

The Road from Paris: Implications of COP21 for Fossil-Fuel Suppliers

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Introduction

The UN Framework Convention on Climate Change (FCCC) concluded its recent meeting in Paris with an Agreement on urgent actions to curtail rising global temperature and greenhouse gas emissions.² If carried out as envisioned in the periods 2020 – 2050 and 2050 – 2100, the Agreement will have enormous environmental and social effects. It will also shake the oil, gas, and coal industries to their foundations and transform their business models. In the U.S., the Paris Agreement will become, if ratified, the legitimizing framework for a national energy policy, based on climate dangers rather than supply concerns. Given the prospects, this paper sketches a scenario in which carbon-intensive fuel suppliers – oil, gas, but not coal -- evolve from their current form into highly-regulated *fuel utility* businesses with significant accountability for climate-action success at regional and city levels. This model would largely replace familiar, integrated oil and gas companies with a new hybrid form. In an increasingly restrictive business environment, the fuel-utility model is a viable compromise between traditional business autonomy and worst-case divestment or stranded asset scenarios.

COP21 and the Paris Agreement

The United Nations COP21 climate conference opened to great expectations and closed with a sense of historic achievement -- or at least, aspiration. Limiting global temperature increases by 2100 to “well below” 2^o C (3.6^o F) relative to pre-industrial levels and achieving global greenhouse gas (GHG) equilibrium in the period 2050 - 2100 will require unprecedented, decades-long cooperation by nearly every country on the planet. Table 1, which lists COP21 GHG-reduction commitments for several Parties to the Paris Agreement, suggests the scale and immediacy of the challenge.

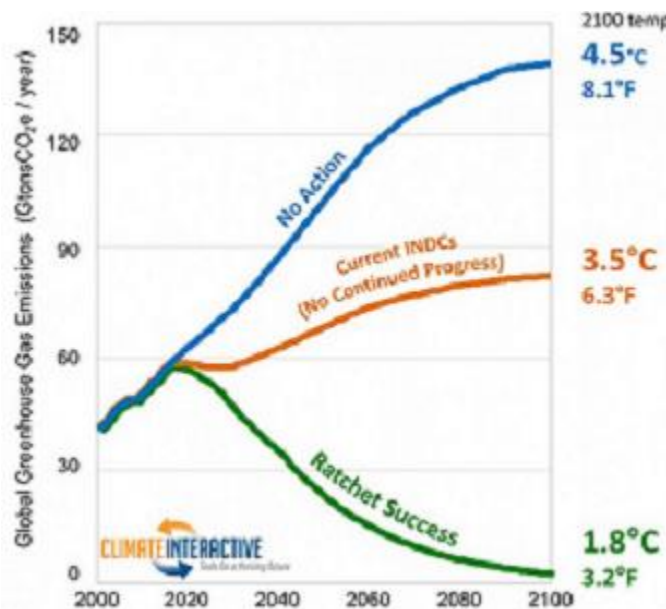
Party	Target Date	Proposed Reductions in Annual GHG Emissions
European Union	2030	40% relative to 1990
China	2030	60-65% relative to 2005
United States	2025	26-28% relative to 2005
Russia	2030	25-30% relative to 1990
India	2030	33-35% relative to 2005
Japan	2030	26% relative to 2013
Brazil	2030	43% relative to 2005

Table 1. Intended Nationally Determined Contributions (INDC's) at COP21 (Reilly, et al, *Energy and Climate Outlook, Perspectives from 2015*, globalchange.mit.edu)

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² 21st Conference of the Parties to the UN Framework Convention on Climate Change (COP21), Paris, 30 Nov – 12 Dec, 2015.

The Paris Agreement “notes with concern” that even these commitments foreshadow annual GHG emissions greater than 55 gigatonnes (CO₂ equiv/yr) in 2030, well above the 40 gigatonnes/yr maximum allowable for a temperature increase $\leq 2^{\circ}\text{C}$. The representative projections in Figure 1 show that pledges at COP21 flatten the status-quo trajectory, but only to a still-dire temperature increase of 3.5°C by 2100.



The shortfall in intended GHG reductions prompted the COP21 Parties not only to reaffirm the 2^o C maximum, but to urge “much greater emission reduction efforts” to hold the temperature increase nearer to 1.5^o C above pre-industrial levels. As GHG reduction accelerates to stay within the 1.5^o – 2^o C cap, the complementary goal in the second half of the 21st century will be to balance anthropogenic GHG emissions and GHG sinks. The Paris Agreement anticipates this would achieve a sustainable GHG state without further aggravating climate change – although this is not an assured prospect.

