THE ROLE FOR NATURAL GAS IN A CHANGING ENERGY WORLD

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Introduction

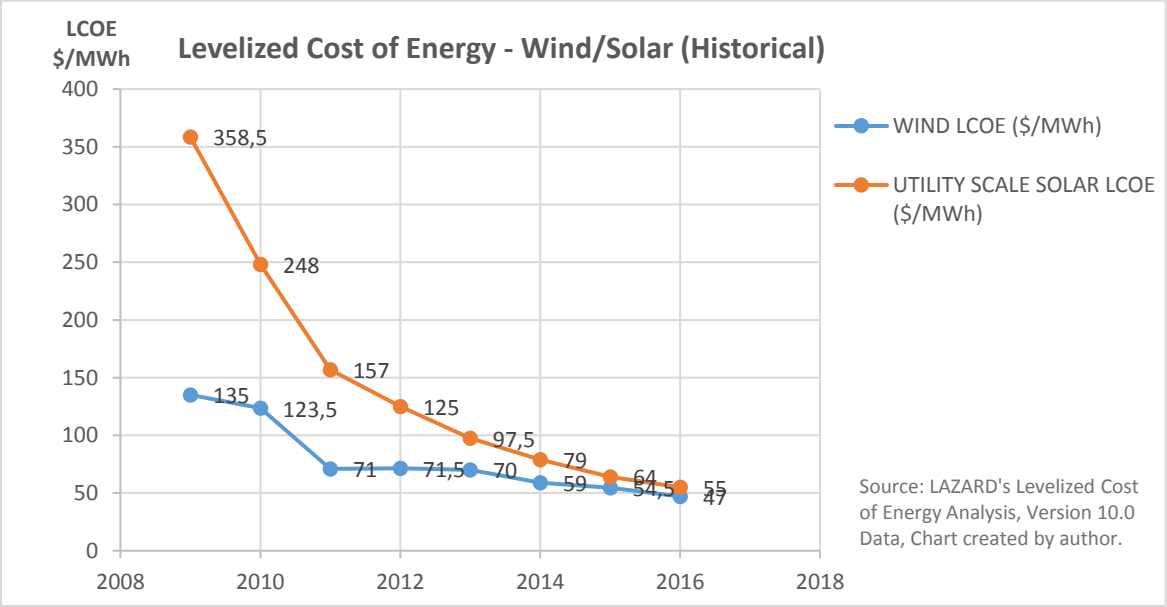
Environmental problems seen in different parts of the world make us think more carefully about the climate change and its effects. Especially the air pollution increasing day by day in China, Poland and Paris makes this problem more tangible beyond the statistics. The world recognizes the danger of climate change and the necessity to take action. In fact, last year for the first time since the early debates on climate change such a big number of countries – 155 – have reached a consensus in Paris COP21 on the transition to clean energy. They pledged to decrease CO2 emissions and to invest in renewables to limit the global warming to 2 degrees.

Climate change has been considered as a global problem since 1970s. Some nascent initiatives to invest in deployment of renewable energy started at these dates. Oil crisis, financial crisis and high-cost feature of clean energy investments inhibited, however, the expansion of renewables until 1990s. After the collapse of Berlin Wall, Germany started to support clean energy investments with substantial subsidies. Renewable energy becomes an international sector in which technology and R&D increased year by year. This situation leads to sharp cost declines in renewable energy and development of "game-changing" technologies.

On the other hand, clean energy has still some challenges such as low-investment, decreasing hydrocarbon prices and regulatory barriers. Even if renewables are currently as cost-efficient as fossil fuels and in certain countries more competitive than fossil fuels, their share in global power generation is still low and investment in clean energy is not enough to meet the COP 21 targets. While this period, natural gas emerges as the least carbon-intensive fossil fuel to facilitate the transition to low-carbon electricity generation. Accordingly, this article aims to discuss the role for natural gas in the coming decades, while the world prepares itself for cleaner energy.

