Corridors, Reliability, and Transmission Line Siting

Planning/NEPA Forum Webinar

Presenters:
Walt George, BLM
Brian Keel, Salt River Project
Venkat Banunarayanan, ICF International

Moderator:
Robert Henke, ICF International

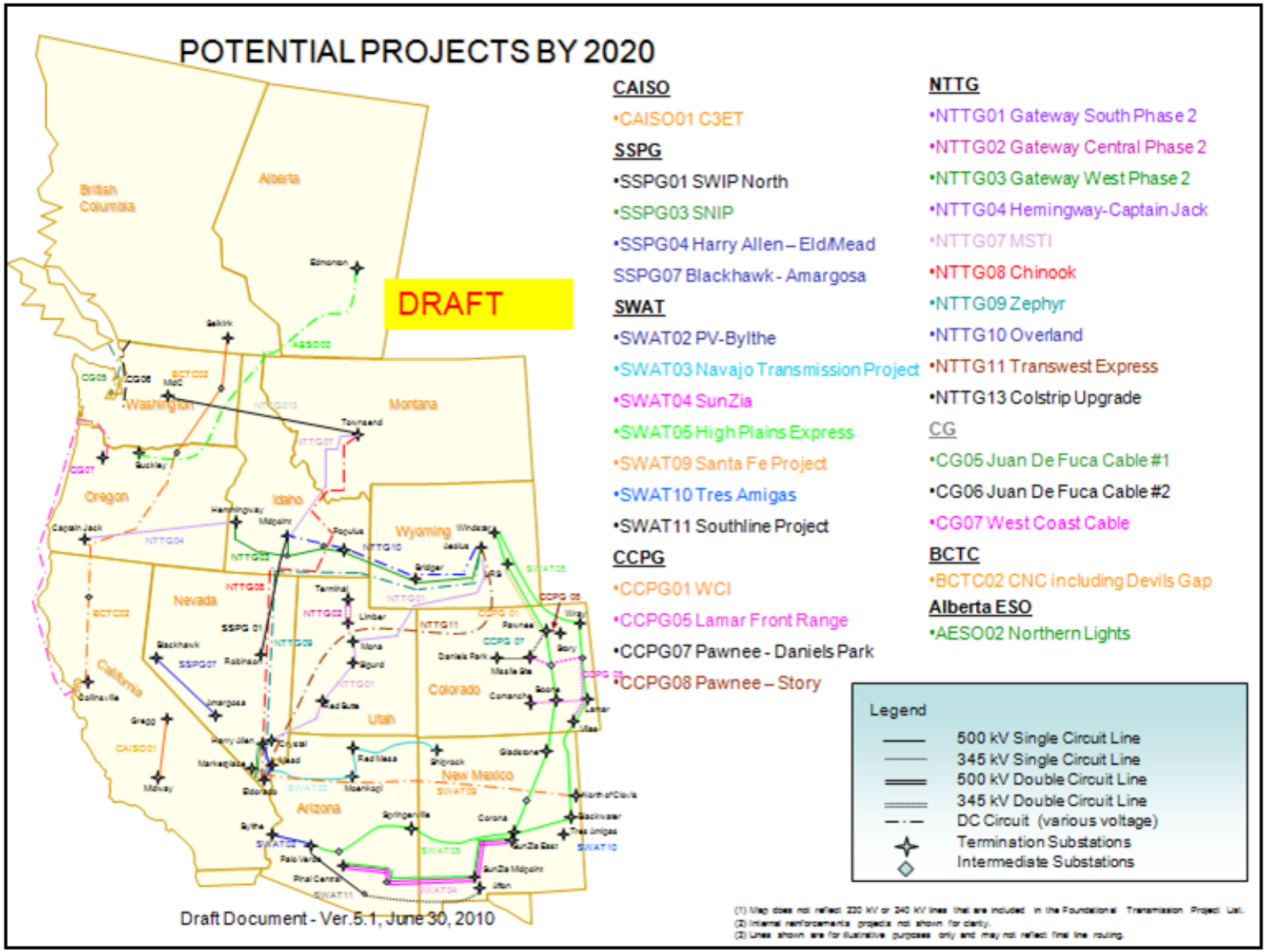
Today’s Featured Speakers:

Presenters:

Walt George, BLM

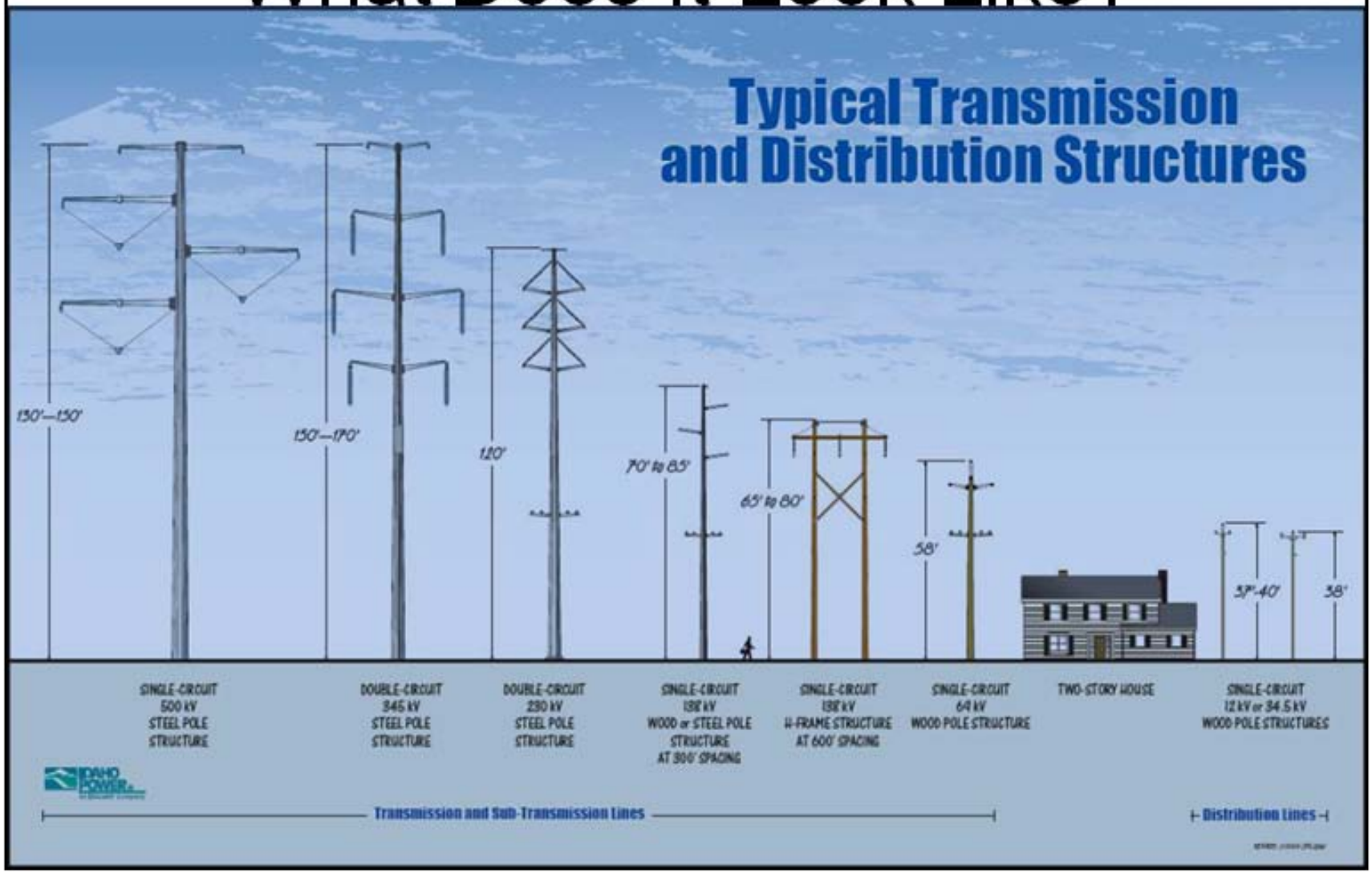
Brian Keel, Salt River Project

Venkat Banunarayanan, ICF International



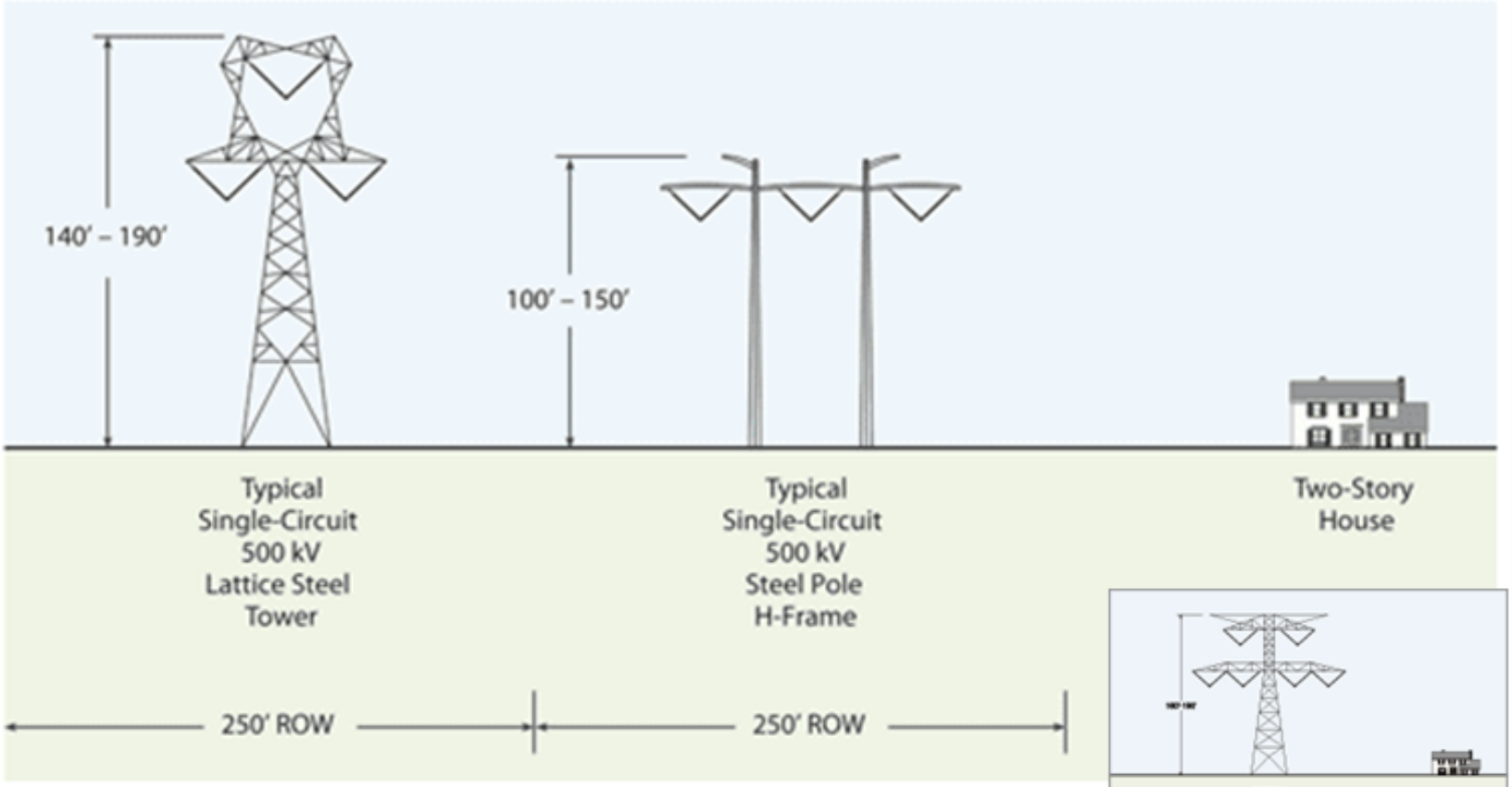
Acknowledge: Subregional Coordination Group (SCG) of WECC's Transmission Expansion Planning Policy Committee (TEPPC)

What Does It Look Like?

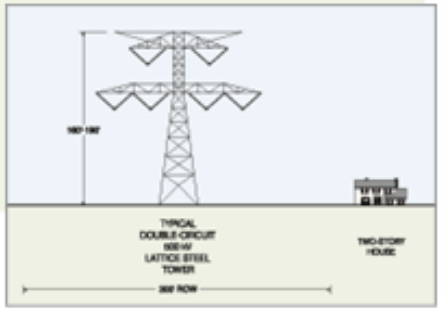


Acknowledgment: Mr. Kip Sikes of Idaho Power

Typical Structure Types



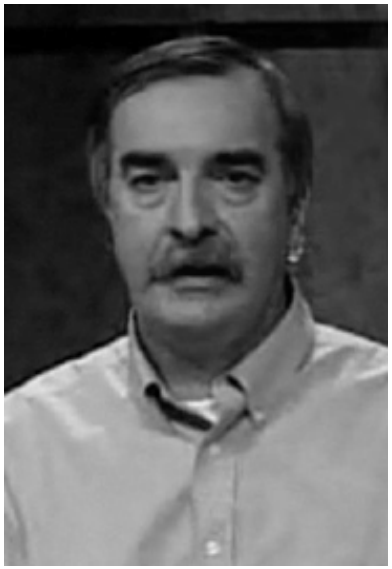
Note: Heights may vary due to terrain and engineering constraints.
Other tower types may be used based on local circumstances.