Figure 1. Projected Temperature Increases post-COP21 (mitsloan.mit.edu/sustainability/profile/climate-interactive)

COP21 outlines an enormous undertaking within and between nations requiring GHG mitigation, adaptation, finance, technology development and transfer, and capacity building. Since the Agreement lacks enforcement mechanisms, the initial national contributions will be voluntary and propelled only by recognition of the common peril. Within individual countries, the COP21 and any subsequent commitments will translate into mandates, regulations, and incentives combined in various ways with capital markets to finance the energy transition. Apart from national interests, the Paris Agreement will also contend with global demand for energy which, even in a relatively conservative projection (Figure 2), may increase by nearly 50% between 2015 and 2050. In the absence of deep decarbonization, fossil fuels (oil, gas, coal) are projected to meet 60% - 65% of primary energy demand at mid-century. Although deep decarbonization requires rapid and pervasive displacement of fossil fuels, coal, petroleum liquids, and gas may still account for 50% - 55% of final energy consumption in 2050.³ Down from approximately 85% currently, these figures are not grounds for complacency among fossil-fuel suppliers. It’s also likely they will be subject to further downward pressure as climate alarms grow louder.

³ See, for example, Deep Decarbonization Pathways Project (2015). *Pathways to Deep Decarbonization 2015 Report*, SDSN - IDDRI.

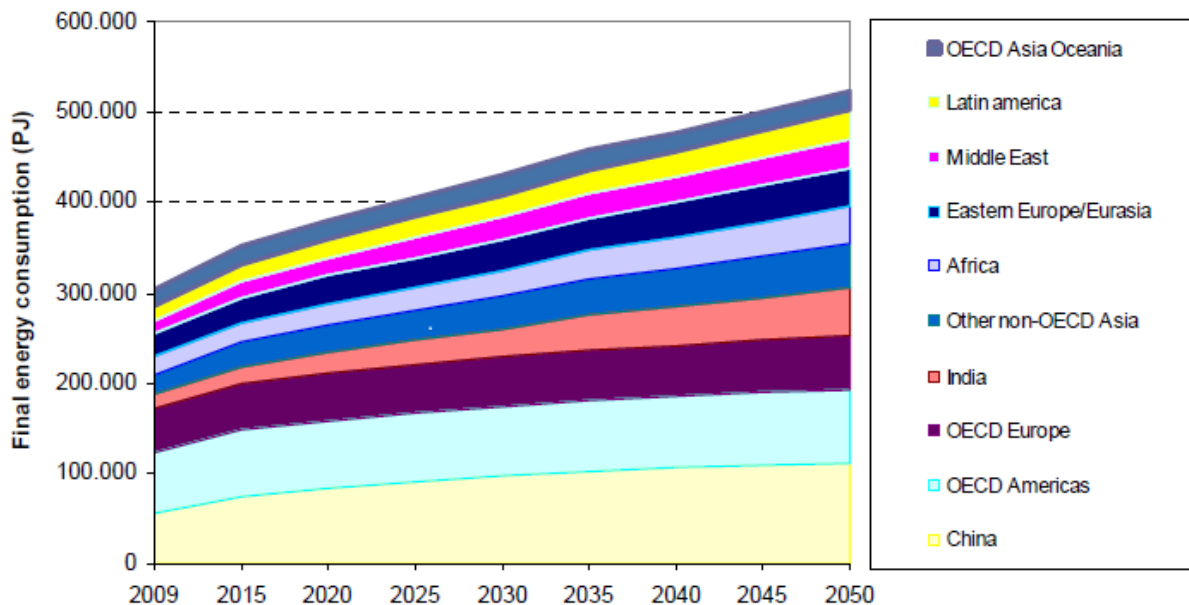


Figure 2. Reference Case Projected Energy Demand (petajoules), Graus and Kermeli, *Energy Revolution* (2012)

In the marketplace of proposals and opinions about climate change, COP21 may well become the definitive call to decarbonize global energy supply and demand. The challenge to coal, oil, and gas businesses will be to remain profitable participants in the transition, as they're pressed by emissions caps, increasingly stringent carbon pricing, and social pressure for low-emissions energy.⁴ For carbon-fuel businesses, the Paris Agreement will play out strongly along three axes: investment and business models, technology, and regional climate action.

