MODERN GRID
INITIATIVE

Modern Grid Initiative
Midwest Summit

Allegheny Power Developmental Field Test – Morgantown, WV

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November 16, 2006

Allegheny Energy

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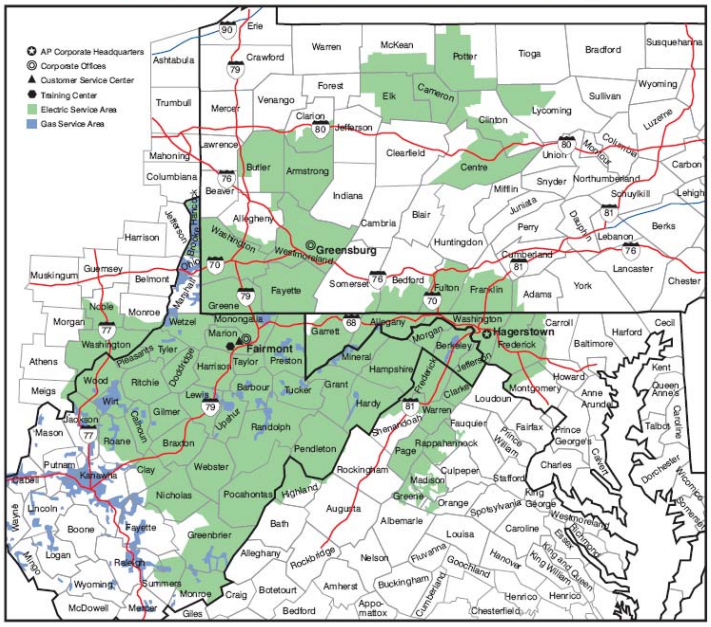
Allegheny Power Service Territory



Allegheny Energy is an investor-owned utility with a balanced portfolio of businesses including:

Allegheny Energy Supply Company, LLC, which owns and operates electrical generating facilities in the Mid-Atlantic region of the United States. We own or control 10,200 megawatts of generation. Approximately 95% of our power output comes from coal.

Allegheny Power, which delivers electrical service to approximately 1.5 million customers in Maryland, Pennsylvania, Virginia, and West Virginia.

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Modern Grid Initiative Overview

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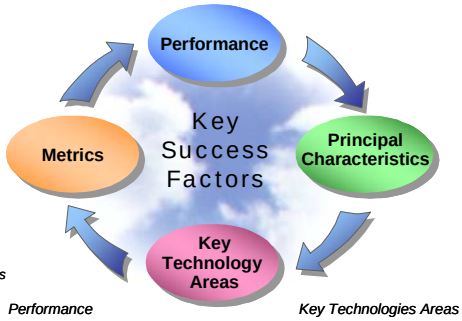
- **A Systems View of the US electric grid**
- **Robust trends suggest a very different future is upon us**
- **As an industry, we have virtually no experience with integrated suites of advanced technology**



Key Success Factors
Reliability
Security
Economics
Power quality
Efficiency and environmental quality
Safety

Performance
Emergency response
Restoration
Routine operations
Optimization
System planning

Principal Characteristics
Self-healing
Empowers and incorporates the consumer
Tolerates security attack
Provides 21st century power quality
Accommodates a wide variety of generation options
Fully enables electricity markets
Optimizes asset utilization and minimizes O&M expenses

Key Technologies Areas
Integrated communications
Sensing, metering, and measurement
Advanced grid components
Advanced control methodologies
Decision support and human interface

Metrics
Congestion costs
Consumer price of energy
Blackout probability
SAIFI
Restoration time
CAIDI
Peak-to-average load ratio
Capacity utilization

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Developmental Field Tests (DFT)

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- **Morgantown, WV**
  - Allegheny Power
  - Design and install a feeder automation plan that can support advanced control and sensing for MGI type feeder automation component planned for Phase II.
  - Phase I and Phase II Objectives:
    - Install a “Weak Tie” between adjacent feeders to automatically restore service to circuit segments not affected by an outage (utilizes feeder’s existing capacity).
    - Demonstrate the use of a capacity limited alternate source during outages, similar to limited DG and/or Battery sources.
      - Test the ability to dynamically, in real time, monitor and match the available capacity to the new circuit load.
      - Implements customer side Demand Management as needed.
    - Proves the autonomous operation of an advanced distribution automation system.
  - Delivers a major improvement in electric service reliability.
  - Identifies an application that can be transferred to utilities nationwide.

