ATC & LDC NEV Coordination Efforts

ATC Customer Meeting

August 20, 2009

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Agenda

- NEV Background
- NEV Collaborative
- Project Coordination
- Q & A

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NEV Background

- Distribution system in Wisconsin have:
  - Multi-grounded neutrals
  - Return current flows through the earth
  - Neutral to Earth Voltage (NEV)
- Direct induction due to distribution load current can also affect NEV levels
- Addressing NEV is new to ATC as a company

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NEV Background

- Transmission system contribution to NEV:
  - Direct induction
    - Magnetic field: can induce a current on the distribution system neutral/earth loop
    - Electric field – gradient can create a voltage difference between conductive surfaces (usually not as significant as magnetic field induction)
  - Induction to static wire
    - Magnetic field: can induce a current on the static wire/earth loop
    - Current on the distribution system neutral can be conducted from this source through a bond or through the earth

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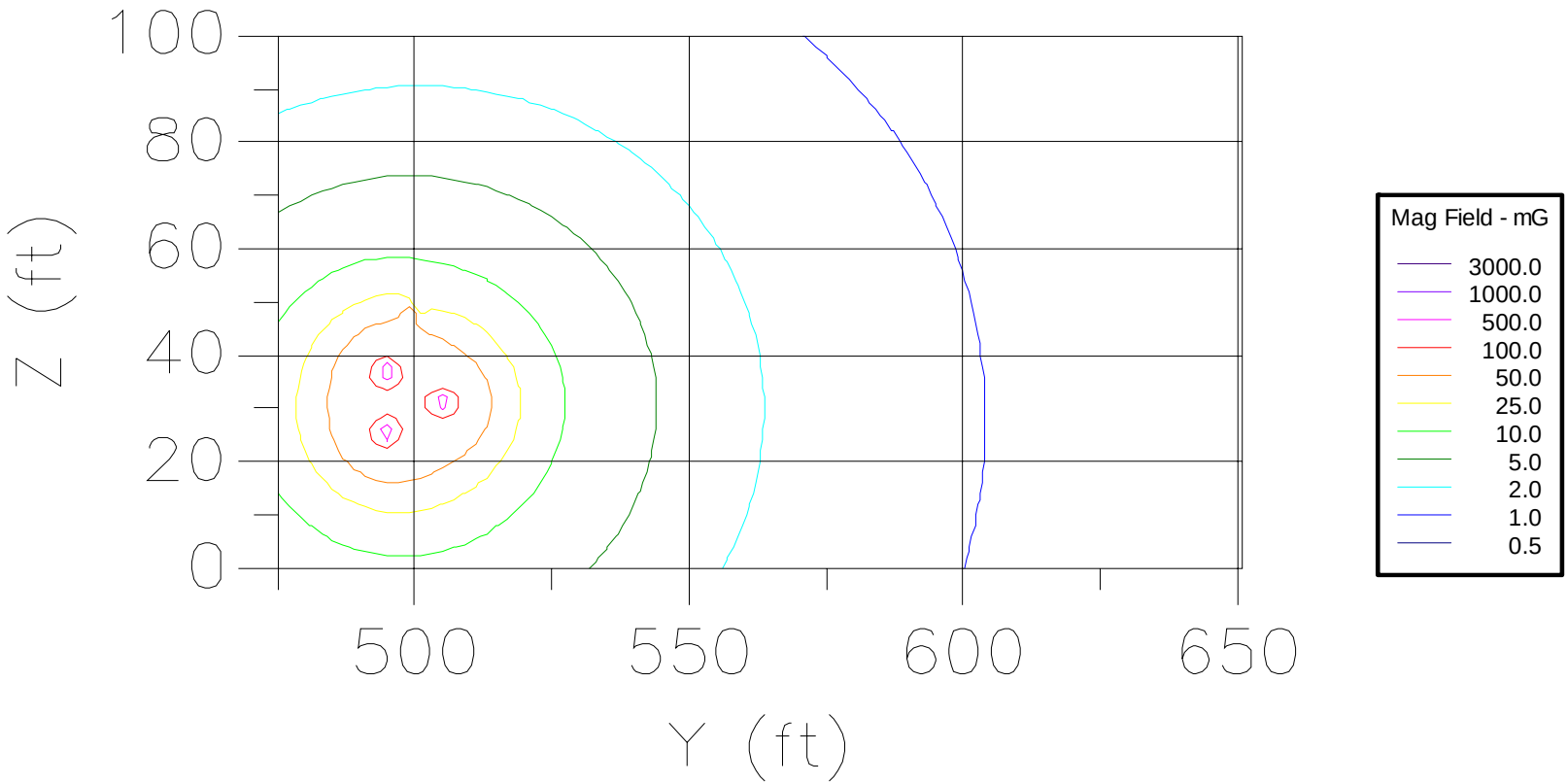
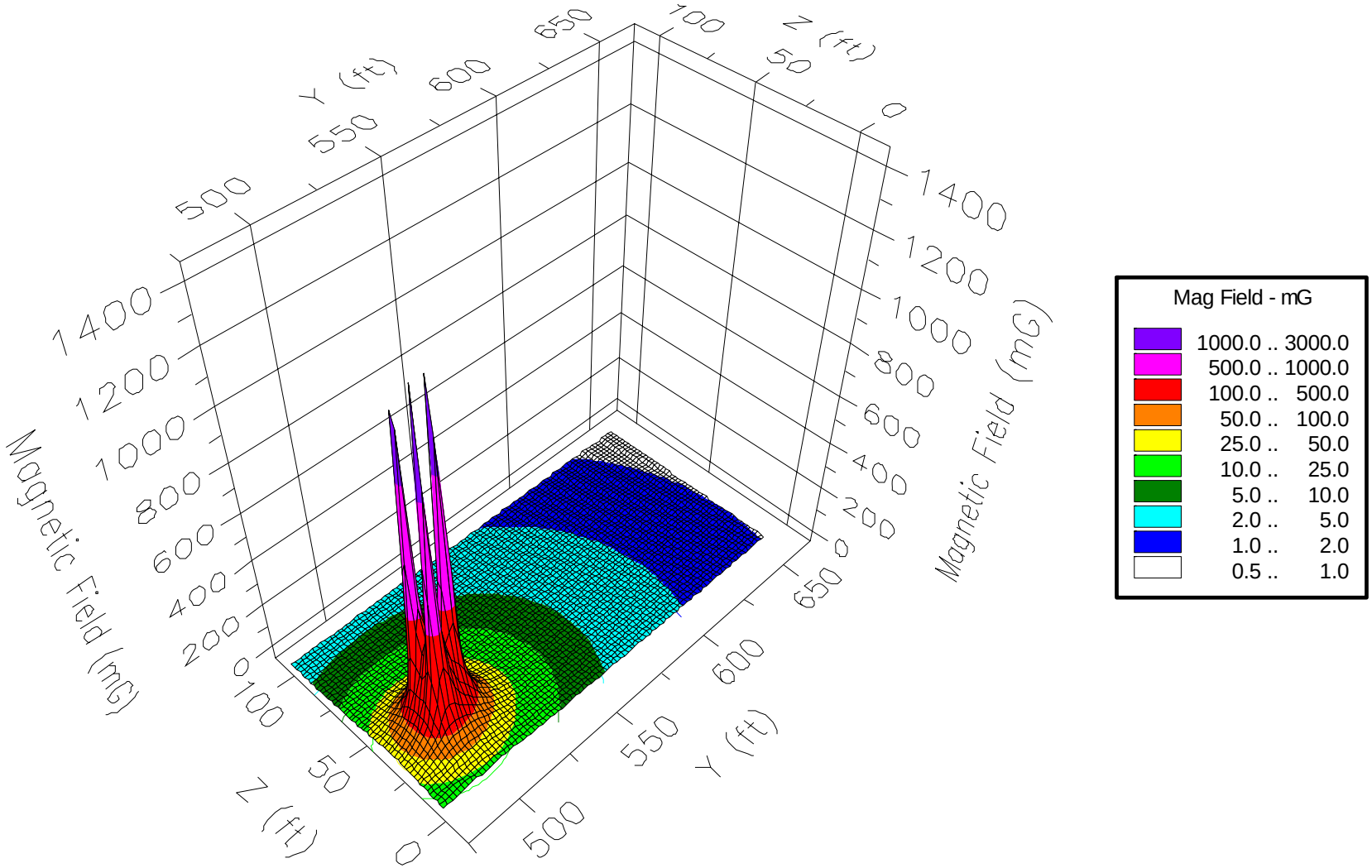
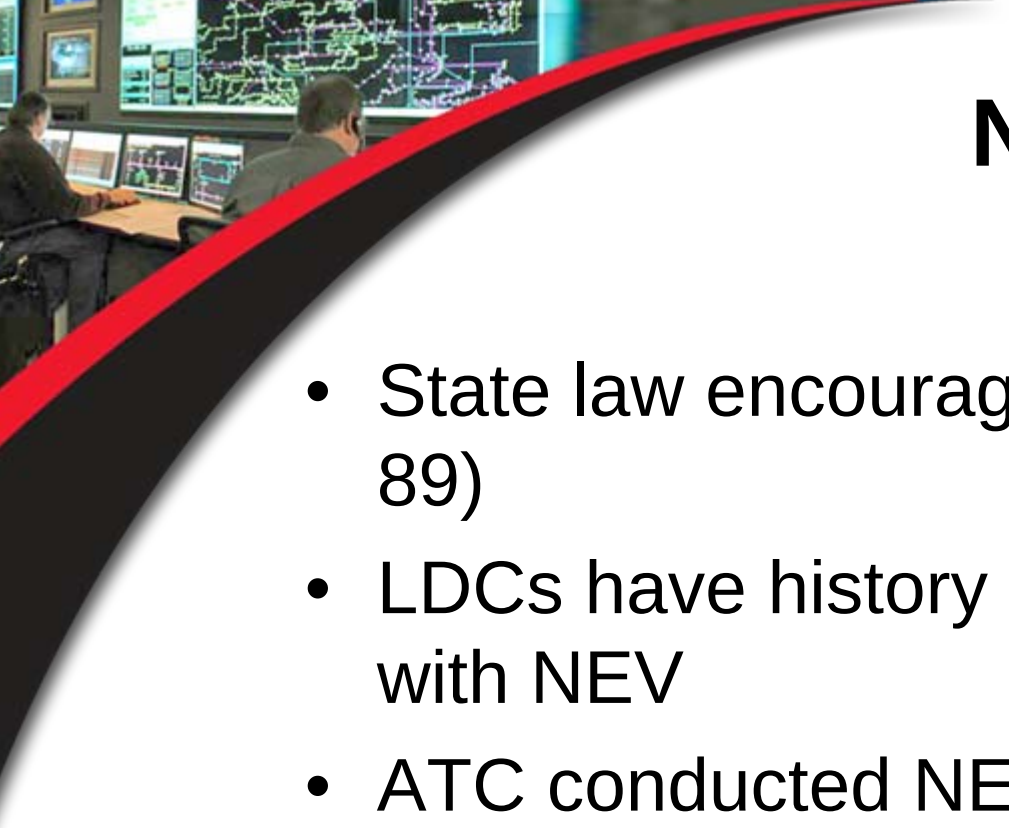
Magnetic Field Contour Map for Delta structure type – 100 amps line current