Investment and Business Models

Climate change involves enormous numbers at planetary scale: thousands of gigatonnes of greenhouse gases, many quadrillions of BTU's, and entire populations of plants, animals, and people. The Paris Agreement envisions capital investments and movements of similar magnitude. At the basic level, COP21 calls on developed nations to commit before 2025 to transferring at least \$100 billion/yr to assist developing countries with climate mitigation and adaptation. While this transfer alone may total a minimum \$7 - \$8 trillion over the horizon to 2100, it's only one element in a World Bank estimate that low-to-middle income countries will need at least \$1 trillion annually to adapt existing and new infrastructure to climate change. Added to these (uncertain) requirements will be transitional investments to increasingly decarbonize global energy supply and use. The IEA's *Energy Investment Outlook*, for example, foresees that holding the global temperature increase to $\leq 2^{\circ}$ C will require energy investments of \$2.6 - \$2.7 trillion/ yr, totaling \$53 trillion by 2035, of which 60% will be in emerging economies (China

⁴ The constraints will extend beyond energy suppliers, of course, to manufacturing, transport modes, end-use products, and energy consumption.

and other Asia, Latin America, and Africa). While the numbers are enormous, the investments for adapting infrastructure and decarbonizing energy supply and use are well within the productive capacity of advanced and emerging economies (Figure 3).

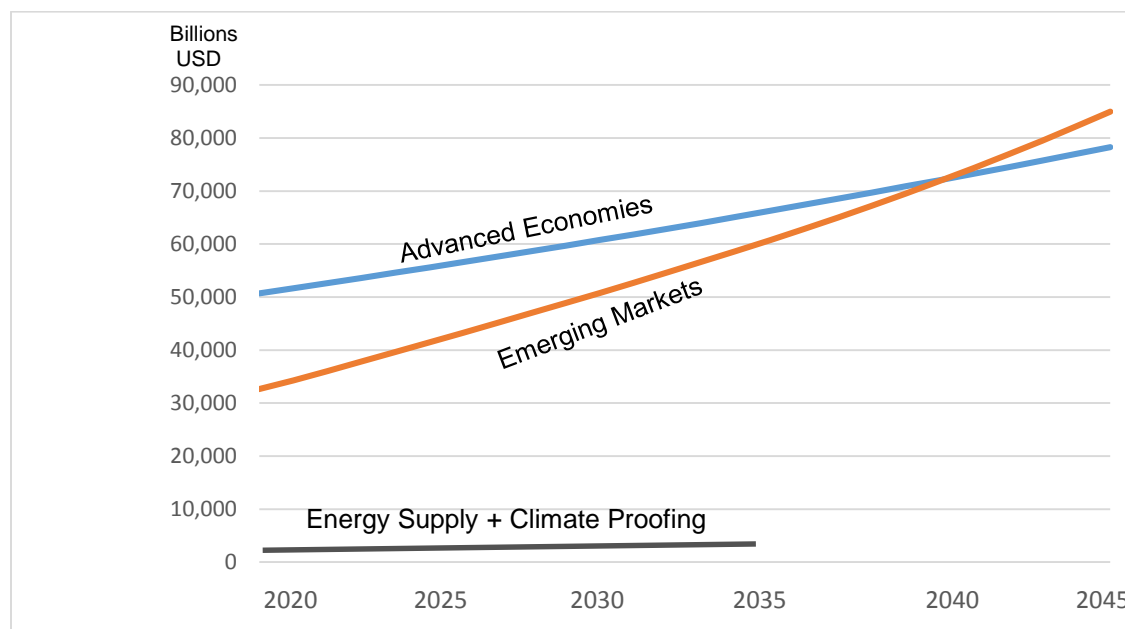


Figure 3. GDP Projections (IHS) and Energy Investments (World Bank and IEA)

New Constraints

Decarbonization isn't a question of adding new economic burdens, but of reallocating public spending and directing private investment away from carbon-intensive energy. Within that context, the Paris Agreement calls on developed countries to mobilize climate finance "from a wide variety of sources, instruments and channels, noting the significant role of public funds". Or, as the IEA puts it, while governments are "evermore active in shaping energy markets and investment decisions... meeting future energy-sector financing will require the mobilization of increasing amounts of private capital." In this context, the first new reality for fossil-fuel suppliers will be the requirement that they participate in novel financial arrangements in which "nations, energy developers, financial institutions, and development agencies would join together to drive energy investments toward energy-efficient and low-carbon solutions".⁵ In addition, the solutions will need to be "energy appropriate," i.e., fully compatible with national and subnational climate goals and local, decarbonized energy portfolios. The resulting prospect is that oil and gas suppliers will spend the next two decades in a financial balancing act under constraint to:

⁵ Carlos Pascual and Jason Bordoff, "A Global Low-Carbon Challenge," *Democracy*, Winter 2016, No. 39.