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Morgantown DFT Circuit

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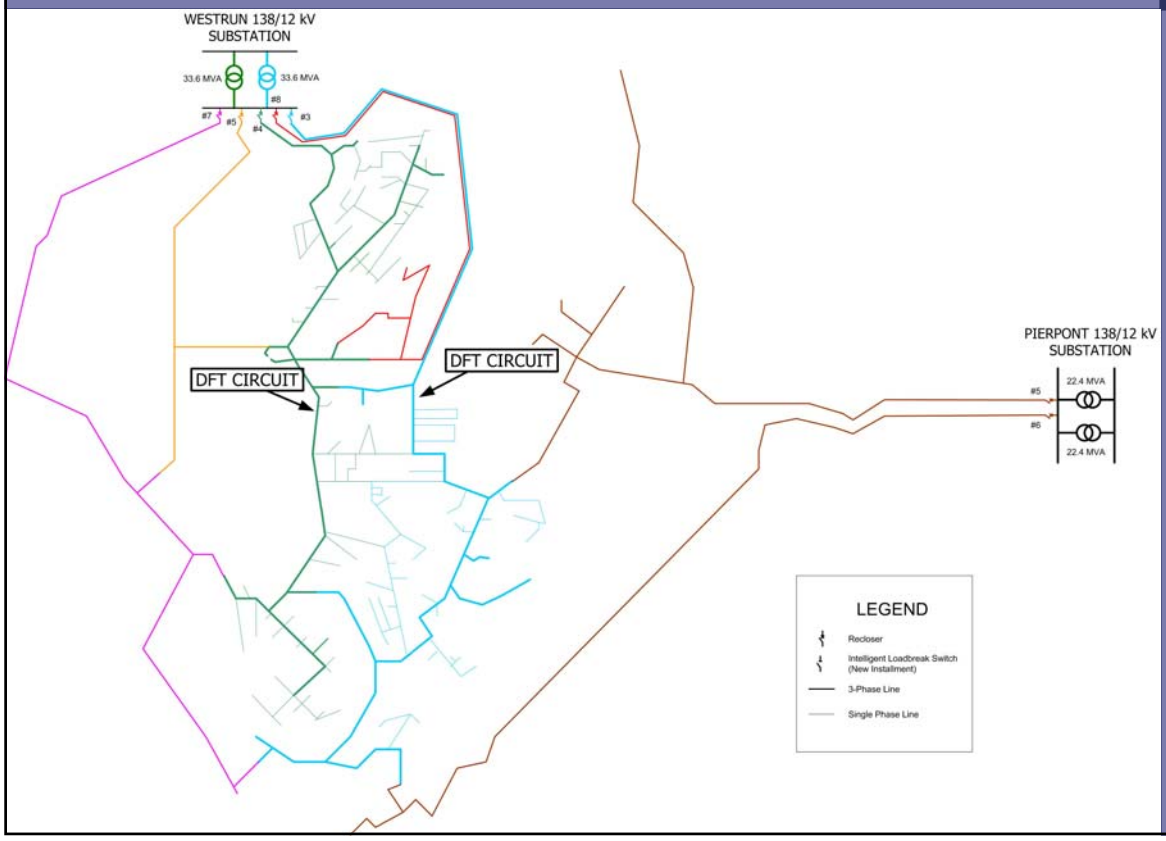

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Morgantown DFT Phase I (2006-2007)

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- **Autonomous Dynamic Feeder Reconfiguration System: The intended system will dynamically collect data from distribution feeders and, in case of a fault, will automatically isolate the fault and restore electric service using available capacity from adjacent feeders. The unique concept of this design is the real time determination and transfer of available capacity from adjacent feeders. This is capacity that is normally not utilized with conventional (manual) load transfer schemes.**
- **Advanced Communications for autonomous operation**
- **Medium Voltage Switchgear**
- **Intelligent Electronic Devices at substation and circuit levels**
- **State-of-the-Art Sensing and Measurement**

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Morgantown DFT Phase II (2008)

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- **Expand Dynamic Feeder Reconfiguration to Dynamic Islanding using Distributed Energy Resources (DER)**
  - **Test advanced distribution automation systems that can adapt to the dynamic availability of Distributed Generation and/or Storage.**
- **Integrate Advanced Metering Infrastructure (AMI)**
- **Integrate Distributed Generation (DG) and Energy Storage Units**
- **Integrate Under-Frequency and Under-Voltage Grid Friendly Appliances**

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Morgantown DFT Circuit Characteristics

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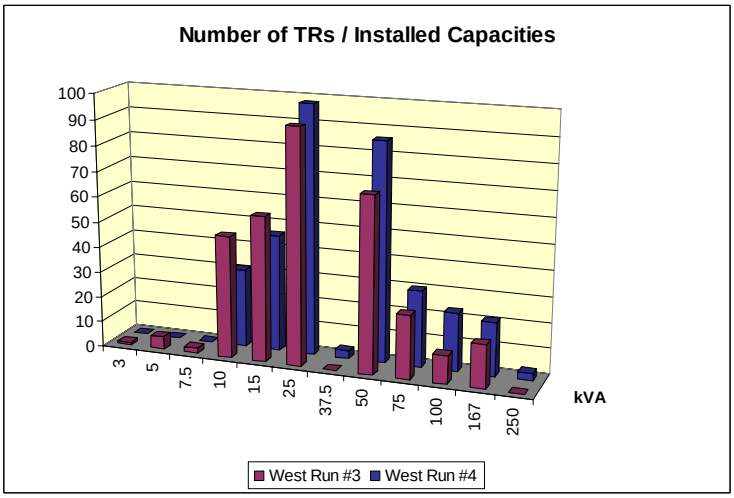
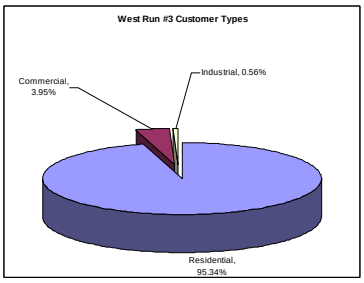
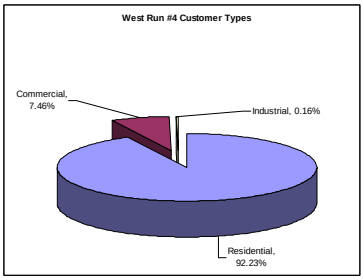
This is an exemplary circuit for the Allegheny Power territory, and we believe for much of the region, if not nation.







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Morgantown DFT Circuit Characteristics (cont.)

