POWER & RENEWABLES

SOLVING THE WORLD'S COMPLEX
POWER & RENEWABLES CHALLENGES

NATHAN

Understanding and Shaping the Global Power and Renewables Transformation

Electric power is centrally important to the global economy and is widely regarded as a key driver of societal development and human welfare. Electric power is also in the midst of a phenomenal transformation with technological revolutions in renewable generation, distributed resources, battery storage, transport electrification, shale gas for power and more.

FOCUS AREAS

This transformation represents both a challenge and an opportunity for market participants.

- **Market Design.** Policymakers, regulators, suppliers, consumers, and other stakeholders need to assess and guide the fundamental design of wholesale and retail electric power markets to reflect the reality of new technologies. What services are provided? Who provides them? What are the costs and who bears them? What prices are paid and who pays them?

- **System Planning.** Grid administrators, regulators, and utilities must optimize the planning and operation of the power network that incorporates new technologies. Centralized and distributed generation. Transmission and distribution assets. Customer-side assets such as rooftop solar. Battery, hydro and other storage. Advanced metering. Remote sensing and big data. AI-based forecasting.

- **Project Development.** Project sponsors, as well as equity and debt investors, must evaluate and appropriately support investments to generate, transmit, distribute, store and consume power with new technologies. Utility-scale wind and solar. Centralized, distributed and behind-the-meter storage. LNG to power. Long-distance transmission facilities. Smart meters. Electric fleet charging stations.

Nathan is a trusted advisor for both public and private organizations seeking to understand and shape this transformation. We have unmatched experience across the globe facilitating market reforms and improving performance, guiding infrastructure investment and operation, and providing technical, economic and financial project support. In this work, Nathan combines deep technical knowledge of the power and renewables industry, broad qualifications across a range of key analytical and organizational disciplines, and a commitment to helping our clients affect meaningful positive change.

Nathan has a proven record of work with government ministries, regulatory agencies, regional authorities, multilateral financial institutions, investment banks, private investors, project developers, and asset owners. We are deservedly respected for our ability to assemble world-class multidisciplinary teams and manage large complex projects under challenging conditions. Few organizations have our history of success in locations as diverse as California, El Salvador, Manitoba, Moldova, Papua New Guinea, and Senegal.

MARKET DESIGN

E-mobility, the electrification of the land, sea and even air transportation, is a dramatic, emerging global trend. Nathan worked with a major seaport on shore power – the use by ships in dock of onshore electricity rather than their own onboard generators. With shore power, the port becomes the maritime equivalent of an EV charging station, and typical rate designs for commercial/industrial customers with high fixed and demand charges can cause serious economic problems. Nathan analyzed different rates as well as changes in port facilities and operations using a detailed simulation of the port's business over multiple years. This analysis is serving as the basis of negotiations with the local utility and regulator for a special shore power rate.

Traditional utility business models from the era of central generation are ill-suited to the new world of distributed generation. Nathan worked for a multilateral bank on business models for distributed commercial and industrial solar. Our team of technical, economic and regulatory experts identified a range of business models, analyzed them from the different perspectives of the country, the utility and the different types of customers, identified the most promising models, and then developed recommendations to increase their adoption.

SYSTEM PLANNING

Energy access will increasingly rely more on off-grid and micro-grid development than the usual integrated generation and transmission system. Nathan experts were retained by a multilateral bank to develop a country-wide roadmap for electrification that included off-grid, micro-grid, and grid extension modalities. We developed a GIS of the existing infrastructure, and analyzed data on the supply of, and need for, electricity. We then determined the locations that would be best served by each modality, the impacts of improved energy access, and the investment required to "kick start" this effort. Our work is being used to guide ongoing energy access efforts.

While distributed resources are increasingly important, the generation and transmission network remains absolutely critical. Nathan experts were retained by a large utility as advisors on an ambitious plan involving billions of dollars in hydro generation and cross-border transmission. Nathan experts worked with utility planners and executives on the development of economic, financial, technological, and regulatory scenarios, the design of alternative resource plans, the modeling, data and analysis of these plans, and the documentation used to communicate recommendations and their rationale. Our work contributed to a comprehensive and rigorous regulatory filing, and development is underway.

PROJECT DEVELOPMENT

Wind and solar development are increasingly being combined with battery storage in what is called "hybrid" development. Nathan was retained by a major independent power producer with plans for a large wind/battery hybrid development. Working with other team members, we conducted an in-depth analysis of the development economics, assessed the impact on the local utility customers, and evaluated the terms and conditions of a potential power purchase agreement. Key issues included investments needed to maintain grid stability, future prospects for fossil and renewable generation, and the avoided cost of the development's capacity and energy contribution. The analysis is being used to finalize the design and financial agreements for the development.

In a world of intermittent generation, hydro investment and operation is becoming even more important. Nathan was retained to conduct technical, economic, environmental and financial due diligence on a large hydro and transmission development. Our work focused on an independent evaluation of the concession permit, production forecast, milestones, performance guarantees, revenues and expenses of the project, based on analysis of the market environment and the construction, operation, compliance, insurance, and commercial plans. Based on our analysis, the project successfully issued a highly-rated public senior secured bond and construction was completed. The plant has since been operating successfully.

PROVEN RESULTS

Speaking of work by Nathan experts, a power industry CEO noted that our "analysis revealed the pros and cons of alternative plans much more clearly than before. The default plan turned out to be among the least preferred - expensive and risky. And a previously-controversial plan turned out to be preferred – the most cost-effective and least risky. We and our Board enthusiastically adopted this preferred plan. In hindsight, this saved our customers millions of dollars."

WHY NATHAN?

- Unmatched global experience
- Deep technical knowledge
- Broad analytical and organizational qualifications
- Proven ability to assemble teams and manage projects
- History of success providing meaningful positive results

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ABOUT NATHAN

Nathan is a private international economic and analytics consulting firm that works with government and commercial clients around the globe to deliver practical solutions and achieve lasting results. Whether building frameworks for economic growth or navigating regulatory hurdles, securing infrastructure financing or evaluating and assessing disputes, Nathan's experts serve as trusted partners, offering clients the analysis, technical advice, and strategies they need for sound decision-making. Known for both technical and service excellence, Nathan has corporate offices in the US, UK, and India and more than 40 program offices around the world. More information about Nathan can be found at nathaninc.com

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