- (a) remain attractive to capital markets for the CAPEX and OPEX funds needed for fossil-fuel exploration, production, and manufacturing;
- (b) underwrite transition costs (e.g., through carbon pricing) for an increasingly decarbonized energy system;
- (c) broaden their own operations to include substantive renewable/ alternative energy, or otherwise cede energy-market share to new competitors;
- (d) evolve a business model that accommodates (1) increasing regulatory intervention and restrictions; (2) capped demand for their products by mid-century, if not sooner.

The requirements make for a new strategic agenda and strongly suggest that energy companies will themselves undergo a transformation in parallel with global decarbonization.⁶ Calls for divestment notwithstanding, fossil fuel businesses will not disappear in any plausible scenario for this century. However, the necessity of providing attractive returns on private investment while answering to an urgent (if not hostile) climate-action agenda will force their business model closer to other foundational industries with core public/ private interests that are dynamic and sometimes conflicting. Health-care is one example, but the more likely evolution under unrelenting climate-action pressure will be towards fossil-fuel suppliers that work and are regulated as *utilities*. This path suggests very stringent national and local intervention in fuel sourcing, pricing, and provisioning, with allowance for cost recovery and a profit ceiling, even though the businesses are privately held. Many jurisdictions have already taken steps in this direction -- regarding fuel blending, for example. The step out for fossil-fuel companies will include a ceiling on investor returns, as in the regulated utility industry, through mechanisms such as a carbon tax that provide funds for the energy transition.

The challenge for oil and gas executives over the 2020 – 2040 timeframe will be to guide the business transformation to a utility model, which certainly isn't nationalization but is far more interventionist than ever before. The utility model may also be the most successful way for fossil-energy companies to survive their worst-case scenario -- the stranded asset situation in which oil and gas resources stay in the ground and cannot be monetized.

Technology Development and Transfer

The Paris Agreement recognizes technology development and transfer as critical to mitigating and adapting to climate change. This isn't a surprise, since technologies for production, storage, transport, and consumption are the foundation for sustaining any energy system, as well as transitioning to alternative(s). It's unlikely that typical development cycles and familiar technologies will be adequate to

⁶ The media depict fossil-energy companies as a bit befuddled at their prospects. See, for example, "Desperately seeking strategy, utilities lost in low-carbon world," *Reuters.com*, December 2, 2015, or "Nodding donkeys; oil companies and climate change," *The Economist*, December 14, 2015.

limit GHG emissions and temperature rise as called for in Paris. Decarbonization on the COP21 timeline to “well under” 2° C will require disruptive energy technologies, accelerated development/deployment cycles, or most dauntingly, both. The Paris Agreement does not take a position on this question, but does call on the Intergovernmental Panel on Climate Change (IPCC) for updated technical guidance by 2018. In any case, progress will be measured against an agreed-set of technology-dependent indicators, as in Table 2.

Sector	Indicator
Energy system	Energy and process-related GHG emissions (Gt CO ₂ -eq) Carbon intensity of primary energy supply (t CO ₂ /toe) Energy intensity of GDP (toe/\$1000)
Power	CO ₂ emissions per unit of electricity (g CO ₂ /kWh)
Transportation	CO ₂ emissions per vehicle-mile for new vehicles (g CO ₂ /v-mile) Carbon intensity of total transport fuel demand (t CO ₂ /toe)
Residential Buildings	Energy demand per dwelling (kWh/ dwelling)
Commercial Buildings	Energy intensity (MJ/ft ²)
toe = tonnes of oil equivalent	

Table 2. Technology-Dependent Indicators (*IEA WEO COP21 Special Briefing, 2015*)

The roster of potential alternatives to oil, gas, and coal as primary energy sources is very familiar, while the technical issues facing them range from energy density, power quality, reliability, storage, and transmission to end-use efficiency, and -- for nuclear in particular -- safety. Scalability and infrastructure construction/ modification pose a parallel set of engineering issues, as does carbon capture and storage (CCS). As noted above, financing the energy transition, including the requisite technologies, will not be insurmountable, since it is well within GDP capacity.

