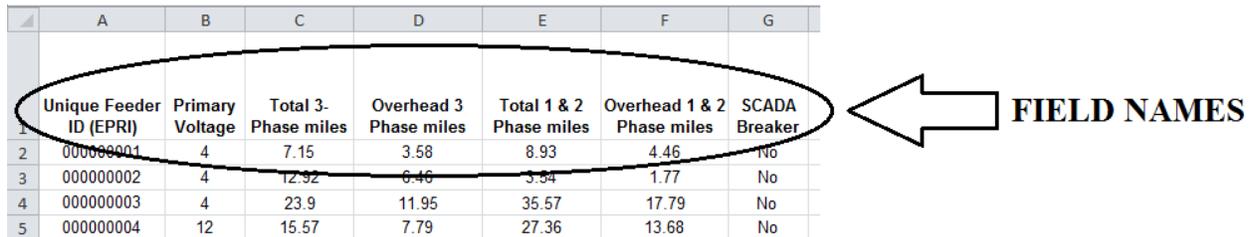


Figure 1. Database Field Names

2.1. Definitions of Field Names

EPRI Feeder # – A number assigned to that particular feeder to identify it within the database. This ID has been generated by EPRI in order to protect the confidentiality of the distribution utilities circuits.

EPRI Substation # – A number assigned to the feeder to identify the particular substation it is fed from. This ID has been generated by EPRI in order to protect the confidentiality of the distribution utilities circuits.

Feeder Type and Topology

Nominal Voltage, kV – The kV in which the feeder is operated at. These values coincide with standard distribution operating levels and may have been consolidated to standardize the data, i.e. for instance feeders that list either 24.9kV or 25kV will be consolidated to a single value so as not to distinguish them from each other.

Total 3-ph ckt miles – Total length, in miles, of the feeder's 3-phase circuits (includes taps and laterals)

Total 3-ph OH ckt miles - Length, in miles, of the overhead portion of the feeder 3-phase circuits. *Note: Underground 3-Phase miles can be calculated by subtracting Overhead 3-Phase miles from Total 3-Phase miles.*

Total 2-ph and 1-ph ckt miles – Length, in miles, of the total single and two phase circuits off the feeder.

Total 2-ph and 1-ph OH – Length, in miles, of the overhead portion of the single and two phase circuits off the feeder. *Note: Underground 1&2 Phase miles can be calculated by subtracting Overhead 1&2 Phase miles from Total 1&2 Phase miles.*

Customer Data

Residential, % – Percentage of energy usage on feeder which consist of Residential Loads.

Commercial, % – Percentage of energy usage on feeder which consist of Commercial Loads.

Industrial, % – Percentage of energy usage on feeder which consist of Industrial Loads.

Agricultural, % – Percentage of energy usage on feeder which consist of Agricultural Loads.

Total Customer Count – The total number of customers being served from the feeder, equal to the sum of the customer sub-categories.

Commercial Customer Count – The number of commercial customers being served from the feeder.

Domestic Customer Count – The number of domestic (residential) customers being served from the feeder.

Industrial Customer Count – The number of industrial customers being served from the feeder.

Other Customer Count – The number of customers being served from the feeder that do not fall under the domestic, commercial, or industrial customer category. Most likely agricultural type customers.

Device Data

Number of line voltage regulators – The total number of line voltage regulators connected to the feeder. *Note: This does not include regulators that may be present at the substation (station LTC voltage regulators). (A regulator is a device used to maintain a constant voltage level on the circuit)*

Number of switched/fixed capacitor banks – The total number of capacitor banks connected to the feeder. *(A device used to regulate voltage on the circuit through the addition of reactive power, VARs)*

Number of feeder tie points – A switch or termination point on the feeder that branches into two additional circuits.

Load Data

Connected service transformer capacity – The sum of the KVA rating for all service transformers tied to the feeder.

Feeder peak load, AMPS – The peak load on the feeder as measured at the substation in Amps.

Feeder peak load Date– The day of the year in which the feeder was at peak load.