Renewables: Rising star of global energy sector…

Environmental concerns have been drivers to use renewable energy sources but clean energy could not attract investment because of inefficiencies in incipient solar and wind technologies until recent years. Substantial improvements in renewable technology have made clean energy sources competitive with fossil fuels by increasing efficiency. According to the National Renewable Energy Laboratory, commercially available solar panel efficiency jumped from about 15% to 22%. Wind

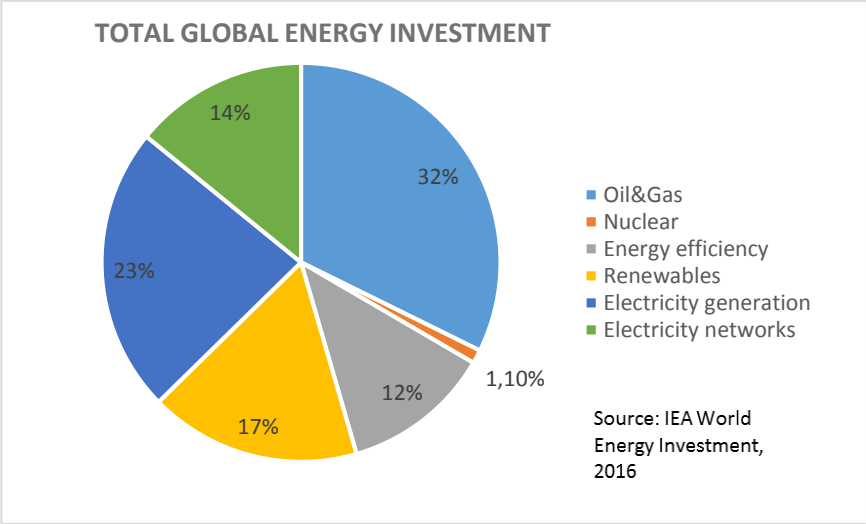


turbines have also become more efficient than the past decade, with an efficiency rate rising to 50% from about 25%, according to the IEA.

As a direct consequence of efficiency gain in renewable energy the production costs have dropped drastically. The levellized cost of electricity (LCOE) for utility-scale solar photovoltaic has declined by 85% from 2009 to 2016 and wind LCOE is currently around 50$ with a decline by 65% in the same period. By 2020, solar photovoltaic is projected to have a lower LCOE than coal or natural gas-fired generation throughout the world. In an increasingly larger number of countries, it has become more economical to install solar and wind capacity than coal capacity[1].

…but still the stepchild of global energy markets

Nonetheless, the acceleration seen in efficiency and cost reduction of renewables does not still reflect on clean energy investments and the share of low carbon sources in global electricity production. According to the IEA World Energy Investment 2016 Report, only 17% of total global energy ($313 billion) investment is made for renewables in 2015. Comparing the previous years ($60 billion in 2000, $300 billion in 2011), it is a substantial progress. However, oil and gas sector continue to hold the biggest place in energy investments with a share of 32% ($583 billion).



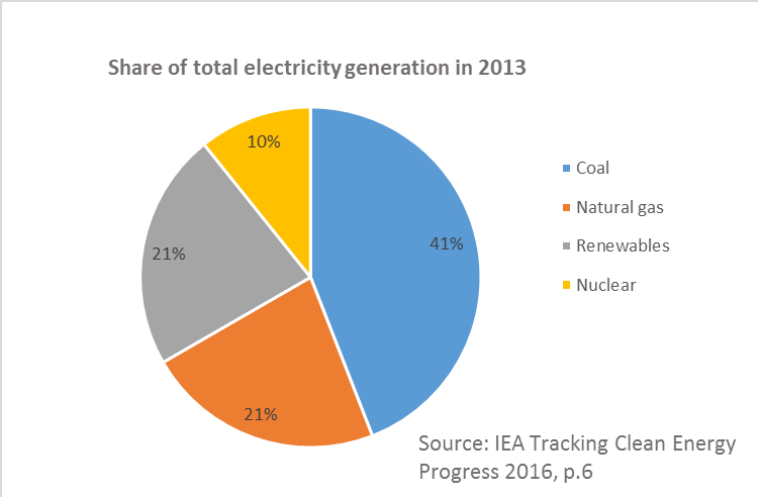
In addition, in the past few years, emerging-market economies have been the key growth area for renewables. In fact, developing countries represented the majority ($156 billion) of investment commitment to renewables in 2015, led by China, India and Brazil compared to $130 billion invested by developed markets in 2015, led by Europe, the United States and Japan[2].

