

## EXPERTS

## Judy Chang

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Régie de l'énergie  
 DOSSIER R.3888.2011  
 DÉPOSÉE EN AUDIENCE  
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## BIOGRAPHY

Judy Chang is an economist with a public policy background. She has expertise in the analysis of electricity power markets and advises clients on the financial and regulatory issues relating to renewable energy investment and procurement decisions. She is experienced in leading utility executives, board members, and stakeholders in making challenging strategic decisions complicated by pressures from customers, policy-makers, regulators, and wholesale and retail competitors. Ms. Chang's recent long-term strategic planning engagements have involved the development of future energy market scenarios and assisting utilities to make strategic decisions that balance regulatory requirements for renewable energy, energy efficiency, other demand-side resources, with the potential retirement of existing generation facilities due to various environmental regulations. These projects involved close analyses of relevant regulatory and economic issues surrounding system planning, including considerations for financial, operational, and market design issues.

Ms. Chang has authored numerous expert reports and submitted expert testimony before the U.S. Federal Energy Regulatory Commission and state regulatory authorities regarding power market issues. She has served as an expert witness in regulatory proceedings and litigation settings. Recently, she was an expert witness in evaluating long-term power purchase agreements between renewable energy developers and electric utilities. Her other recent work includes evaluating the potential impact of integrating renewable energy onto power systems. Accordingly, she has designed and helped develop a model that estimates the operational effects and the associated costs of variable resources on a grid.

Ms. Chang has authored a number of articles and reports and presented at a variety of industry conferences. She recently spent two years in India, where she worked on evaluating and financing renewable energy investments for international and multilateral agencies. She holds a Master's in Public Policy from Harvard University's Kennedy School of Government, is a member of the Board of Directors of the Massachusetts Clean Energy Center, and the founding Executive Director of New England Women in Energy and the Environment.

## TESTIMONY

Testimony and Exhibits of Judy W. Chang and Jürgen Weiss, Ph.D. in Response to the Petition of Western Massachusetts Electric Company (WMECO), for approval of power purchase agreements between WMECO and one on-shore wind projects, before the Massachusetts Department of Public Utilities, D.P.U. 11-12

Judy Chang, Jürgen Weiss

## Education

Harvard University, Kennedy School of Government, Master's in Public Policy

University of California at Davis, B.Sc. in Electrical Engineering

## Practices

Electric Power  
 Utility Regulatory Policy and Ratemaking  
 Valuation

## News &amp; Events

Judy Chang to Present at Independent Power Producers Society of Alberta Conference  
 Nebraska Transmission Infrastructure Ready to Accommodate at Least 2,000 MW of Additional Wind Generation According to Brattle Study

Judy Chang Featured on NPR Discussing Tensions Between Utilities and Rooftop Solar Companies

Deploying Up to 5,000 MW of Grid-Integrated Electricity Storage in Texas Could Provide Substantial Net Benefits According to Brattle Economists

Judy Chang Presents on the EPA's Proposed Clean Power Plan at Harvard Kennedy School Energy Policy Seminar Series

June 21, 2011

Testimony (Oral) of Judy W. Chang and Dr. Jurgen Weiss in *Response to NSTAR Electric Company's Petitions for Approval of a Purchase Power and Renewable Energy Certificate Contract in accordance with the requirements of the Act Relative to Green Communities (St. 2008, c. 169, § 83) and the Request for Proposal Process approved by the Department of Public Utilities in D.P.U. 10-76*, before the Massachusetts Department of Public Utilities, Dockets No. 11-05, 11-06 and 11-07

Judy Chang, Jürgen Weiss  
June 2011

Direct Prefiled Testimony of Judy W. Chang and Dr. Jurgen Weiss in *Response to NSTAR Electric Company's Petitions for Approval of a Purchase Power and Renewable Energy Certificate Contract in accordance with the requirements of the Act Relative to Green Communities (St. 2008, c. 169, § 83) and the Request for Proposal Process approved by the Department of Public Utilities in D.P.U. 10-76*, before the Massachusetts Department of Public Utilities, Dockets No. 11-05, 11-06 and 11-07

Judy Chang, Jürgen Weiss  
May 2011

Testimony (Oral) of Dr. Jurgen Weiss and Judy W. Chang in *Response to the Petition of Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid for approval by the Department of Public Utilities of amended power purchase agreements between National Grid and Cape Wind Associates, LLC.*, before the Massachusetts Department of Public Utilities, Docket No. 10-54