Feeder peak load, Time – The time of day in which the feeder was at peak load.

DG Data

Total amount of DG on circuit – The sum of the rated kW output for all DG on the feeder.

Existing PV capacity, installed – The sum of the rated kW output for all PV systems connected to the feeder.

Largest PV System installed, kW – The size, in kW, of the largest single PV system on the feeder. Does not take into account Utility Owned PV.

PV Capacity with UOG – Total kW PV on the feeder which also includes Utility Owned PV Generation (UOG).

UOG PV, kW – If present on the feeder this value is the total kW rating of all Utility Owned Generation (UOG) that is made up of PV.

of UOG PV Sites – The number of utility owned PV systems on the feeder.

2.2. What's not in Database

- Location Data – In order to protect the confidential nature of the utility's distribution system GPS coordinates and geographical data are not available in this database.
- Conductor Type – Although requested the type of conductor (1/0, 336.4kcmil) is not currently available as a feeder parameter.
- The Following items were requested but due to the difficulty in obtaining for all feeders they are not currently present in the database.
 - Main 3-Phase Conductor
 - LTC set points
 - Distance between voltage regulators
 - Voltage Regulator set points
 - Short Circuit Capacity at farthest 3-Phase node
 - Approximate service area (sq mi)

- Feeder minimum load
- Feeder minimum load time (month/hour)

3. DATABASE STATISTICS

This section will give a brief statistical overview of the contents of the EPRI Feeder Database.

Summary:

Number of Feeders in Data – 4192

Most common kV rating – 12kV

Average 3-Phase Backbone: 9.4mi

Average circuit miles (3P+1&2PH): 15.4mi

3.1. Histograms

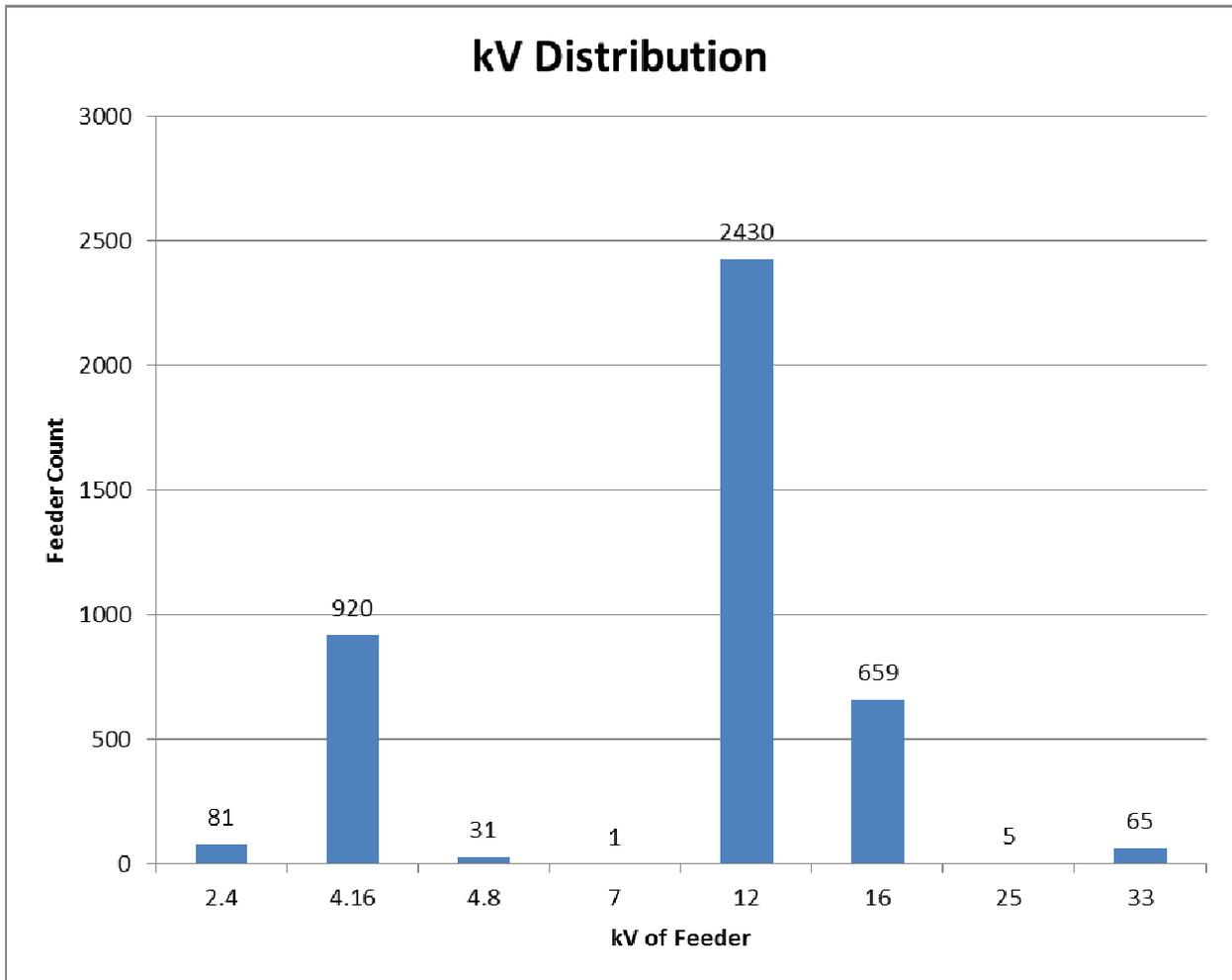


