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**Bridging Natural Gas to a Low
Carbon World: Sure, Right?**

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Key Takeaways

- We have seen an erosion of support for natural gas as a bridge fuel over the past couple of years
- The future role of natural gas for electric generation hinges, among other things, on U.S. climate policy
- With the new Administration, unless individual cities and states take action, the future compared to the recent past will place greater importance on the use of fossil fuels and less on meeting GHG targets
- It seems the most rational policy, at this time, is to still rely on natural gas for electric generation for the next two decades and possibly even longer
- It is important that the public-policy discussion steers away from “rhetorical heat” and toward “analytical light”

Questions for a Dialogue

- What accounts for the growing concern by some groups over natural gas as a bridge fuel?
- What should be the future role of natural gas in the electric sector? Bridge fuel, exit fuel, enduring fuel?
- What are the positive and negative attributes of natural gas as a fuel source for electric generation? These attributes are from an economic, environmental, portfolio and societal perspective
- What does it mean to over rely (or under rely) on natural gas?
 - ✓ What are the consequences?
 - ✓ Which is most serious and poses the greatest societal threat? (Type 1 and 2 errors)
- If gas-fired electric generation is socially suboptimal, how can we best correct the problem?
 - ✓ To what extent can markets address the problem?
 - ✓ What government intervention is justified?
- Is natural gas part of the problem to a low-carbon future, or is it part of the solution?

Opponents/Skeptics of Natural Gas

- “Natural gas is dirty, dangerous, and run amok”
- “Natural gas: bridge fuel or fool’s gold?”
- “Is natural gas a good bridge fuel while better options are developed?”
- “A bridge to nowhere”
- “Huge gas leaks add doubt on gas as a bridge fuel”
- “Natural gas is not a bridge fuel, it’s a death sentence”
- “Natural gas is best left in the ground”
- “Natural gas as an exit ramp”
- “Natural gas is more of a gateway drug than a bridge to a clean energy future”

Opponents – *continued*

- Three reasons given for why natural gas may not be preferable environmentally, even to coal
 - ❖ The negative environmental effects of fracking on the local community and the environment
 - ❖ Methane leakage throughout the natural-gas supply system
 - ❖ “Shutting out” of carbon-free technologies like nuclear, solar and wind; some environmentalists and others have argued that a shift to a zero-carbon energy future is imminent and can occur at little cost
- *Escalation of opponents’ effort to block new gas infrastructure projects and discourage gas usage and supply*

The Issues

- Role of natural gas for electric generation both in the short term and long term (e.g., 2030 v 2060)
 - Why some groups are opposing natural gas whereas a few years ago they supported its use in electric generation as a bridge fuel
 - The environmental effect of natural gas relative to coal and other fuels
 - The benefits and costs of depending on natural gas as a bridge fuel to a low-carbon future
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(Note: A “bridge fuel” is defined as a source of electricity generation that we can rely on until renewable energy becomes more economical)

The Issues – *continued*

- The capability of renewable energy to fill the gap if restrictions limit the use of natural gas for electric generation
- The role of natural gas in a “greener” energy future
- Comparing the negatives of natural gas with the positives
 - **Positives**: natural gas is usable in different efficient, flexible, and scalable generating technologies
 - **Negatives**: natural gas is still a fossil fuel that emits not only CO₂ but also methane into the atmosphere
- Overall, natural gas is abundant and economical in different uses, but as a contributor to climate change its use becomes questionable

Different Strategies for Natural Gas in Electric Generation

- Phase-out natural gas as quickly as practical
 - Rely on natural gas until large-scale renewable energy becomes economical (“bridge fuel”)
 - Rely on natural gas in the long term (“natural gas is not just a bridge fuel but a solution”)
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- Should we rely on the market alone or have government intervene to control natural-gas usage
 - ✓ Market failures
 - ✓ Government failures

Some Facts

- Shift from coal to natural gas has already pushed down U.S. energy-related CO₂ emissions by 12% between 2005 and 2015
- Need natural gas to keep electric grid reliable and operating as renewable energy grows in importance; we need natural gas in the transition until new technologies come along (e.g., energy storage)
- Eliminating natural gas from the mix will prolong the use of coal but accelerate the use of renewable energy and probably nuclear power
- The U.S. has an abundance of natural gas that can be produced at low cost

Some Facts – *continued*

- Natural gas has been a “coal killer” (“nuclear power killer” to a lesser extent)
- The flexibility of natural gas has increased the value of renewable energy on electricity grids
- Natural gas is not a *deep de-carbonization option* when compared with energy efficiency, nuclear power, renewable energy, and CCS
- Studies have concluded that gas-fired electric generation is more sensitive in the short term to changes in natural gas prices than to assumptions about carbon mitigation or the costs for other low-carbon technologies

Some Facts – *continued*

- Recent studies have concluded that the EPA estimates of methane emissions throughout the natural gas system have been overly optimistic
- About 60% of U.S. natural gas production comes from “fracking” techniques applied in shale formations
- Lower natural gas prices displace use of coal, but they also boost overall energy consumption and reduce use of nuclear and renewable energy
- The role of natural gas depends on long-term GHG targets

GHG Targets and Natural Gas

- **450 ppm** (target temperature limit of around 2°C): can use natural gas for a short time, peaking before 2030
- **350 ppm** (target temperature limit below 2°C): requires removing CO₂ out of the atmosphere and stop using all fossil fuels immediately
- **550 ppm** (risks climate-change catastrophe): natural gas assumes the role of a bridge peaking in usage around 2050
- **~400 ppm** (current level of CO₂)

According to the United Nations Environment Programme, even if the pledges made by nations participating in the Paris Agreement are fulfilled, global emissions will result in a path where temperature would rise around 2.9° to 3.4°C this century

Disputed Assertions (or Alternative Facts, If You Prefer)

- Displacement of coal with natural gas for electric generation is a highly cost-effective way to reduce GHG emissions
- New gas infrastructure will prolong the use of natural gas beyond the time required to keep climate change to a safe level
- Natural gas can play a limited role in long-term efforts toward deep de-carbonization
- Using natural gas as a bridge fuel could delay renewable energy by several years

General Comments

- Two options are available to reduce carbon dioxide emissions by enough to substantially mitigate the chance of disruptive climate change:
 - Capture carbon from the air and store it
 - Reduce future consumption of fossil fuels in a drastic manner
- There are two broad market forces that can preclude an activist policy agenda to rising fossil fuel consumption
 - Marginal cost of fossil fuel > cost of clean energy technologies
 - Improvements in energy-efficiency and carbon-free technologies (e.g., via R&D)

General Comments – *continued*

- We will have an abundance of fossils for decades if not centuries; reducing fossil fuels will therefore require deep cuts in the *demand* for fossil fuels
- Without substantial GHG policies, it is likely that the U.S. and the rest of the world will rely heavily on fossil fuels indefinitely
- Over the next several years, renewable energy will unlikely play a primary role in base-load electric generation or as a replacement for petroleum-fueled transportation vehicles
- The current business-as-usual combination of markets and public policy is therefore unlikely to reduce GHGs on their own

- Two market failures preventing drastic reduction of fossil-fuel consumption
 - GHG emissions are not price adequately
 - Basic R&D for clean energy is often underfunded
- With carbon dioxide concentrations continuing to grow, incremental changes are insufficient to aggressively address concerns over climate change, at least in the minds of many
- Instead, they argue that we need big, game-changing technologies that can be widely adopted and exported to the rest of the world