



**We Energies**  
Energy You Can Depend On

ESRI GEOCONX 2017

# Enterprise GIS – ADMS Integration

## Enhancing GIS Network Model on-the-fly

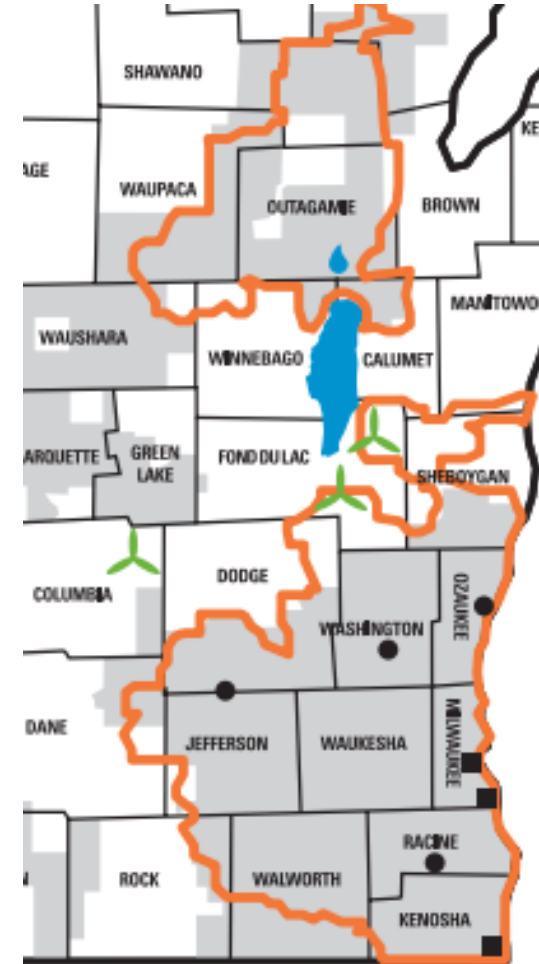
Parag Parikh ABB, Dawn Neuy WE Energies

# WE Energies

## Overview

Total accounts: 2,240,640  
Electric accounts: 1,148,805  
Electric distribution lines: 45,420 miles (Overhead: 22,210; Underground: 23,210)  
Substations: 353

- GIS – ADMS Integration Objectives
- Leverage enterprise GIS investment
- Deploy configurable GIS – ADMS interface
- Deploy ADMS network analysis applications



