Climate and Energy Discourse in the US: What is the Path Forward?

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Background

Energy and climate change are at the core of energy and environmental policy discourse in many countries around the world, and it is influencing the international geopolitical context. It has also become a centerpiece of the US political discourse, with some calling for an end to fossil fuels in an aggressive time frame. The policies being proposed include, but are not limited to, eliminating fossil fuel subsidies, promoting the expanded use of renewables and batteries, pushing greater adoption of electric vehicles, banning hydraulic fracturing, and banning the export of crude oil and natural gas.

While an aggressive stance toward phasing out fossil fuels under the guise of "energy transitions" can gain traction among certain voting constituencies, it is important to understand the roles that legacy, scale and technology play in achieving such a goal. In addition, it is important to understand the complexities of facilitating such an aggressive energy policy in the US. From a historical perspective, the US has previously seen very aggressive calls for things such as energy independence in the interest of energy security, yet no such outcome has been achieved, largely due to economic headwinds, despite every US president since the 1970s reiterating a similar aspiration. Environmentally-motivated ambitions to eliminate fossil fuels are likely to face similar issues.

The US energy mix has been, and still is, dominated by fossil fuels. As can be seen in Fig. 1, crude oil and natural gas have been staples of the US energy mix, accounting collectively for 55.7% of total primary energy use in 1950, 64.5% in 1984, and 67.1% in 2018. Coal has seen its market share in the US decline, displaced first by natural gas, hydro and nuclear, then later by natural gas and renewables. The growth of renewable energy sources – wind and solar in particular – has been incredibly high over the last couple of decades. The share of wind has grown to over 2.5% of primary energy use, and solar has seen its share rise to almost 1.0%. While these shares, out of context, do not represent a large fraction of US energy, it is important to note that just 20 years ago wind and solar *combined* for less than 1.0% of total primary energy use.

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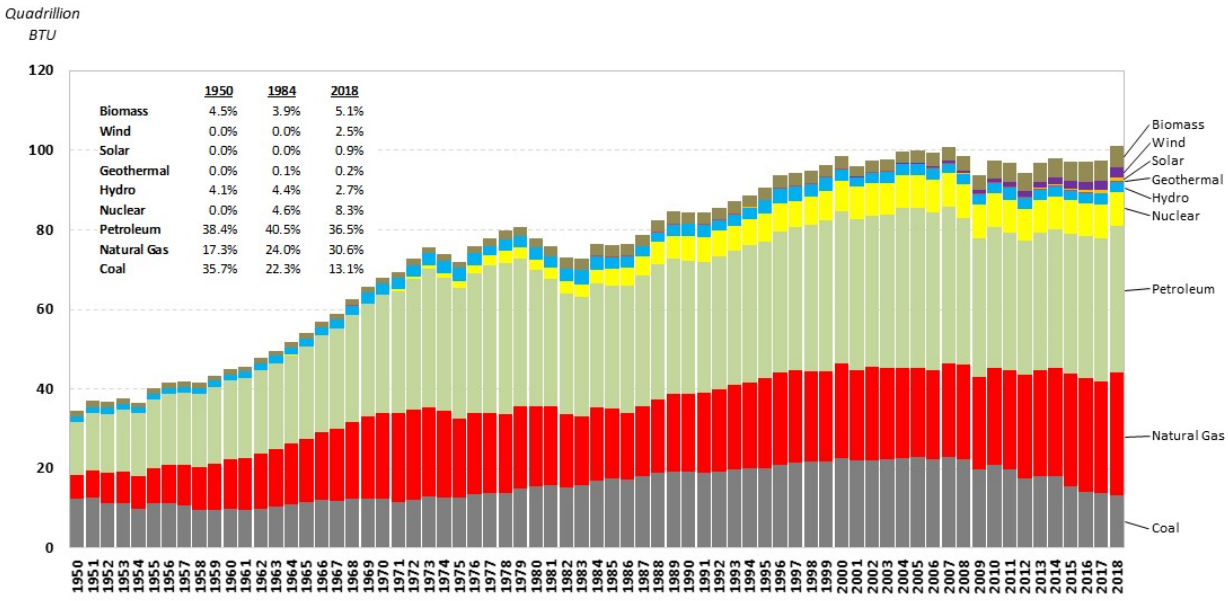
Fig. 1　Primary Energy Consumption by Source, 1950-2018 (with table of market shares)