Judy Chang, Jürgen Weiss  
September 2010

Direct Prefiled Testimony of Dr. Jurgen Weiss and Judy W. Chang in *Response to the Petition of Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid for approval by the Department of Public Utilities of amended power purchase agreements between National Grid and Cape Wind Associates, LLC.*, before the Massachusetts Department of Public Utilities, Docket No. 10-54

Jürgen Weiss, Judy Chang  
August 2010

Prepared Joint Direct Testimony of Judy Chang and Philip Q Hanser, on Behalf of the City of Vernon, California in its *Prepared Petition for Declaratory Order and Request for Waiver of Filing Fee of City of Vernon, California*, before the Federal Energy Regulatory Commission (FERC) Docket No. EL09-64-000

Judy Chang, Philip Q Hanser  
July 15, 2009

Comment—"A Marginal-Value Approach to Pricing Reactive Power Services" in *Principles for Efficient and Reliable Reactive Power Supply and Consumption*, before the Federal Energy Regulatory Commission (FERC), Docket No. AD05-1-000

Judy Chang, Philip Q Hanser, Martin Baughman  
April 4, 2005

Prepared Joint Affidavit of Judy Chang and Philip Q Hanser on behalf of Northeast Utilities Service Company and affiliated companies' market-based rate authorization, before the Federal Energy Regulatory Commission (FERC), Docket No. ER96-496-010, et al

Judy Chang, Philip Q Hanser  
September 27, 2004, Revised December 9, 2004

Prepared Joint Affidavit of Judy Chang and Philip Q Hanser on behalf of Northeast Utilities, Devon Power LLC, et al., before the Federal Energy Regulatory Commission (FERC), Docket No. ER03-563-030

Judy Chang, Philip Q Hanser  
March 24, 2004

## PUBLICATIONS

- Report**      **Nebraska Renewable Energy Exports: Challenges and Opportunities**  
December 12, 2014  
Judy Chang, Michael Hagerty, Johannes P. Pfeifenberger, and Ann Murray  
Prepared for the Nebraska Power Review Board
- Presentation**      **Nebraska Renewable Energy Export (LB 1115) Study**  
December 12, 2014  
Judy Chang, Michael Hagerty, and Johannes P. Pfeifenberger  
Presented to the Nebraska Power Review Board
- Presentation**      **The Value of Distributed Electrical Energy Storage in Texas: Proposed Policy for Enabling Grid-Integrated Storage Investments**  
December 5, 2014  
Judy Chang, Johannes P. Pfeifenberger, Kathleen Spees, and Matthew K. Davis  
Presented at the UBS Investment Research Webinar
- Presentation**      **Dynamics and Opportunities in Transmission Development**  
December 2, 2014  
Johannes P. Pfeifenberger, Judy Chang, and John Tsoukalis  
Presented to TransForum East, Washington, DC
- Report**      **The Value of Distributed Electricity Storage in Texas: Proposed Policy for Enabling Grid-Integrated Storage Investments**  
November 10, 2014  
Judy Chang, Johannes P. Pfeifenberger, Kathleen Spees, and Matthew K. Davis  
Prepared for Oncor
- Report**      **Stakeholder-Driven Scenario Development for the ERCOT 2014 Long-Term System Assessment**  
September 30, 2014  
Judy Chang, Michael Hagerty, and Johannes P. Pfeifenberger  
Prepared for ERCOT
- Report**      **Policy Brief - EPA's Proposed Clean Power Plan: Implications for States and the Electric Industry**  
June 2014  
Metin Celebi, Kathleen Spees, Michael Hagerty, Samuel A. Newell, Dean M. Murphy, Marc Chupka, Jürgen Weiss, Judy Chang, and Ira H. Shavel  
Published by The Brattle Group, Inc.
- Presentation**      **Contrasting Competitively-Bid Transmission Investments in the U.S. and Abroad**  
May 13, 2014  
Johannes P. Pfeifenberger, Judy Chang, Matthew K. Davis, and Mariko Geronimo  
Presented at a UBS Conference Call
- Presentation**      **Transmission To Capture Geographic Diversity of Renewables: Cost Savings Associated with Interconnecting Systems with High Renewables Penetration**  
May 6, 2014  
Judy Chang, Johannes P. Pfeifenberger, Pablo Ruiz, and Kai E. Van Horn  
Presented to TransForum West, San Diego, CA
- Report**      **A Market-based Regional Approach to Valuing and Reducing GHG Emissions from Power Sector**  
April 2014  
Judy Chang, Jürgen Weiss, and Yingxia Yang  
Prepared for Great River Energy
- Presentation**      **A Market-based Regional Approach to Implementing EPA's GHG Emissions Regulation**  
February 5, 2014  
Judy Chang, Jürgen Weiss, Yingxia Yang, Jon Brekke, and Will Kaul
- Presentation**      **Competition in Transmission Planning and Development: Current**