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# WE Energies

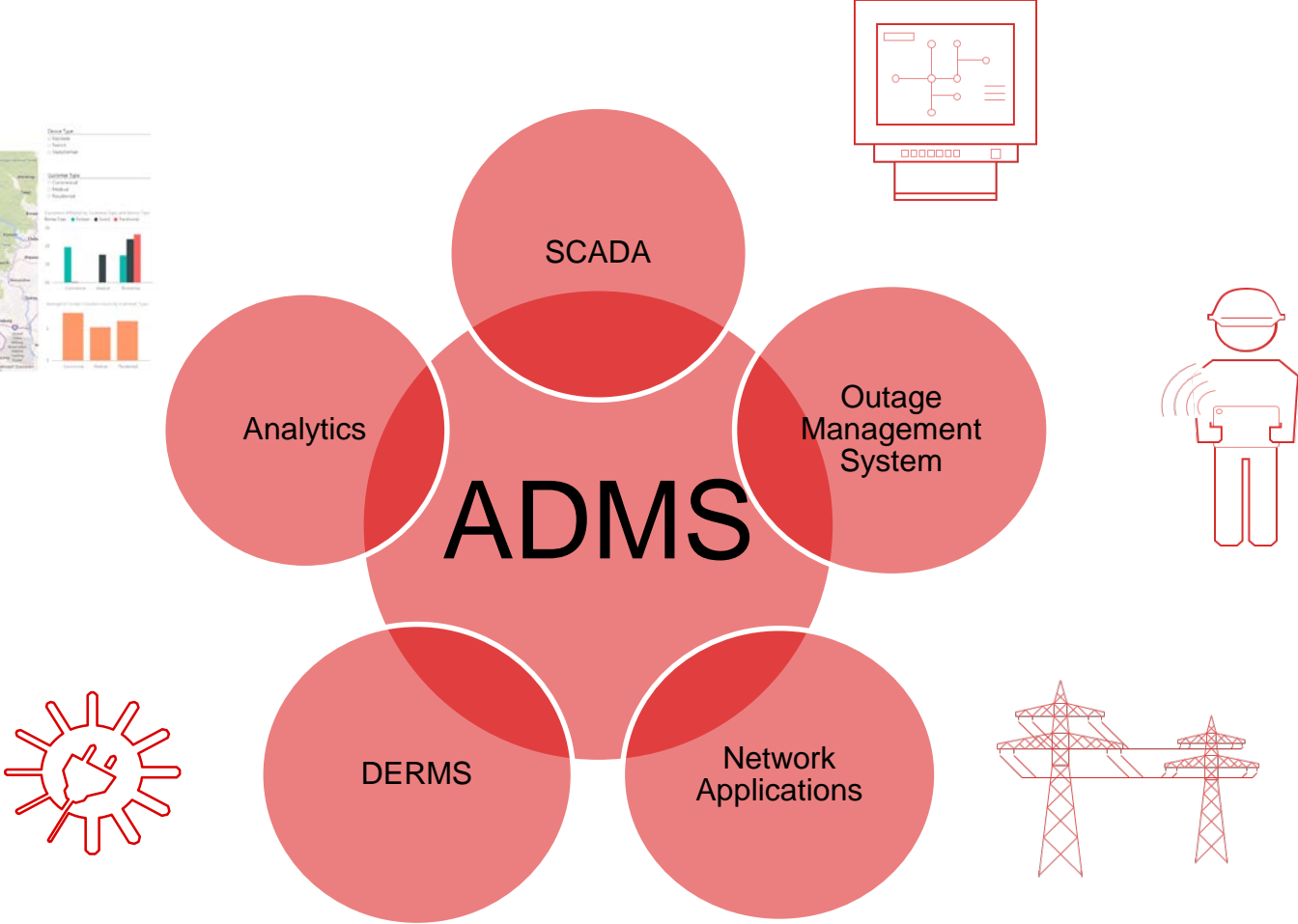
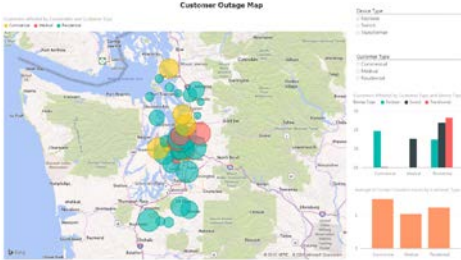
## History

- Deployed OMS in 1996
- Network created and maintained within OMS
- GIS/ADMS Integration
  - Planning started in 2015
  - Current Release: ArcGIS 10
- ADMS Enterprise Integration:
  - CIS, IVR, MWM, SCADA, AMI

## Integration challenges

- Multiple geodatabases
- Frequency of model and data changes
- Version management and Change detection
- Geodatabase Details
  - Geographic
  - Site and Schematics
- Network extent – Sub-transmission, substation, distribution
- Power system data, name plating rating, impedances
- Standards? IEC 61968 – 11?

# What is ADMS ?



# WE Energies

Enhancing ArcGIS schema to support ADMS applications

Geodatabase Attributes	Outage Analysis	Switching	Fault Location	Load Flow Analysis	State Estimation	Volt-VAR Control
Connectivity	✓	✓	✓	✓	✓	✓
Phase	✓	✓	✓	✓	✓	✓
Voltage	✓	✓	✓	✓	✓	✓
Device Rating	✓	✓	x	✓	x	✓
Load	✓	✓	x	✓	✓	✓
Impedance	x	x	✓	✓	✓	✓
Construction	x	x	✓	✓	✓	✓
Device Controller	x	x	✓	✓	✓	✓
Sensors	x	x	✓	✓	✓	✓

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## ArcGIS – ADMS Integration

### GIS – ADMS data model comparison

- Data model definition
- Feature classes & attributes
- Network definition
- Detail vs. speed
- Unique vs. consistent view
- Operational device modeling:
- Network energization
- Site and schematic views
- Equipment not modeled in the GIS
  - Elbows, Bypass switches etc.

