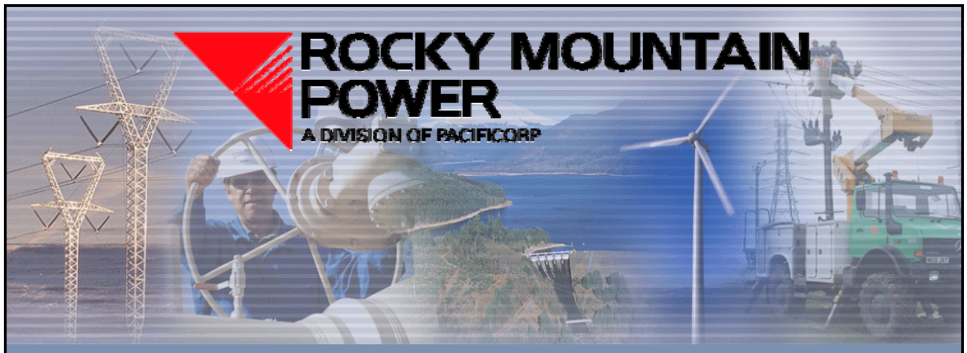
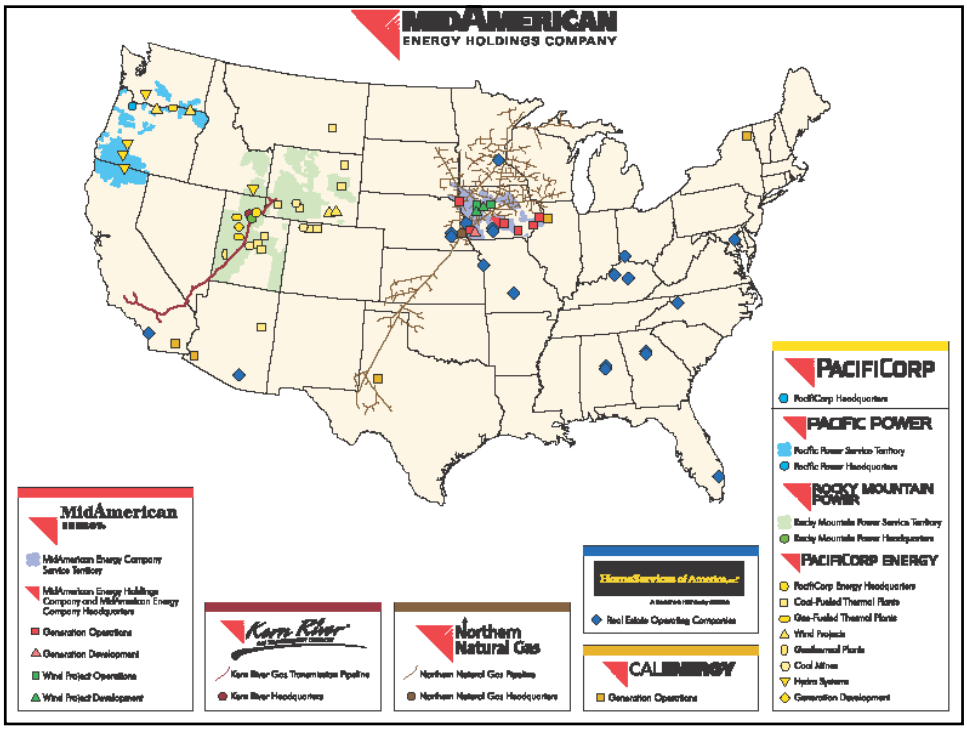


Electrical Pollution—
What Is It and How do you Prevent It?

23 April 2008

Dennis Hansen
Principal Engineer
Power Quality and Reliability



Rocky Mountain Power

	RMP	UTAH
• Customers	1,000,000	770,000
– Rural	340,000	120,000
– Urban	660,000	650,000
• Revenue	$2.0b	$1.4b
– Rural	$1.0b	$0.4b
– Urban	$1.0b	$1.0b
• Employees*	3,750	2,400
• Territory	110,000 square miles	

*Includes PacifiCorp Energy employees

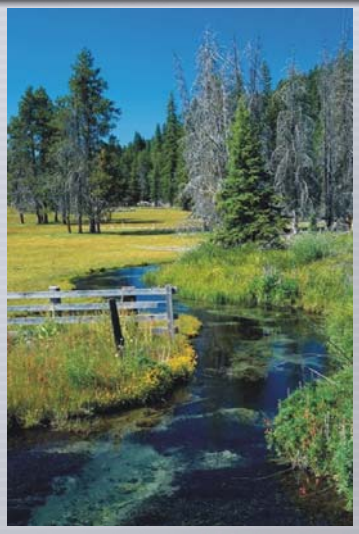
Definition of *Electrical Pollution*

"A condition of the electric power system* wherein the normally pure sinusoidal voltage is corrupted in some way—either in form or magnitude."

*as opposed to another environment such as stray voltages and currents in the earth

Power System is like Other Environments

- Environment can be defined, and pristine vs. polluted conditions can also be defined.
- Causes of pollution can usually be identified and mitigated.
- Tolerance levels can be determined and may vary according to susceptibilities of inhabitants.
- Correcting an existing problem is almost always more expensive than preventing a problem at the design stage.

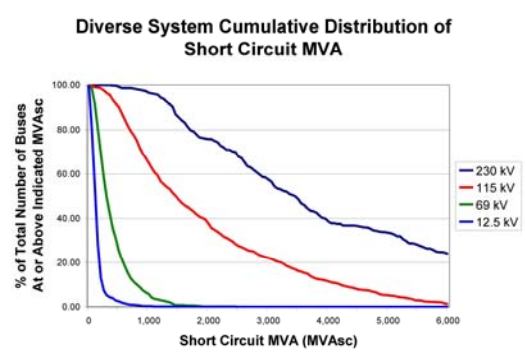


Principles of Preventing Electrical Pollution

- Sound Fundamental Design
  - Consider both static and dynamic load
- Form Policies/Programs that are Fair & Complete
  - Partition dynamic margins fairly
  - Don't bow to the pressure to connect without conditions
  - Standards and Education are current
  - Need both proactive and reactive field monitoring
- Have Adequate Tools and Resources
  - Human resources
  - Office tools and field tools to model potential loads and screen out pollution

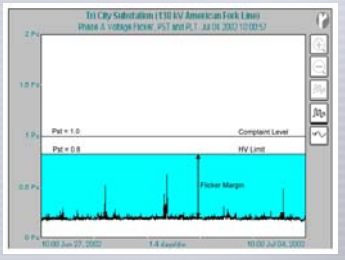
Sound Fundamental Design

- Consider short circuit duty as well as capacity.
- Most loads will be slowly changing (static).
- Some loads will be dynamic.



Fair and Complete Policies and Programs

- Partition dynamic margins fairly
- Don't bow to the pressure to connect without conditions
- Standards and Education are current
- Need both proactive and reactive field monitoring



Adequate Tools and Resources

- Trained employees or consultants
- Office tools and accessible data on hand to model dynamic loads
- Field tools to screen simple dynamic loads

Now, introducing our Expert Panel…

- Sound Fundamental Power System Design
  - Dr. Tom McDermott – EnerNex
- Companies with Policies and Programs
  - Jon Roholt – Idaho Power Company
  - Fouad Dagher – National Grid
- Electrical Pollution Screening Tool
  - Dr. Mark Halpin – Auburn University


ROCKY MOUNTAIN
POWER
A DIVISION OF PACIFICORP