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In This Issue: **Corporate Finance Addresses Uncertainty**

Columbia Business School

Corporate Finance and Sustainability: the Case of the Electric Utility Industry

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The notion of economic and environmental sustainability enjoys broad public support. Yet, the substantial costs of making the transition toward a more sustainable energy economy raise important—and insufficiently investigated—questions about the use of investor capital. Given the timetable that advocates of change hope to meet, the speed of the transition would be historically unprecedented.[1] Previous shifts from one major energy source to another, such as wood to coal, occurred gradually over the span of many generations.[2] The required transition of a sector now of much greater size, and on which far more societal stability and safety depend, must proceed at a significantly faster rate and will require enormous amounts of capital. Deploying an additional worldwide solar capacity of 1 terawatt by 2030, for example, would require $1 trillion in investment and that would have to come largely from private sources.[3]

A fierce debate is underway about the potential role for electric utilities in such a transition. State utility regulatory commissions are grappling with connections between infrastructure design (e.g., centralized versus distributed energy generation), ownership (e.g., utility, customer, third-party, or some combination), and the features and capabilities of the modern electric grid (e.g., basic services versus "smart" homes). Unfortunately, there is some evidence that utilities might prefer to avoid the challenges of this transition.[4]

In this debate, it is important to remember that electric utility regulation was designed more than a century ago to allow utilities to raise large amounts of private capital to create large-scale developments in electric power infrastructure. Over this time, utility stocks have rewarded their investors on a risk-adjusted basis, even during the challenging 21st century financial market environment. The average annual total shareholder return from January 2000 to December 2017 for utility stocks was 7.3 percent; the average annual total return for stocks in the nine largest sectors of the economy as a whole was only 6.4 percent,[5] even though utility stocks were less volatile.[6]

While disruptive competition is a real risk to electric utilities, investors continue to see electric utility shares as good long-term investments. The pace of evolution in the electric industry has historically been slow; certainly in contrast to what transition advocates suggest is necessary to avoid significant impacts of climate change in the future. Most states in the U.S. still use cost-of-service (COS) regulation, which emerged in its current form in the 1940s. Under that model, utility executives have an incentive to make capital investments if the expected earned return is in excess of their required return.[7] But this incentive might not be consistent with a long-run sustainable electric utility future and will largely depend on the type of assets developed with that capital.

While traditional COS regulation is still standard practice, a few pioneering commissions have made, or are looking to make, fundamental changes to the way they regulate utilities.

Although fossil fuels are still used to generate at least 50 percent of the electricity sold to ultimate consumers, cleaner energy sources (e.g., wind generators, large-scale solar plants) have recently become the cheapest way to generate power. Industry analysts forecast continued decline in the costs of developing and operating renewable energy projects over the next decade and beyond.[8]

1. Janos Pasztor, "The Need for Governance of Climate Geoengineering," *Ethics & International Affairs*, 31(4) 419-430; 2017.

2. James Meadowcroft, "What about the Politics? Sustainable Development, Transition Management, and Long Term Energy Transitions," *Policy Sciences*, November 2009, 42:323; 2; Arnulf Grubler, "Energy Transitions Research: Insights and Cautionary Tales," *Energy Policy* 50: 8–16, 2012.

3 SustainableBusiness.com. International Solar Alliance to Mobilize $1 Trillion, April 28, 2016.

4. Elisabeth Graffy and Steve Kihm, "Does Disruptive Competition Mean a Death Spiral for Energy Utilities?" *Energy Law Journal* 35(1), 2014.

5. Based on average annual total returns (dividends and capital gains) for the following SPDR Select Sector portfolios: Consumer Discretionary (XLY) 7.9%; Consumer Staples (XLP) 7.5%; Energy (XLE) 7.5%; Financial (XLF) 4.1%; Health Care (XLV) 7.1%; Industrial (XLI) 7.2%; Materials (XLB) 7.1%; Technology (XLK) 2.2%; and Utility (XLU) 7.3%. Source: Authors' calculations based on data from the Center for Research in Security Prices.