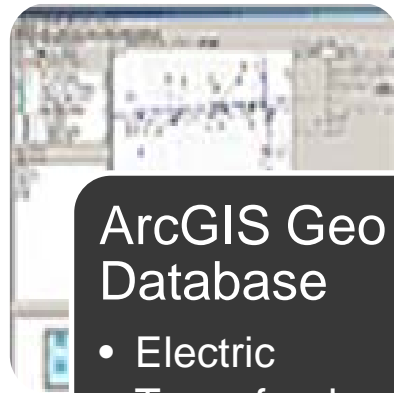


Using GIS as the spatial data source enables “Single Source of Truth”

# ArcGIS – ADMS Integration

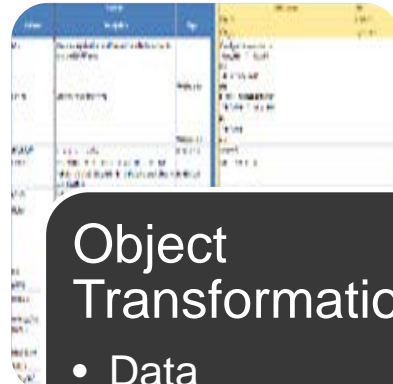
## GIS Data Extraction & Transformation

## Model Update



### ArcGIS Geo Database

- Electric
- Trace feeders
- Landbase export as tiles



### Object Transformation

- Data transformation
- Data enhancement



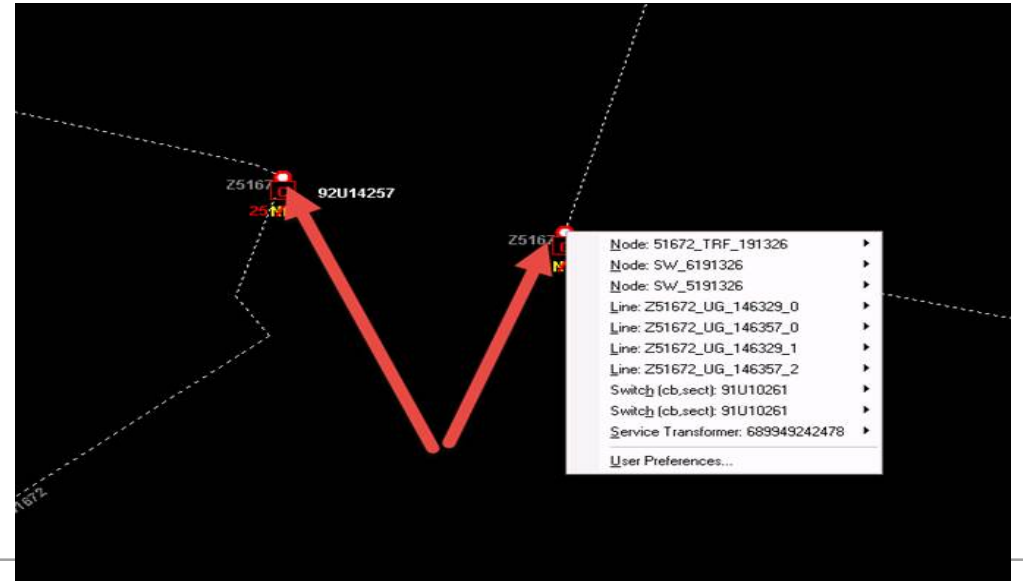
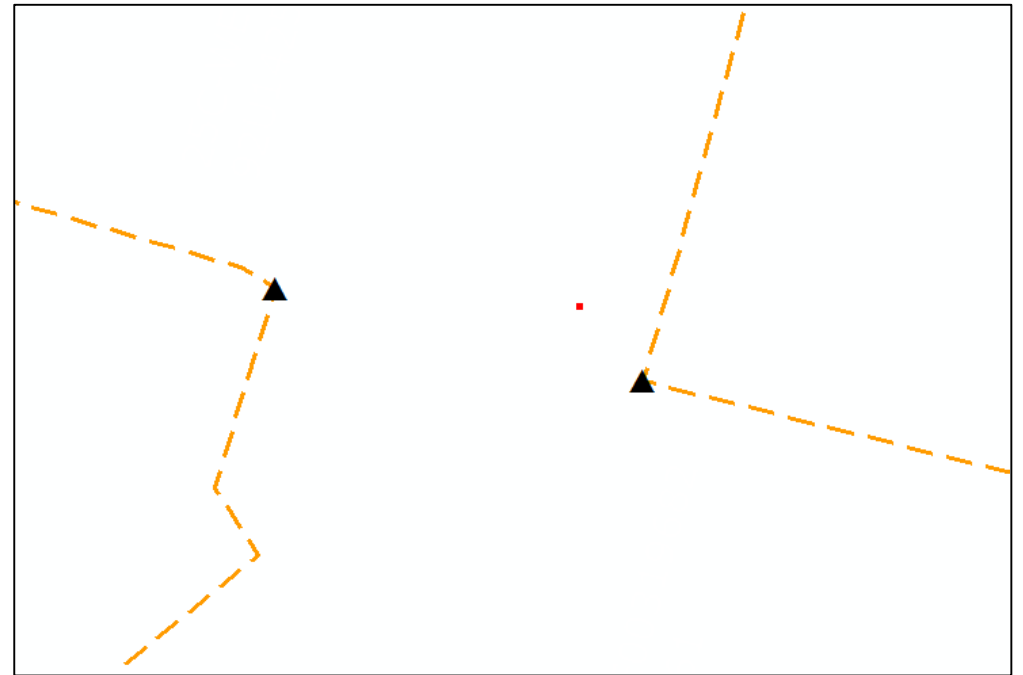
### ADMS Database