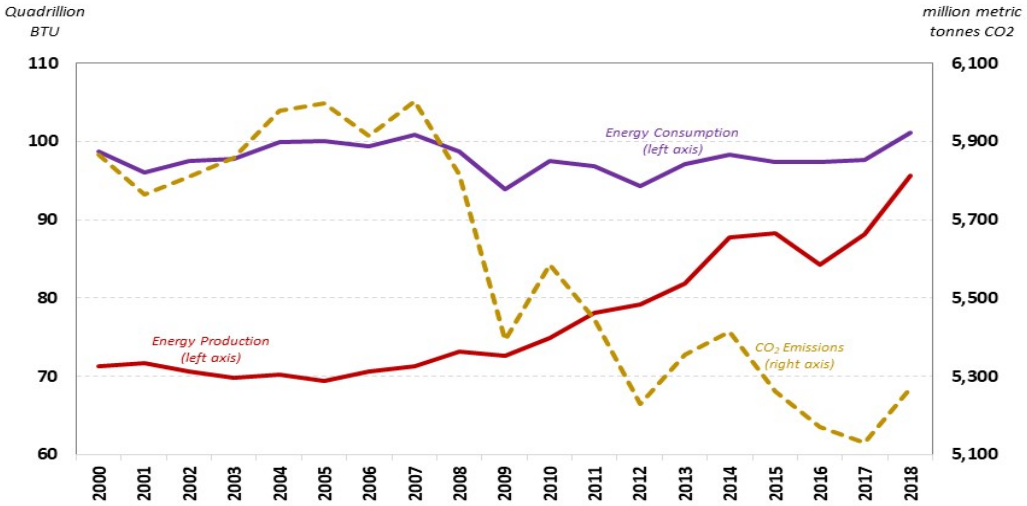
Source: Data from the US Energy Information Administration

The recent decline of coal and growth of natural gas and renewables centers in the US power sector. Coal's precipitous decline over the last decade is a function of the age of the coal-fired generation fleet, and the scale at which new technology – renewables (wind and solar) and the extraction (shale) and combustion (combined-cycle) of natural gas – is altering the competitive landscape. Regarding renewables, the growth rate in net generation from wind and solar has topped 24% and 31% per year since 2000, respectively, and the two energy sources have reached a combined market share of over 8% of total US power generation. The rapid growth of wind and solar – both of which are intermittent, non-dispatchable resources – has been disruptive, placing new stresses on US power markets, challenging the traditional role of utilities, and demanding some creative approaches by independent system operators to balance system load in the face of daily and seasonal variability in wind and solar. For better or worse, this highlights that future growth of wind and solar will demand sufficient backup generation capacity, storage technology and/or greater transmission integration, each of which will require significant capital outlay or ongoing payments to existing power generators (for example, ancillary services) to keep backup generation available.

The shale revolution, in particular, has accelerated the decline of coal use in power generation. The last major build-out of coal generation capacity in the US was in the late 1970s through early 1980s, largely the result of energy security concerns that drove a preference for domestically produced energy sources, and the US is home to over a quarter of the world's recoverable coal resources. In fact, the Power Plant and Industrial Fuel Use Act of 1978 provided that new baseload electric power plants would use coal rather than natural gas (this was later repealed in the 1980s).

Assuming a 40-year design life, the US is currently in the midst of a time period that demands decisions about coal-fired capacity: (1) upgrade and retrofit or (2) retire and replace. The choice in the presence of very low-cost natural gas appears to be the latter.

Fig. 2　Energy Consumption, Production and CO_2 Emissions



Source: Data from the US Energy Information Administration

The oft underappreciated two largest sources of change in the global energy system over the last two decades have been the dramatic growth in US oil and gas production and energy demand growth in Asia. Indeed, the two forces have intersected to create a very different dynamic in energy markets and geopolitics. In the US, light tight oil is now about 60% of domestic oil output and shale gas now accounts for over 70% of all domestic dry gas productions. The rapid growth in domestic crude oil and natural gas production has contributed significantly to overall energy production, and has served to close the gap between domestic energy consumption and production, all as carbon emissions have fallen (see Fig. 2). Moreover, the abundance of oil and gas in the US has allowed the US to become a significant exporter of crude oil and petroleum products – exports to 109 different countries in 2018 at levels over 7 times that in 2000 – and natural gas – exports to 33 different countries in 2018 at levels almost 15 times that in 2000. This, in turn, has afforded the government a new tool in foreign policy.

To facilitate the recent rapid growth in US energy exports, significant policy shifts have transpired, with a long-standing ban on crude oil exports being lifted in late 2015 and multiple national interest determination studies on the impact of LNG exports that ultimately supported new LNG export licenses. In the latter case, facilities in operation, under construction and approved will push the total export potential to over 20 bcf/d by 2025. Expanded exports will reinforce the role that energy plays in US foreign policy. Of course, capacity does not guarantee volume, but the reality being forged in the Permian Basin has huge implications as oil-directed activity is bringing

large associated gas volumes that could open new export opportunities. Currently, however, large volumes of natural gas are being flared in the Permian Basin due to a lack of gas pipeline take-away capacity, which must be addressed. The ability to move associated gas production to market is also important if natural gas is to fulfill its potential of reducing carbon emissions by displacing higher carbon fuel sources.

What does this all mean for the future of US energy and environmental policy?

