2025 SCAMPS ANNUAL CONVENTION

Hilton Head Island, SC
June 1, 2025 – June 4, 2025
Sonesta Resort

Your Hometown Utility Source

Department of Public Utilities

Planning, Designing and Analyzing Electrical Distribution Circuits Utilizing Synergi Modeling Software

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Your Hometown Utility Source

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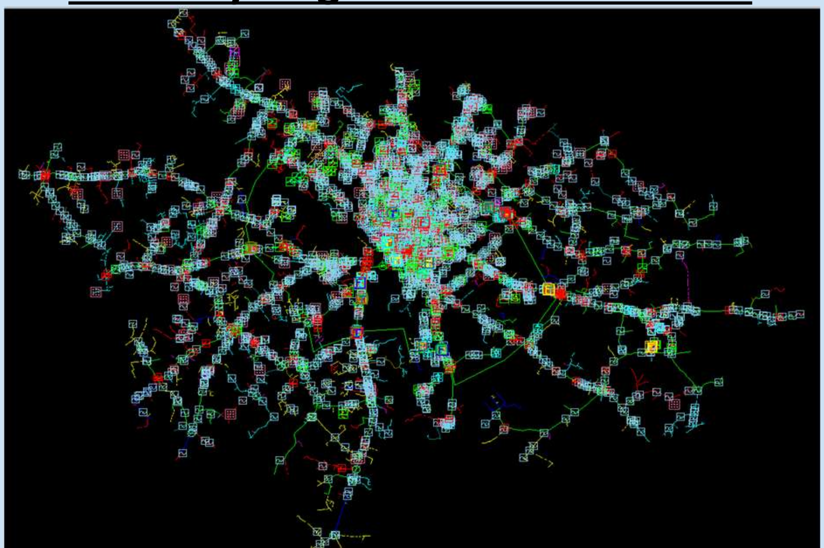
Agenda

- Introduction
- ODPU Synergi Electrical Distribution Model
- Conceptual ideas/Feasable System Improvements
  - Sub 17 – 8.32kV Conversion to 24.9kV from Sub 10
  - Sub 12 Capacitor Placement
- ODPU Long Term Vision
  - Short Range Electric Work Plan
  - Long Range Electric Work Plan
- Takaways
- Questions

Introduction

- Orangeburg, South Carolina. Est 1927.
- Provide Electric, Water, Wastewater & Gas
- Roughly 25,000 Electric Meters In Service
- 20 Electrical Substations
  - Total Available Capacity = ~1000MVA
  - Total Load = ~150MVA
- 115kV Transmission Loop w/ Bisector

ODPU Synergi Distribution Model

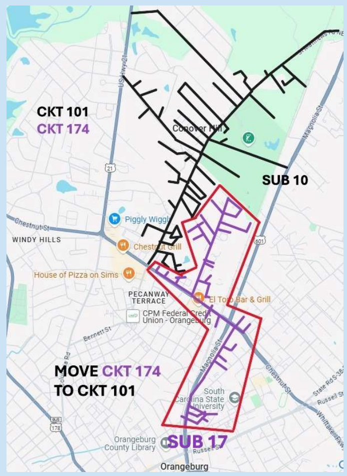


Conceptual Ideas/Feasable System Improvements

❖ **Sub 17**

Converting Circuits from 8.32kV to 24.9kV

- ➢ **CKT 174 Converted to CKT 101**



CKT 174 Converted to CKT 101

CKT #	% Load	Demand kW	Demand kVAR	Demand kVA	PF	Max A	Connected kVA	Load kW	Load kVAR
101	39.2	9116	2240	9387	97	235	15487	9104	2521
174	28.4	2402	674	2495	96	170	15733	2384	993

Comparing 8.32kV to 24.9kV

- 1/3 voltage = 3x current (Amps)
- This yields 9x I^2R losses!
- I^2R losses are losses due to energy dissipated in the form of heat
- Inefficient and costs $$$
- This is like having a car with 9 times less MPG

CKT 174 Converted to CKT 101

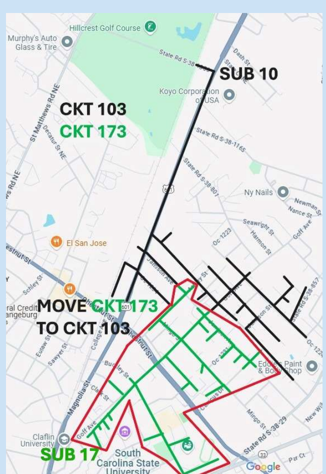
CKT #	% Load	Demand kW	Demand kVAR	Demand kVA	PF	Max A	Connected kVA	Load kW	Load kVAR
101	48.4	11449	2695	11762	97	290	31220	11407	3484

