

INTERSTATE PIPELINES | EXPLORATION & PRODUCTION | MIDSTREAM



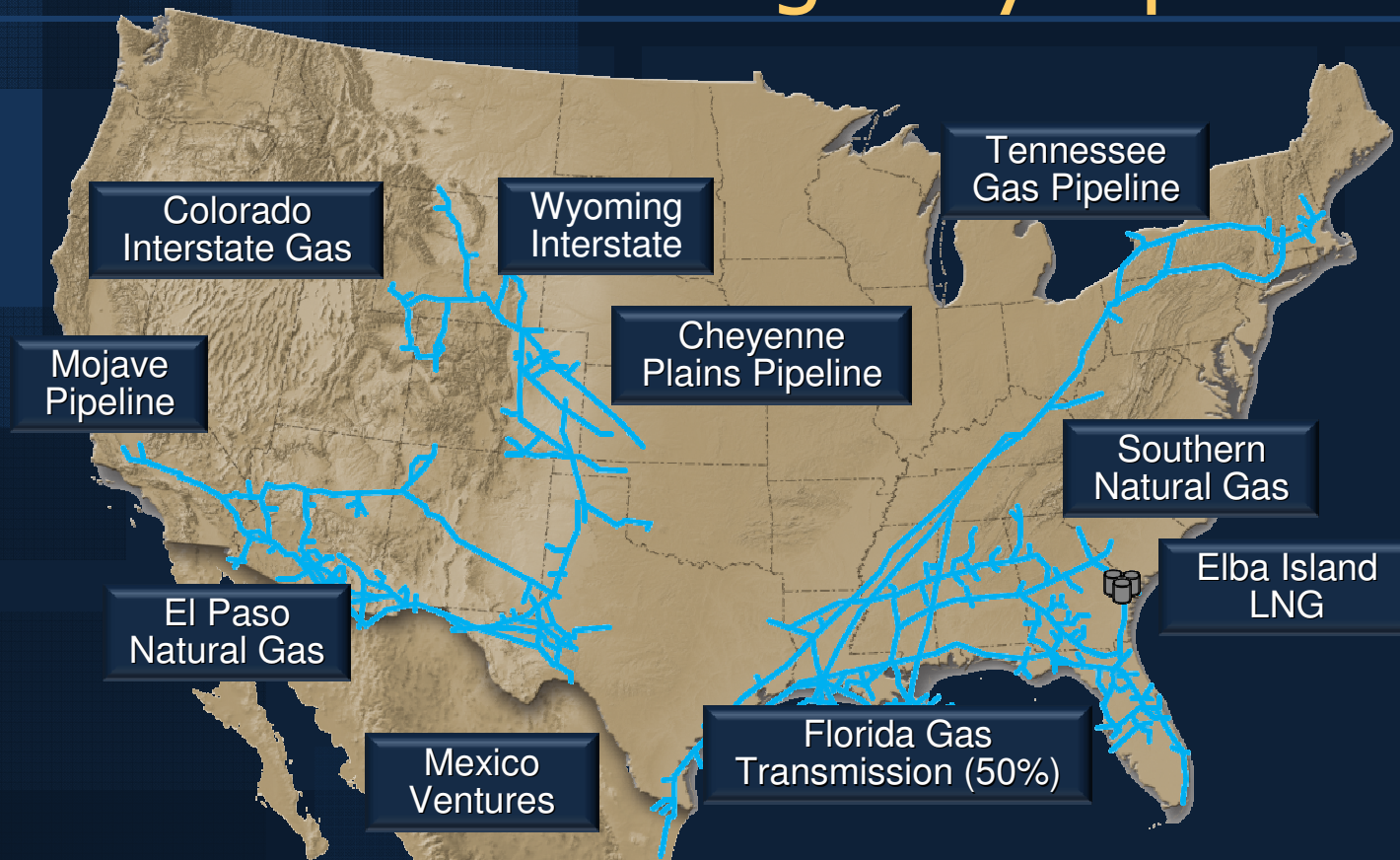
# Future Trends in Corrosion Control

NACE Houston Section  
January 10, 2012

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# Obligatory Pipeline Map



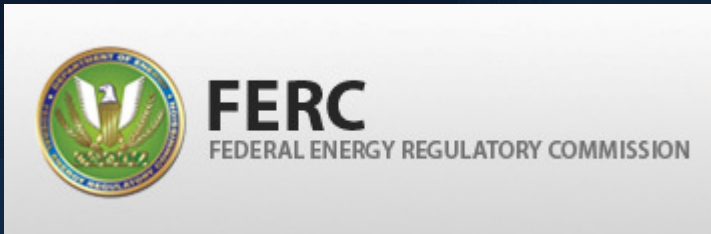
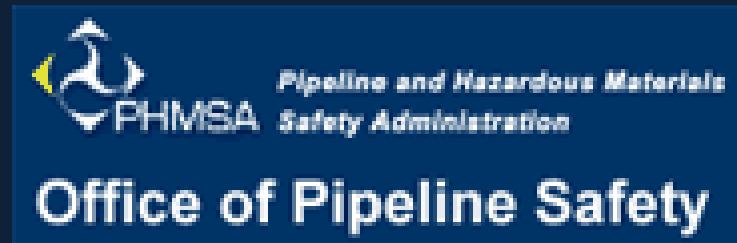
- 19% of total U.S. interstate pipeline mileage
- 26 Bcf/d capacity (15% of total U.S.)
- 19 Bcf/d throughput (30% of gas delivered to U.S. consumers)

# Trends

- Regulatory requirements
- Public expectations
- Energy markets and sources
- Environmental requirements
- Labor costs
- Communications/electronics costs
- Data
- Pipeline congestion

Bureau of Ocean Energy Management, Regulation and Enforcement

# Regulatory



# Regulatory Trends

- Regulatory requirements for corrosion control are increasing
  - Not a pendulum, but a ratchet
- For pipelines
  - New integrity management requirements
  - New requirements for construction practices
  - No waivers, permits for trade-offs for maintaining levels of public safety (e.g. alternate MAOP rule)
  - Eliminating grandfathering

- Documentation
  - If it isn't written down, it never happened
  - Expectation of regulators is for documentation of everything forever
  - Even decision-making processes are documented
- Qualifications of personnel
- Qualifications of materials specifications / mills / raw materials / shipping procedures /
- Increased inspections and assessments
- Criminal penalties

# Public Expectations

# Public Expectation Trends

- The bar continues to be raised for public safety
- With instant access to information, the general public is much more informed about all pipeline incidents