6. Standard deviations are: Consumer Discretionary (XLY) 17.9%; Consumer Staples (XLP) 11.6%; Energy (XLE) 21.3%; Financial (XLF) 21.3%; Health Care (XLV) 13.7%; Industrial (XLI) 18.0%; Materials (XLB) 20.6%; Technology (XLK) 23.6%; and Utility (XLU) 14.9%. Source: Authors' calculations based on data from the Center for Research in Security Prices.

7. If the return utilities earn just equals the return investors require, adding a plant creates zero net present value and therefore does not lead to higher stock prices. If the return lies below investor requirement, net present value is negative and adding a plant then leads to lower stock prices.

8. IRENA (2018), *Renewable Power Generation Costs in 2017*, International Renewable Energy Agency, Abu Dhabi.

Corporate Finance to the Rescue?

The good news is there is a way to accelerate large-scale sustainable energy transitions while creating shareholder value, but it depends on a somewhat different form of utility regulation. Choosing the investment incentives that align the goals of policymakers and shareholder-focused utility executives involves four key insights from corporate finance:

1. In competitive financial markets, investors price the stocks of all companies facing similar risk so as to produce the same expected return to investors, regardless of the corporate return (e.g., return on equity or ROE) that the individual firms will earn when they invest that capital.

2. This is true of utilities that have earned relatively low rates of return on old assets, as well as utilities who have earned relatively high returns. If the return the utility can earn exceeds the return that new investors require, executives will have an incentive to raise capital from these new investors, implicitly "paying" them the required return at the time of stock issuance. The value of any extra return above the required return inures to the benefit of the existing shareholders, not new investors, in the form of a capital gain.[9]

3. Investment in a utility asset that produces the most shareholder value is not necessarily the one that earns the highest rate of return, has the least risk, or has the largest scale. It is the joint interaction of those three key drivers which determine utility stock prices. With that understanding, shareholder-focused executives and regulators could better identify and create incentives for utilities to invest capital in sustainable resources.[10]

4. Corporate finance principles also invite utility stock valuation models into the policy discussion, something currently missing. Without such models, it is virtually impossible to determine how proposed policy changes may benefit investor-owned electric utilities.

With these four corporate finance insights in mind, we present a conceptual model of shareholder value to illustrate the incentives with one regulatory reform already substantially implemented (in New York) and one that is still under development (in Minnesota). The corporate finance insights help us understand how reform initiatives affect incentives to create shareholder value and how uncertainty can also cloud that assessment.

A Conceptual Framework

To address the reliability and energy needs of their customers, shareholder-focused utility executives must determine whether their shareholders are better served by investing capital in either a new coal-fired power plant, a combined cycle gas plant, a utility-scale solar or wind farm, or none of the above, conditioned by three elements: (1) the return on equity the utility can expect to make on each project (i.e., the corporate return); (2) the investors' required return on equity capital for each project (i.e., what investors expect to make on the stock if they are to buy it); and (3) the size of the investment. The following simple equation is a form of the well-established economic value added (EVA) model[11] that can assist with policy analysis:

$$V=(r-k)I,$$

where V is the annual incremental shareholder value created, r is the return on equity or ROE the utility can statistically expect to earn on the project, k is the return investors require if they are to invest in the stock (could also vary from project to project, depending on systematic risk differences), and I is the scale of the project (measured in dollars that will also vary from project to project). Any incremental increase in V translates into higher stock prices.

If regulators wish more investment in clean, sustainable resources rather than fossil-fuel-based sources, then they can provide incentives so that utility managers act accordingly. As the formula shows, it is the *difference* between the corporate return (r) and the investors' required return (k), not r alone, that determines the economic value of similarly scaled utility investment projects. If the two returns are equal, there is no incentive to invest, no matter how large the investment scale is. Nevertheless, even a small positive difference between r and k can be determinative if the scale (I) is large enough. In other words, large-scale investments in a project with a modest (r - k) gap could produce more value for investors than smaller projects, even if the (r - k) gap is relatively greater in the latter case. Because this value proposition holds, regardless of the type of project, regulatory guidance must take such comparisons into account.