By implementing this conversion:

- ✓ 170A @ 8.32kV is eliminated
- ✓ 55A @ 24.9kV is reabsorbed
- ✓ I^2R losses reduced by 96.4%

Converting Circuits from 8.32kV to 24.9kV

- ➢ CKT 173 Converted to CKT 103



CKT 173 Converted to CKT 103

CKT #	% Load	Demand kW	Demand kVAR	Demand kVA	PF	Max A	Connected kVA	Load kW	Load kVAR
103	3.7	648	132	661	98	22	2465	647	155
173	12.4	1051	300	1093	96	75	7458	1049	617

CKT 173 Converted to CKT 103

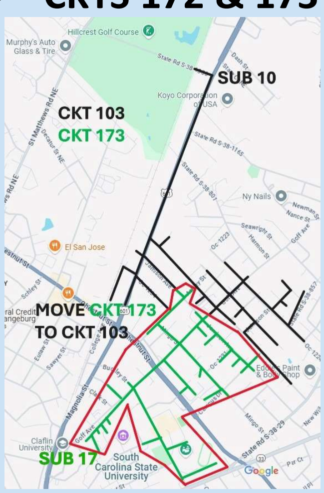
CKT #	% Load	Demand kW	Demand kVAR	Demand kVA	PF	Max A	Connected kVA	Load kW	Load kVAR
103	7.8	1672	414	1723	97	47	9923	1670	788

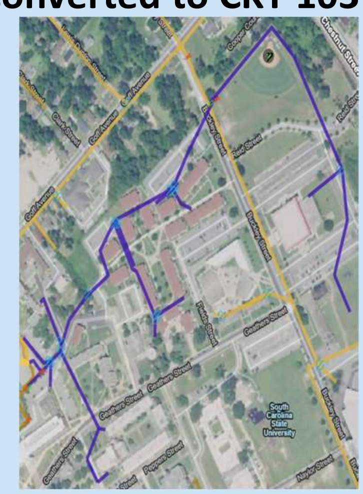
By implementing this conversion:

- ✓ 75A @ 8.32kV is eliminated
- ✓ 25A @ 24.9kV is reabsorbed
- ✓ I^2R losses reduced by 71.7%

Converting Circuits from 8.32kV to 24.9kV

- ➢ CKTS 172 & 173 Converted to CKT 103



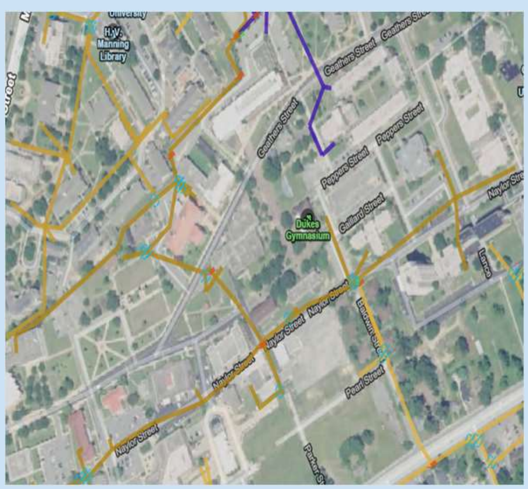


CKT 172

CKTS 172 & 173 Converted to CKT 103

CKT #	% Load	Demand kW	Demand kVAR	Demand kVA	PF	Max A	Connected kVA	Load kW	Load kVAR
103	11.3	2551	596	2619	97	68	15398	2547	1125

CKT 171 Converted to CKT 103



CKT 171

CKTS 171, 172 & 173 Converted to CKT 103

CKT #	% Load	Demand kW	Demand kVAR	Demand kVA	PF	Max A	Connected kVA	Load kW	Load kVAR
103	15	3567	788	3653	98	90	23518	3559	1758

By implementing this conversion:

- ✓ **386A @ 8.32kV is eliminated**
- ✓ **123A @ 24.9kV is reabsorbed**
- ✓ **I^2R losses reduced by 10.5%**

Converting 8.32kV to 24.9kV

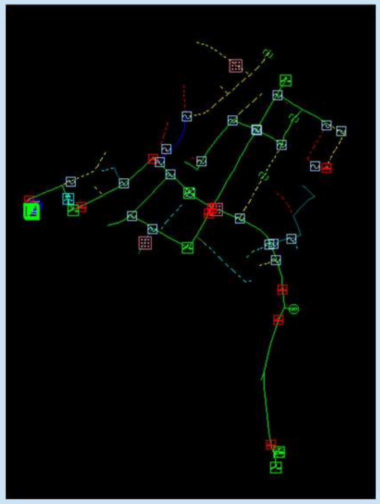
- ✓ ODPU eliminates 8.32kV equipment inventory
- ✓ ODPU utilizes existing 24.9kV inventory
- ✓ This is a cost savings for OPDU!

