

# GABE KWOK

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*Energy consultant with expertise in energy planning, wholesale electricity markets, asset evaluation and economic analysis.*

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## PROFESSIONAL EXPERIENCE


### EVOLVED ENERGY RESEARCH, PORTLAND, OR

Principal, March 2016– Present

- For Portland General Electric, led assessment of economy-wide pathways to deep decarbonization in PGE's service area.
- For Hydro-Québec, developed a roadmap for the Northeast United States to achieve their GHG emission reduction goals and assessed the potential cost savings of shared infrastructure with Québec.
- For the developer of a pumped storage project, assessed the role of the project in a least-cost resource plan for the Pacific Northwest across a range of future policy and technology pricing futures.
- For the Clean Energy Transition Institute, evaluated pathways to deep decarbonization for the Northwest.
- For the Risky Business Project, analyzed the scale of economic opportunities and infrastructure requirements associated with developing a clean energy economy in the United States. Technical analysis used as the foundation for the report *From Risk To Return: Investing in a Clean Energy Economy*.
- For the State of Washington Office of the Governor and Office of Financial Management, designed and evaluated technology pathways to reduce the state's GHG emissions to 80 percent below 1990 levels by 2050. Analysis used by state agencies to support new GHG limits and identify policies and investments to meet mid-century climate goals.
- For the Energy Foundation, analyzed the contribution of mitigation strategies in reducing U.S. transportation CO<sub>2</sub> emissions through 2050 under deep decarbonization. Used index decomposition analysis to estimate the impacts of electrification, energy efficiency, biofuels and smart growth.
- For the New York State Energy Research and Development Authority (NYSERDA), assessed pathways consistent with the state's 40 percent by 2030 and 80 percent by 2050 GHG emissions reduction goals.

### ENERGY AND ENVIRONMENTAL ECONOMICS, INC., SAN FRANCISCO, CA

Senior Consultant, September 2011 – December 2015

- For PacifiCorp and CAISO, co-authored report detailing the economic benefits of developing a regional energy market.
  - For California's five largest electric utilities, assessed the utility cost and greenhouse gas impacts of increasing the state's then 33% renewables portfolio standard (RPS) to 50%.
  - For the California Public Utilities Commission (CPUC), co-developed the RPS Calculator, a tool which produces renewable resource portfolios to meet California's RPS targets. Modeling outputs are used in the CPUC's Long-Term Procurement Planning proceeding and the CAISO's Transmission Planning Process.
  - For the CPUC, led review of modeling approaches to evaluate the macroeconomic impacts of renewable energy policies.
  - For PacifiCorp and CAISO, analyzed the economic benefits of an energy imbalance market (EIM) between CAISO and PacifiCorp. Resulting report submitted by CAISO to the Federal Energy Regulatory Commission (FERC) in its successful filing to form an EIM.
  - For NorthWestern Energy (NWE), led analysis of the benefits of co-optimizing the dispatch of NWE's gas-fired generation resources for energy and ancillary services.
  - For the Western Interstate Energy Board, evaluated issues associated with the interdependency between the gas and electric industries in the Western Interconnection.
  - For the Western Electricity Coordinating Council, provided power generation technology cost and performance recommendations for use in WECC's Transmission Expansion Planning and Policy Committee studies.
  - For the ClimateWorks Foundation, identified priority strategies to support the integration of variable renewable energy generation in China.
  - For the Regulatory Assistance Project and China's State Electricity Regulatory Commission, contributed to studies recommending reforms for China's power and water sectors.
  - For AltaLink, assessed the impacts of two new HVDC transmission lines on Alberta energy and ancillary services prices. Report submitted to the Critical Transmission Review Committee and the Government of Alberta approved the project.
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- For the University of California Office of the President, designed and evaluated wholesale electricity portfolios to meet UC's pledge to become carbon neutral by 2025. Analysis culminated in the decision by UC to purchase energy from an 80 MW solar PV plant to supply direct access campuses and medical centers.
- For the potential buyer of a gas-fired combined cycle plant, provided energy and capacity prices across multiple scenarios.
- For a utility, estimated the economic and reliability benefits of a pumped-storage hydroelectric plant over a range of uncertainties, including renewable penetrations, water conditions and weather conditions.
- For an independent power producer, estimated the impacts of California's cap-and-trade program on wholesale energy prices across the Western U.S. Carbon market analysis complemented the client's ongoing asset optimization activities.