Figure 2. kV Distribution

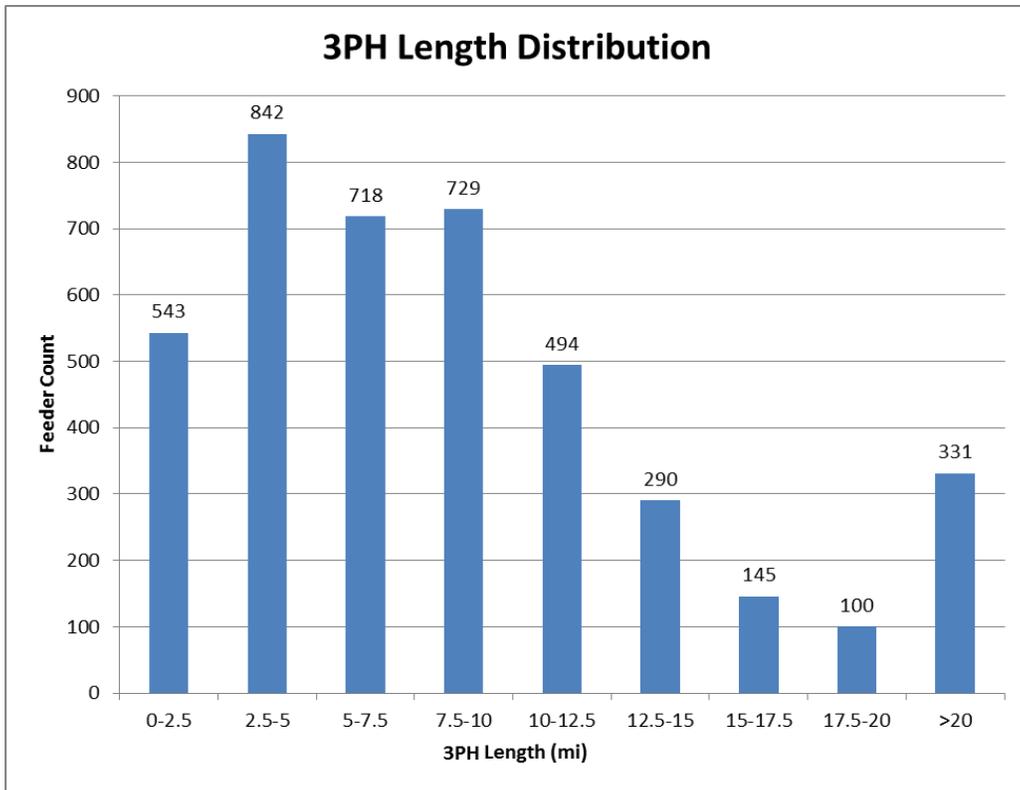


Figure 3. 3PH Length Distribution

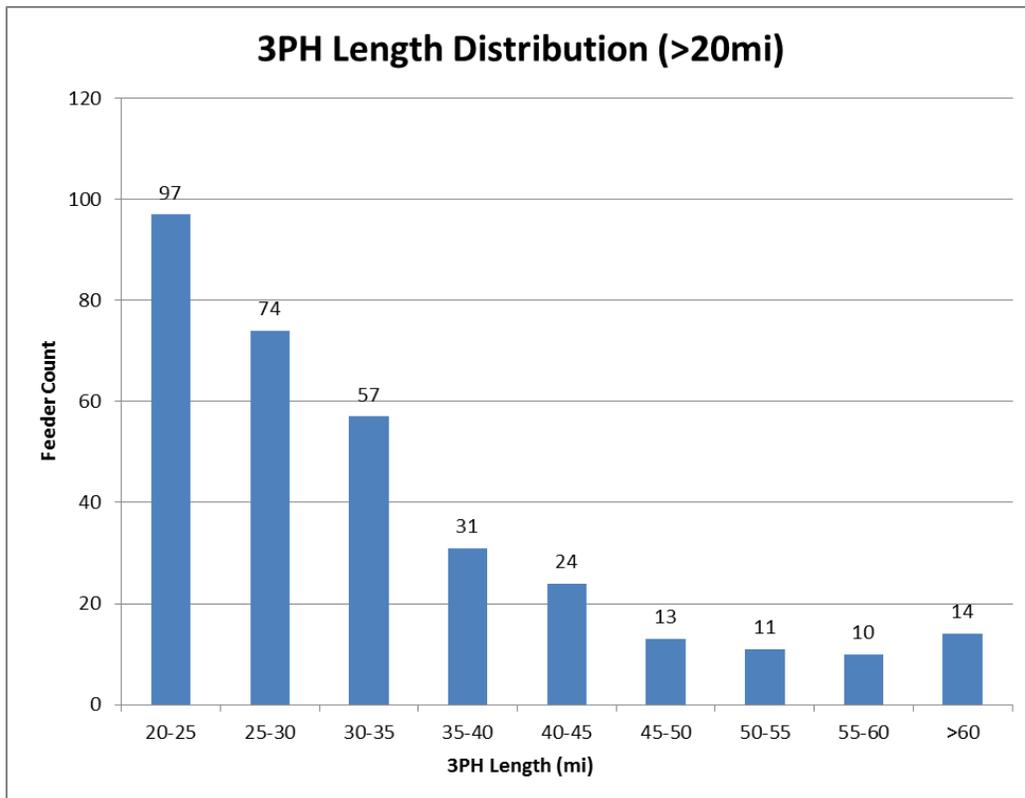


Figure 4. 3PH Length Distribution (Greater than 80 miles)