**Status and International Experience**

January 31, 2014

Johannes P. Pfeifenberger, Judy Chang, Matthew K. Davis, and Mariko Geronimo

Prepared for the EUCI's Transmission Policy: A National Summit

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Report	<b>Recommendations for Enhancing ERCOT's Long-Term Transmission Planning Process</b> October 2013 Judy Chang, Johannes P. Pfeifenberger, Samuel A. Newell, Toshiki (Bruce) Tsuchida, and Michael Hagerty The Brattle Group, Inc., prepared for The Electric Reliability Council of Texas (ERCOT)
Presentation	<b>Trends and Benefits of Transmission Investments: Identifying and Analyzing Value</b> September 26, 2013 Judy Chang, Johannes P. Pfeifenberger, and Michael Hagerty Presented to the CEA Transmission Council, Ottawa, Canada
Presentation	<b>Assessing and Understanding the Implications of Economics of Coal-Fired Plants</b> September 26, 2013 Judy Chang Presented at the Alberta Power Symposium, Calgary
Presentation	<b>The Benefits of Electric Transmission: Identifying and Analyzing the Value of Investments</b> July 31, 2013 Judy Chang, Johannes P. Pfeifenberger, and Michael Hagerty Presented to the Working group for Investment in Reliable and Economic Electric Systems (WIRES)
Report	<b>The Benefits of Electric Transmission: Identifying and Analyzing the Value of Investments</b> July 2013 Judy Chang, Johannes P. Pfeifenberger, and Michael Hagerty Published by Working group for Investment in Reliable and Economic electric Systems (WIRES)
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Article	<b>Bridging the Seams: Interregional planning under FERC Order 1000</b> November 2012 Johannes P. Pfeifenberger, Judy Chang, and Delphine Hou Published in <i>Public Utilities Fortnightly</i>
Presentation	<b>Challenges of Renewable Integration: Comparison of Experiences</b> October 18, 2012 Judy Chang Presented at the 4th Annual Renewable Energy Technology Conference & Exhibition, Washington, DC
Presentation	<b>Energy Supply and Demand: "A Market Perspective"</b> October 3, 2012 Judy Chang Presented at the EnergySMART 2012 Conference, Boston, MA
Presentation	<b>The Future of Electric Utilities in the U.S. and China</b> June 25, 2012 Peter S. Fox-Penner and Judy Chang Presented to the State Grid Energy Research Institute, Beijing, China
Report	<b>The Potential Impact of Solar PV on Electricity Markets in Texas</b> June 19, 2012 Jürgen Weiss, Judy Chang, and Onur Aydin Prepared for the Solar Energy Industries Association and the Energy Foundation

