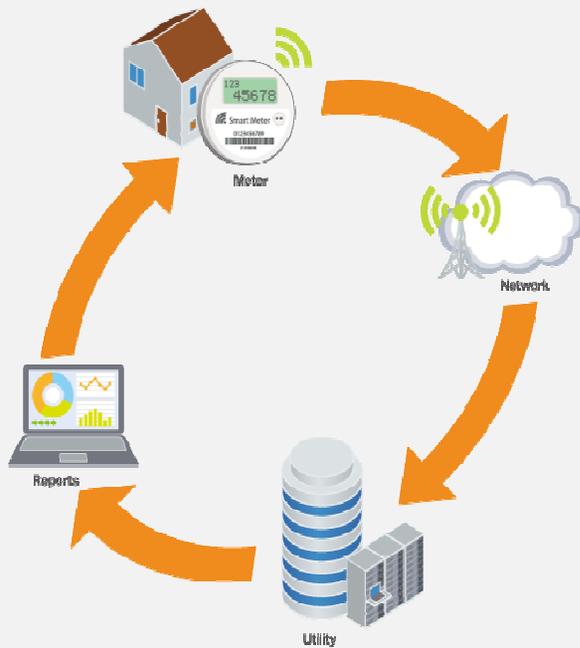


City of Columbia Council Work Session

Monday, June 6, 2022



AMI – Advanced Metering Infrastructure



- Electric Meter with Communication Capabilities
- City-Wide Wireless Communication Network
- Back End Meter Data Management
- Customer Portal

AMI Immediate Benefits

- Real-Time Data Collection
- Fewer Labor-Hours Driving Collection Routes
- More Efficient and Timely Account Turnover
- Immediate Outage Notifications

AMI – Potential Long Term Benefits

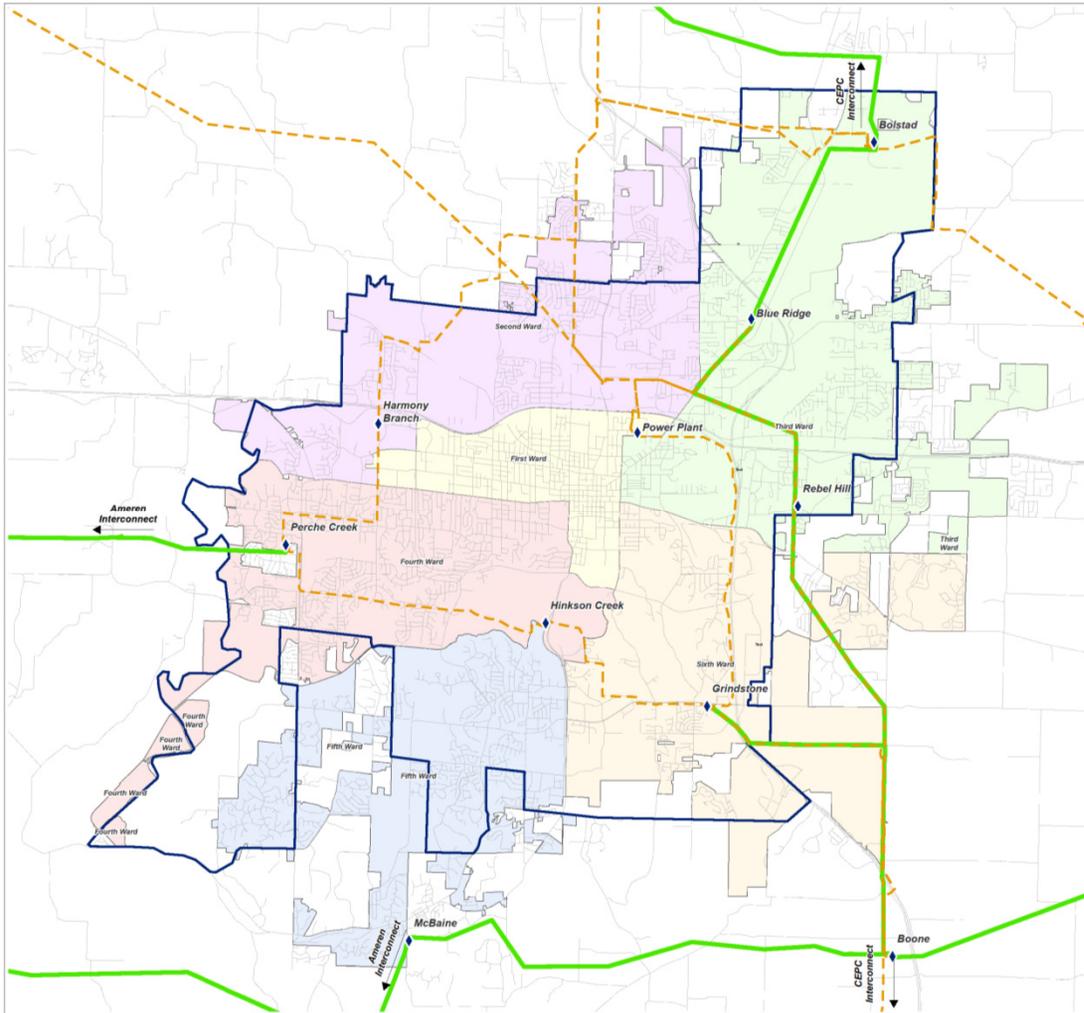
- Flexible Billing Design
 - Demand, Time of Use, Etc.
- Visibility Into Residential Solar Generation
- Utility Interaction with Smart Devices
 - Electric Vehicle, Smart Thermostats, Etc.
- Interaction with Customers as Part of Efficiency Programs