Beside the low investment, climate-friendly energy sources cannot play a significant role in global electricity production. In 2013, the share of renewables in total power generation was 21% comparing to the share of natural gas and coal accounting for 62%.[3] Electricity production with renewables grew by an estimated 5% in 2015 and now accounts for around 23% of total power generation globally by reaching a record 153 Gigawatt (GW).[4] However, neither these numbers in electricity production nor the current investment level is enough for a low-carbon future. In fact, the COP21 in December 2015 highlighted the need for an additional $1 trillion in annual renewable infrastructure investment by 2030 and greenhouse emissions cut by 80% to meet the goal of limiting global warming to 2 degrees. The question then arises: in this environment where negative effects of

[1] World Energy Forum, "Renewable Infrastructure Investment Handbook: A Guide for Institutional Investors", December 2016.
[2] According to the United Nations Environmental Programme (UNEP) and Bloomberg New Energy Finance (BNEF).
[3] IEA, "Tracking Clean Energy Progress 2016", p.6.
[4] IEA, Medium-Term Renewable Market Report.

climate change are getting worse and costs of renewables are becoming more and more competitive, how to explain the lack of investment in clean energy?

The interviews with investors across geographies and sizes conducted by World Energy Forum[5] give a plausible response to this question. According to these interviews, the key reason of low investment is the lack of standardization in the renewable markets. Contracts are not standardized, regulation varies widely across countries and time, deals are scattered and due diligence is mostly conducted by existing infrastructure teams, on a case-by-case basis. As such, a publicly available and standardized track record in the sector has not been long enough to generate momentum among mainstream investors. Recently, to standardize the sector IRENA has launched "IRENA Solar Energy Standardization Effort", which will bring together public and private sector stakeholders to define a mutually acceptable template for solar project contracts and documents. Likewise, International Finance Corporation (IFC) has prepared project developer guides on utility-scale solar photovoltaic power plants, which includes sample contracts.



The second reason for low investment in clean energy is the regulatory uncertainties. While uncertainty in regulatory framework of emerging markets is a hindering factor, in developed markets over-regulation and lack of coordination generated significant legal costs for investors. Furthermore, electricity transmission constitutes another issue. Even in the United States, some electricity transmission lines are no easier to get approved than natural gas pipelines. Obtaining permission from the state or local authorities to build transmission lines is also difficult in many other regions.[6]

It is important to note that renewable markets do not still have a mature structure because the exponential changes in cost and efficiency have been too recent. As Reid Hoffmann pointed out "*Promising technologies that are ready for real-world testing and iteration but are not yet mature or risk-free enough to attract traditional investors cannot find the funding they need to survive this key stage of their development*."[7] The market will become more attractive as technology evolves further and the remaining challenges will naturally disperse as the sector gains momentum.

Beside the low-investment issue, the intermittency problem of the renewables remains which means that we still need something to back them up and provide electricity when the sun does not shine and wind does not blow. Fortunately, energy storage technology has made substantial progress recently with nearly $660 million investment[8] to overcome the seasonality issue of renewable power generation. Boosted by the growth of electric vehicle markets, the average price of battery packs has

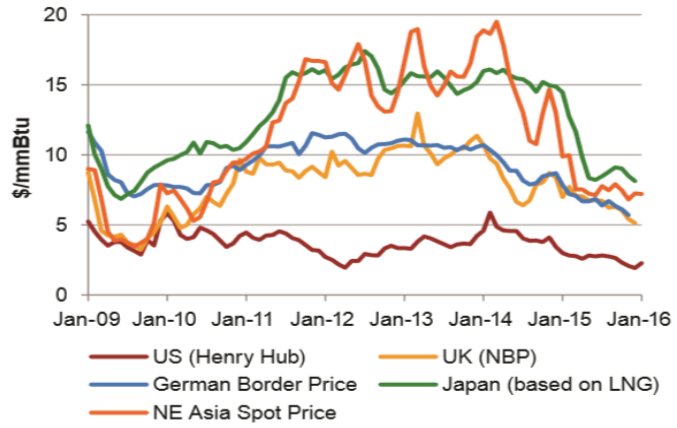
[5] World Energy Forum, "Renewable Infrastructure Investment Handbook: A Guide for Institutional Investors", December 2016, p. 12.
[6] Cambridge
[7] Reid Hoffman, "Sunny Day Fund: Why We Need to Invest In Our Shared Energy Future Now", acessible on https://www.linkedin.com/pulse/sunny-day-fund-why-we-need-invest-our-shared-energy-future-hoffman
[8] US Energy Storage Monitor, GTM Research and Energy Storage Association, 6 December 2016. https://cleantechnica.com/2016/12/07/corporate-energy-storage-investment-reaches-660-million-third-quarter/

fallen from $1000/kWh in 2010 to $350/kWh in 2015, according to the United Nations Environment Programme (UNEP). In a close future big and cheap batteries will be available to store electricity for use in the grid. Even so, we need to wait for a few years or more for clean energy. Meanwhile natural gas steps forward as the least carbon intensive fossil fuel to back up renewable energy sources.