- Presentation** **Estimating the Socioeconomic Value of Satellite-Derived Solar & Meteorological Data: A Case Study and Discussion of Tradeoffs**  
June 14, 2012  
Judy Chang and Kamen Madjarov  
Presented at the Workshop on Defining, Measuring, and Communicating the Socio-economic Benefits of Geospatial Information/GEOSS 2012, Boulder, CO
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- Presentation** **Policy Challenges Associated with Renewable Energy Integration**  
April 2011  
Judy Chang, Kamen Madjarov, Peter S. Fox-Penner, and Philip Q Hanser  
Prepared for the 2011 MITEI Symposium: Managing Large-Scale Penetration of Intermittent Renewables
- Presentation** **Renewable Integration: Quantifying the Effects of Variable Energy Resources**  
January 24, 2011  
Judy Chang  
Presented at the Wind and Solar Integration Summit, Scottsdale, AZ
- 
- Presentation** **Shareholder Incentives: Ratemaking Mechanisms for Sustainable Energy Efficiency Programs**  
November 9, 2010  
Judy Chang  
Presented at the Law Seminar International Conference on Electric Utility Rate Cases, Boston, MA
- Presentation** **Looking Forward: High Wind and Solar Penetration on the Grid**  
October 7, 2010  
Judy Chang  
Presented at the NARUC Renewable Energy Retreat, Riverside, CA
- Presentation** **Renewable Integration Model Presentation**  
August 25, 2010  
Judy Chang and Philip Q Hanser  
Presented at the California Public Utility Commission's Long-Term Procurement Plan Workshop, San Francisco, CA
- Presentation** **Renewable Energy Integration: Issues and Analyses**  
August 11, 2010  
Judy Chang  
Presented at the EUCI Conference on Renewable Energy Development and Transmission Expansion, Portland, OR
- Article** **Plugging In: Can the grid handle the coming electric vehicle load?**  
June 2010  
Dean M. Murphy, Onur Aydin, Judy Chang, and Marc Chupka  
Published in *Public Utilities Fortnightly*
- Presentation** **Renewable Integration Model and Analysis**  
April 21, 2010  
Judy Chang, Kamen Madjarov, Ross Baldick, Antonio Alvarez, and Philip Q Hanser  
Poster Presented by Kamen Madjarov at IEEE 2010 Transmission and Distribution Conference and Exposition, New Orleans, LA
- Presentation** **Renewables and Storage: Does Size Matter**  
March 18, 2010  
Judy Chang and Jürgen Weiss  
Presented at the 15th Annual POWER Research Conference on Energy Research and Policy, University of California, Berkeley
- Report** **Renewables and Storage – Does Size Matter?**  
March 11, 2010  
Judy Chang, Kathleen Spees, and Jürgen Weiss  
Published by The Brattle Group, Inc.
- Report** **Job and Economic Benefits of Transmission and Wind Generation**

**Investments in the SPP Region**

March 2010

Johannes P. Pfeifenberger, Judy Chang, Delphine Hou, and Kamen Madjarov

Prepared for the Southwest Power Pool

**Report****2010 Integrated Resource Plan for Connecticut**

January 2010

Samuel A. Newell, Dean M. Murphy, Marc Chupka, Judy Chang, and Mariko Geronimo

Published by The Brattle Group, Inc.

**Presentation****Update on Renewable Energy Market Trends**

June 11, 2009

Judy Chang

Presented at a Seminar on Financing Clean Energy Projects under the Reinvestment Act of 2009, organized by Environment Business Council of New England

**Report****Assessment of a Maine ISA Structure as a Possible Alternative to ISO-NE Participation**

May 2009

Ken Belcher, Johannes P. Pfeifenberger, Judy Chang, and Delphine Hou  
Prepared for Central Maine Power Company and the Industrial Energy Consumer Group.**Report****Transmission Super Highways: Assessing the Potential Benefits of Extra-High-Voltage Transmission Overlays in the Midwest**

March 2009

Peter S. Fox-Penner, Judy Chang, Delphine Hou, and Ryan Hledik  
Published by The Brattle Group, Inc.**Report****2009 Integrated Resource Plan for Connecticut**

January 2009

Onur Aydin, Judy Chang, Marc Chupka, Mariko Geronimo, Dean M. Murphy, Samuel A. Newell, and Joseph B. Wharton  
Published by The Brattle Group, Inc.**Presentation****International Renewable Energy Financing**

November 30, 2006

Judy Chang

Presented at Euromoney's Renewable Energy Finance Forum, New Delhi, India

**Presentation****Wind Power Grid Integration: How to Evaluate Potential Grid Impact of Proposed Wind Projects**

April 6, 2005

Judy Chang

Presented at the Electric Power 2005 Conference

**Article****LMPs/FTRs Alone Will Not Solve Transmission Problems Blackout Showed**

November 2003

Philip Q. Hanser and Judy Chang

Published in *Natural Gas & Electricity***Presentation****Transmission Management in the Deregulated Electric Industry - A Case Study on Reactive Power**

October 9, 2003

Judy Chang

Presented at the Ancillary Services Conference, Denver, CO

**Article****Transmission Management in the Deregulated Electric Industry: A Case Study on Reactive Power**

October 2003

Dean M. Murphy, Frank C. Graves, and Judy Chang

Published in *The Electricity Journal*

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Presentation **Regulatory Design for Reactive Power and Voltage Support Services**  
December 2001

Judy Chang

Presented to the Comisión de Regulación de Energía y Gas, Bogotá,  
Colombia

Presentation **International Review of Reactive Power Management**

May 4, 2001

Judy Chang

Presented to the Comisión de Regulación de Energía y Gas, Bogotá,  
Colombia