An Analytical Example

The example of a publicly traded electric utility, Portland General Electric (symbol POR), shows why the main policy tool that regulators have historically focused on (the authorized ROE) might not be sufficient to create an incentive for utilities to invest more in clean generation. Using POR's current stock price and projections from *The Value Line Investment Survey*, the standard dividend discount valuation model suggests that the return expected by investors in investments of similar risk to POR is only 7.9 percent (see Appendix A), but that Value Line expects that the utility will actually generate 9.5 percent returns on equity for the utility, which is higher than the investor required return. Therefore,

9. Stewart Myers, "The Application of Finance Theory to Public Utility Rate Cases," *Bell Journal of Economic and Management Science*, 3: 58-97, p. 80, 1972.

10. Given the space limitations for this article, we do not consider the problems raised by potential principal-agent conflicts, ones in which managers pursue agendas based on their own self-interest rather than protecting shareholder interests. For example, growth by acquisition is rarely a winning proposition for the shareholders of the acquiring firm, but it does tend to produce higher salaries and greater prestige for CEOs. Several major utilities have adopted acquisition strategies. Incorporating agency theory into this framework would enhance its analytical precision.

11. *The Stern Stewart Performance 1000 Database Package: Introduction and Documentation*, New York: Stern Stewart Management Services, 1993.

increasing capital investment should lift POR's stock price; decreasing capital investment should lower it.[12] We explore a "base case with innovation scenario" in which the regulator restricts new capital investment to a level only required to maintain the existing system. Any facilities necessary to serve new load or to provide new services will be provided by third parties, using the renewable distributed energy resource (DER) option.[13]

The valuation model suggests that POR's stock price will decline upon announcement of the new policy, falling by 11.7 percent. Note that even though the return on equity (r) is unchanged, if r exceeds k, any movement to a renewable path that lowers utility capital investment from planned levels will reduce shareholder value, potentially resulting in a lack of support from shareholder-focused utility executives. One could propose increasing the utility's return (r) as compensation for slower capital growth. Yet, increasing the return on equity to 10.0 percent when moving to the slower-growth path will still leave POR's stock price 5.8 percent lower than it was before the new policy was announced. POR's shareholder-focused executives would therefore prefer the original higher-growth scenario because even though the utility earns a lower return on equity under the original scenario, it sees a higher stock price. The return on equity must rise to 10.5 percent to make the utility indifferent between the two scenarios.

The model can also be used in analyzing risk impacts. If reducing capital expenditures lowers the utility's future risk, the model can show the impact. Constructing new assets is typically riskier than operating existing ones so investors then might require a slightly lower return on POR stock (k = 7.5 percent). Holding the return on equity at 9.5 percent, the model shows that this mitigates some of the lost investment opportunity, but doesn't eliminate all of it. POR's stock price is still 5.2 percent lower than it was before the new policy was announced.

In response, the utility could suggest a willingness to support the low-growth path if regulators: (1) set r at 10.2 percent; and (2) provide some additional cost recovery guarantees, further reducing risk, and lowering the investors' required return to 7.2 percent. The model suggests that this combination would push POR's stock price to a level that is 9.7 percent *higher* than the original price. The valuation model informs which components to change and by how much to create a positive value proposition for shareholders.

Regulatory Policies Through a Corporate Finance Lens

The corporate finance principles discussed earlier can help regulators create incentives to invest capital in particular types of energy resources or infrastructural designs. We look at significant initiatives currently underway in New York and in Minnesota to show how the corporate finance concepts apply to the reforms being envisioned and/or implemented.

Regulatory Reform in New York

New York's "Reforming the Energy Vision" (REV) initiative seeks to change an electric utility from a wires and delivery entity to a platform provider with a consumer-centered approach that looks very different from the utility of just ten years ago.[14]

Given the decisions the New York Public Service Commission (NYPSC) has already made, it appears that REV creates an opportunity for utility stock prices to rise. In New York over the next 3-5 years: (1) investment scale is likely to be larger; (2) risk is likely to be lower; and (3) utility returns are likely to be higher. What the longer term end-state of REV eventually looks like is very unclear. Because most of the value in utility stocks comes from cash flows farther in the future, expectations about the end-state can have a significant impact on the stock prices of New York's investor-owned utilities.