- Data loading
- Incremental data loading to a case Study and verify
- Apply changes to production system

# ArcGIS – ADMS Integration

## Data transformation

- Map GIS objects to ADMS objects
- Performs object transformation, giving ADMS identification
- Network connectivity using GIS defined connectivity
- Unique ID assignment
- Attribute manipulation
- Expansion or replacement of feature classes
- Elimination of unnecessary feature classes
- Assign Area of Responsibility (AoR)

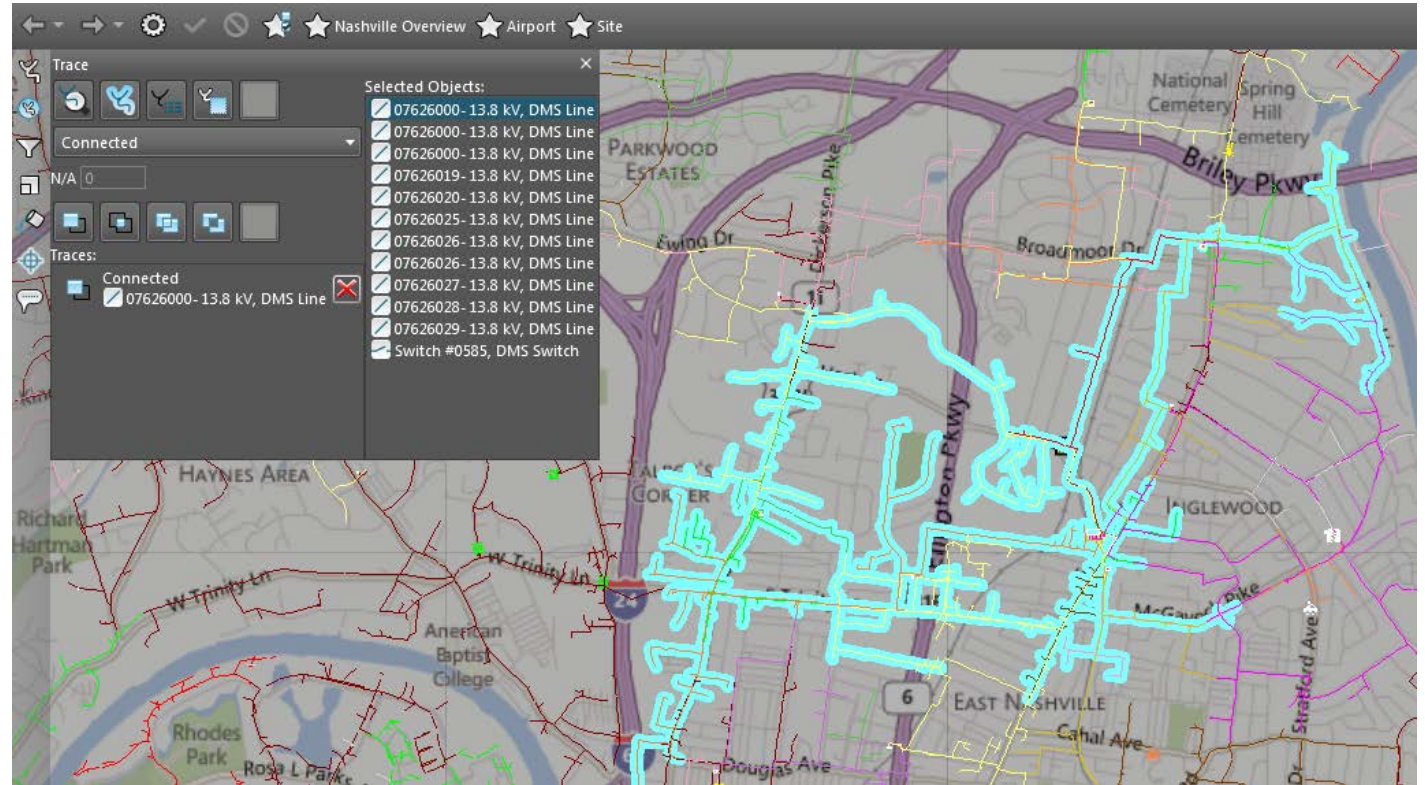




# ArcGIS – ADMS Integration

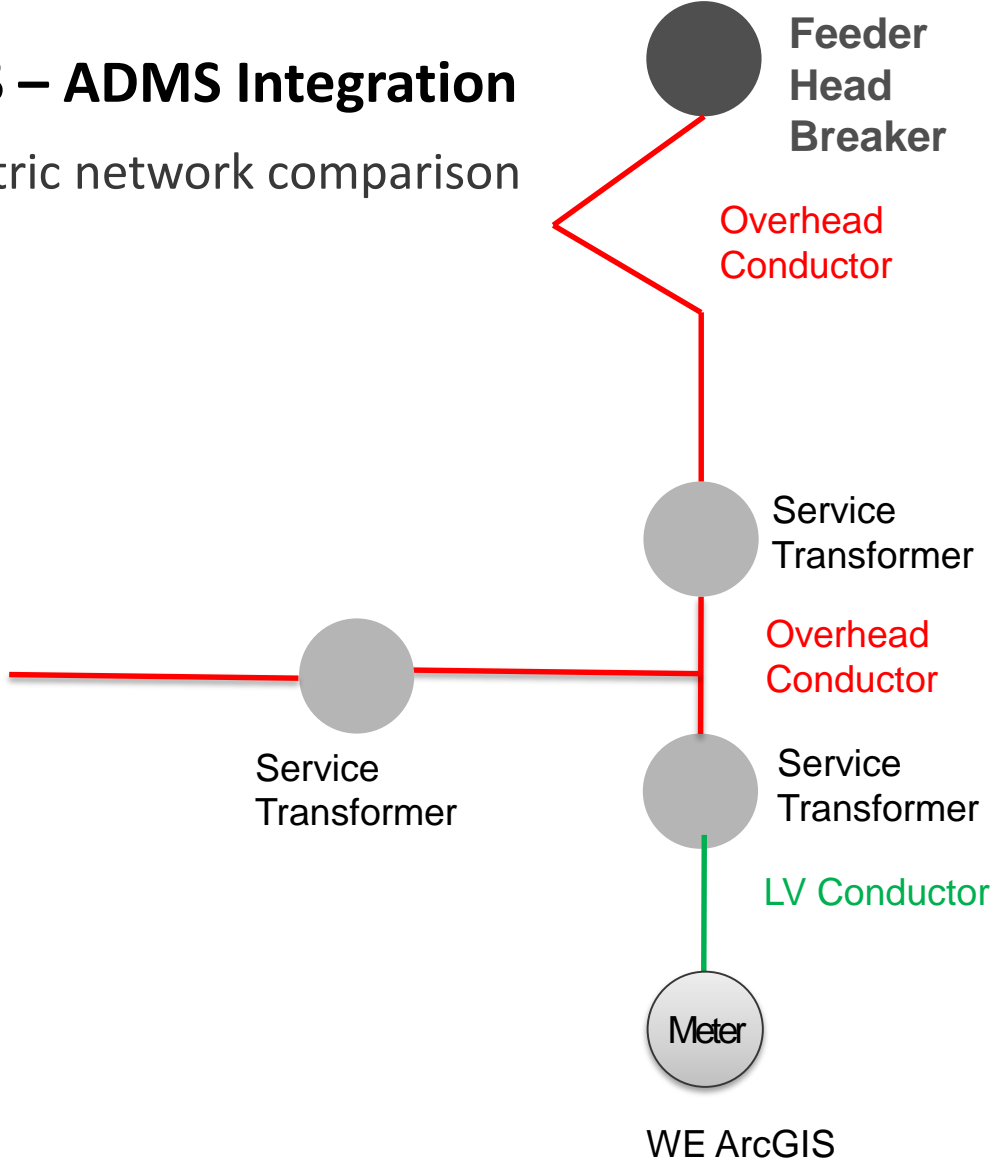
## Network tracing

- Network tracing
- Stop trace at feeder boundary points
- Recommended boundaries:
  - Open switches
  - Feeder heads separating distribution level from substation level
  - Dead Span