AMI – Next Steps

- FY2023 – Hire Consultant for Pre-Design, More Refined Budget, and Specification Writing
- Award Design and Construction Services to Long Term Service and Equipment Provider
- \$24 Million Total Programmed in Capital Projects Over 3 Years Starting FY2024

Transmission

- Import Power From Regional Power Plants
- High Voltage – 161kV – Ideal for High Power and Distance
 - BES (Bulk Electric System)
 - Lower – 69kV – Local Substation Connections
- Columbia Power Plants Provide Peaking Capacity to Reduce Stress on Transmission System
- Water and Light Obligated to Provide Transmission Service to Fulton and University



1:24,000



- ◆ Substations
- 161Kv Existing Transmission Line
- - - 69Kv Existing Transmission Line
- Water & Light Electric Territory
- First Ward
- Second Ward
- Third Ward
- Fourth Ward
- Fifth Ward
- Sixth Ward

April 2022

Sources:
 Transmission Lines-City of Columbia Water & Light Department
 Wards-City of Columbia Geospatial Information Services Office

New Transmission Projects

- University Of Missouri
 - Redundant 69kV Transmission
 - New Connection Between Grindstone and Hinkson Creek Substation
- Boone Stephens Solar Field
 - 64 MW – Part of Renewable Portfolio
 - 69kV Transmission to Bolstad Substation

Transmission Planning

- Cooperation with MISO and SERC
 - Near Term (6 months) and Long Term (5 years)
 - These Entities Ignore 69kV Issues
- Water and Light Completes a Yearly Transmission Assessment
- Transmission Planning Identifies Potential Reliability Issues
- Columbia Strives to Go Beyond NERC Standards to Maximize Reliability

NERC Standard Overview

Contingency Category	Initial Conditions	Outage Event	Interruption of Firm Transmission Service Allowed	Non-Consequential Load Loss Allowed
No Contingency (P0)	Normal System	No Outage	No	No
Single Contingency (P1)	Normal System	Loss of generator, transmission line or transformer	No	No
Failure at Substation (P2)	Normal System	1. Bus Section Outage 2. Internal Breaker Fault	Yes, in most cases (V<300 kV)	Yes, in most cases (V<300 kV)
Prior Generation Outage (P3)	Loss of generator unit followed by System adjustments	Loss of generator, transmission line or transformer	No	No
Stuck Breaker Contingency (P4)	Normal System	Loss of multiple elements caused by a stuck breaker attempting to clear a fault on a transmission element	Yes	Yes

