Energy Industry Trends
United States Perspective

Infrastructure Knowledge and Technology Conference

IKT – Institute for Underground Infrastructure
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Hydraulic Fracturing and Horizontal Boring

➢Discussion of this topic could last for days.

➢Collectively referred to in the media as "Fracking" – this is without question one of the most well publicized trends in the US, if not the world.

➢Fracking techniques are making available what is now estimated to be between 100 and 200 year supply of natural gas for the United States.

➢Numerous groups are protesting based on environmental issues.

➢LNG import facilities being converted to export facilities.

Hydraulic Fracturing and Horizontal Boring
(continued)

➢Concerning oil production, US is surpassing (2014) both Saudi Arabia & Russia to become the world's leading oil producer.

➢Extensive pipelines for both oil and natural gas (NG) being built as rapidly as possible across the US and Canada.

➢Impact on the electric generation industry – coal is being pushed aside in favor of NG for new generating plants. Lowering costs and benefiting environment.

➢This trend is very good for both the growth of jobs and the economy (e.g. plastics manufacturing companies moving to US based on lower energy costs; NG refueling stations being built for NG powered cars).

Hydraulic Fracturing and Horizontal Boring

(continued)

US Natural Gas Transmission Pipelines
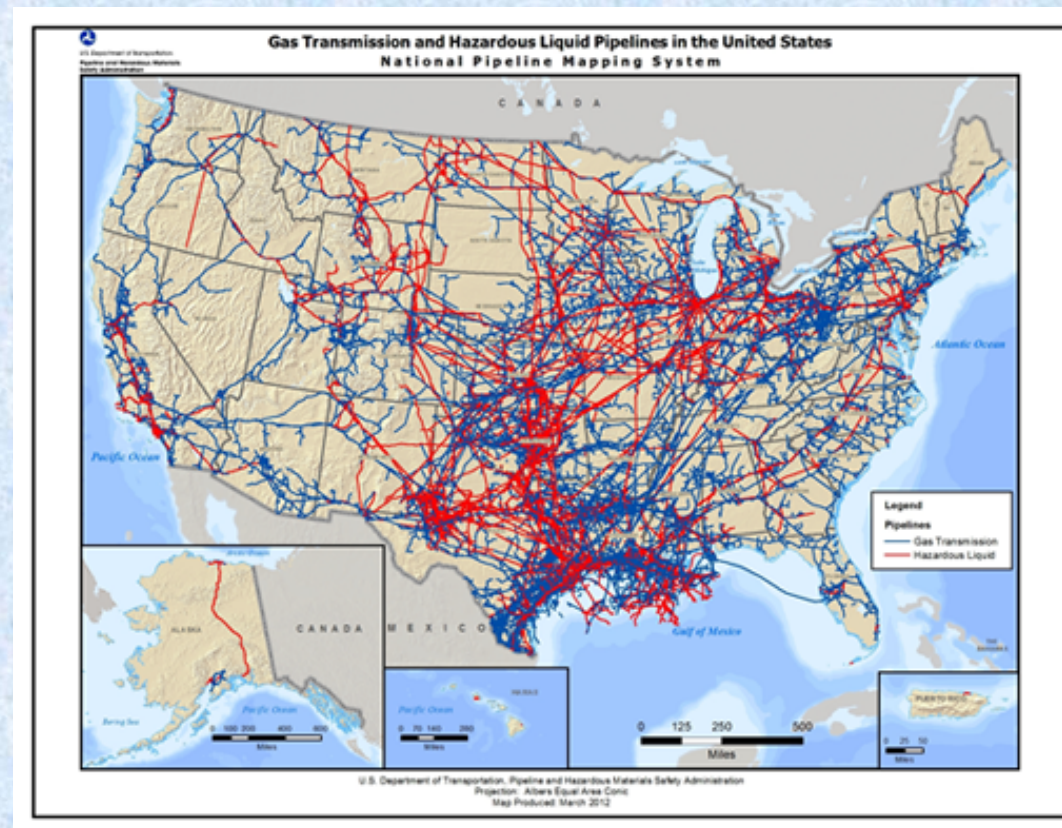
Smart Grid

➢ Discussion of this trend could also last for days.

➢ Transition from analog to digital electric system has been in process for a number of years and will last for years into the future due to complexity, costs, and the wide range of ownership of systems (private, public, and municipal owners) across the country.

➢ Federal government is promoting this transition and is heavily involved not only from a regulatory perspective, but also as a cyber-terrorism issue.

➢ Utilities are also increasingly concerned with 'hackers' in general. A grid shut-down (whether due to ordinary hackers or foreign cyber-terrorists) would be devastating to any country's economy, including US.

