**"We Need It All": Lessons from California**

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By any account, accommodating climate change initiatives, implementing state and/or federal renewable energy standards, and transitioning to a clean energy economy will require a fundamental restructuring of the electric power industry.

At the forefront of the transition to a clean energy, low carbon emission economy, California presents an interesting case study in how states will implement renewable energy and carbon emission policies. The challenges facing California today are likely to be repeated throughout the country.

**Milbank** partner **Edwin F. Feo** and associate attorney **Henry T. Scott** look at the situation in California and consider what lessons can be learnt for the renewables sector in the US and beyond.

Current California law requires Californians to reduce carbon dioxide emissions to 1990 levels and procure a third of generation from renewable resources. Experts agree: meeting California's policy objectives and legislative requirements will require thousands of additional megawatts of renewable generation and many more miles of additional transmission lines, in addition to healthy investment in energy efficiency programs, conservation measures, and smart grid technologies. A wide range of investments in energy infrastructure is required to facilitate the Golden State's realization of its green energy goals.

As California plans to achieve its ambitious energy goals, special interest groups have unfairly characterized the debate surrounding the future of the electricity sector as a choice between local, distributed renewables and conservation, on the one hand, and transmission investment and large-scale renewables on the other. Advocates of the distributed generation alone approach often have as their primary interest a desire to prevent the development of new transmission lines or large-scale generation facilities. Indeed, the rallying cry of the new NIMBYists who oppose "green" transmission lines is to build local renewable resources instead of more distantly located renewables. Opponents of new transmission lines have slowed San Diego Gas & Electric's 150-mile Sunrise Powerlink Transmission Project, and may have halted the development of Los Angeles Department of Water & Power's Green Path North transmission project.

On the other side of the debate, a preference for building large energy infrastructure facilities is engrained in many sectors of the electric power industry. Indeed, utilities tend to have a natural preference for the economies of scale associated with large-scale generating facilities, which they view as easier to plan and manage, and are more consistent with the traditional, centralized generation and dispatch model with which they are familiar. A 500 megawatt, readily dispatchable concentrated solar power plant shares many characteristics with a traditional fossil fuel-fired power plant. The vendors of equipment of large scale facilities-whether gas-fired or wind generated-share an economic interest in the central power station model.

In reality, this "choice" is really a false dichotomy. The adoption of distributed generation projects in concert with the deployment of large renewable generation projects and transmission upgrades yields synergistic benefits. Rooftop solar projects complement, rather than replace, the need for utility-scale wind projects because of natural variances in solar and wind resource profiles. During the hottest afternoon hours, solar generation reaches its daily apogee whereas wind production may tend to peak in the morning and evening hours, when solar energy production is lower.

Likewise, investments in transmission and distribution upgrades facilitate a "smarter" grid by enabling operators to leverage meteorological data to better match electricity demand with available renewable resources. Improved energy efficiency and conservation efforts shave peak demand, and thereby reduce the need for marginal, higher-priced peaking units. Because renewable resources have no fuel costs, almost without exception, renewable resources bid into day-ahead electricity markets at the bottom of the supply curve. This, too, helps with the "greening" of the electricity supply.

While widespread adoption of distributed solar projects should reduce the need for some grid investments, issues associated with the predictability of power output and reliability suggest that distributed generation projects must be accompanied with investments in large-scale renewable power projects and additional investments in the electric grid. First, additional transmission and distribution build-out reduces reliability risk, by permitting end-users to draw upon a broader base of intermittent resources. Second, an overreliance on distributed solar projects would put severe pressure on peaking power units, and may result in congestion in existing transmission and distribution networks. While energy storage technologies may mitigate this issue, such technologies are yet to be demonstrated on a commercial scale. At the same time, long-range plans must model uncertainty to account for additional contributions from distributed generations systems in out years.

In addition to ignoring the synergistic benefits associated with a more balanced approach, the either-or fallacy ignores the extent of change required to achieve the widely held policy objectives of energy independence, significant reductions carbon dioxide and greenhouse gas emissions, resource diversity, and improved electric system reliability. Recent studies confirm that achieving these important policy objectives will require a coordinated, multi-faceted approach along several lines of attack.

The degree of required investment is staggering. For example, the California Public Utilities Commission (CPUC) estimates that achieving 33 per cent renewable electricity by 2020 will require 13,000 megawatts of additional dependable renewable capacity and seven additional major transmission lines at a cost of US$12 billion. Even in a low load reference case that assumes aggressive conservation policies, the CPUC estimates that the California will need 11,352 megawatts of additional dependable renewable capacity by 2020.

The integration of renewable resources into the electric grid will require substantial improvements to the transmission grid, and significant investment in new and upgraded transmission lines, even under a high distributed generation case. This is partly the case because of the retirement of aging fossil-fueled generators and also reflects the fact that transmission lines were not originally constructed to draw power from renewable rich resource areas. Notably, the CPUC estimates that an all-gas scenario is only marginally (10.2 per cent) more expensive than 33 per cent renewables.

As of August 2009, 108 projects clustered in twelve geographic areas representing 39,000MW of capacity, 31,455MW of which is renewable, wait on the California Independent System Operator (CAISO) queue. The estimated network upgrade costs per project vary markedly. While 4,000MW worth of renewable energy projects have network upgrade costs of less than US$20 million each, four large-scale renewable energy projects representing nearly 2,000MW of capacity have network upgrade costs in excess of US$500 million each. The situation at the CAISO queue is likely to be repeated throughout the country as utilities and transmission system operators struggle to meet renewable energy standards and transition to low-carbon generation mix.

Moreover, the size and composition of the CAISO queue underscores the need for system-wide planning to ensure efficient investment as well the scope of investment required. California's Renewable Energy Transmission Initiative (RETI), an effort by a diverse group of stakeholders including utilities, environmental groups, and governmental officials, to identify the most cost-efficient transmission corridors with the least environmental impact, presents a model that is already being replicated at the regional level by the Western Regional Governor's Association and may soon be replicated by the federal government.

While California is uniquely situated with an enviable and diverse renewable resource base, California's struggle to meet its renewable energy goals nonetheless serves as a reminder that the scope of change will require a comprehensive strategy that shaves peak demand, incorporates distributed solar, integrates additional large-scale renewable resources, and expands transmission access to renewable rich resource areas.

Implementing renewable energy and carbon emissions policies will require creative thinking, technologies and policies. Increased reliance on intermittent renewable resources shifts the dispatch paradigm from a centrally controlled model to one that calls for technically agile networks capable of providing real-time systems solutions. Upgraded, "smart" transmission and distributions systems will be at the center of a transformed electric sector. Evolving technologies and rapidly changing market conditions suggest that policymakers should take a flexible approach, while still engaging in the long-term planning required to make required large-scale infrastructure investments.

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