Will future government policy disrupt US oil and gas production? While one can never say "never" there are certain realities that have heavy bearing on the answer, and it is difficult to envision passage of a federal policy construct that will significantly encumber, much less shut down, US oil and gas production. For one, the US State Department's Bureau of Energy Resources has expanded its staffing and role in foreign policy discourse, a development that predates the Trump administration. This reflects recognition of US "energy abundance" as well as overt efforts on both sides of the aisle to connect US energy abundance to allied interests and foreign policy. So, the foreign policy implications of US energy abundance bear a significant counterweight to efforts aimed at impeding US oil and gas.

In addition, there has been a substantial economic benefit associated with the US shale revolution. This ranges from wealth associated with upstream activities and employment, to cost-savings and environmental benefits associated with abundant natural gas, to expanded investment and activity in energy-intensive industrial sectors. While these benefits are larger in some regions than other, any top-down policy approach at the Federal level risks disenfranchisement of large constituencies across the country. For example, the impact of various policies that target the oil and gas industry will necessarily have a larger impact in regions with high dependence on oil and gas – both producing and consuming – than in other regions, so any Federal policy vector must consider the disproportionate regional impacts it may carry. All this said, the oil and gas industry and direct industry-related activities are major sources of CO_2. Therein lies the conundrum. Emissions must be addressed and regional economic engines must be maintained, or at least given enough runway to adjust.

Carbon emissions present the ultimate problem of the global commons. As such, policies adopted at a local, regional, or national level still suffer from an inability to enforce action in other regions/nations. In 2018 global carbon emissions came from a variety of different regions, and about the US represents 15% of the global total. Moreover, the OECD accounts for about 35% of global carbon emissions. Given the pace at which energy demand is growing in the developing world, these shares will continue to shift more heavily to non-OECD nations. This, of course, motivates international discourse on the matter, but even those discussions lack any enforcement mechanism (and may never) for implementation.

Local action is, in general, much more likely, but everywhere is different. This emanates from the thesis that “politics are local” and the calculus associated with any policy proposal varies regionally. This point was highlighted in a February 2015 Baker Institute report entitled, *The Market Impacts of New Natural Gas Directed Policies in the United States* (https://www.bakerinstitute.org/research/market-impacts-new-natural-gas-directed-policies-united-states/). In sum, in areas where energy and economic activity are intertwined, anti-development campaigns face significant headwinds due to constituent support that is already engendered. By contrast, in areas where energy infrastructure is more greenfield, resistance to new development may gain traction from already-existing, competing vested interests. Recognizing the local nature of constituent support for various policies is critical to understanding what will and what won’t work in achieving a stated goal.

In some regions, local resource endowments will be a significant driver of economic success where policy support tips the scales. The experience of the wind industry in Texas is a prime example. Texas is home to over 27% of US wind capacity, which is the result of a virtual perfect storm that results from market structure, policy support, and a high-quality wind resource. Moreover, wind has expanded even as rapid oil and gas production growth has occurred in co-located regions. The energy portfolio in Texas is reflective of *local* constituent support, and has benefitted from both local and federal incentives. But, replication of a similar portfolio cannot be expected in other regions because the local resource endowments are different. Hence, the outcomes will be different.

Closing thought

Nobody actually knows what the future will bring. History is replete with policy proposals that never amounted to anything, led to unintended negative consequences, did not deliver the full intended impact, and/or were met with intense resistance over purported costs that never materialized. This only highlights the uncertainties that are inherent to policy discourse and market response. It is paramount that governments and the private sector engage both with each other and with society in a constructive manner to ensure energy access as well as economic and environmental sustainability.

The legacy of existing energy capital and the scale of the current energy system mean transitions will likely take time. Demonizing particular fuel sources will not eliminate their use around the world, much less in the US, but proactively addressing technical challenges can ultimately mitigate externalities. We have seen ample evidence of this in the developed world with regard to various local environmental pollutants over time (this, in fact, gives rise to the fundamentals underlying the environmental Kuznets curve). In the end, hydrocarbons will be a part of the energy future, but the challenges of the day must be addressed. This will ultimately drive US energy and environmental policy. The realities of what US oil and gas production have meant for US economic interests, foreign policy, and environmental progress cannot be swept away. As such, oil and gas

will likely continue to play a role in the US energy system for some time to come, even as climate change moves to the forefront of political discourse.

Writer's Profile

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He directs the Baker Institute's Center for Energy Studies and the Masters of Energy Economics Program at Rice University, where he also holds adjunct professor appointments in the Department of Economics and the Department of Civil and Environmental Engineering. Dr. Medlock is a principal in the development of the Rice World Natural Gas Trade Model, which is aimed at assessing the future of international natural gas trade. He is an active member of American Association for the Advancement of Science (AAAS), American Economic Association (AEA), and International Association for Energy Economics (IAEE). He received his Ph.D. in economics from Rice University in May 2000.