The transformation of the electric utility from the traditional wires-only model to the platform model will require substantial investment in new infrastructure. For example, the NYPSC is allowing Consolidated Edison, the state's largest utility, to spend up to about $1 billion on advanced metering infrastructure (AMI) necessary for its new role as a distribution system platform.[15] As such, the increased investment scale, coupled with a return on equity greater than the investors' required return, will tend to increase investor-owned utility stock prices in New York.

REV also encourages the private sector to assume responsibilities that used to be the sole responsibility of the utility. For example, the NYPSC required each of the state's investor-owned utilities to identify investment opportunities such as in micro-grids that would maintain reliability, resiliency, and provide other grid services but at lower cost to utility ratepayers.[16] But because this would reduce the utility's investment in assets yielding more than the cost of capital, this would tend to reduce New York utility stock prices.

The NYPSC is hoping to see consumers invest more in distributed energy resources, in place of costly infrastructure investments just discussed. Utilities will enable opportuni-

12. See Appendix A for the valuation model analysis and scenario results calculations.

13. Reducing investment scale is not the only approach that regulators could take to promote a transition towards a more sustainable future. We simply present this as a single example, among many approaches that could be taken.

14. NYPSC (2015) *Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision: Order Adopting Regulatory Policy Framework and Implementation Plans*, State of New York Public Service Commission, Case 14-M-0101, Issued February 26, 2015.

15. NYPSC (2017) *Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Consolidated Edison Company of New York, Inc. for Electric Service: Order Approving Advanced Metering Infrastructure Business Plan Subject to Conditions*, State of New York Public Service Commission, Case 15-E-0050, Issued March 17, 2016.

16. NYPSC (2015) *Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision: Order Adopting Regulatory Policy Framework and Implementation Plans*, State of New York Public Service Commission, Case 14-M-0101, Issued February 26, 2015.

ties for third-parties to create DERs (e.g., rooftop solar and micro-grids), but the utilities will generally not be competing in such markets.[17] Because the utility would be selling less electricity, this could adversely affect authorized returns.[18] Then again, recent reductions in the prices paid for excess electricity production from DERs could result in lower future third-party DER investment, which would have the opposite effect.[19]

The NYPSC has also begun regulatory reforms that are likely to improve New York utilities' returns.[20] A series of metrics have been defined to reward the utility for better engagement, system efficiency improvements, and DER deployment. The NYPSC also sees new business opportunities for the state's utilities, known as Platform Service Revenues (PSR), with the potential to increase returns (*r*).

Although the NYPSC did not explicitly apply the corporate finance principles described above, our model has shown that REV reforms may better align shareholder-focused executives at electric utilities with a more sustainable electric industry in New York.

Regulatory Reform in Minnesota

Minnesota supports change in the electric industry both through the formation of a collaborative (i.e., the e21 initiative)[21] and, more recently, by opening a regulatory investigation within the Minnesota Public Utility Commission (MNPUC).[22] Minnesota's utility regulatory models focus on transitioning towards performance-based ratemaking (PBR) while maintaining existing electric utility roles and responsibilities. This regulatory model attempts to regulate and compensate utilities based on their ability to meet pre-defined performance metrics while also providing more revenue certainty through multi-year rate plans (MRPs).[23] The issue is how this change in regulatory policy would affect utility risk, return, and scale, and ultimately, shareholder value.

Incremental capital investment in the utilities' distribution networks that earn rates of return higher than the cost of capital will create shareholder value. If, however, the amount of capital involved is relatively small, the shareholder value increase will also likely be small. For example, Xcel Energy proposed investments in metering infrastructure and data management systems to modernize its grid, though the scale of the proposal was quite modest at about $40 million and representing less than 1 percent of its total rate base on an annual basis.[24] Recall that we must look at the manner in which proposals affect r, k, and I. Here the small scale is a noticeable characteristic, potentially limiting shareholder value even though the relationship between r and k is favorable.