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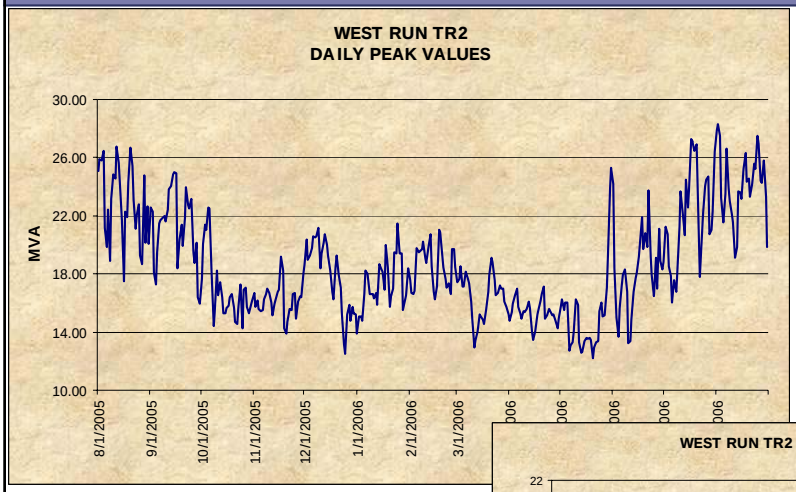

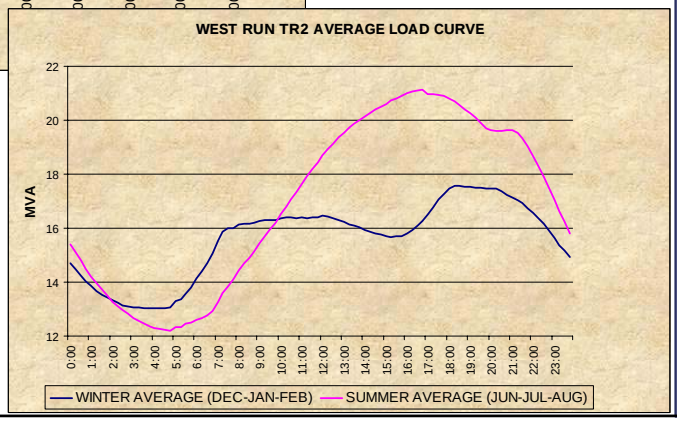

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Morgantown DFT Circuit Characteristics (cont.)

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Reliability Indices

SAIDI	2001	2002	2003	2004	2005
West Run #3	19.52	65.84	192.65	198.01	2193.16
West Run #4	27.43	34.15	53.81	102.58	929.50

CAIDI	2001	2002	2003	2004	2005
West Run #3	85.07	55.11	149.00	655.48	1387.33
West Run #4	140.21	164.14	177.41	285.23	1847.76

SAIFI	2001	2002	2003	2004	2005
West Run #3	0.228398	1.189985	1.289199	0.303107	1.580765
West Run #4	0.198227	0.208831	0.303201	0.359420	0.507920

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Morgantown DFT Phase I Goals

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- **Significantly improve reliability indices (SAIDI, CAIDI, SAIFI, MAIFI, etc),**
- **Defer or avoid some planned capital investments by improving the utilization of the existing system,**
- **Extend the lifetime of the power equipment by being exposed to fewer short-circuit currents,**
- **Improve power quality,**
- **Minimize the labor cost associated with fault location,**
- **Improve the protective coordination scheme by remote control**

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Morgantown DFT Phase II Goals

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- Coordinate Demand Response and DER technologies,
- Create Static & Dynamic Islanding,
- Improve reliability indices (SAIDI, CAIDI, SAIFI, MAIFI, etc),
- Defer or avoid some planned capital investments (Substations) by improving capacity utilization,
- Improve power quality to 21st Century requirements,
- Empower the consumer through AMI,
- Provide peak shaving and load leveling,
- Provide frequency response and voltage support to the transmission system

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Morgantown Modern Grid Operation

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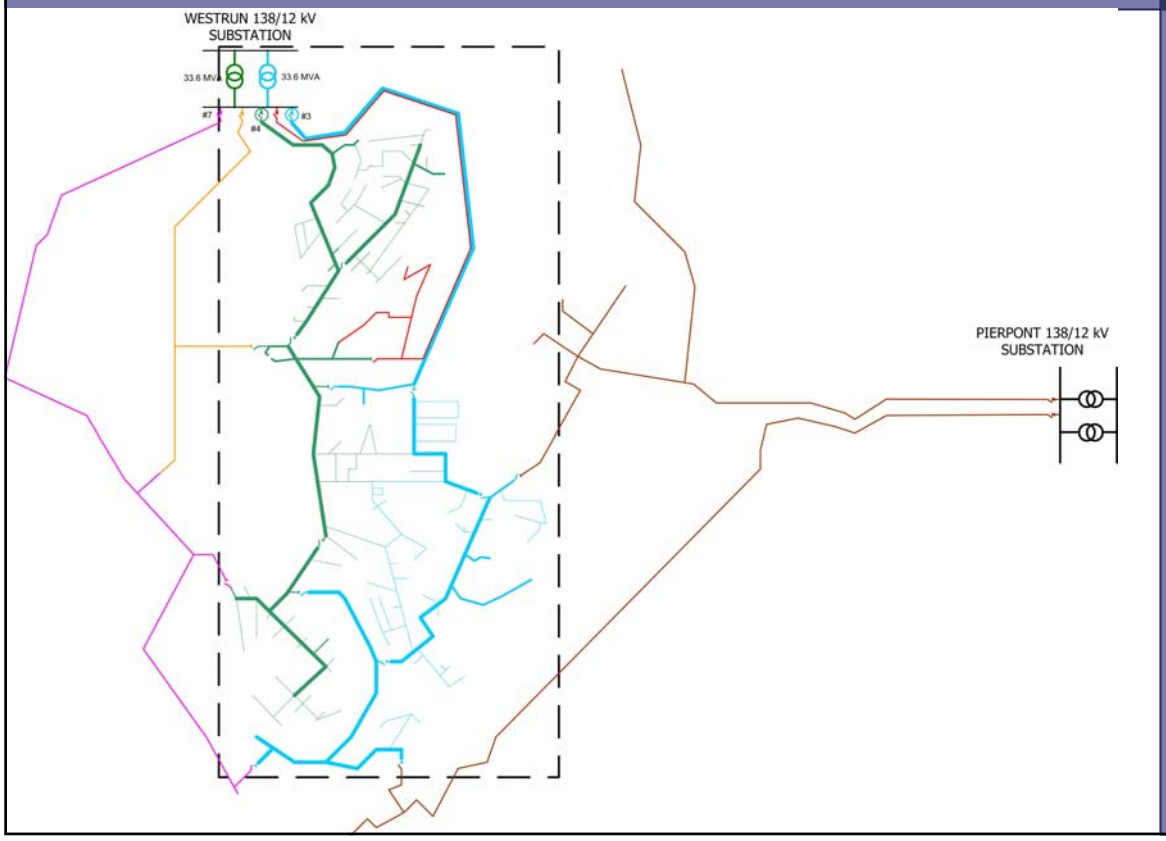