NERC Standard Overview

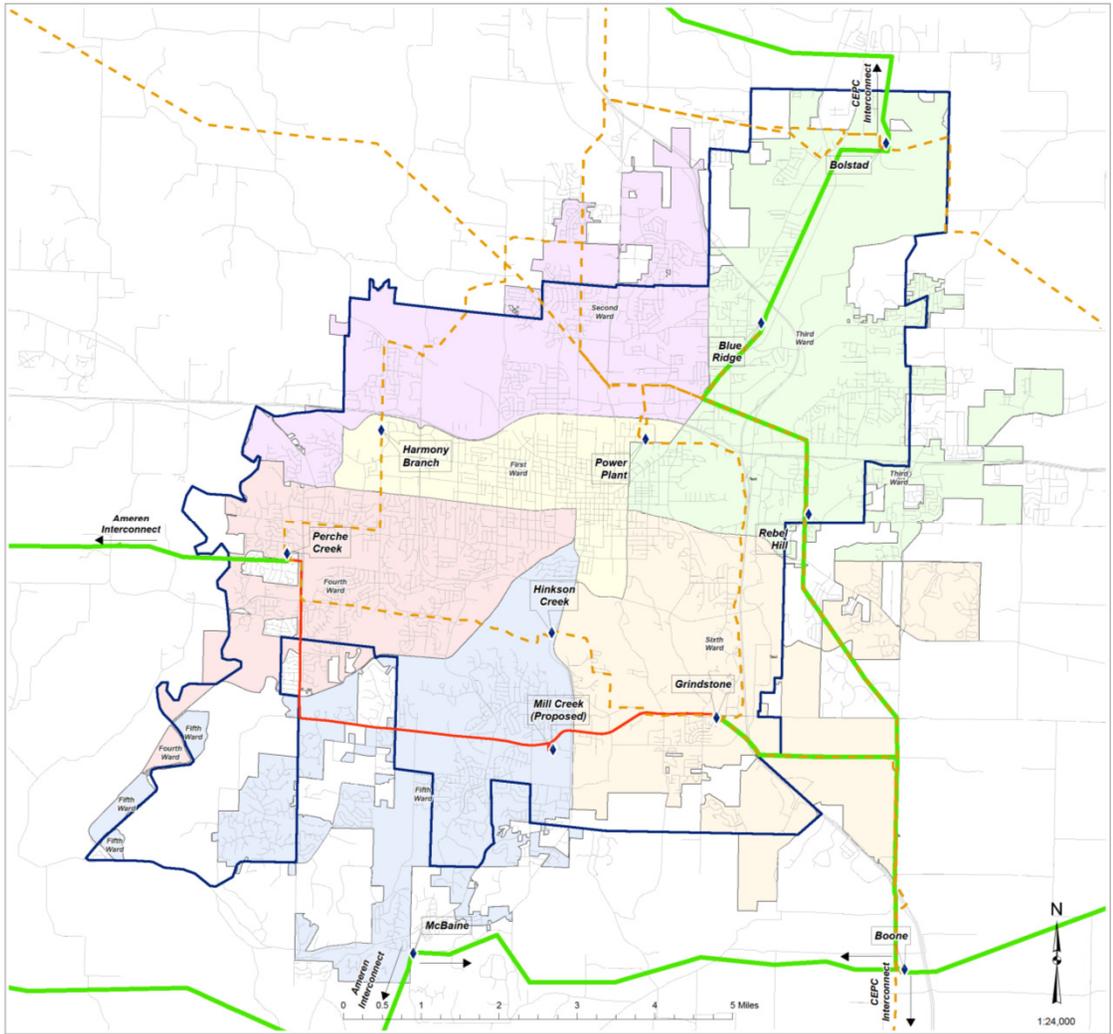
Contingency Category	Initial Conditions	Outage Event	Interruption of Firm Transmission Service Allowed	Non-Consequential Load Loss Allowed
Protection failure Contingency (P5)	Normal System	Failure of a non-redundant relay protecting the faulted element to operate as designed, for a generation, transmission line, transformer, bus section; multiple elements out	Yes	Yes
Two overlapping Singles Contingency (P6)	Loss of a transmission line or transformer followed by system adjustments	Loss of generator, transmission line or transformer, typically during maintenance of the first element.	Yes	Yes
Common Structure Contingency (P7)	Normal System	Loss of any two transmission lines on common structure	Yes	Yes

Transmission System Challenges

- Mid-Missouri Load Served Primarily by 69kV Sub-Transmission
 - Columbia Water and Light and Surrounding Utilities
- Large Addition of Wind and Solar Makes the Regional Transmission Grid Harder to Model in Spring and Fall
 - High Wind Generation Coupled with Maintenance Season
- Provide Necessary Transmission to University
- Transmission Provides Path to Import Renewable Energy
- Transmission Projects Take Years to Complete

Transmission Build Options

- Option A – Optimal Solution
 - New Substation and Load Moved from 69kV to 161kV
 - Redundant Connection to Perche Creek Substation
- Option W – Hinkson Creek Overbuild – Acceptable Solution
 - Similar to Option A with Re-routed Transmission Lines
 - No New Substation – Replace Hinkson Creek
 - Gets Hinkson Creek Out of Flood Plain
- Other Solutions Considered Sub-Optimal