Magnetic Field Surface Map for Delta structure type – 100 amps line current





NEV Collaborative
Background

- State law encourages corridor-sharing (Act 89)
- LDCs have history and expertise dealing with NEV
- ATC conducted NEV studies in specific transmission projects
- Assessment and mitigation is an iterative process between ATC and LDCs

Design Options for Reducing NEV

- Bridge discontinuities
- Install an underbuilt transmission shield wire
- Increase separation
- Bond the shield wire to earth and the distribution neutral
- Use a delta configuration
- Bury a counterpoise & bond to the UG neutral
- Incorporate optimal phasing in the design of new double-circuit structures that minimizes induction

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PSCW Response

- Additional modeling experience needed
- Prudent avoidance should be explored
- Design mitigation if avoidance is not feasible
- Mitigation is handled on a case by case basis

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NEV Collaborative -
Cooperation Between the ATC & Local Distribution Utilities (LDCS)

- Identify which projects could have NEV impacts
- Develop an interaction and reporting process
- Use of design guide for documenting processes
- Prepare for consistent landowner communications
- Develop process for addressing non-project NEV inquiries
- Address other issues as identified-quarterly meetings in 2009

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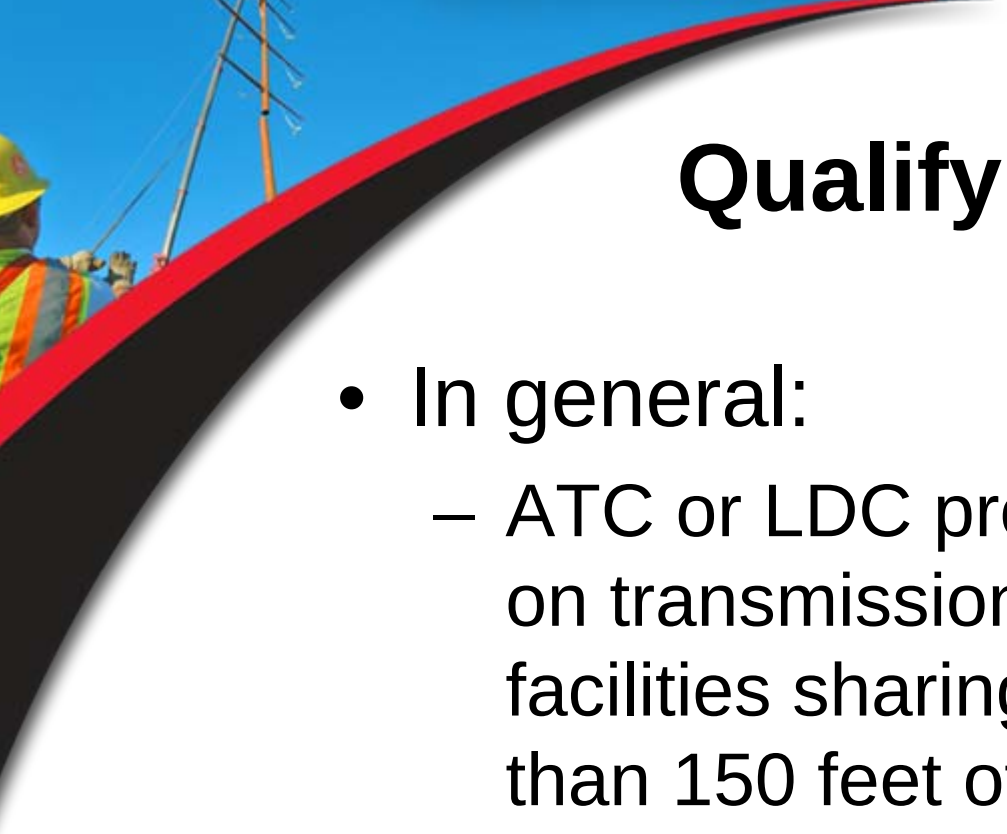


Qualifying Project Types

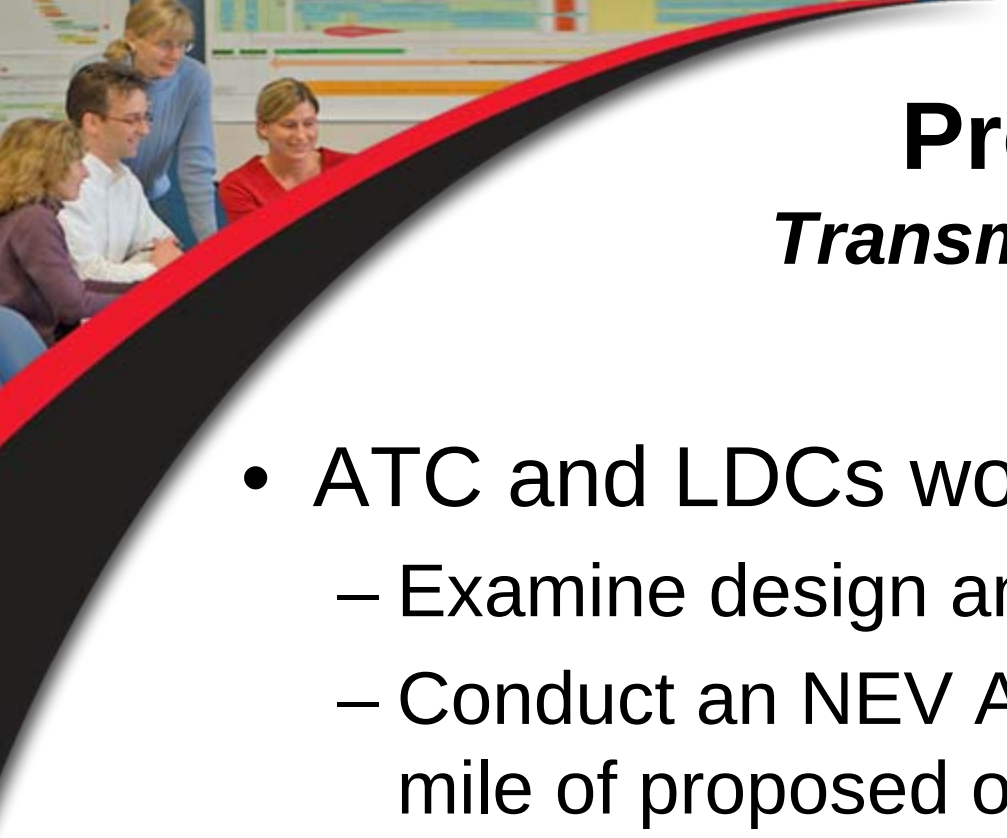
- In general:
  - ATC or LDC project work that occurs on transmission and/or distribution facilities sharing a corridor with less than 150 feet of horizontal separation for a length greater than 1000’
  - two-lane road for more than two transmission spans
- *NEV assessment will be done*