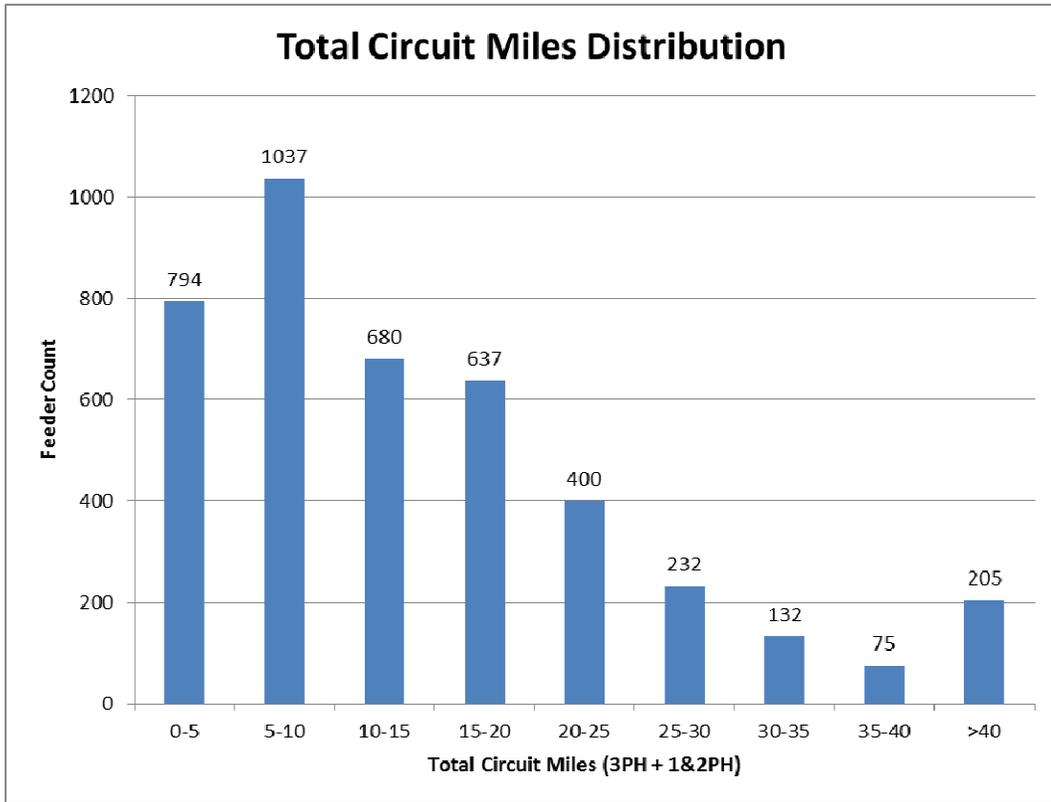


Figure 5. Total Circuit Miles Distribution

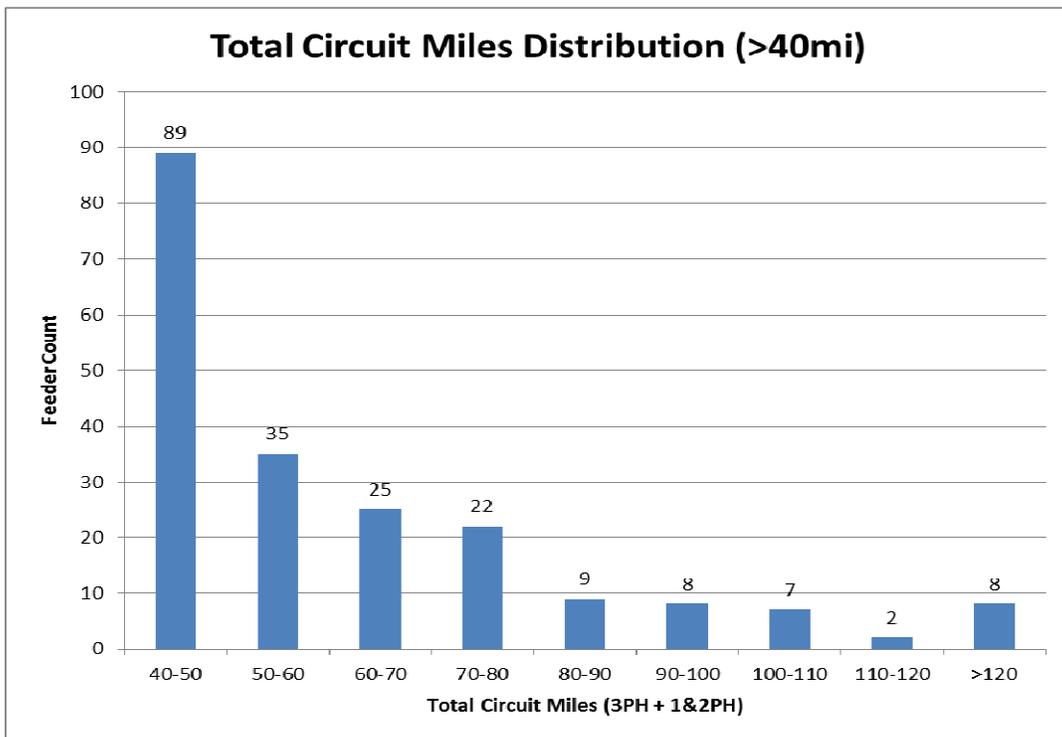


Figure 6. Total Circuit Miles Distribution (Greater than 40 miles)