Smart Grid

➢ The increasing use of technology with the electric grid involves: smart meters on houses, substations upgrades, many aspects of generating plants, etc.

➢ The new technology applications provide many, many more access points for hackers and terrorists into the system as the Smart Grid develops further.

➢ This trend offers tremendous opportunities for workers in the technology fields.

Workforce Aging

➢This trend affects most Western countries, as well as Japan, and continues to challenge the industry because it does not appear to have any easy or timely solutions.

➢International City/County Management Association reports that >63% of city and county managers are greater than 50 years old, and 25% were >60 years old.

➢Attempts to counter the shortage of skilled workers being brought about by this trend include:

- Promotion of math, science, engineering, and technology programs to students
- Hiring retired employees to work as contract workers

➢Surveys show that <50% of companies have an actual plan to address this growing problem.

➢This is obviously a trend that will benefit younger, educated employees.

Social Ecology

➤This trend is not well know by its name, but it is definitely a rising issue in world affairs.

➤Social Ecology (SE) is a process or a way to view and deal with change, its impacts on people and their communities (whether the change is a new electric power line, a sewer line, or the relocation of an entire city).

➤In today's world, citizens are not only better informed, but they are better connected with other people with the same interests and concerns.

➤This is a key factor in the increasingly common media headlines about protests, riots, violence over pipelines - government actions - regulatory changes, etc.

Social Ecology

➢The SE approach that has worked well by engaging citizens early in the planning process and listening to stakeholders and then addressing their concerns. This eliminates the likelihood of disruptive activists that are drawn to these type projects. It's basically problem-solving before issues become "problems".

➢Examples of the SE approach being used globally:

- March 2014, new rules mandating that <u>European companies</u> disclose information concerning a project's impact on a community and about environmental performance as well

- At <u>China's 18th Party Congress</u>, the State Council ordered that all major industrial project in the whole of China must complete a risk assessment with proposed mitigation measures included before work can begin"

Social Ecology

- Duke Energy Peru now has a manager of Social Responsibility whose staff is solely devoted to helping communities

- Daily media headlines are showing more and more that citizens are willing to "take to the streets" to make their concerns known and to find solutions to issues that impact their communities

- Given options about vegetation and tree clearing, landowners shared that they would support wider clearance of trees for power lines based on cooperative discussions (this practice is estimated to potentially reduce storm damage & restoration expenses by approximately 50% along the east coast of the US).

- While the survey was directed at electric power lines, the larger lesson to be learned is that the public can be viewed as a "positive" factor for infrastructure projects if approached properly.

➢Using a SE approach to planning a project involves

Social Ecology: The "People Factor"

1. It is frequently presumed (even before contact is made) that citizens will be adversaries…and they do take on that role based on how issues are handled by infrastructure company and agency personnel.

2. Very common for politicians to be 'used' by advocacy groups and others to achieve goals.

3. Politicized projects result in increased costs, bad publicity, lost good will, and delayed schedules.

4. Citizens can be cooperative when treated as "partners" in project planning and development. This is not always an easy process, but when used -- it has proven its value by avoiding unexpected delays and unexpected challenges to the project schedule.

Distributed Generation

➢Possibly the most important long-term trend for the electric industry.

➢Significant global trend towards distributed generation (essentially solar generation).

➢How will the electric power be generated that 'backs-up' the new distributed generation sources?

➢Near-term impacts are dependent in large part on advancement of energy storage technology.

➢Affected greatly by governmental actions (grants, research, etc.).

➢What's unknown at this point is how many existing electric utilities will choose to fight the DG trend…and how many will chose to participate in the new opportunities.

Potential Demise (?) of the Monopoly Business Model
(Closely related to distributed generation issue)

Challenges to continuation of the current business model:

- Growth of electric demand has flattened in recent years.
- Economic growth is projected by some to be anemic or only mildly positive for the 10-20 years, partly as result of sovereign debt loads.
- Electric infrastructure is aging and needs significant upgrading and expansion.
- Environmental regulations continue to be on the rise and have costs increases associated with the changes.
- System upgrades (rebuilding of infrastructure, smart grid, generation assets, etc.) will drive needs for increasing capital investments.
- By 2050 nearly all (excepting some hydro plants) generating plants will be retired and their power supply will need to be replaced.
- Some people advocate abandoning nuclear generation (estimated to provide >70% of our carbon-free electricity…climate concerns?).

A) Will the monopoly business model be able to survive long-term?

B) Almost certainly there will be huge opportunities for those who embrace the changes of the future that electric utilities and citizens now face.