Qualifying Project Types

- In general, projects that change the conductor configuration, separation, bonding or grounding in the defined corridor will be evaluated and reported
- Similar treatment to “filing” projects
- Bi-annual reporting to PSCW on non-filing projects

Qualifying Project Types

1. All requests for attachment to transmission structures made by LDCs (excluding perpendicular crossings)
2. An increase in transmission system operating voltage
3. An increase in conductor size on an existing transmission line (excluding emergency restorations)
4. Relocation of a transmission line that reduces the separation between the existing distribution conductors and an existing transmission line
5. A change in conductor configuration for an existing transmission line
6. A change in configuration for an existing distribution line
7. Construction of a new distribution line that will share a corridor with an existing transmission line
8. Change to the transmission line static wire grounding or bonding on the transmission structure with underbuilt distribution
9. Transmission thermal upgrade projects



Project Coordination

Transmission and Distribution Share Corridor

- ATC and LDCs work together to:
  - Examine design and route alternatives
  - Conduct an NEV Assessment within ½ mile of proposed or existing line routes

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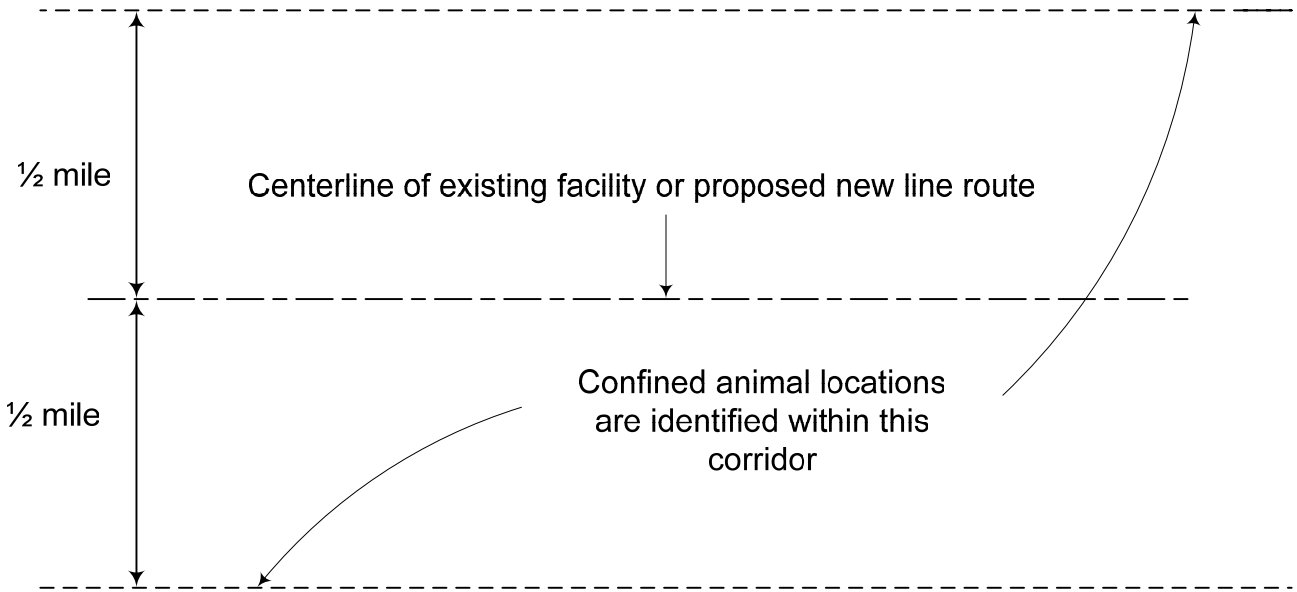
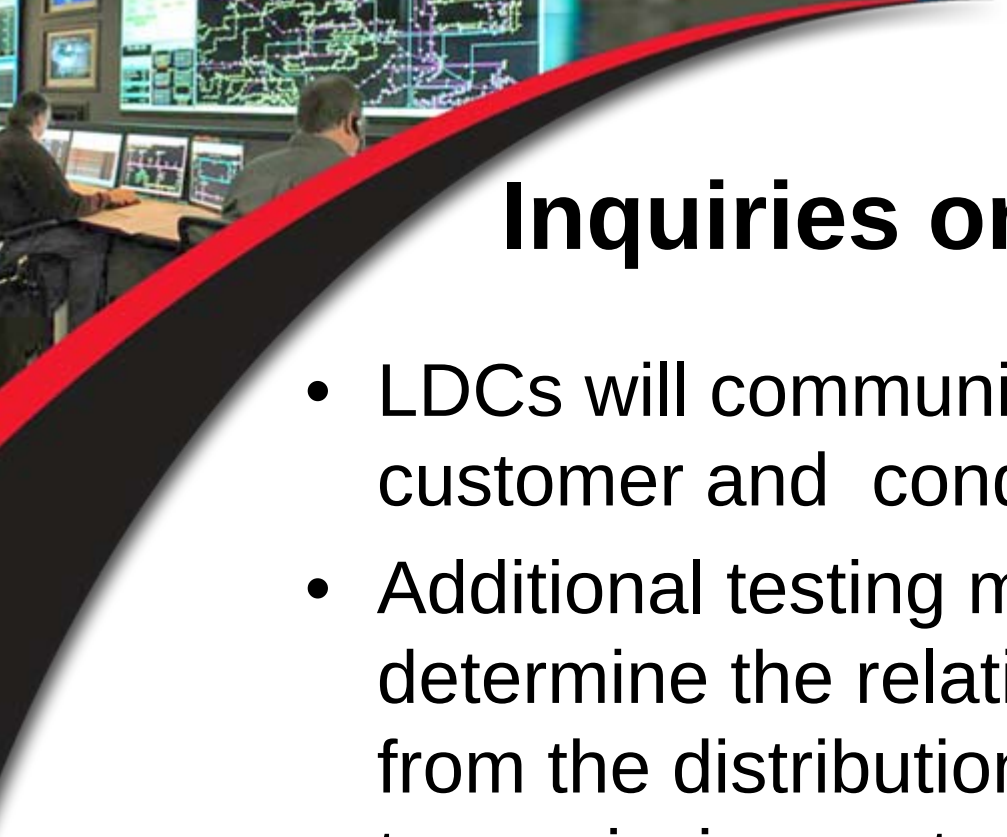
Confined Animal Studies

Radius of Study Area Defined



NEV Assessment

- Includes:
  - Confined animal study (within ½ mile of the proposed project)
  - Pre and post construction stray voltage testing at identified animal confinement facilities, offered and conducted by the LDCs
  - Possible additional NEV measurements and system modeling
  - Implementation of design alternatives to minimize NEV, if necessary



Inquiries on Existing Facilities

- LDCs will communicate with the end use customer and conduct the initial tests
- Additional testing may be warranted to determine the relative levels of contribution from the distribution system and transmission system
- The LDCs and ATC will work cooperatively on a mitigation plan

Questions?

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