500 kV double circuit steel lattice tower

Acknowledgment: Mr. Kip Sikes of Idaho Power

Speaker: Walter E. George



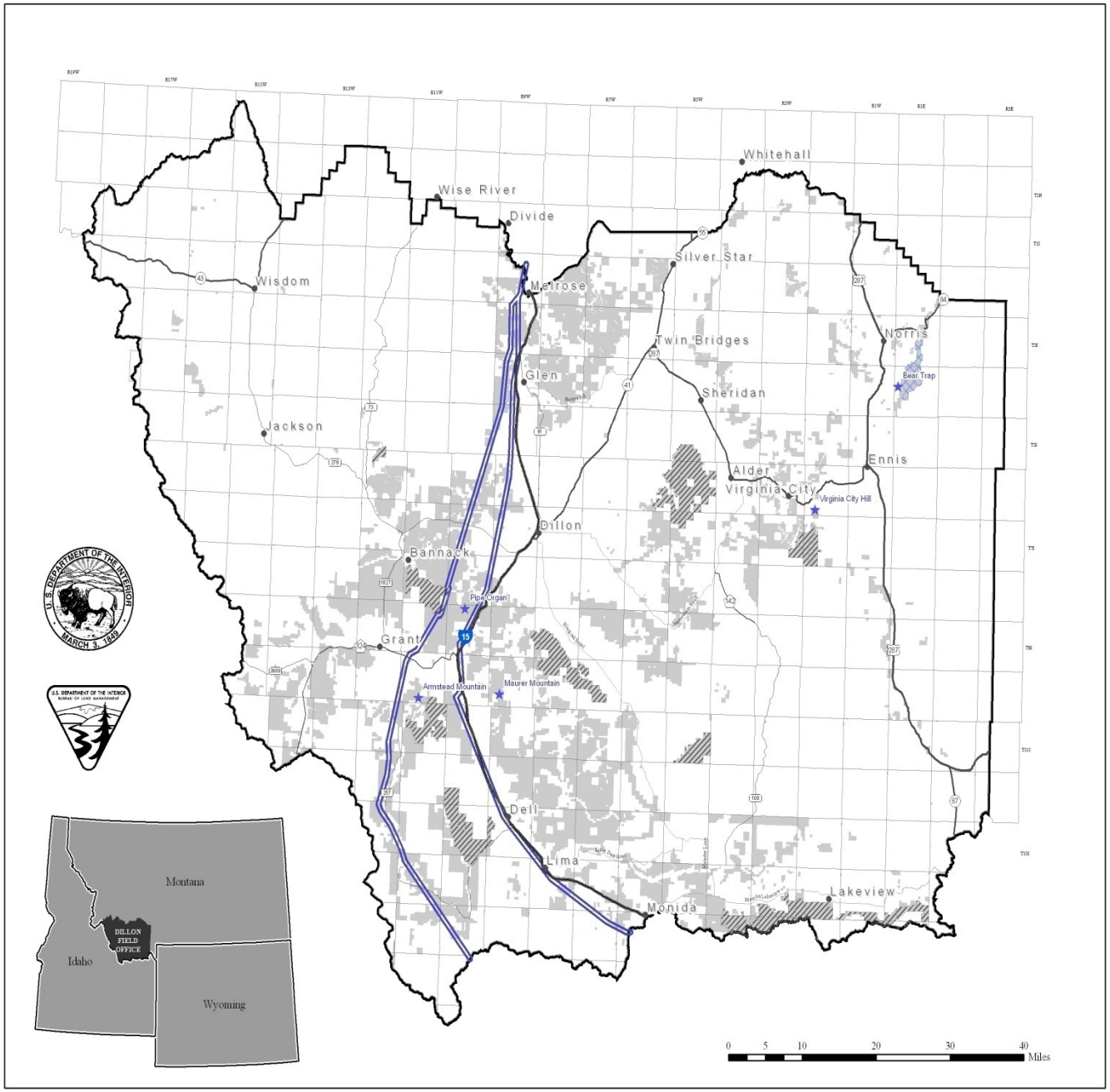
Walt is a National Project Manager with the Bureau of Land Management (BLM) at the BLM Wyoming State Office in Cheyenne. Walt directs large complex Right-of-Way (ROW) interstate transmission projects including the Gateway West Transmission Line project. Walt has worked for the BLM since 1982 in Land Use Planning, the National Environmental Policy Act (NEPA) and oil and gas permits. Walt also serves as an instructor at the BLM's National Training Center (NTC), in the BLM's Electric Systems Short Course, Realty Academy (ROW), NEPA for Managers, Cumulative Effects, Visual Resource Management for Fluid Minerals, Reclamation Science, Basic Land Acquisitions and Negotiations, and Managing Major ROW Projects courses.

BLM's CORRIDOR PHILOSHPHY

- FLPMA (Sec. 503), "In order to minimize adverse environmental impacts and proliferation of separate rights-of-way, the utilization of rights-of-way in common (*corridors*) shall be required to the extent practical . . . "

- Energy Policy Act of 2005 (Section 368)
  - 6,000 miles of corridors designated on federal lands in 11 Western States
  - Federal Government's preferred location for linear facilities

- BLM Manual 2802.1 B.1&2, “Whenever possible the BLM will manage ROW use of public land through a system of designated corridors. Use of designated corridors for future ROW grants will be actively encouraged by the BLM. A designated corridor is a preferred location for the placement of rights-of-way.”



US DEPARTMENT OF THE INTERIOR
Bureau of Land Management

Dillon Field Office
Draft RMP/EIS

Legend

- Utility Corridor
- Avoidance
- Exclusion
- Right of Way Communication Sites
- Dillon Field Office
- Public Land Survey
- BLM Ownership

Map shows avoidance areas, exclusion areas, designated corridors, and designated communcation site use areas for Alternative B.

Avoidance and Exclusion Areas and Designated Corridors and Use Areas Alternative B

Albers Equal Area, NAD27

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March 2004

Map 20

Benefits of Designated Corridors

- Projects in corridors should need limited on-the-ground environmental studies or alternative route consideration
- Environmental effects are confined, not widely dispersed
- Industry is provided some certainty for infrastructure planning purposes
- Permit processing is streamlined and expedited

Types of Corridors on Public Land

- EPAct Section 368 Designated Corridors
- RMP Designated Corridors
  - Identified as the preferred location, but not required
  - Corridor use mandatory. Plan must be amended if outside corridor
- De Facto Corridors
  - Follow existing linear facilities with only minor environmental issues

Challenges to Using Corridors

- Corridors are only designated on public lands
- High level analysis missed some conflicts
- Designated corridors do not fully meet applicant's purpose and need
- Separating lines by great distance is the most practical way to ensure system reliability

Speaker: Brian Keel

Mr. Keel graduated from the University of Illinois in 1988 with a BS in Electrical Engineering and in 1989 with a MS in Electrical Engineering. He was employed by Duke Power Company in Charlotte, NC as a nuclear support engineer for one and a half years before joining Public Service Indiana in 1990. He performed environmental and generation planning determining optimal solution for Clean Air Act Compliance, then performed local and regional transmission planning. He then joined Salt River Project in 1998 and currently holds the position of Manager, Transmission System Planning.