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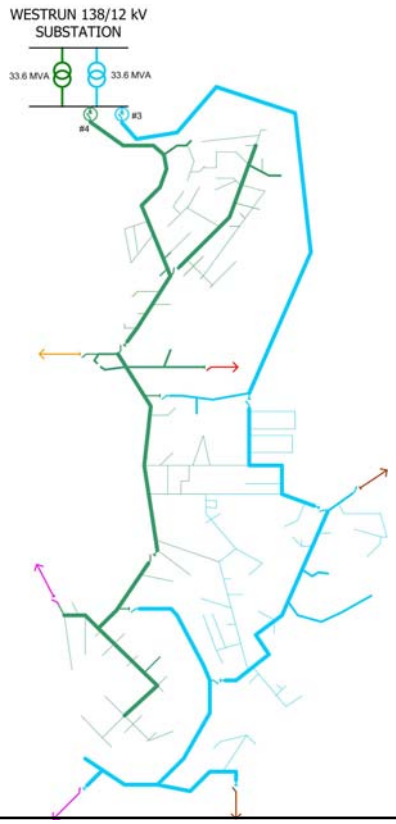

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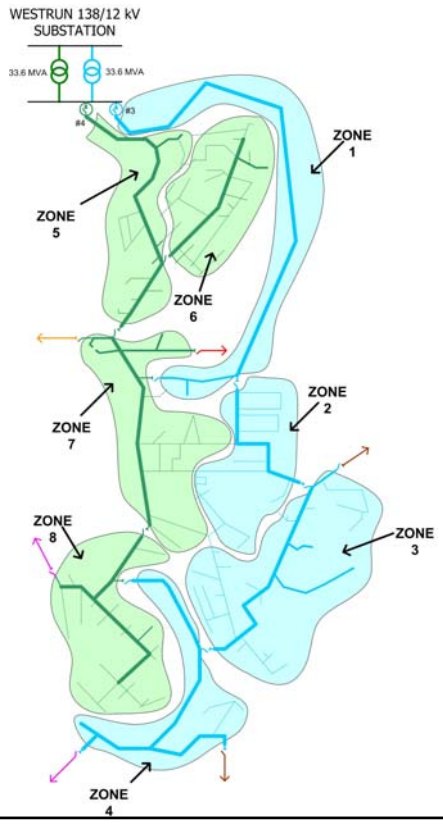

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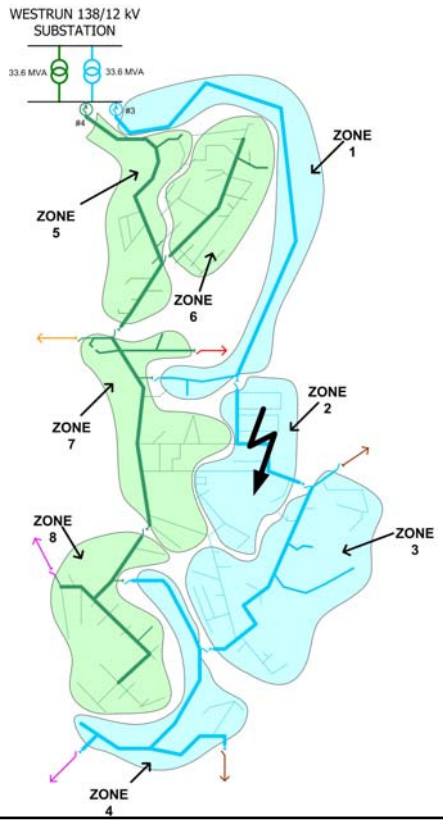

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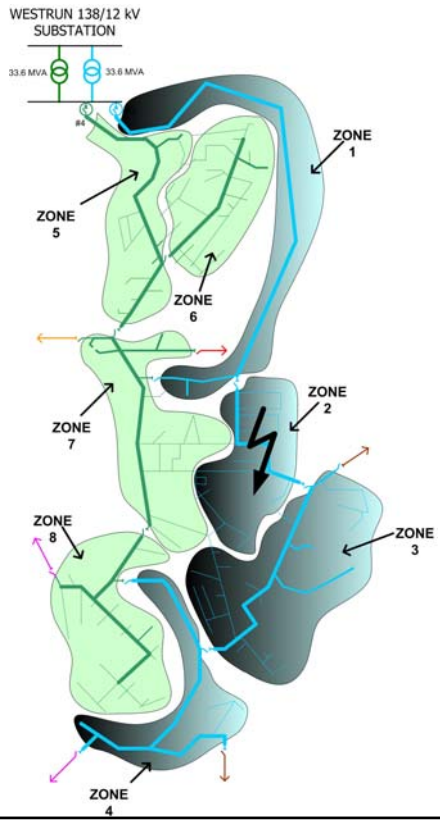

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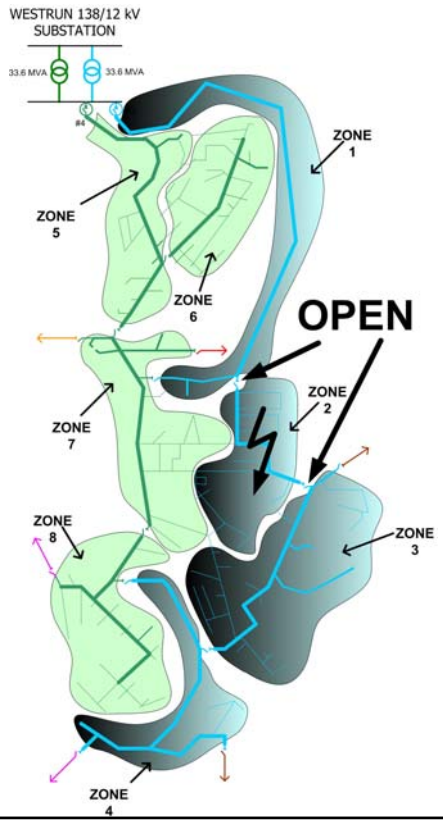