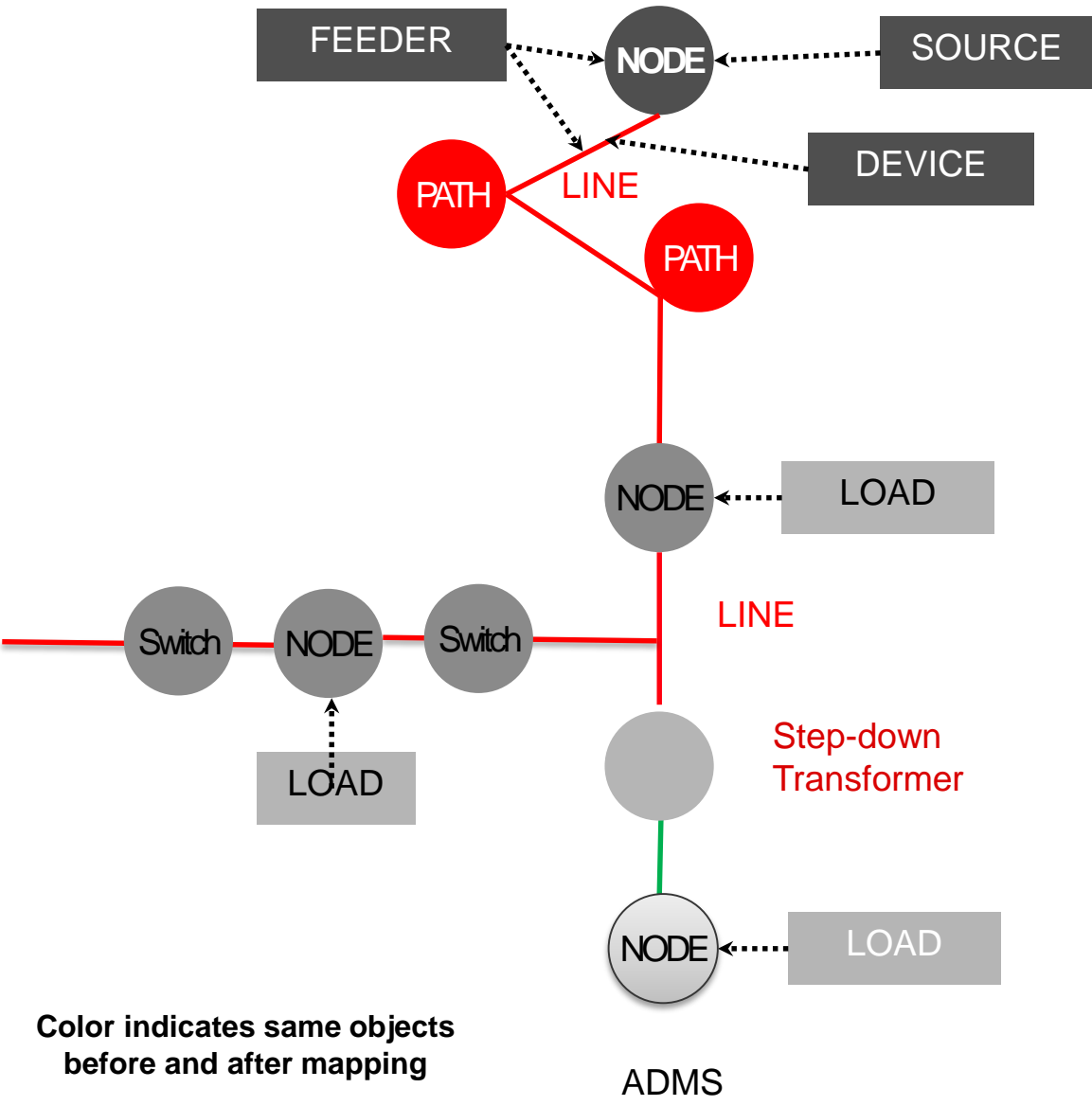


# ArcGIS – ADMS Integration

Geometric network comparison



WE ArcGIS



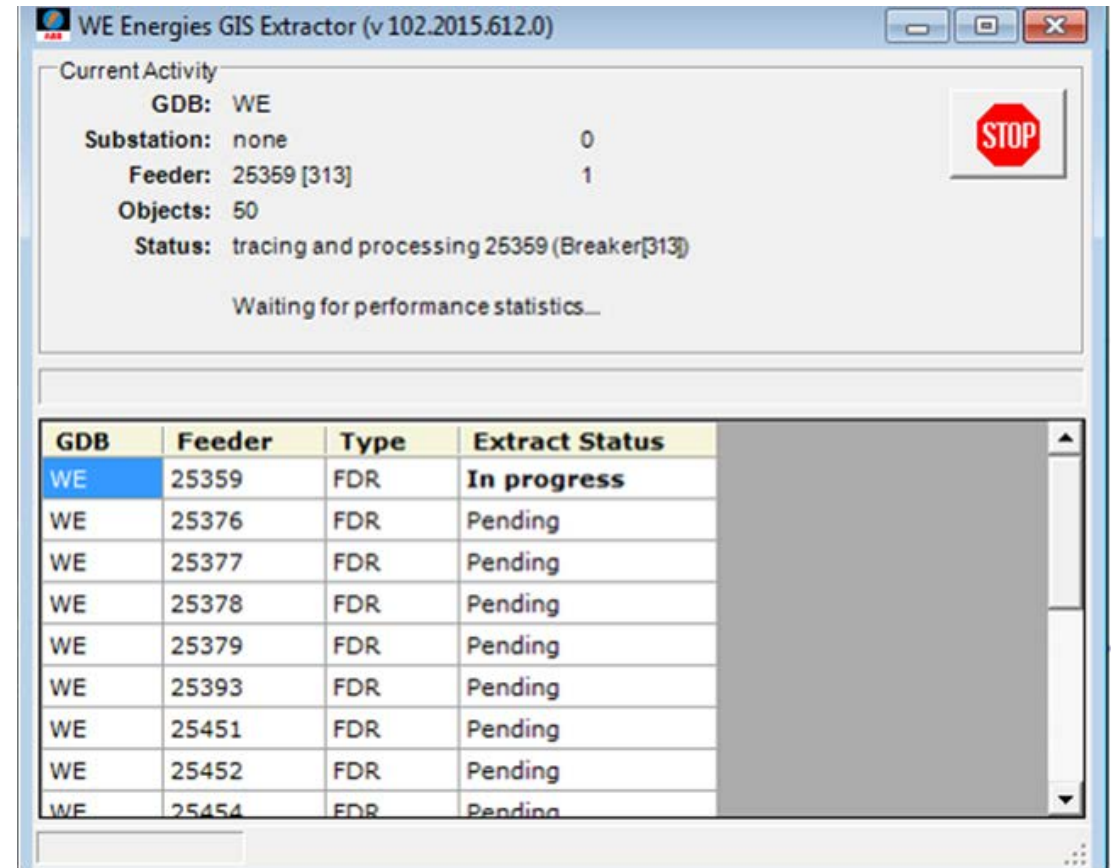
Color indicates same objects before and after mapping

ADMS

# ArcGIS – ADMS Integration

## Data Extraction and Transformation

- Development Environment
  - ArcObjects and .Net
- Full Extract or Incremental Extract
  - Extract data by a subset – Feeder or Substation
- Changes identified by ArcGIS versioning
- Configurable options
  - Feature class mapping
  - Attribute mapping
  - Network enhancement



The screenshot shows the 'WE Energies GIS Extractor (v 102.2015.612.0)' window. The 'Current Activity' section displays the following information:

- GDB: WE
- Substation: none 0
- Feeder: 25359 [313] 1
- Objects: 50
- Status: tracing and processing 25359 (Breaker[313])

