Role of Natural Gas in a Low Carbon Environment

DRAFT v.3

Background:

In the 2011 Prudent Development Report, the National Petroleum Council (NPC) reviewed the *"contribution natural gas can make towards a "lower carbon energy future" by reducing emissions of greenhouse gases (GHGs)"*[1]. The focus of the 2011 study was primarily domestic and the major conclusion was that given the abundant natural gas supplies, natural gas can play a *"pivotal role in reducing emissions from various end-use segments"* and makes *"an attractive option in a suite of options"* for potentially meeting a 50% reduction target from a 2005 baseline by 2050. A variety of technologies to reduce emissions as the result of consumption of natural gas in the end-use sectors were reviewed. The NPC estimated that these technologies had the potential to reduce emissions between 120-860 million metric tons of carbon dioxide equivalents (CO2e).

As part of the Conference of Parties (COP) 21 meeting in Paris, an agreement[2] was adopted which *"aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by holding the increase in the global average temperature to well below 2 °C above preindustrial levels."* A variety of research entities have reviewed the role of the energy sector under such constraints. However, most of these research often offer a theoretical view of the future with perhaps optimistic assumptions related to the scale of zero emitting technologies or pessimistic assumptions related to the role of natural gas in a low carbon environment and discounting the realities surrounding consideration of energy, economic and environmental securities facing communities and countries. On September 5, 2016, the G20 at the Hangzhou Summit communicated that **"***Given the natural gas that is a less emission-intensive fossil fuel, we will enhance collaboration on solutions that promote natural gas extraction, transportation, and processing in a manner that minimizes environmental negative impacts."*

Therefore, the focus of this study will be to review the current and future technologies and policies related to natural gas and the associated potential to reduce GHG emissions particularly in the US as well as globally. The report will layout the potential important role of natural gas in the transition to a low carbon economy, incorporating key principles of energy security, economic security and environmental (GHG) net benefits.

[1] Carbon and Other Emissions in the End-Use Sectors, Prudent Development, NPC 2011

[2] [HYPERLINK "http://unfccc.int/documentation/documents/advanced_search/items/6911.php?priref=600008831"]

Study Outline:

~~1. **Drivers of low carbon economy**~~

~~*Goal: to identify and articulate the drivers of a low carbon economy*~~

~~2. **Defining "low carbon energy future"**.~~

~~*Goal: to define the term "low carbon energy future" for the project under realistic perspective and scale of the challenge*~~

~~a. Paris Accord- 2 degree goals?~~
~~b. Other?~~

1. 3. **US and global GHG emissions in a lower-carbon economy**

Goal: to frame the scope of a lower-carbon energy future and to provide a baseline reference for this work

Discuss respected and credible (such as IEA, EIA, others) forecasts (with transparent insights to inputs) of future GHG emissions in view of policies expected to reduce GHG emissions over time. Include discussions of technologies assumed in achieving lower GHG levels, including costs and expected penetration of technologies. This is to provide a baseline reference for this work. This can also be used to frame the scope of a lower-carbon energy future.

~~*Goal: to review and assess historical and current (2015) energy mix and baseline GHG emission; and employing respected [agreed on set of models] provide a "fair-way" of projected GHG emissions with and without a carbon price (used a proxy for low carbon future)*~~

~~c. Assessment of baseline GHG emissions and energy mix~~
~~d. Assessment of future projected GHG emissions and energy mix (reference case)~~
~~i. With carbon price~~
~~i. Without carbon price~~

2. Role of natural gas in a low carbon energy economy

3. *Goal: to identify the potential for natural gas under a low carbon economy for policy-makers and industry*

e. Overview of current markets and uses, including consumption patterns and emissions benefits since 2005
   i. Res/Com.; Power, Industrial, Transportation and Exports consumption patterns

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Commented [fcg1]: The intent and goal here is to do something we did for the NPC 2011 report and somewhat analogous to what EMF does. Once the low carbon energy future is defined, the intent is to review the variety of respected models that have projected the GHG emissions and energy mix. Also, it provides a window of the achievements in CO2 reductions over the past decade mainly achieved through greater use of natural gas (over a billion tons in the US as computed by EIA). NPC is a study of studies and we will not be conducting independent modeling.

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ii. Lifecycle analysis of natural gas employing updated emissions data and net GHG benefits from 2005-current
iii. Analysis of economic benefits of natural gas from 2005-current
iv. Review of current and historical policy instruments (state, federal and international) to enhance or deter natural gas growth
v. Infrastructure as an enabler of emissions reductions

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f. Role of technology in reducing emissions from using natural gas in end-use sectors
   i. Upstream technologies to reduce methane emissions
   ii. Review of current and emerging low emissions, advanced technology applications with natural gas
      1. Direct use (feedstock)
      2. CCS
      3. Advanced technologies in residential/commercial, power, industrial and transportation
      4. Integration with renewables
      5. Others (as new ideas emerge in study)
   iii. Analysis of GHG reduction potentials per technology. Include costs, potential scale, and performance metrics relative to alternatives.

3. **Energy transition with natural gas:**
Goal: To outline the GHG benefits of applying the enabling technologies and work-practices identified in section 4.2 and to identify the necessary policies needed to ensure the transition is successful and roles of various institutions and stakeholders.

~~a. Projection of potential GHG reductions employing technologies from 4b on "reference case" emission projections from 3b.~~

b. Assessment of regulatory/policy framework to enable greater penetration of natural gas, including gas-power integration, LNG export and natural gas exports, CCS R&D and commercialization
   ~~i.~~ Provide context for natural gas penetration in view of existing and planned ~~analysis of best~~ policy frameworks ~~from review of 4.a.iv that is optimized for the low-carbon definition of the project.~~ Highlight policy approaches that achieve cost-effective GHG emissions reductions, and considering natural gas in the broad context of other mitigation technologies.
   ii. Role of financial markets and innovative carbon financing in non-OECD countries (moved from below in earlier draft)
   ~~iii.~~

c. Role of industry, state and federal governments, including DOE, DOD, DOS etc.
   i. The intent is to identify opportunities ~~provide streamlined roadmaps for policies~~ to enable the adoption of low carbon technologies, including natural gas, in a cost-effective and material manner.

d. ~~Blueprint~~ Role of natural gas in achieving a ~~Approach to manage~~ transition to a lower carbon economy ~~with natural gas~~