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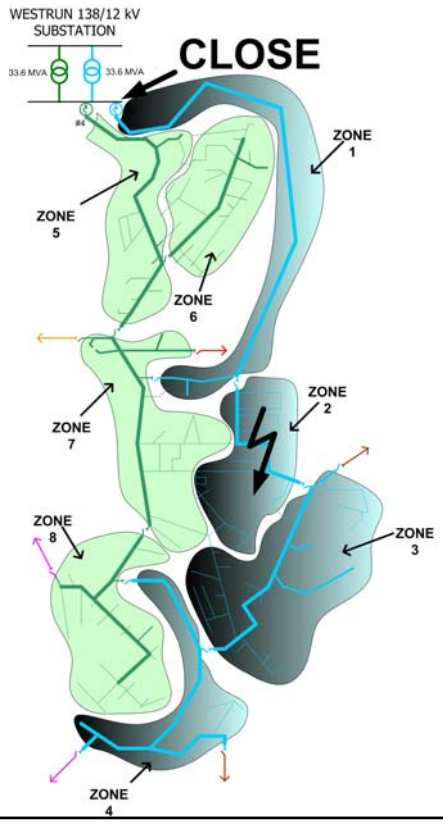

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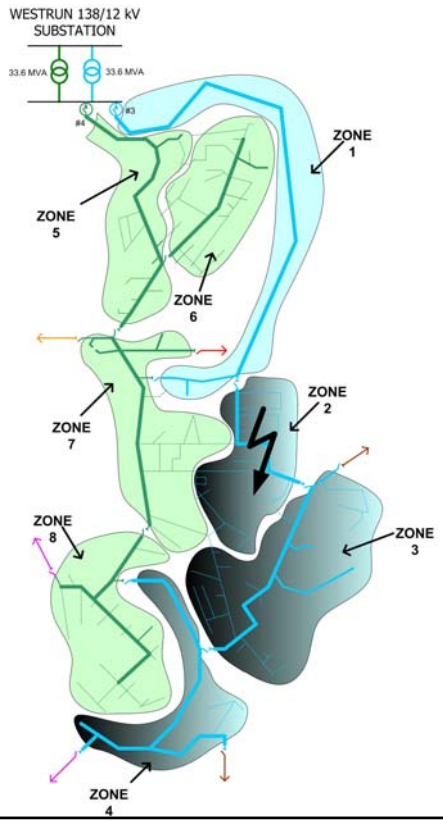

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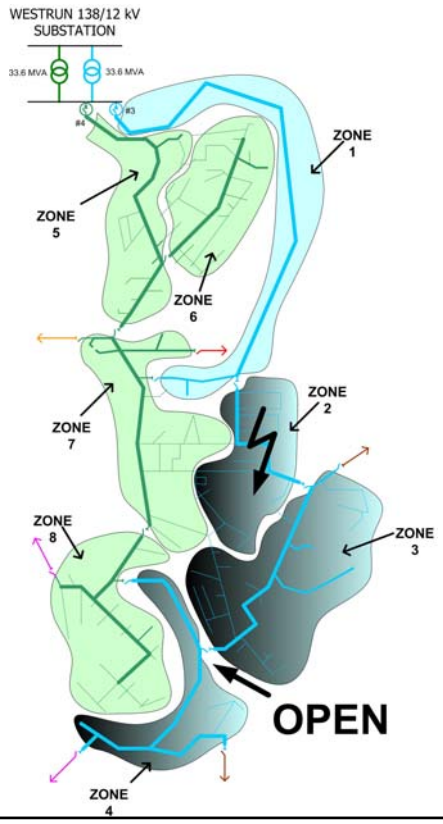

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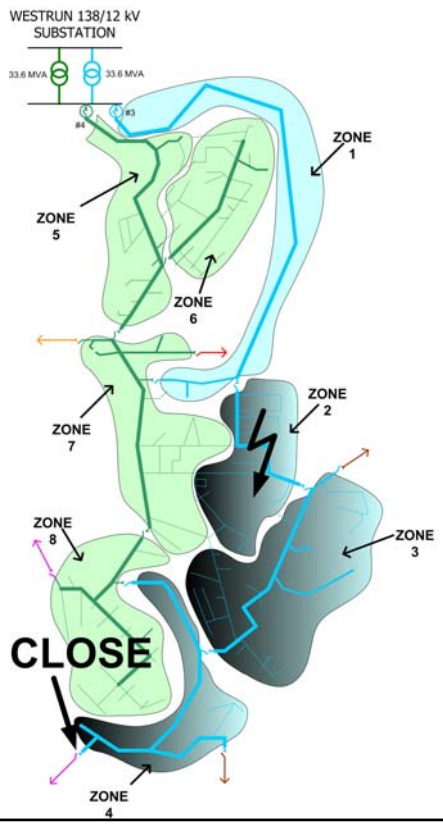