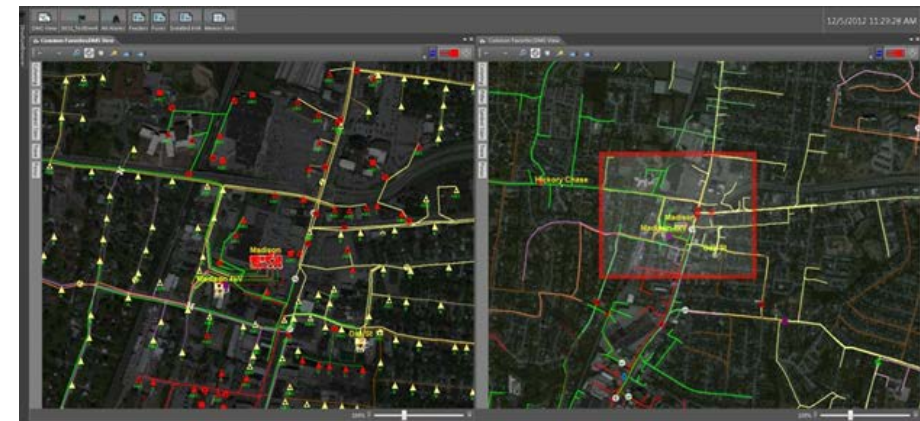
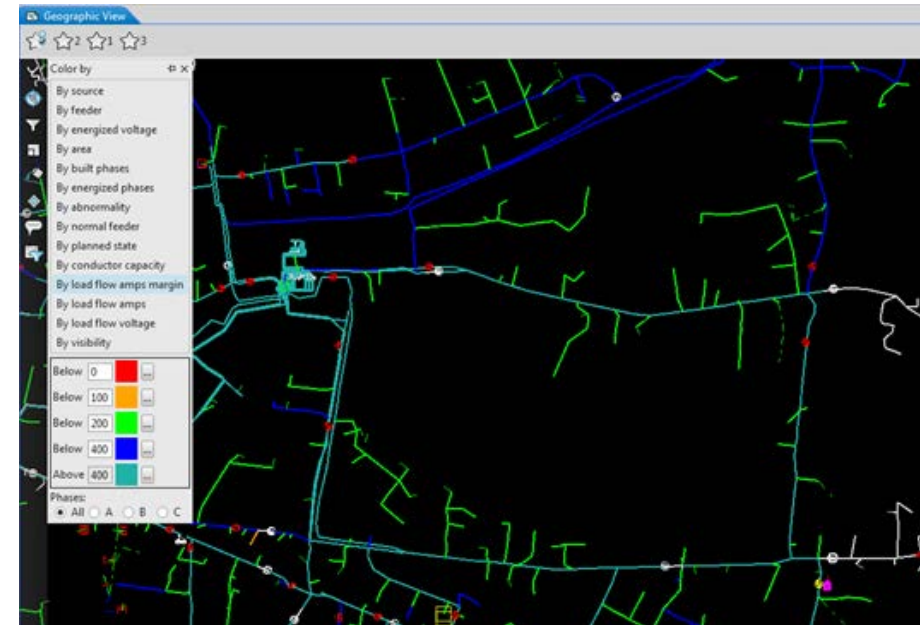
A red octagonal 'STOP' button is visible in the top right corner of the activity panel. Below the activity panel, a table shows the extraction progress for various feeders:

GDB	Feeder	Type	Extract Status
WE	25359	FDR	In progress
WE	25376	FDR	Pending
WE	25377	FDR	Pending
WE	25378	FDR	Pending
WE	25379	FDR	Pending
WE	25393	FDR	Pending
WE	25451	FDR	Pending
WE	25452	FDR	Pending
WE	25454	FDR	Pending

# ArcGIS – ADMS Integration











## Data Verification

- De-energization
- Identify loops and parallels
- Missing loads (service transformers)
- Missing Device “Types”
- Isolated loads
- Planned vs In Service



# Network Manager ADMS

## Integrated ADMS benefits

	Separate SCADA-OMS-DMS	ABB integrated ADMS
Avoid multiple network models		
Temporary network changes readily available for all functions		
Avoid multiple integration points to external IT systems		
Common user interface		
Increased situational awareness		

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## ArcGIS – ADMS Integration

Questions ?