Natural Gas as a "Bridge" to low-carbon future

Currently natural gas accounts for roughly a quarter of global energy demand and natural gas markets go through a transition period, too. Gas would be much more attractive in the coming years for three reasons: decreasing costs depending oil price fall, oversupply and lack of demand; increasing predominance of gas-to-gas pricing mechanism and finally more flexible LNG contractual terms.

Figure 3.16: Monthly Average Regional Gas Prices, 2009 - January 2016

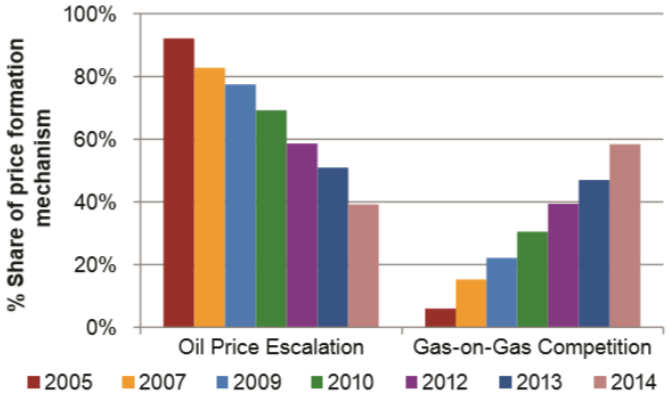


Sources: IHS, Cedigaz, US DOE

Supply glut caused by US shale gas and decreasing gas demand in Europe have dropped the prices. As of 1 January 2017, Henry Hub Front Month price is 3.38$/MMBtu dropping from 3.59$ in December 2016. NBP Front Month price is recorded as 6.28$/MMBtu and NE Asia LNG Spot price is recorded as 9.79 $/MMBtu on 1 January 2017.[9] Even if gas prices increased by approximately 1$/MMBtu comparing with the previous year, current prices are expected to remain flat in Reuters' forecasts.

Furthermore, global natural gas market is evolving towards gas-to-gas competition pricing system from oil-linked pricing. De-linked gas prices provide flexibility and homogeneity for gas markets in the world by transforming gas into a commodity priced by interaction of supply and demand. As it is seen in the graph which shows European import price formation between 2005 and 2014, natural gas trade in Europe is becoming more and more independent from oil prices. In 2014, approximately 60% of traded volumes are priced by gas-to-gas competition at physical or notional hubs. So, natural gas is becoming more attractive with low prices and a more liquid market structure.

Figure 3.15: European Import Price Formation, 2005 to 2014

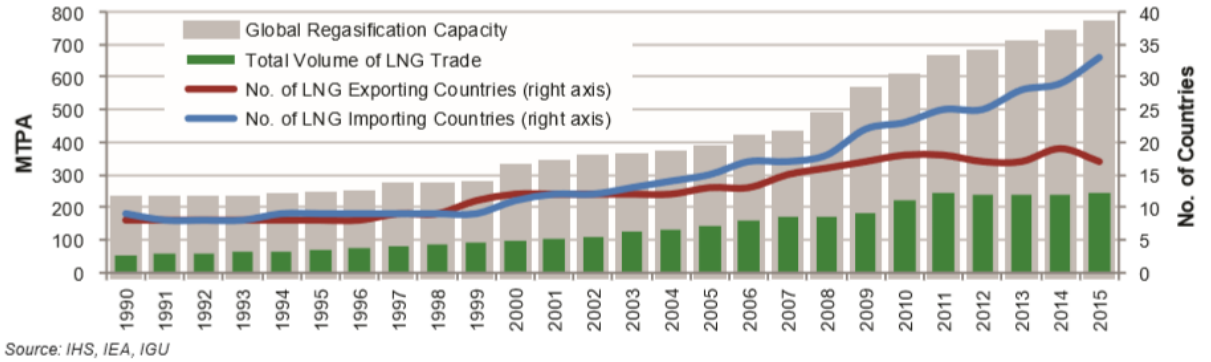


Note: Oil Price Escalation = prices linked, usually through a base price and an escalation clause, to competing fuels, typically crude oil, gas oil and/or fuel oil. Gas-on-Gas Competition = prices determined by the interplay of supply and demand – gas-on-gas competition – that are traded at physical or notional hubs.
Sources: IGU Wholesale Gas Price Survey - 2015 Edition

[9] Thomson Reuters Eikon Gas Overview.