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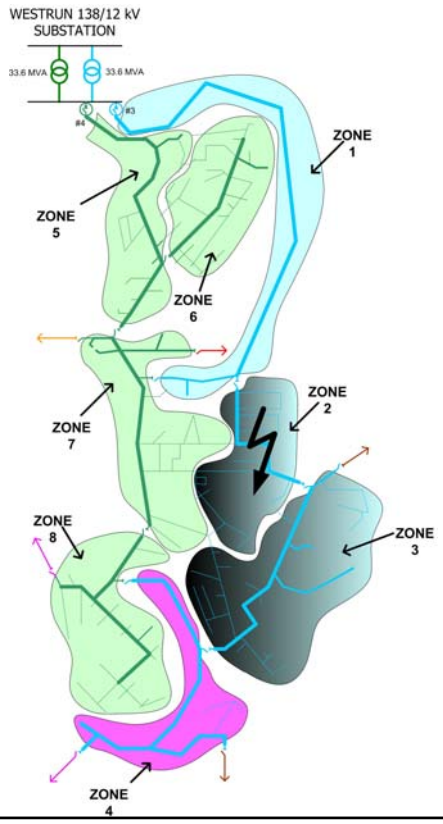

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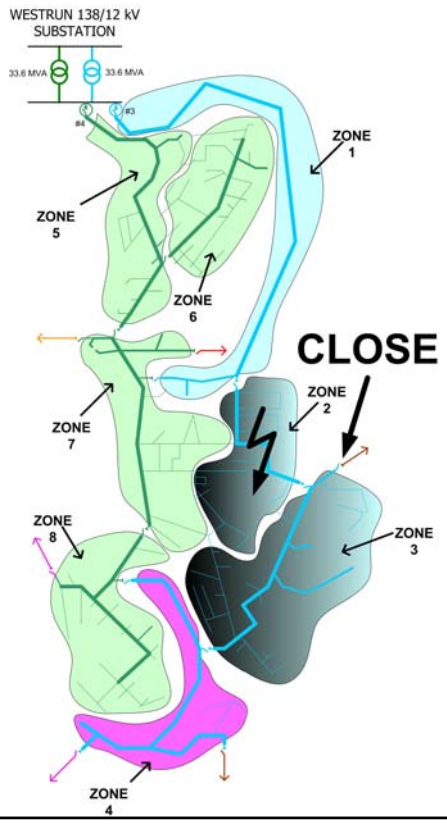

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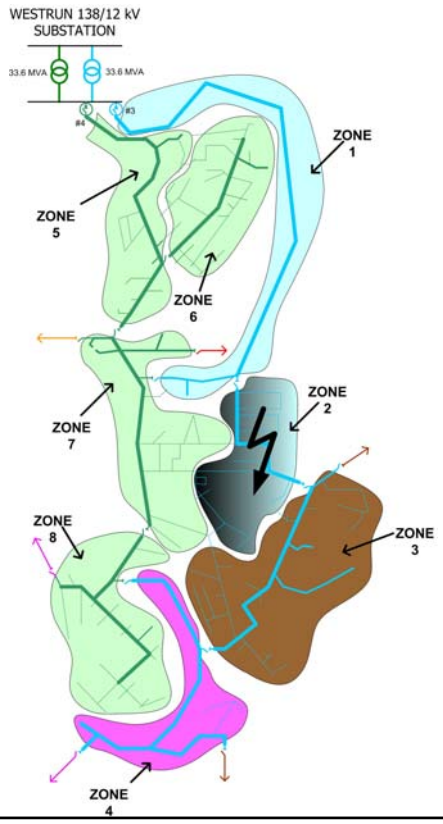

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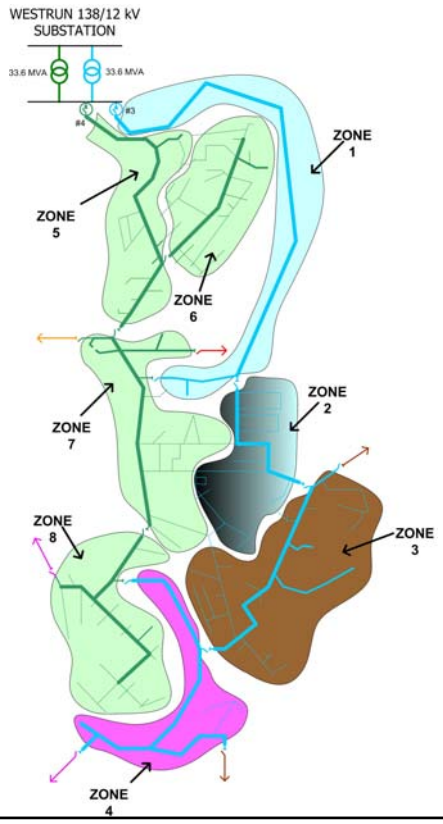

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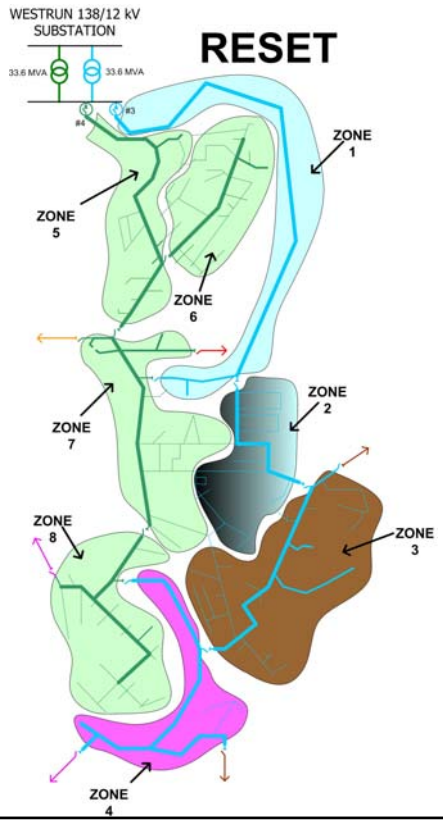