Conceptual Ideas/Feasable System Improvements

- ❖ Sub 12

Sub 12 Capacitor Placement Feasability Study

- CKT 121

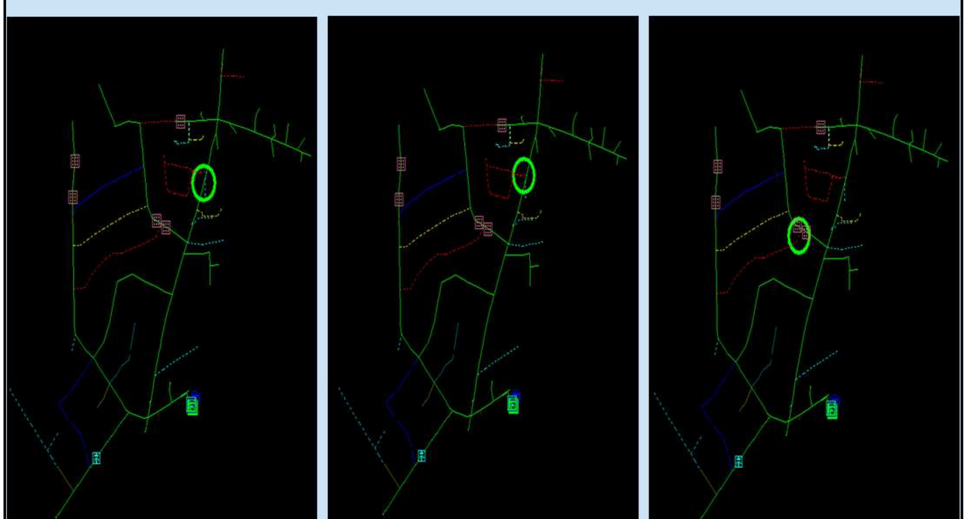


Sub 12 Existing Circuit Conditions

Circuit ID	Minimum Circuit Volts 3 Phase	Minimum Circuit Volts 1 Phase	Power Factor	Total Connected kVA	Demand kVA	Demand kW	Demand kVAR	Loss kW
121	118.7	118.6	96	5803	2373	2285	642	18
122	117.4	117.8	95	8133	2408	2284	763	44
123	117	117	92	11066	5395	4973	2092	80
124	121.2	120.9	95	3856	1015	966	311	2
Sub 12	118.6	118.5	94	28858	11177	10508	3809	259