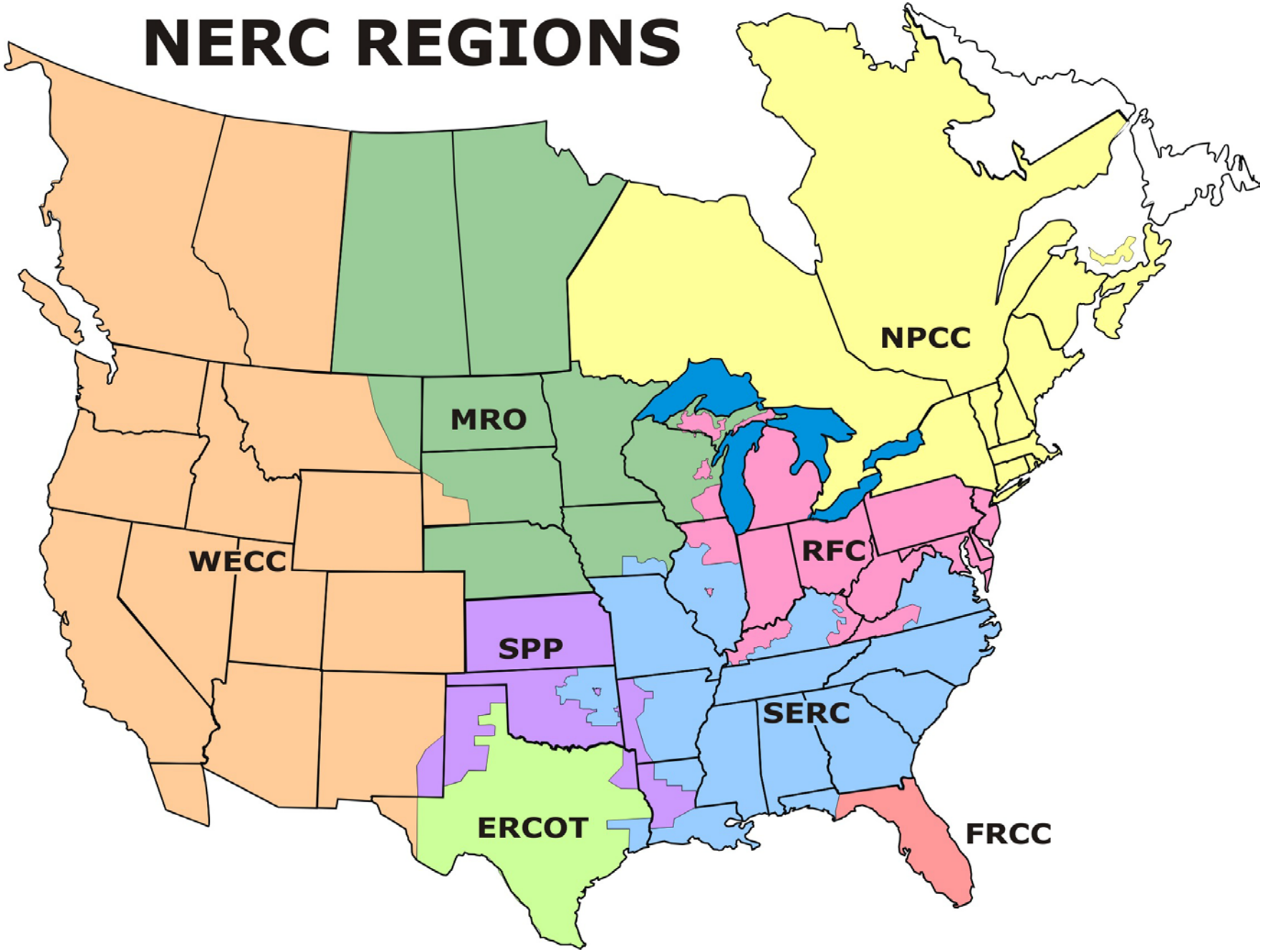
WECC & WECC Transmission Criteria

- Topics:
- What is WECC?
- WECC’s Role in Transmission
- WECC Common Corridor Criteria

What is WECC?

- North American Electricity Reliability Corporation – NERC
- Western Electricity Coordinating Council – WECC
- Bulk electric system reliability in Western interconnection
- WECC Board & Standing Committees - Operating, Planning and Marketing
  - Numerous subcommittees

NERC REGIONS



WECC's Role in Transmission

- NERC and WECC to monitor, assess, and enforce compliance with Reliability Standards

- Regional Planning Project Review
- Project Rating Review
  - 3 Phase Rating Process
- WECC Initiated Progress Reports

WECC Common Corridor Criteria

- NERC Standard and WECC Criteria Difference
  - Standards – Sanction-able & Enforceable
  - Criteria – WECC Regional Criteria
- NERC Category C
  - Multiple Failures 2 Circuits on Same Tower
- WECC WRS1.1 Criteria
  - Multiple Failures 2 Circuits in Common Corridor

Double Circuit 500/230kV

WECC Common Corridor Criteria

- TPL-(001-004)-WECC-1-CR
  - WRS1.1
    - Multiple Failure or Common Mode of 2 Circuits in Corridor
    - Not same towers
    - Adjacent Circuits

WECC Common Corridor Criteria

- Common Corridor:
  - Contiguous right-of-way or two parallel ROWs
  - structure centerline separation less than the longest span or 500 feet
  - whichever is greater
- Adjacent Transmission Circuits:
  - Transmission Circuits within a Common Corridor with no other transmission circuits between them.

WECC Common Corridor Criterion

- WECC-0071 Draft Team for Common Corridor
- Reasons for discussion and possible changes:
- Progress to date:

WECC Common Corridor Criterion

- Reliability versus Cost
  - Separation:
    - may not measurably improve reliability
    - requires additional cost
    - may increase land use restrictions
    - may limit line siting opportunities
    - could cause creation of additional corridors
    - creates difficulties siting across Public Land

Summary

- WECC
- Role of WECC in Transmission
- Common Corridor in WECC

Speaker: Venkat Banunarayanan

Dr. Banunarayanan is a Senior Manager in ICF's Transmission Services Group within the Whole Power Practice where he analyzes issues relating to impact of energy policies, power generation, renewable energy, transmission and ancillary services valuation, transmission congestion and energy and capacity markets. His expertise includes applying fundamentals-based power system analysis methods to evaluate the impact of various factors such as proposed energy policies, fuel prices and generation and transmission expansion plans. He has co-authored papers published on internationally known peer reviewed journals, such as IEEE Transactions on Power Systems and CIGRE. Dr. Banunarayanan has worked with a variety of clients ranging from private companies, power developers, utilities, Independent System Operators, and state and federal government organizations.