The track record for fossil-fuel suppliers has been rapid adoption at the ready-for-commercialization stage of the technology cycle, not fundamental research. Hydraulic fracturing, horizontal drilling, and facilities engineering in deep-ocean environments are the most prominent examples of this policy. Public financing through national laboratories, universities, and research institutes will continue to lead fundamental energy research, with significant -- perhaps decisive -- new funding from interests outside the fossil-fuel industry. The financial constraints described previously will reinforce the fast-adopter position, even in a higher oil-price environment. The dilemma for industry executives will be whether to

confine fast technology adoption to the deteriorating core fuel-supply business, move seriously into new spaces, or deploy technology in a hybrid business model.⁷

Regional Climate Action

In addition to investment and technology, the Paris Agreement will be implemented along the policy axis. The new development here is formal recognition that “cooperative action by and among subnational authorities” will be essential to climate-change mitigation and adaptation. The acknowledgement paves the way for increasingly vigorous action by regions, states, and cities under overall national and international direction. Many regions and cities already participate in climate-action coalitions with ambitious goals in renewable-energy supply, infrastructure modernization, energy efficiency, transport, demand reduction, and climate adaptation. California’s Senate Bill SB 350, for example, aims to fundamentally reconfigure the state’s transportation-energy market towards electrification by positioning electric utilities in direct competition with petroleum suppliers.⁸ Similarly the U.S. EPA’s Clean Power Plan, the “most significant greenhouse gas (GHG) policy ever undertaken in the United States,” sets a national GHG-reduction goal for existing fossil-fuel power plants, but leaves implementation to the states.⁹

While COP21 reinforces the role of regions and states in implementing climate policy, it will also accelerate devolution of authority and responsibility to cities and urban clusters. Cities, in particular, will be instrumental to meeting the $\leq 2^{\circ}$ C limit, since the IPCC estimates that urban areas account for 65% - 75% of global energy consumption, 70% - 75% of energy-related CO₂ emissions, and 40% - 50% of global GHG emissions.¹⁰

The impact of cities on climate change will inevitably increase over the century, given projected urban population growth of 2 - 3 billion people and consequent energy and land-use demands. Without GHG abatement, particularly in fast-growing cities in developing countries, the climate impact will be severely negative as urban energy consumption nearly triples by 2050.¹¹ However, given “bold and swift action

⁷ Oil majors tried to cover both the core business and alternative energy during the decade 2000 – 2010 through relatively small investments in renewables such as biomass. Few observers considered this a serious effort, and it had no impact on either company bottom lines or the growth of alternative energy.

⁸ California Senate SB 350, *Clean Energy and Pollution Reduction Act of 2015* (October 2015) requires the California Public Utilities Commission to solicit proposals from electric utilities for “multiyear programs and investments to accelerate widespread transportation electrification to reduce dependence on petroleum”.

⁹ J. Larsen, S. Laidlaw, *et al.*, “Assessing the Final Clean Power Plan: Emissions Outcomes,” Center for Strategic and International Studies, January 2016.

¹⁰ Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2014*.

¹¹ For example, 240 EJ in 2010 to 730 EJ in 2050, F. Creutzig, G. Baiocchi, *et al.*, “Global typology of urban energy use,” *pnas.org/cgi/doi/10.1073/pnas.1315545112*.

by city leaders, [which] may require new sources of finance and national policy support,” cities could move the GHG emissions trajectory closer to the 2° C ceiling (Figure 4).¹²