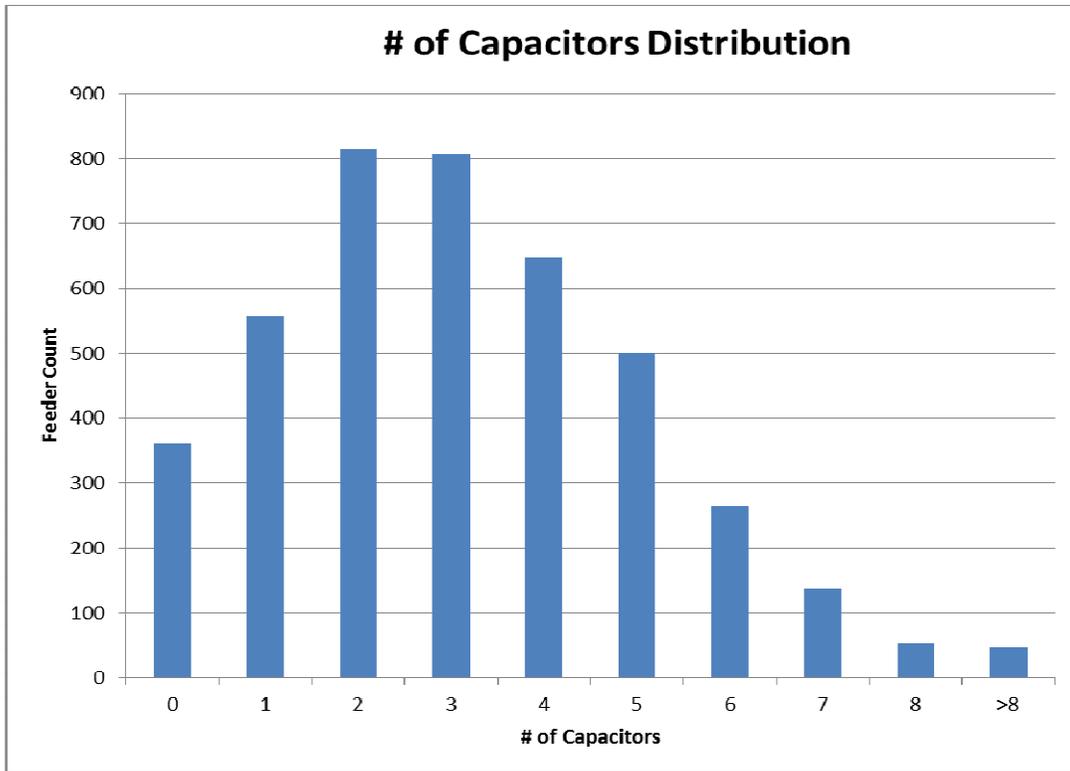


Figure 7. Capacitors Distribution

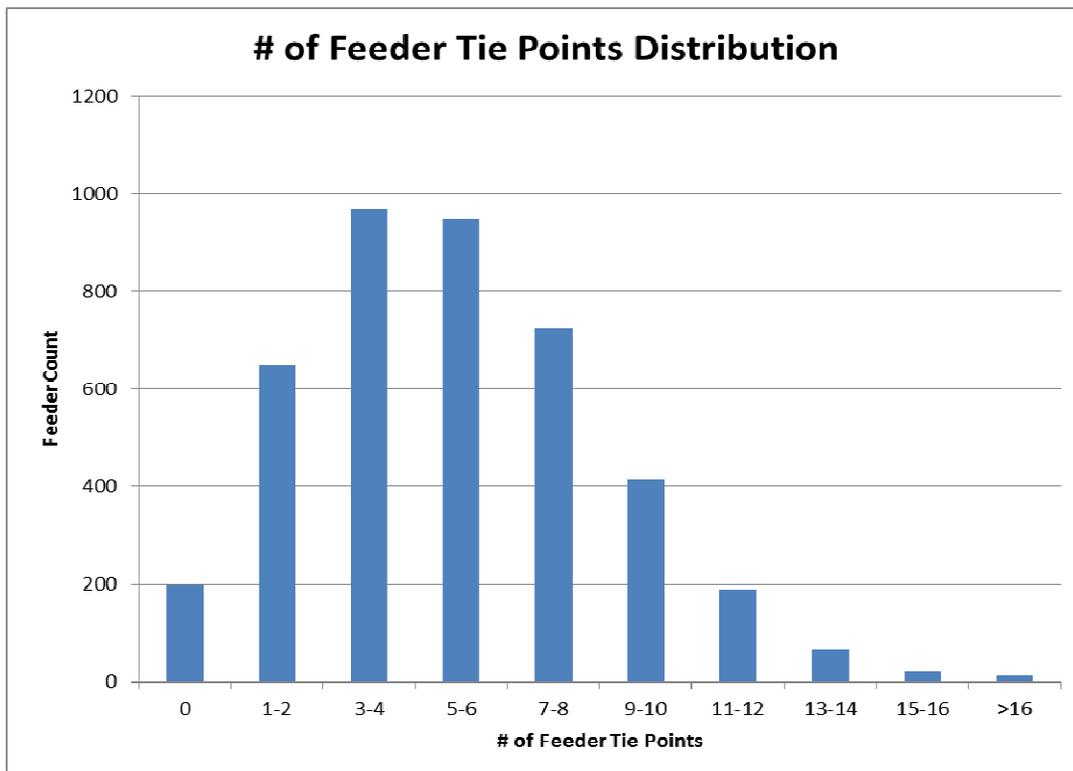


Figure 8. Feeder Tie Points Distribution

Table 1. Database Maximums (Total 3-Phase, Total Circuit Miles, Peak Load)

Max 3-Phase Length:										
ID	kV	3-PH Length (mi)	1&2PH (mi)	# Reg	# Cap	# tie points	Peak Load (Amps)	Total Customers	kW DG	kW PV
2113	16	83.2	6	1	1	0	19	112	0	0

Greatest Total Circuit Miles:										
ID	kV	3-PH Length (mi)	1&2PH (mi)	# Reg	# Cap	# tie points	Peak Load (Amps)	Total Customers	kW DG	kW PV
3193	25	11.7	299.4	1	3	1	91	2,116	111	109

Max Peak Load										
ID	kV	3-PH Length (mi)	1&2PH (mi)	# Reg	# Cap	# tie points	Peak Load (Amps)	Total Customers	kW DG	kW PV
1595	33	3.4	0	0	0	1	610	-	0	0

Greatest # of Feeder Tie Points										
ID	kV	3-PH Length (mi)	1&2PH (mi)	# Reg	# Cap	# tie points	Peak Load (Amps)	Total Customers	kW DG	kW PV
477	12	10.3	10.9	0	4	26	455	4,519	236	236

Greatest # of Capacitors										
ID	kV	3-PH Length (mi)	1&2PH (mi)	# Reg	# Cap	# tie points	Peak Load (Amps)	Total Customers	kW DG	kW PV
2269	12	47.2	8.4	0	14	12	459	2,102	182	182

3.2. Database Anomalies

- 12 Feeders with 0 Total Circuit Miles