Goals of the Study

- Develop a Framework for determining separation distances between transmission lines
- Apply the framework to Wyoming and determine a minimum range of acceptable line separation distances

The Study

- Performs a detailed literature survey
- Develops a robust, universally applicable framework
- Applies the framework to the state of Wyoming

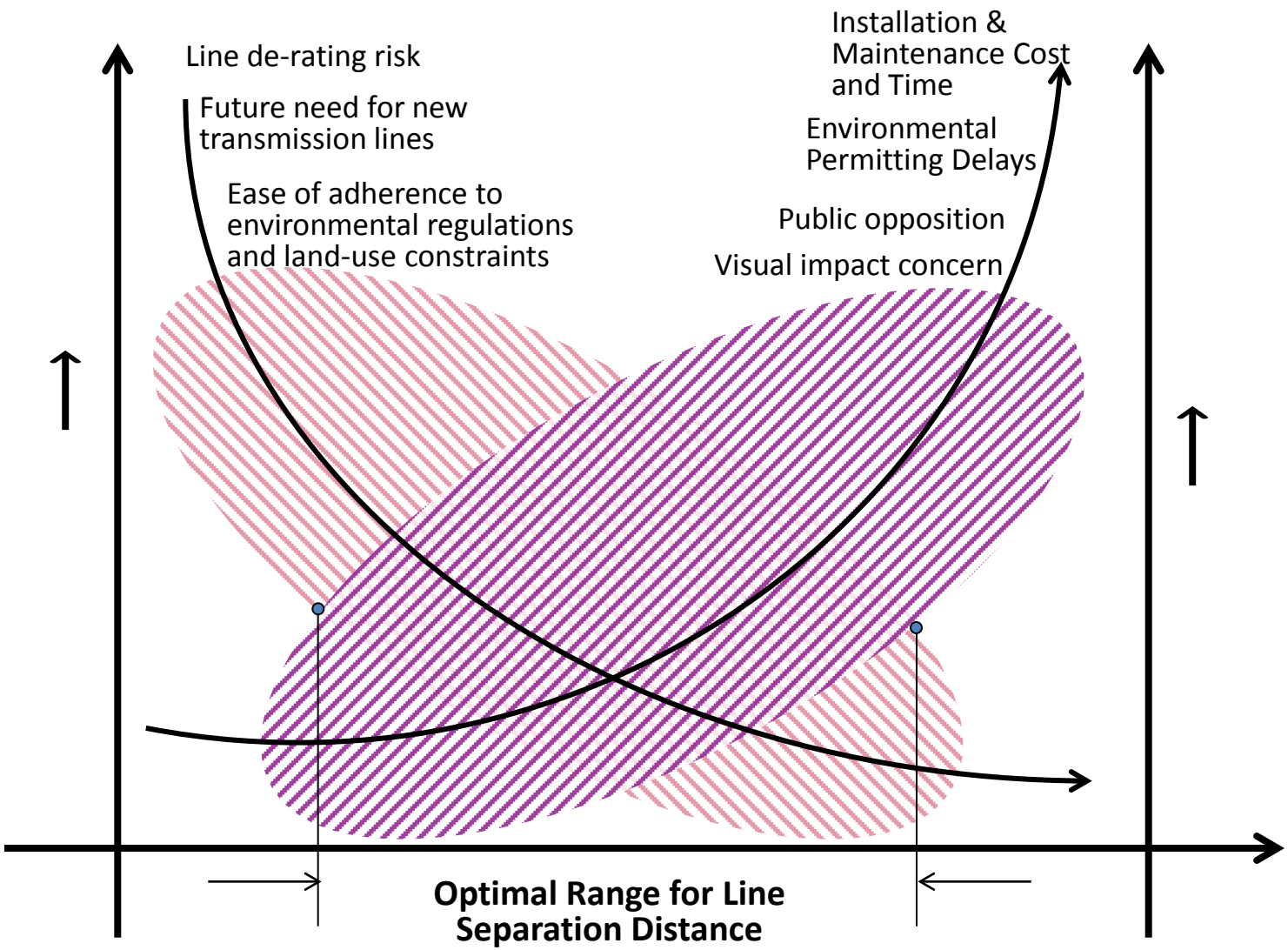
The Study does not

- Replace WECC approval process for transmission lines
- Perform environmental impact or other analyses.

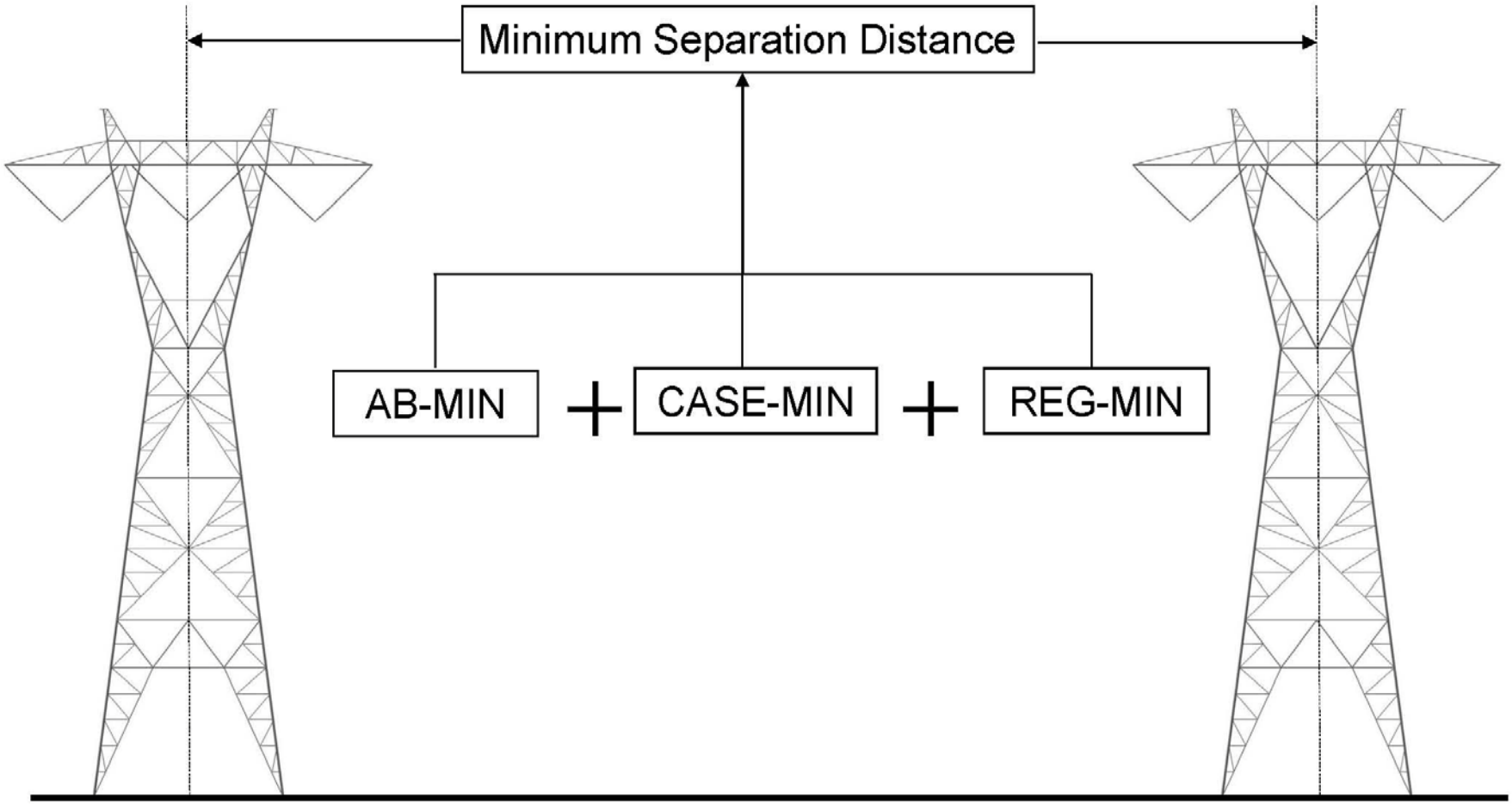
Influence on Line Separation Distance - WECC