- Social media gives the expectation of interaction between pipeline companies and the public
- Public expects companies to be responsible citizens
- High cost of civil litigation



## Effects

- Pipeline operators have to respond differently to incidents
- Public will put pressure on legislators to increase regulatory requirements
- Pipeline operators will need to do more to increase pipeline safety
- Civil liability will dictate that operators cannot simply do the minimum to meet regulatory requirements

# Energy Markets and Sources

# Energy Trends

- Non-traditional gas sources
  - Oil sands
  - Shale
- Domestic production is increasing
- Public and governmental pressures for increasingly green energy
  - Bio fuels such as ethanol
  - Green energy such as wind, solar, and hydroelectric
- CO<sub>2</sub> pipelines for sequestration and hydraulic fracturing

# Effects

- More pipelines going to different places
- SCC issues with ethanol
- Internal corrosion issues with CO<sub>2</sub>

# Environmental Requirements

# Environmental Trends

- Environmental awareness is increasing
- Carbon footprint
- VOCs
- SPCC requirements
- Mercury, PCBs, lead, asbestos
- New issues – fiberglass and copper are the new asbestos and lead
- Ground beds

# Effects

- Environmental approvals will take longer and be more difficult to obtain
- Costs for doing business will increase
- Changes in how we do things
- Companies will have to demonstrate to the public that they are responsible
- Greenhouse gas emissions will incentivize certain activities and disincentivize others
- LAUF will become extremely important