#### **U.S. ENVIRONMENTAL PROTECTION AGENCY, RESEARCH TRIANGLE PARK, NC**

Energy Modeling Contractor, Energy and Climate Assessment Team, 2011

#### **NICHOLAS INSTITUTE FOR ENVIRONMENTAL POLICY SOLUTIONS, DURHAM, NC**

Research Assistant, 2010-2011

#### **CHEVRON CORPORATION, GUANGZHOU, CHINA**

Intern, Caltex South China, Summer 2007

### **PUBLICATIONS**

- Jones, R., B. Haley, G. Kwok, J. Hargreaves, J. Williams. 2018. "Electrification and the Future of Electricity Markets: Transitioning to a Low-Carbon Energy System." *IEEE Power and Energy Magazine* 16 (4), 79-89.
- Olson, A., A. Mahone, E. Hart, J. Hargreaves, R. Jones, N. Schlag, G. Kwok, N. Ryan, R. Orans, R. Frowd. 2015. "Halfway There: Can California Achieve a 50% Renewable Grid?" *IEEE Power and Energy Magazine* 13 (4), 41-52.
- Junfeng, H., G. Kwok, W. Xuan, J.H. Williams, F. Kahrl. 2013. "Using natural gas generation to improve power system efficiency in China." *Energy Policy* 60: 116-121.
- Kahrl, F., H. Junfeng, G. Kwok, J.H. Williams. 2013. "Strategies for expanding natural gas-fired electricity generation in China: Economics and policy." *Energy Strategy Reviews* 2: 182-189.
- Orans, R., A. Olson, J. Moore, J. Hargreaves, R. Jones, G. Kwok, F. Kahrl, C.K. Woo. 2013. "Energy Imbalance Market Benefits in the West: A Case Study of PacifiCorp and CAISO." *The Electricity Journal* 26(5): 26-36.
- Woo, C.K., I. Horowitz, G. Kwok, S.K. Wan, W. Weng. 2012. "A Win-Win Mechanism for Electricity Procurement by a Local Distribution Company." *The Electricity Journal* 26(1): 27-35.
- Chandel, M.K., G. Kwok, R.B. Jackson, L.F. Pratson. 2012. "The potential of waste-to-energy in reducing GHG emissions." *Carbon Management* 3(2): 133-144.

### **REPORTS**

- "Exploring Pathways to Deep Decarbonization for the Portland General Electric Service Territory", report prepared for Portland General Electric, April 2018.
- "Deep Decarbonization in the Northeastern United States and Expanded Coordination with Hydro-Québec," report prepared for Hydro-Québec, April 2018.
- "Deep Decarbonization Pathways Analysis for Washington State", report prepared for the State of Washington Office of the Governor and Office of Financial Management, December 2016.
- "Passenger Transportation Innovation Study", report prepared for the Risky Business Project, December 2016.
- "Basin Creek Dispatch Study: Analyzing the Benefits of a Co-Optimized Dispatch Procedure", report prepared for NorthWestern Energy, March 2016.
- "Regional Coordination in the West: Benefits of PacifiCorp and California ISO Integration", report prepared for PacifiCorp, October 2015.
- "APS Energy Imbalance Market Participation: Economic Benefits Assessment", report prepared for Arizona Public Service (APS), April 2015.
- "Pathways to deep decarbonization in the United States", report prepared for the Deep Decarbonization Pathways Project of the Sustainable Development Solutions Network and the Institute for Sustainable Development and International Relations, November 2014.
- "Benefits Analysis of Puget Sound Energy's Participation in the ISO Energy Imbalance Market", report prepared for Puget Sound Energy (PSE), September 2014.

- “Natural Gas Infrastructure Adequacy in the Western Interconnection: An Electric System Perspective, Phase 2 Report,” report prepared for the Western Interstate Energy Board (WIEB), July 2014.
- “Natural Gas Infrastructure Adequacy in the Western Interconnection: An Electric System Perspective, Phase 1 Interim Report,” report prepared for WIEB, March 2014.
- “Capital Cost Review of Power Generation Technologies: Recommendations for WECC’s 10- and 20-Year Studies”, report prepared for the Western Electricity Coordinating Council (WECC), March 2014.
- “Investigating a Higher Renewables Portfolio Standard in California,” report prepared for LADWP, PG&E, SMUD, SDG&E and SCE, January 2014.
- “PacifiCorp-ISO Energy Imbalance Market Benefits,” report prepared for PacifiCorp and CAISO, March 2013.
- “Cost and Performance Review of Generation Technologies: Recommendations for WECC 10- and 20-Year Study Process,” report prepared for WECC, October 2012.
- “I-5 Corridor Reinforcement Phase 2 Non-Wires Analysis: Feasibility for Line Deferral,” report prepared for Bonneville Power Administration, December 2011.

## **EDUCATION**

### **DUKE UNIVERSITY, Durham, NC**

*Master of Environmental Management, Energy and Environment Program, May 2011*

### **TEXAS A&M UNIVERSITY, College Station, TX**

*Bachelor of Science in Economics, May 2009*