- ***WRS 1.1*** Applies NERC Category C.5 initiating event of a non-three phase fault with normal clearing to two lines in a common corridor unless the event frequency is determined to be less than one in thirty years.
  - Safe harbor provision - ***WRS 1.1*** applies only to lines in a common corridor.
  - Two transmission lines share a common corridor if the centerline separation between them is less than the longest span length of the lines at the point of separation or 500 feet, whichever is greater.
- All transmission lines need to show compliance with the ***WRS 1.1*** criterion

Variations in Optimal Line Separation Distance



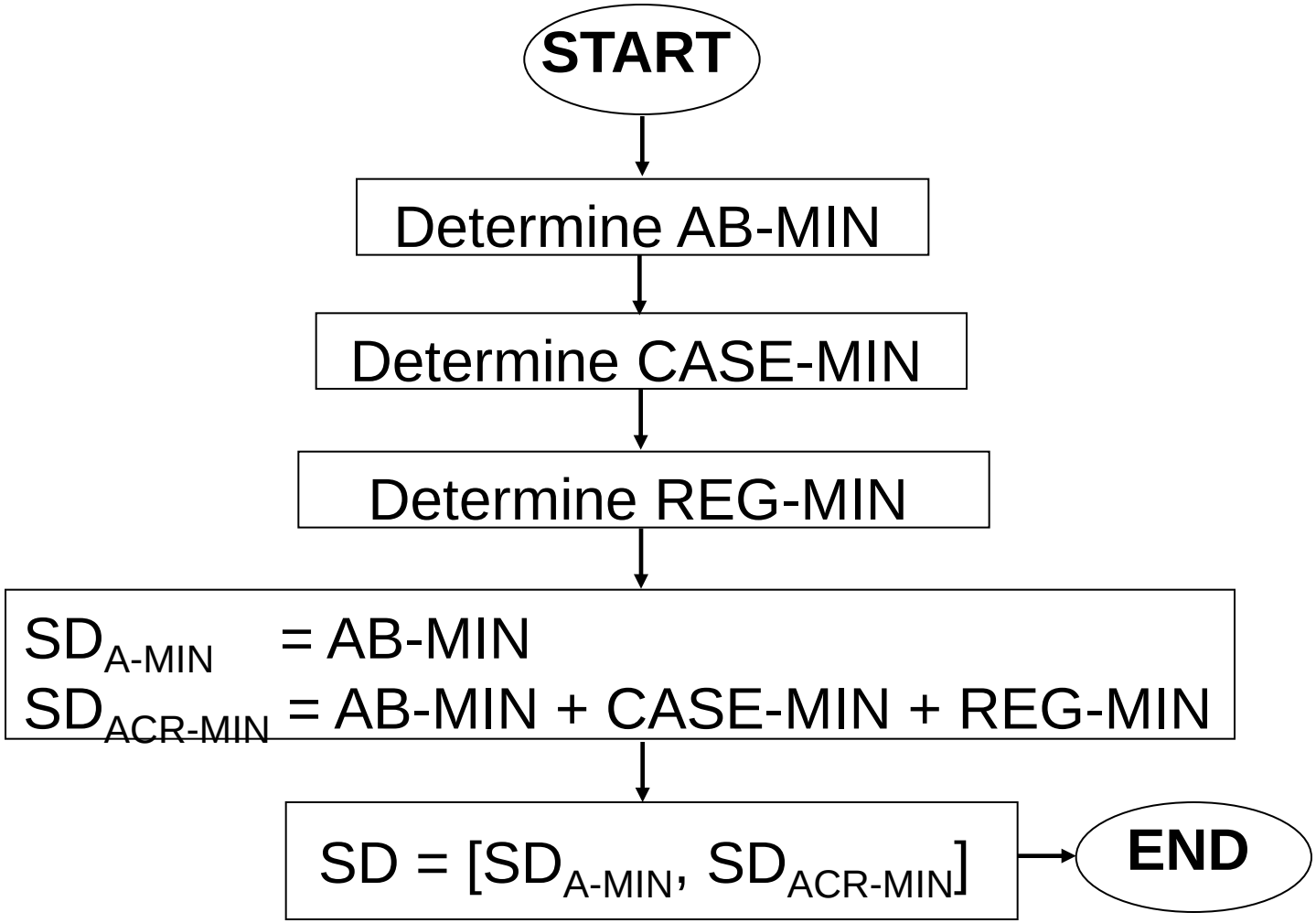
Framework to Determine Separation Distance