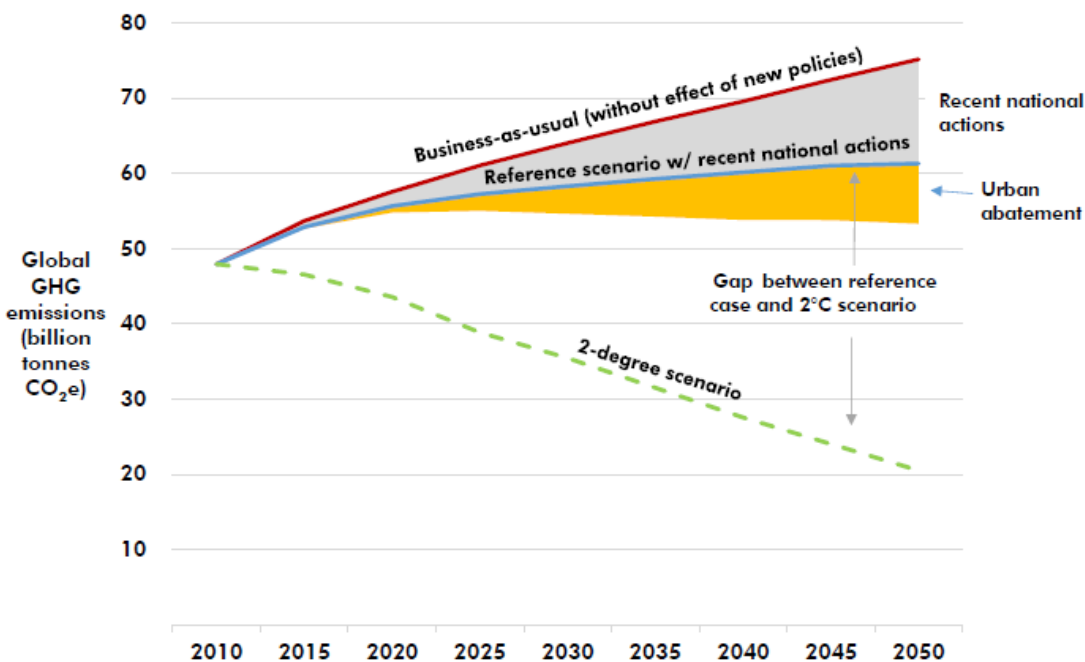


Figure 4. Potential Urban GHG Abatement (Erikson and Tempest, 2014). The Reference Case w/recent national actions includes COP21 INDC’s (Intended Nationally Determined Contributions).

COP21 will strongly reinforce the call by cities (e.g., Compact of Mayors, European Covenant of Mayors, C40 Climate Leadership Group, *et al*) for national governments to authorize and underwrite their leading role in climate-action policy, financing, and implementation. Such devolution of authority to cities means that energy businesses will be working with newly-and widely-empowered urban governments and coalitions. One of the first urban or regional demands will be for greater influence and control over locally appropriate energy sources, followed quickly by infrastructure demands and energy efficiency requirements. Oil and gas businesses will face emphatic, localized, and diverse energy agendas they’ve not seen before, representing hundreds of millions of urban dwellers.

Conclusion

The Paris Agreement will set its signatories on a course of historic climate actions. In the U.S., the Agreement will legitimize a national energy policy – based on climate peril, not security of supply. It will reinforce *de facto* actions in this direction such as the coal-leasing moratorium on federal lands, which some observers see as a “fundamental shift in how the federal government had begun to operate, by

¹² P. Erikson and K. Tempest, “Advancing climate ambition,” *Stockholm Environment Institute Working Paper 2014-06*.

curbing the supply of fossil fuels available for burning rather than just working to reduce overall demand".¹³ Within the context of U.S. securities law, the Agreement will require fossil-energy suppliers to be forthcoming about the potential impact of climate actions on their business.¹⁴ These developments are signposts that fossil-fuel suppliers will face an increasingly restrictive, if not hostile, business environment.¹⁵ Added to these prospects, the financial and regional implications of the Paris Agreement will force fossil-energy companies away from their familiar scale and autonomy towards a regional and urban energy-utility model attuned to locally appropriate energy use.

The bleak path ahead for U.S. coal companies need not be the one that oil and gas businesses will inevitably follow, albeit with a time delay. Avoiding a similar fate, however, will require strategic foresight that recognizes the Paris Agreement as an opportunity to identify and test the early steps to a new, energy-utility business model. The convergence of forces on oil and gas companies point in this direction -- away from defending business as usual and towards corporate transformation. Fossil-fuel suppliers remaining at mid-21st century won't become the local electric company, although they might absorb it -- but they will be managed and regulated like one.

¹³ "Obama Announces Moratorium on New Federal Coal Leases," *Washington Post*, January 15, 2016.

¹⁴ Michael Gerrard, "What the Paris Agreement Means Legally for Fossil Fuels," Columbia/SIPA Center on Global Energy Policy, *Paris COP21 Commentary*, Dec 18, 2015, <http://energypolicy.columbia.edu>.

¹⁵ See, for example, the comments of Kevin de Leon, President Pro Tem of the California Senate, *re* SB 350: "Ultimately, California is going to demand that an industry which represents most of the problem has an economic and moral duty to be part of the solution," *Bloomberg Businessweek*, Oct 15, 2015.