# Communications/Electronics



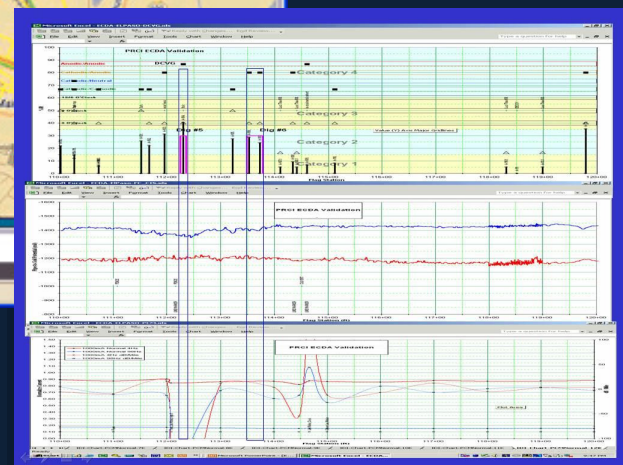
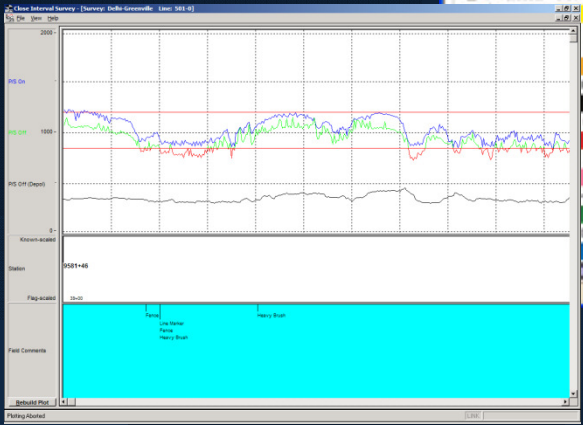
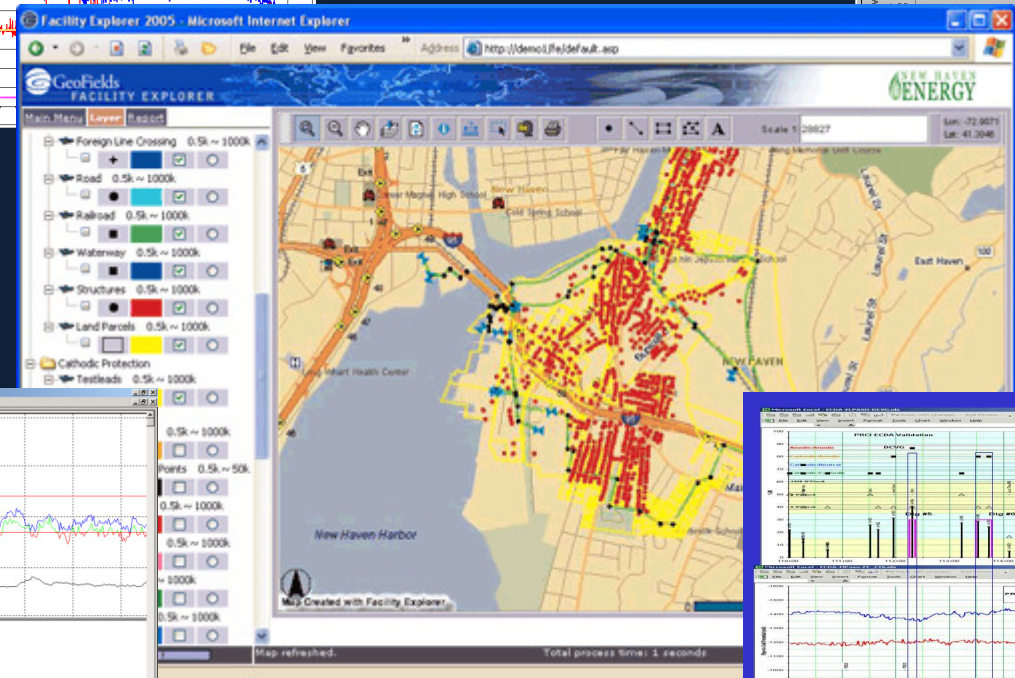
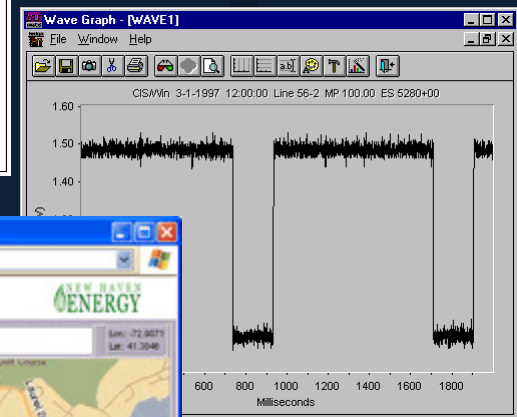
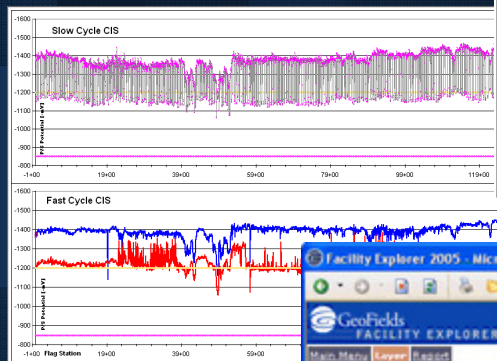
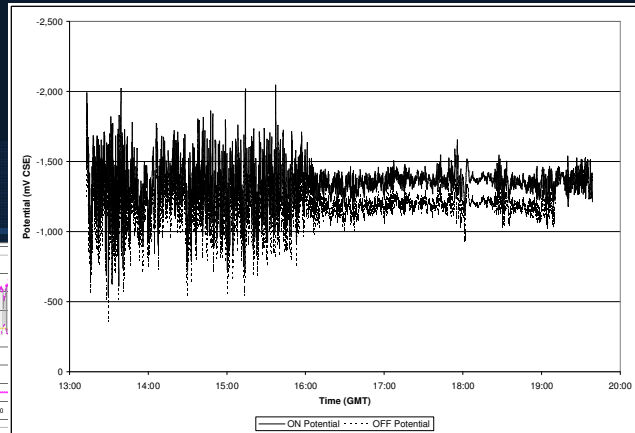
# Communications/Electronics Trends