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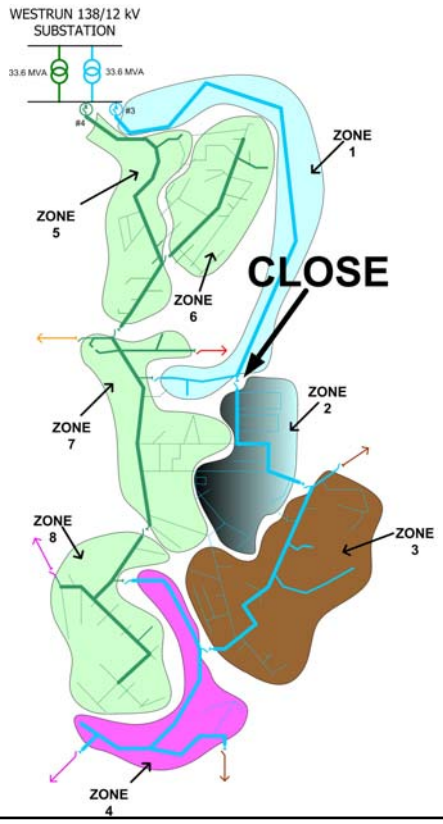

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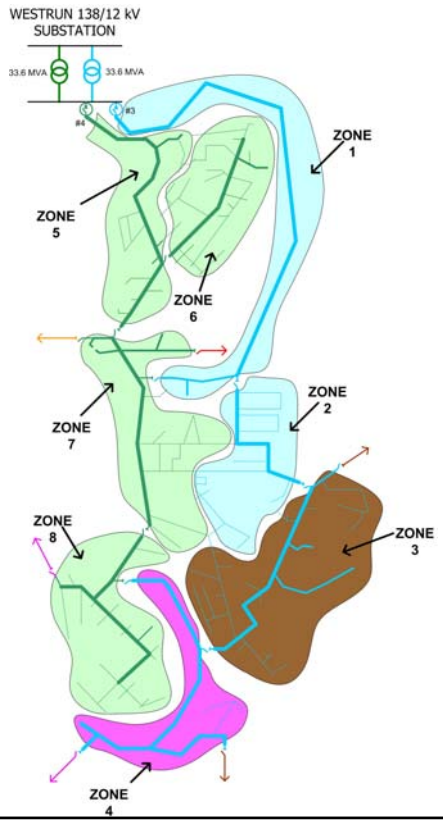

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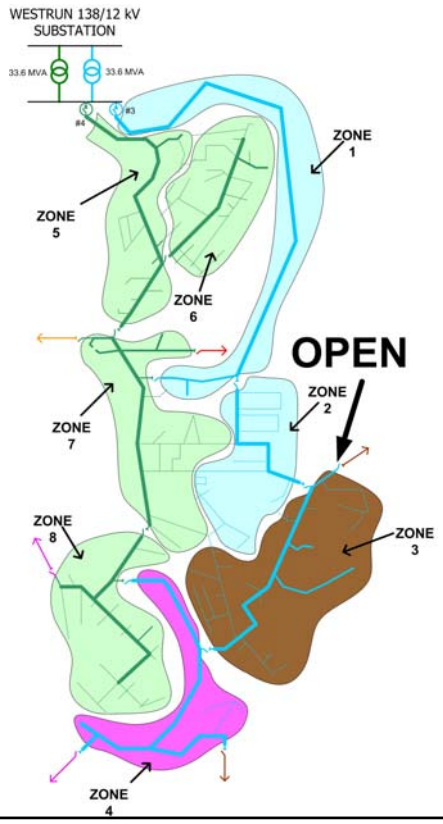

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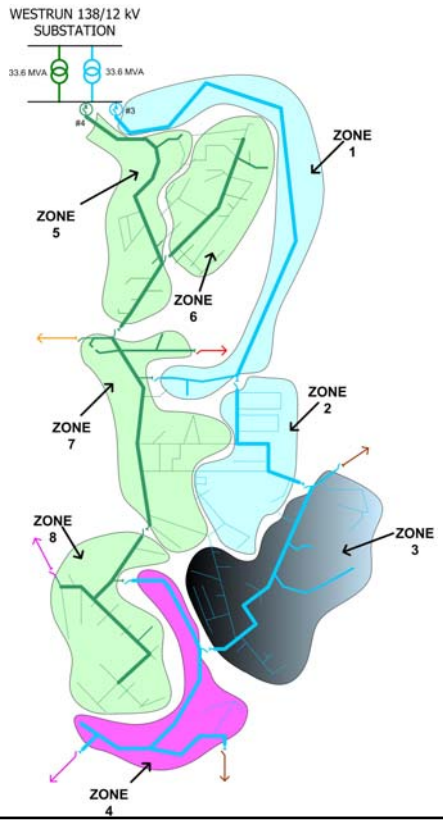

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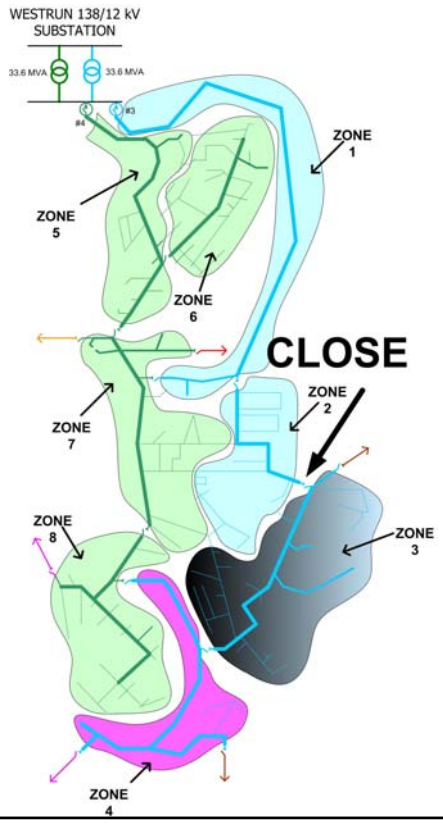