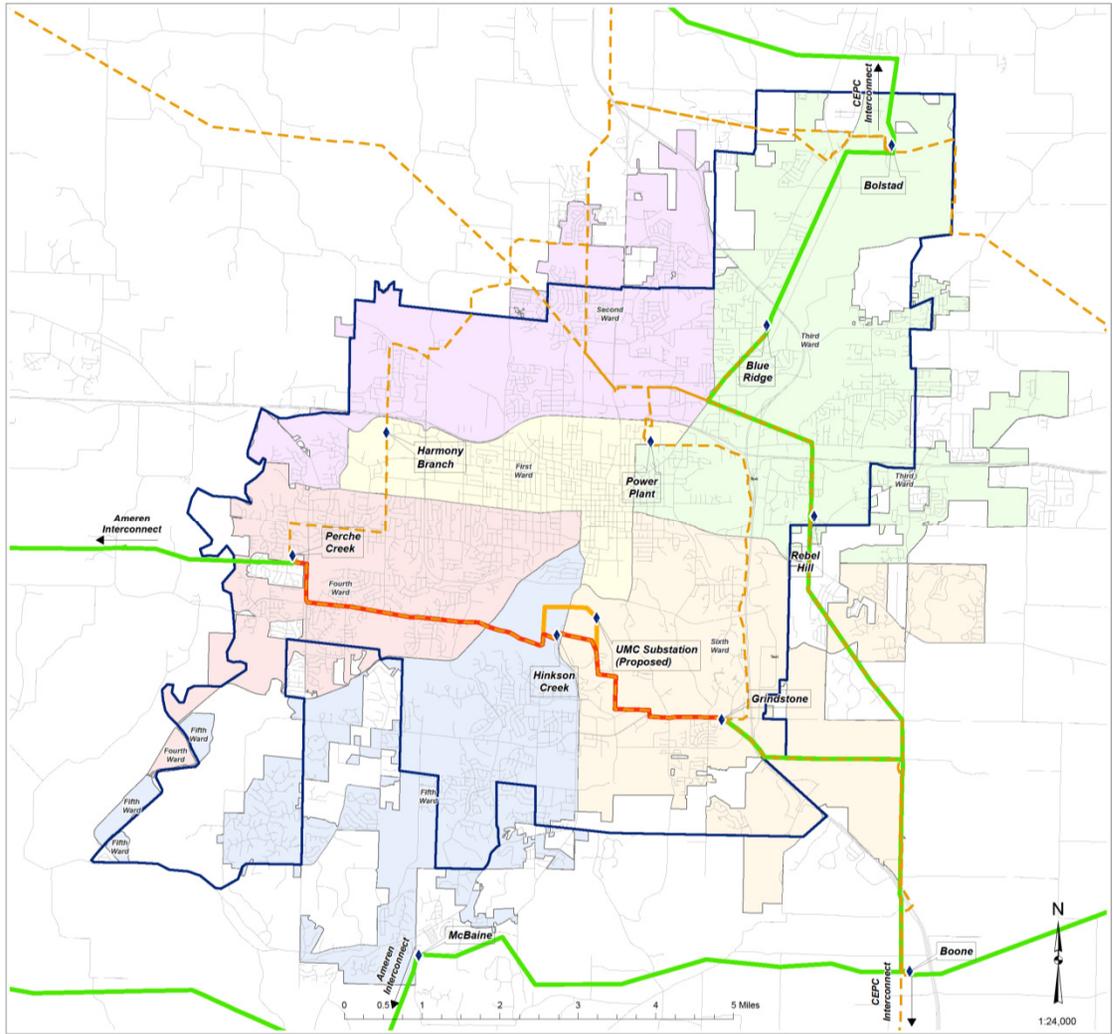
Option A (modified)

- ◆ Substations
- Proposed Option 161Kv
- 161Kv Existing Transmission Line
- - - 69Kv Existing Transmission Line
- ▭ Water & Light Electric Territory
- ▭ First Ward
- ▭ Second Ward
- ▭ Third Ward
- ▭ Fourth Ward
- ▭ Fifth Ward
- ▭ Sixth Ward



March 2021

Sources:
Transmission Lines-City of Columbia Water & Light Department
Wards-City of Columbia Geospatial Information Services Office



Option W

- ◆ Substations
- Proposed Option 161kV
- Proposed Option 69kV
- 161kV Existing Transmission Line
- 69kV Existing Transmission Line
- ▭ Water & Light Electric Territory
- ▭ First Ward
- ▭ Second Ward
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March 2021

Sources:
 Transmission Lines-City of Columbia Water & Light Department
 Wards-City of Columbia Geospatial Information Services Office



Conclusion of Public Session



Moving Forward

- Staff needs to develop a work plan and needs direction on the following:
 - AMI
 - Perche Substation Expansion
 - Transmission Alternatives
 - Renewable Energy