- Communications costs are decreasing
- Costs of electronics are decreasing
- Consumer tie-ins will offer huge returns to scale discounts
- Everything is smart
- Everything is connected

# Effects

- Cloud data
- Increased automation
- More and more data
- Aps for mobile devices
- Tracking vehicles for efficiency

# Data



# Data Trends

- Costs of storing data electronically
  - 1Tb drive < \$100

# Effects

- Data integration is key
- Databases must be accessible
- Databases must be compatible
- Need tools, systems, and infrastructure to manage data

# Labor cost trend

# Labor Cost Trends

- Labor costs are increasing in the US despite the recession
- Labor costs are significantly lower in China and Mexico, but increasing as well
- The overall cost of sending a technician with a truck and tools out to do work is increasing at a higher rate
- Pipeline employees have the highest return per employee of any major industry

## Effects

- Pipeline companies are under constant pressure to reduce operating costs
- Increased automation, such as remote monitoring, will reduce manpower requirements
- Pipeline companies will outsource any tasks that are not day-to-day operations
- Labor-intensive activities that can be outsourced will continue to be



# Pipeline Congestion

# Pipeline Congestion Trends

- Changes to energy markets and sources of production require new infrastructure
- The US currently has approximately 2.2 million miles of pipelines that transport hazardous materials

## Effects

- More sharing of rights-of-way (ROWs) with other pipelines and power transmission (HVAC, HVDC from power generation plants, wind, solar and hydroelectric)
- More issues with stray-current corrosion requiring more testing and remediation
- Increased focus on AC corrosion monitoring and mitigation

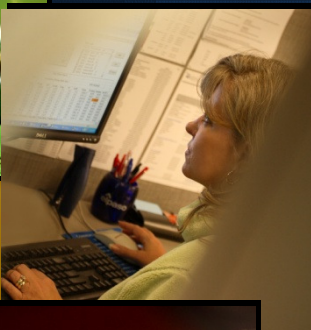
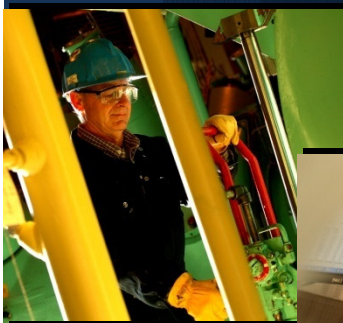
# Summary

- Expectations for public safety and protection of the environment are increasing, leading to additional costs
- Labor costs are increasing in the US and decreasing offshore, and communications / electronics costs are decreasing, leading to increased automation
- Congested ROWs and non-traditional production areas will increase the pipeline mileage in the US, leading to congestion issues

# Questions



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