The possibility to export and import natural gas in liquid form is another advantage for this commodity, as it is highlighted once again after nuclear accident in Fukushima. Supply security has always been a hot topic for energy importing countries by pushing them to diversify energy sources in order to hurdle with supply and demand shocks. Globally, 9.8% of natural gas is supplied as LNG. Since it is flexible and does not necessitate pipeline infrastructure, LNG emerges as a good option to diversify energy portfolios and to meet demand spikes. Furthermore, LNG is adding flexibility to the gas market

Figure 3.1 LNG Trade Volumes, 1990–2015



Source: IHS, IEA, IGU

[1]Excluding Indonesia, which buys cargoes exclusively from domestic liquefaction plants.
[2]The United States is included in both totals, since it exports domestically-produced LNG from Kenai LNG in Alaska and re-exports LNG from regasification terminals in the Gulf of Mexico.

and allowing to trade gas more independently. Its share in the global gas market is set to increase in the coming years. Indeed, LNG supplies have seen a growth at a faster pace than total gas consumption. Total LNG trade reached 244.8 MT in 2015, up 4.7 MT from 2014 especially with the start-up of several new projects in Australia and Indonesia. Although the Pacific Basin remains the largest source of demand, growth was driven by Europe and the Middle East with new LNG importing countries from both regions in 2015.[10]

Despite its advantages, LNG is a cost-intensive way of natural gas trading which requires liquefaction, re-gasification infrastructure and shipment expenses. For that reason until recent years, LNG contracts have been made for long-term, with oil indexation pricing and fixed destination clauses. However, this picture is changing. The Global Gas Security Review[11] finds that LNG contract structures are becoming less rigid, increasing market liquidity. In 2015, about 40% of LNG contracts had fixed destination terms, down from 60% in the previous year. Flexible contractual structures are important for gas security as they enable to aggregate gas volumes at a lower cost from various regions. In the case of a supply disruption or a demand shock, LNG trade flows would rapidly shift so that gas can reach the regions that need it most.

The destination flexibility of the LNG trade is launched by US LNG exporters which is described as “LNG revolution”. The fully flexible contractual model has made US LNG more attractive by improving the ability of the global gas system to react to potential demand or supply shocks and by making it easier to shift volumes from one destination to another. Furthermore, US LNG price is indexed to Henry Hub prices which are much lower than NBP or TTF hubs prices. This is why according to IEA’s forecasts almost half of incremental LNG production between 2016 and 2021 is expected to come from the United States.

[10] International Gas Union, 2016 World LNG Report, p.4.
[11] IEA, Global Gas Security Review, How Flexible Are LNG Prices In Practice?, 2016.

Beside the destination flexibility, two other major trends have been apparent after 2010 concerning LNG contracts. First, volume per contract has become smaller. This allows a gradually more open market with a higher number of buyers and sellers, and growing participation of smaller LNG importers in emerging markets. Second, oil indexation pricing mechanism gives its place to more direct gas linkages. As prices are less tied to oil and given the market oversupply, gas prices can remain low even if oil prices rebound. This could open a new place for LNG as a marine bunker fuel and could be an important market in the 2020s.[12] Furthermore, in recent years, the floating and regasification unit (FSRU) rendering LNG more accessible, faster and cheaper by avoiding multibillion dollar investments in infrastructure and in regasification. FSRU regasification capacity has increased rapidly since 2008, reaching 100 bcm per year in 2016. Today it represents 10% of global regasification capacity (versus 2% in 2008) and its share is set to continue to increase steeply with FSRUs under construction. [13]

All in all, energy world goes through a period of transition. It is somewhere between hydrocarbons and renewables and it seems that this period will take a little more time. In this period, natural gas may act as a "bridge" to move away from carbon intensive coal and oil with its advantages such as low prices, more flexible LNG contracts and being the least carbon intensive fossil fuel. Nevertheless, this bridge must be supported with policies and investments to make renewables the primary generation source. It should not be forgotten the fact that natural gas is also carbon intensive source and without renewables it can do nothing for a low-carbon future. Thus, finding a careful balance of natural gas and renewable energy portfolios is a must in this changing energy world.

[12] "The Prospects for COP 21 and the Future Role of Natural Gas", An Interview with David Robinson, Oxford Institute for Energy Studies, December 2015, p.4.
[13] *Ibid*., p.61-63.