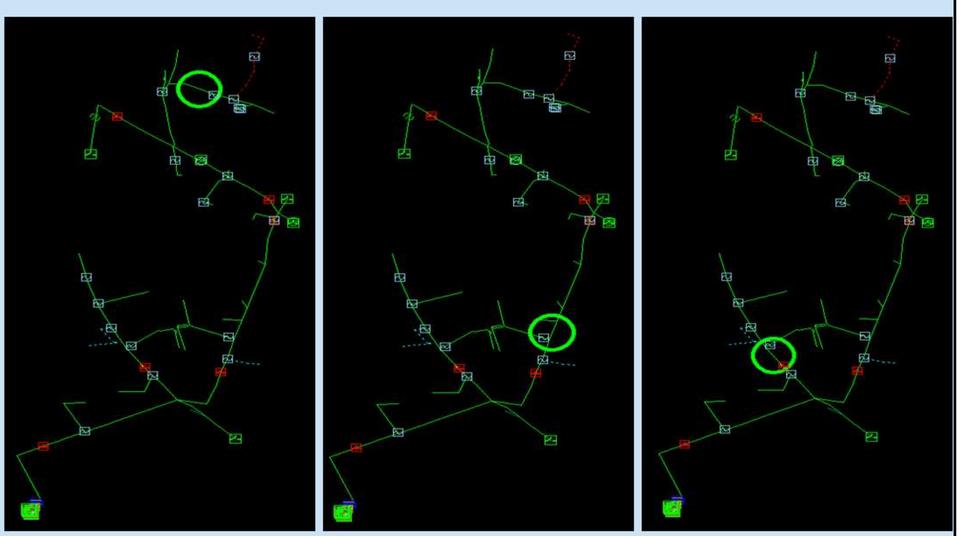
CKT 121 Capacitor Placement

CKT 122 Capacitor Placement

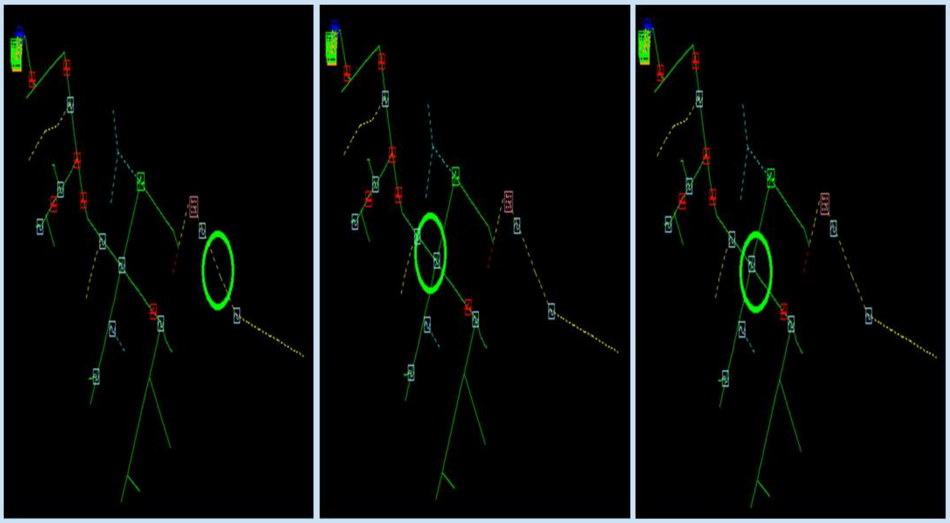


CKT 123 Capacitor Placement

CKT 123 Capacitor Placement Con't



CKT 124 Capacitor Placement



Sub 12 Expected Circuit Conditions

Table 2. Sub 12 Overall Expected Circuit Conditions

Section	Circuit	kVAR	V	Power Factor Into	Source kVA	Source Power Factor
14056.4.OH	121	1200	120.1	-78.7	1	-97.1
4743.8.OH	121	450	120.0	-76.0	157	-91.5
3183.1.OH	121	50	119.1	-96.1	22	-90.7
86173.4.OH	122	1200	118.4	-86.6	-75	-98.4
7141.OH	122	150	118.0	-89.7	34	-97.1
5188.4.OH	123	1200	120.0	-53.6	-295	98.4
5191.3.OH	123	900	119.9	-79.0	-40	100
7249.4.OH	123	1200	119.9	-70.6	166	-97.4
7249.5.OH	123	900	119.5	-80.1	303	-92.5
7245.2.OH	123	300	119.5	99.3	127	-90.5
5165.OH	123	50	119.5	-99.7	25	-90.1
107781.2.OH	124	50	119.7	-84.4	-14	96.6
7296.4.OH	124	450	120.0	-73.2	-12	-98.0
7296.5.OH	124	150	120.0	-90.0	42	-94.0

*According to the ODPU Synergi Distribution Model

Sub 12 Overall Impacts

✓ 728 KVA CAN BE RETURNED TO THE POWER SOURCE.

Short Range Electric Workplan

- 5 Year Construction Plan
- Addressing low hanging fruit – improvements that can be made with little $$$ and effort

Short Range Electric Workplan

- Sub 17 – 8.32kV Conversion to 24.9kV
- Equipment Verification/Replacement
- Work Instruction to perform conversions
- Demo Sub 17

Short Range Electric Workplan (Continued)

- Sub 25 (Online Q4 2025)
- Feed Subs 2 & 7 from Sub 25 @ 8.32kV
- Verify/Replace Equipment
- Convert Subs 2 & 7 CKTS to 24.9kV from Sub 25
- Demo Subs 2 & 7

Short Range Electric Workplan (Continued)

- Newly arriving distribution loads
- Inserting as "spot" loads into the Synergi Model to inspect system effects
- Addressing low hanging fruit – improvements that can be made with little cost and effort

Long Range Electric Workplan

- $$$ impacts of additional new loads
- Budgetary $$$ placeholders for improvement projects
- Documented plan for resource allocation & manpower

Takeaways

- ✓ Reducing I^2R losses improves system efficiency and reduces equipment inventory
- ✓ Utilizing Capacitors increases power factor, provides voltage support and frees up "wasted" source kVA
- ✓ Overall outcome saves $$$

Takeaways (continued)

- Long Term Planning provides a "Grand Vision" of goals
- A forecast model is helpful when analyzing networks
- Overall plan is an instruction set for the ODPU Electric Division

Takeaways (continued)

- Systems Planning and Feasibility Studies provide planning options
- Better planning can improve system efficiency with proper implementation
- Overall outcome saves $$$

Questions?

THANK YOU!!!