If the e21 initiative encourages Minnesota utilities to promote broader adoption of DERs to defer or avoid future capital investments in generation, transmission, and/or distribution assets (similar to what is being implemented in New York), the utilities may see a negative impact on investment scale. Again, if the utility return exceeds the return required by investors, this should put downward pressure on shareholder value. However, it may be possible for Minnesota electric utilities to make broader capital investments (e.g., distribution automation, sensing technologies, etc.) to support efforts to manage the desired large additions of distributed energy resources. On net, it is not clear if total investment scale will increase or decrease in the medium- to long-term under these reforms.

Unlike New York, the changes under consideration in Minnesota do not suggest a change in utilities' vertically integrated roles, in which they provide the entire spectrum of activities from power generation through transmission and distribution to end users. Increased competition from third-party energy service providers is also not currently under consideration. Under e21, Minnesota utilities retain a broad array of assets and the potential for new capital-intensive projects such as grid-scale renewable generation assets.

There is, however, another change underway in Minnesota's regulatory framework. Minnesota is transitioning to PBR and may increase future (e.g., 3 to 5 years) rates by indexing them to measures of inflation and productivity. The e21 initiative also encourages utilities to make more money from performance incentives and new products and services rather than just authorized return on utility investment under the current COS model. Figure 1 shows the e21 initiative's continuum of reform shifting earnings.

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17. The NYPSC identified a few exceptions to this position. In particular, where markets are failing to adequately develop, then the public interest may warrant utility investment to support such development. See NYPSC (2015) *Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision: Order Adopting Regulatory Policy Framework and Implementation Plans*, State of New York Public Service Commission, Case 14-M-0101, Issued February 26, 2015.

18. All investor-owned utilities in New York charge residential and smaller commercial customers with solar PV systems based on the amount of electricity (kWh) they consume in a billing cycle. Consolidated Edison is piloting a different rate design that charges consumers a lower rate for the electricity (kWh) but adds a new charge for the maximum demand of electricity (kW) during the billing cycle. See Consolidated Edison (2016) *Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision: Advanced Metering Infrastructure Customer Engagement Plan*, State of New York Public Service Commission, Case 14-M-0101, Filing on July 29, 2016.

19. Excess compensation reform in New York resulted in a movement away from the traditional full-retail rate, that has been an integral part of NY and other states' net-energy metering policies, to a system based on a stack of different value streams which will inherently be worth less than the system it replaces. See NYPSC (2017) *In the Matter of Value of Distributed Energy Resources: Order on Net Energy Metering Transition, Phase One of Value of Distributed Energy Resources, and Related Matters*, State of New York Public Service Commission, Case 15-E-0751, Issued March 9, 2017.

20. NYPSC (2016) *Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision: Order Adopting a Ratemaking and Utility Revenue Model Policy Framework*, State of New York Public Service Commission, Case 14-M-0101, Order Issued and Effective May 19, 2016.

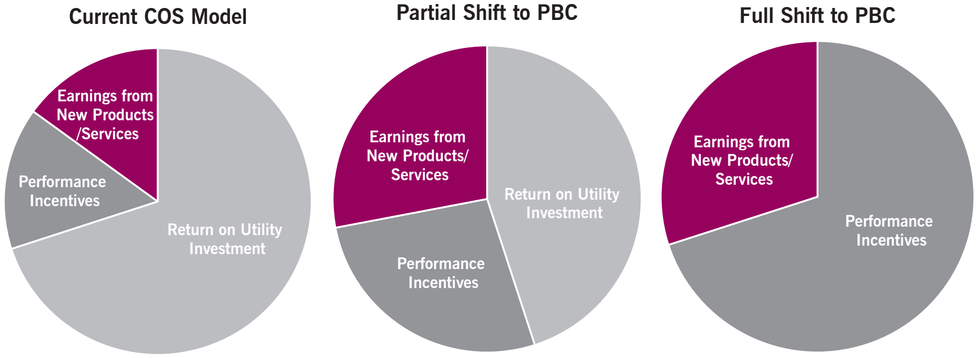
21. Minnesota's e21 initiative was launched in 2014 and was a collaborative outside the adjudicated regulatory process to develop recommendations on changes to Minnesota's regulatory model, among other issues.