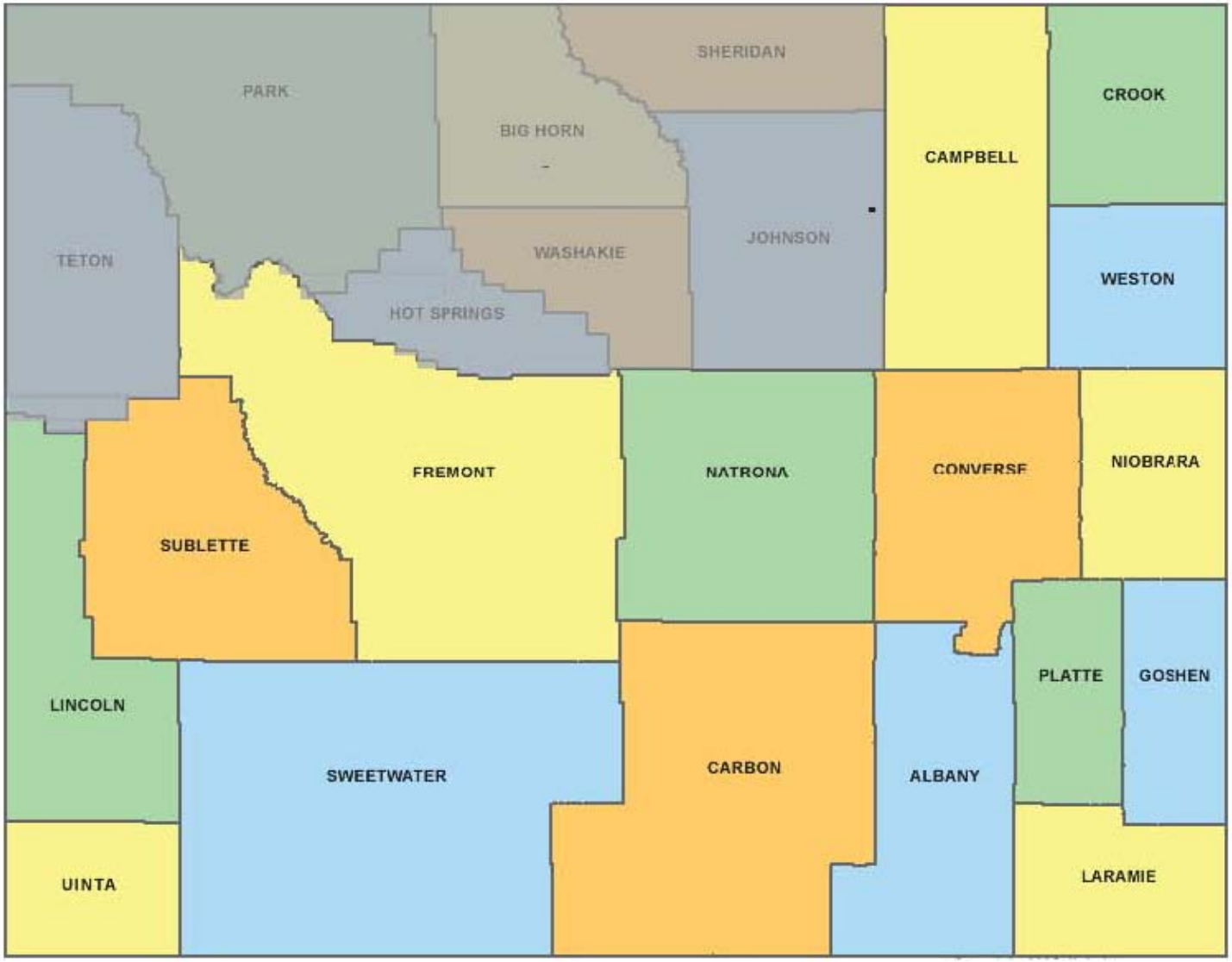
Separation Distance Components

- AB-MIN
  - Depends on NESC, OSHA rules
  - Considers transmission tower height and sag length
- CASE-MIN
  - Project specific component
  - Can be positive or negative
  - Example: Project passes through a narrow valley that may force separation distance to be less than AB-MIN
- REG-MIN
  - Based on regionally varying factors such as weather
  - May need detailed analysis to determine separation distance

Determining range of separation distance from framework components



Application to Wyoming – Counties Considered



Application to Wyoming – AB-MIN & CASE-MIN

- AB-MIN ~= 260 feet

(Based on a typical 500 kV line and tower characteristics and NESC/OSHA regulations)

- CASE-MIN = 0 feet

(Assume no project specific constraints exist in this example)

Application to Wyoming – Regional Factors

REG-MIN = Incremental line separation needed to account for all factors regional to Wyoming.

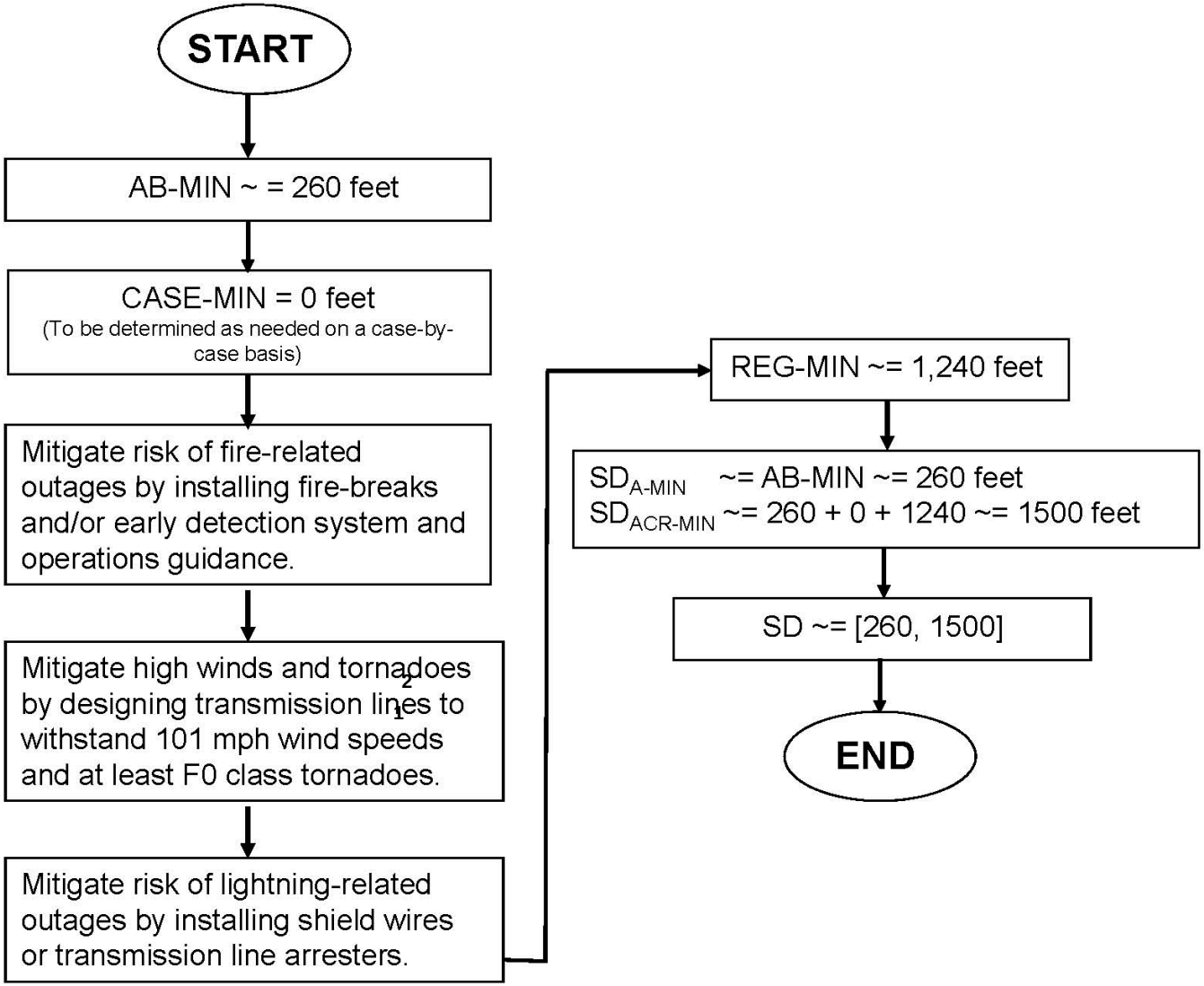
- Significant weather factors based on analyses of the causes of historical transmission line outages in WECC