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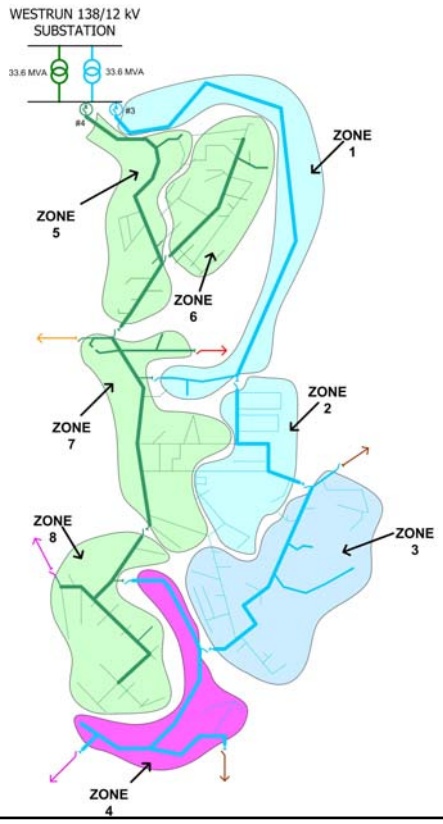

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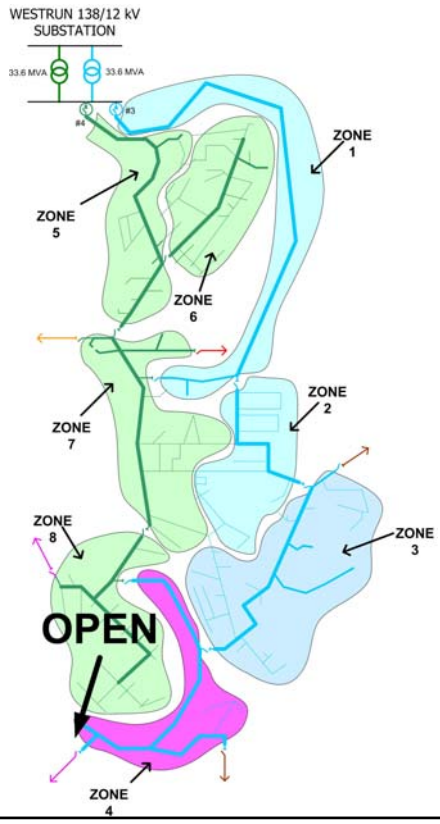

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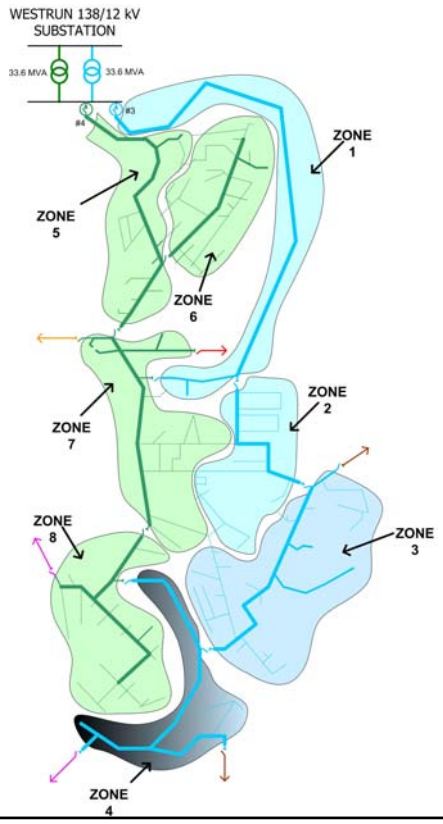

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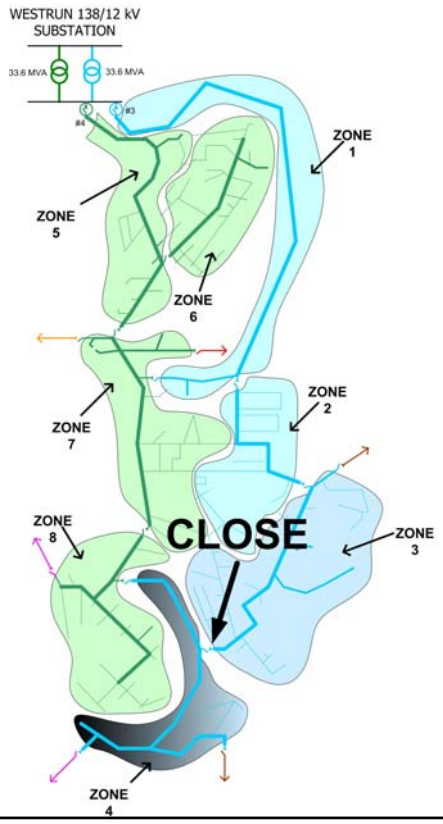

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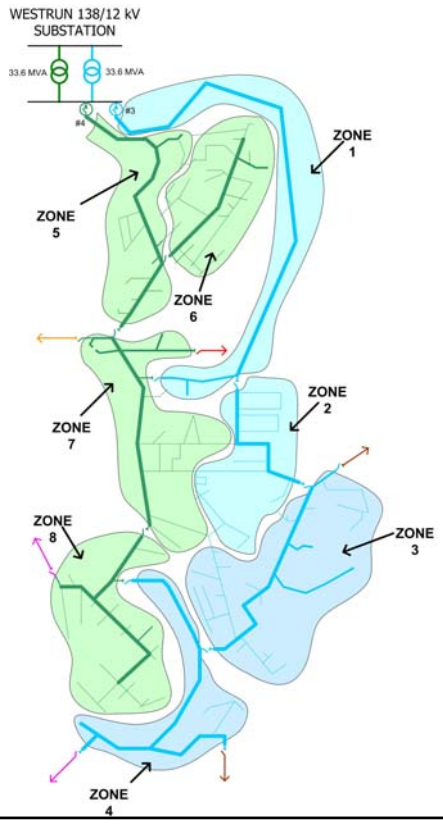

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