22. MN PUC (2017). Notice of Comment Period. *In the Matter of a Commission Investigation to Identify and Develop Performance Metrics and, Potentially, Incentives, for Xcel Energy's Electric Utility Operations*. Docket 17-401. September 22.

23. Mark Lowry and Tim Woolf, "Performance-Based Regulation in a High Distributed Energy Resources Future" *Future Electric Utility Regulation*, Lawrence Berkeley National Laboratory, Berkeley, CA. January. Report No. 3, 2016.

24. Xcel Energy, "Grid Modernization Report," *In the Matter of the 2015 Minnesota Biennial Transmission and Distribution Projects Report,* Docket 15-962; October 30, 2015.

Figure 1 **Potential transition in regulatory mechanism in Minnesota**



The Minnesota *r* in our model would come from a variety of sources including existing assets, new utility investment plus new non-traditional revenue sources. Shifts in the sources of utility earnings could have profound impacts on utility stock prices.

Performance incentives compensate the utility for meeting goals that may imply greater scale, risk, and returns for utility shareholders. For example, performance incentives for driving electric vehicle (EV) adoption may include incremental capital investments in EV charging infrastructure (i.e., increase in *I*) and would directly provide additional earnings (*V*). On the other hand, more explicitly tying utility earnings to goals may result in less predictability in utility earnings, which could increase *k* if that risk is systematic. Likewise, a larger share of earnings from new products and services (i.e., contributing to *V*) might also lead to greater variability in utility earnings, which could result in higher systematic risk (*k*).

The net effect of Minnesota's e21 reforms on changes in *I* and changes in the difference between *r* and *k* will dictate the pace of transition to a more sustainable energy future as the MNPUC envisions. The transformation in Minnesota is at the very early stages with many details yet to be worked out and so the impact on utility shareholder value is more difficult to determine than in New York.

Conclusion

If electric utilities are to help accelerate or even lead energy system transitions, incentive-oriented policies and redesigned regulations must nevertheless continue to maintain critical public services while balancing environmental sustainability with economic sustainability. Corporate finance principles can provide guidance for designing effective policies that permit consideration of all three goals.

We showed that all three elements of our conceptual model (i.e., risk, return, and scale) require attention by regulators and policymakers in order to create value for shareholders. As the case studies illustrate, applying our conceptual model to existing regulatory and utility business model initiatives illustrates how state policies and regulatory decisions can create powerful incentives for shareholder-focused utility executives to support such transitions.

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Appendix A
Valuation Model Analysis

$$P = \frac{BVPS(r)(1-b)}{k-b(r)}$$

Where P = estimated per-share stock price; $BVPS$ = book value per share; r = return on equity; b = earnings retention ratio; and k = investors' required return. To find k given all other inputs, we transform the model as follows:

$$k = \frac{BVPS(r)(1-b)}{P} + b(r) = \frac{\$27.25(0.095)(1-0.45)}{\$39.18} + 0.45(0.095) = 0.079$$

The initial model for policy analysis is therefore:

$$P = \frac{\$27.25(0.095)(1-0.45)}{0.079-0.45(0.095)} = \$39.18$$

Scenario results are shown in the table. Note b is adjusted using the formula $b = 0.02 / r$ to maintain a 2.0 percent long-run growth rate in all but the base case.

Table 1 **Scenario results**

Capital Growth	Compensating Adjustment	*BVPS*	*r*	*b*	*k*	*P*	Change in *P* Compared to Base Case
base case (4.3%)	---	$27.25	9.5%	45.0%	7.9%	$39.18	---
reduced (2.0%)	---	$27.25	9.5%	21.1%	7.9%	$34.59	-11.7%
reduced (2.0%)	raise *r* to 10.0%	$27.25	10.0%	20.0%	7.9%	$36.89	-5.8%
reduced (2.0%)	raise *r* to 10.5%	$27.25	10.5%	19.1%	7.9%	$39.18	---
reduced (2.0%)	lower *k* to 7.5%	$27.25	9.5%	21.1%	7.5%	$37.16	-5.2%
reduced (2.0%)	raise *r* to 10.2% lower *k* to 7.2%	$27.25	10.2%	19.6%	7.2%	$42.97	+9.7%

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