Therefore,

$$\text{REG-MIN} = \mathbf{max}\left(\text{REG-MIN}_{\text{WIND}}, \text{REG-MIN}_{\text{STORM}}, \text{REG-MIN}_{\text{FIRE}}\ \text{REG-MIN}_{\text{TORNADOES}}\ \text{REG-MIN}_{\text{LIGHTNING}}\right)$$

where each REG-MIN component is the incremental line separation due to the corresponding weather factor

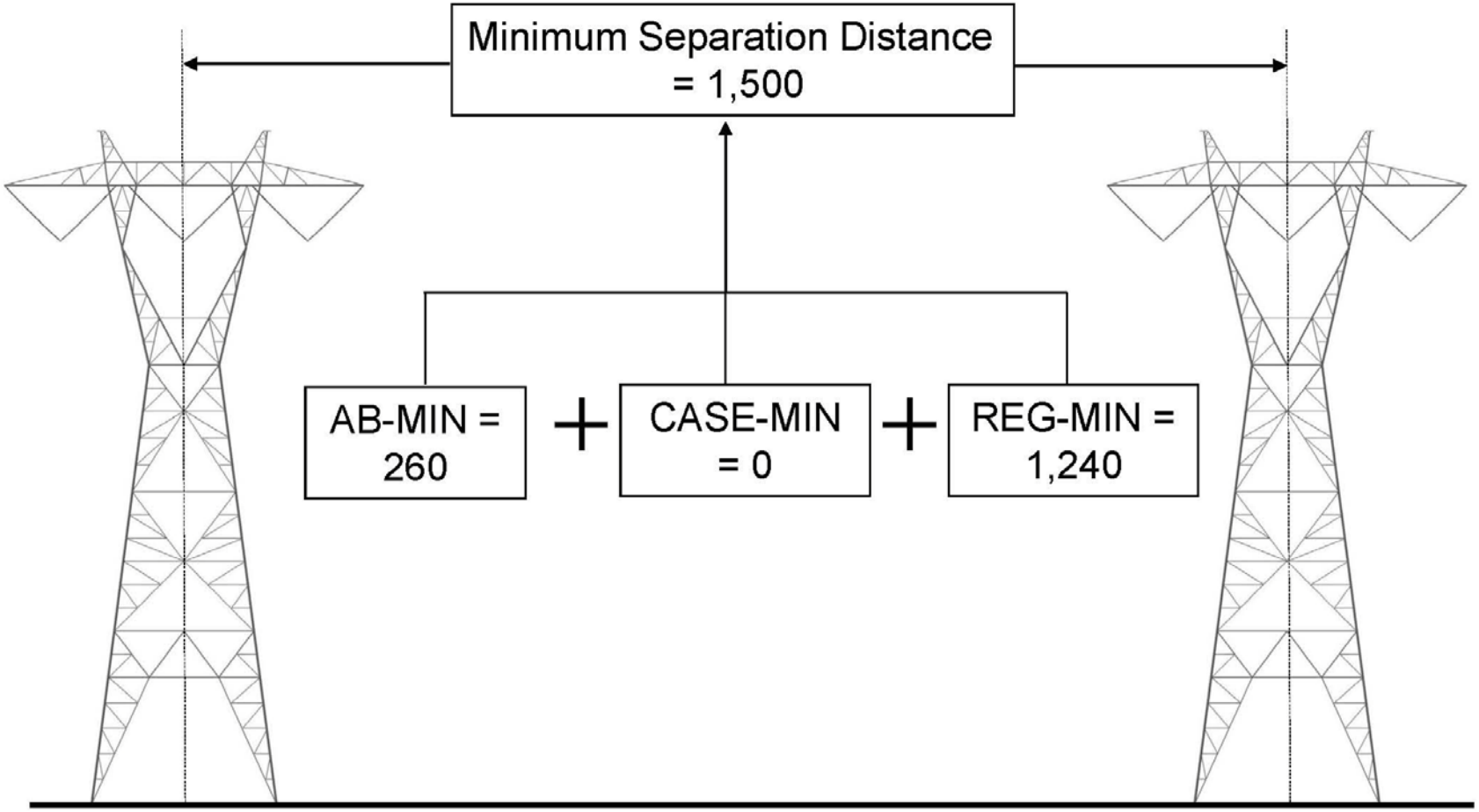
Application to Wyoming – Determining minimum range for line separation distance



[1] *More details on assumptions regarding specific characteristics of tornadoes can be found in the report*

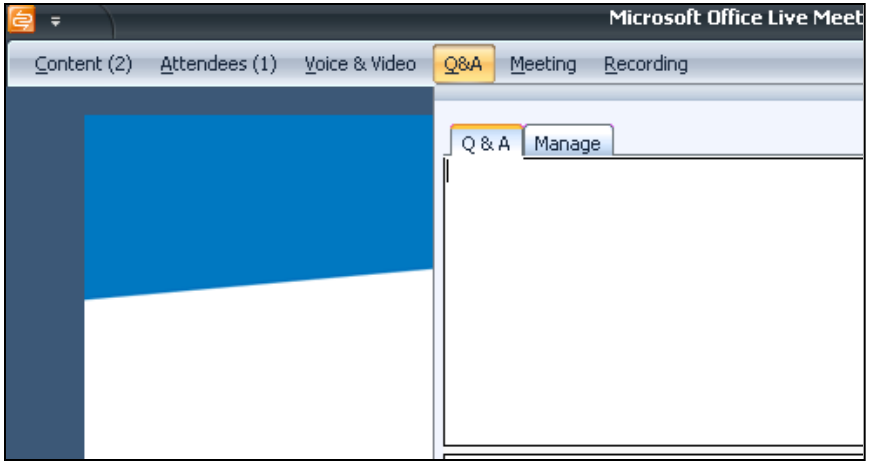
[2] *Based on available wind speed data in Wyoming; Also assumed to comply with NESC extreme wind and ice loading scenarios*

Application to Wyoming – Analysis Results



Questions?

Please submit questions electronically using the Q&A drop-down at the top of your screen.



Next Webinar:

Corridors, Reliability, and Transmission

Line Siting

August 18, 2010

12-1:15p.m. MST/11-12:15p.m. PST

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National Training Center's Knowledge Resource Center:
http://www.ntc.blm.gov/krc/viewresource.php?courseID=442

Download *Framework For Analyzing Separation Distances between Transmission Lines in Wyoming*:
www.icfi.com/wytransmission