

BOYD H. PRO

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Renewable Energy Consultant

*Wind Energy Analysis,
Biomass and Waste Fuel
Technologies, Energy for
Transportation,
Atmospheric Data
Collection, Power Output
Simulation, Computer
Modeling, Database and
Statistical Analysis Tool
Development, Renewable
Energy Policy*

Education

BS, Physics,
University of Washington,
2004

BA, Environmental Studies,
University of Washington,
2004

Profile

Mr. Pro provides technical consulting services for advanced and renewable energy technologies, focusing primarily on wind energy as well as biomass and waste fuel technologies and energy for transportation. He is also experienced in a large variety of renewable energy technologies as well as fossil fuel and other non-renewable power generation technologies. Over the past six years, Mr. Pro has been involved in over 60 different renewable and advanced energy projects, providing services such as due diligence review, renewable portfolio development and integrated resource planning, resource assessment, energy production analysis, proposal evaluations, project identification, economic feasibility studies, and RFP development, for clients including private developers, banks, government organizations, community organizations, tribes, and nearly 20 different US utilities. Mr. Pro received his degrees in Physics (B.S.) and Environmental Studies (B.A.) from the University of Washington in 2004. He joined Chinook Wind in January 2007 after working as a consultant and project scientist in the Renewable Energy Group at Black & Veatch Corporation in Kansas City. He currently splits most of his time between Chinook Wind and Convivium Renewable Energy, a multidisciplinary consulting group that he helped found.

Experience

Wind Resource Assessment and Site Modeling, Cascade Community Wind Company 2009-present

Wind Energy Analyst

Providing a variety of wind resource analysis and project siting services for more than 15 community-supported wind projects in Washington State. Services include site prospecting assistance, meteorological tower siting and instrumentation, data monitoring, wind resource assessment, and energy production analysis.

SODAR Campaign Management, Cascade Community Wind Company 2009-present

Wind Energy Analyst

Managing the client's remote sensing and site prospecting campaign including siting and deployment of SODAR unit, monitoring of data and advising on length of collection periods, data collection and analysis, and data correlation to co-located meteorological towers and off-site reference stations.

Wind Resource Assessment and Site Modeling, Energy Northwest 2007-present

Wind Energy Analyst

Providing meteorological tower configuration and monitoring as well as wind data processing and analysis services for multiple complex-terrain sites in Washington State ranging in size from 30MW to 200MW. Services include collection and validation of raw wind data from meteorological towers and SODAR, analysis of long term wind speed and wind shear characteristics, annual energy production and net capacity factor estimates, computer modeling of site wind resources, meteorological instrument troubleshooting, and regular evaluation and update of wind characteristics, tower status, and potential instrument or data logger issues.

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Wind Resource Assessment Due Diligence, Confidential European Developer
2010

Wind Energy Analyst

Provided due diligence for two pre-development wind sites in Oregon State. Conducted site visits to validate existing met tower configurations and confirm and document site characteristics. Conducted review of previous wind resource analysis.

Wind Data Analysis Tool Development, Chinook Wind
2009-present

Data Analyst and Programmer

Providing custom development of computer-based wind data analysis tools utilizing various computer programming languages, database tools, and statistical analysis packages.

Wind Resource Assessment, Confidential US Developer
2009-present

Wind Energy Analyst

Providing custom meteorological tower configuration, including design and installation of monitoring instruments as well as wind data processing and analysis services for two complex-terrain sites in Washington State.

Landfill Gas to Energy Due Diligence, Confidential Client: United States
2009

Technical Consultant

Performed independent LFG forecast for ten sites throughout the United States as a subcontractor to Black & Veatch Corporation. The sites included existing projects with planned expansion as well as undeveloped sites. Several different projections for each site were reviewed and presented against independent model projections.

Wind Resource Assessment and Site Modeling, Confidential US Developer
2009

Wind Energy Analyst

Provided review of existing meteorological towers at the site and analysis of the associated data, site modeling, and layout development for a 400 MW project within a Native American Reservation area in the central United States.

Wind Resource Assessment and Site Modeling, Coastal Community Action Program
2008-2009

Wind Energy Analyst

Provided analysis of meteorological data, site modeling and layout development, visual simulation, and turbine manufacturer site suitability analysis and review. CCAP, a non-profit social services program, commissioned the project in June 2010 and is currently generating power to provide funding to their organization.

SODAR and Met Data analysis and correlation, Ridgeline Energy
2007-2008

Wind Energy Analyst

Provided data collection, processing, validation, analysis and correlation of several co-located SODAR and meteorological tower measurements. Custom data analysis tools were developed to evaluate the shear profile and met-to-SODAR correlation. The analysis provided the client with a more confident understanding of the shear profile at multiple locations throughout their site, particularly the shear characteristics above the meteorological tower measurement heights and at the potential hub-height levels for different turbine designs.

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Wind Resource Assessment and Site Modeling, Ridgeline Energy

2007-present

Wind Energy Analyst

Provided a variety of wind data processing and analysis services for multiple large-scale wind power sites in the Western US, including collection, processing, and validation of raw wind data from meteorological tower instruments as well as SODAR data, analysis of long term wind speed and wind shear characteristics, annual energy production and net capacity factor estimates, computer modeling of site wind resources, and time-of-day pricing analysis for power purchase negotiation.

Wind Resource Assessment and Site Modeling, Confidential US Wind Developer

2007

Wind Energy Analyst

Provided site identification and resource assessment, including data processing and analysis services, for sites in Texas and New York State. Services include collection, processing, and validation of raw wind data from meteorological towers and SODAR, analysis of long term wind speed and wind shear characteristics, annual energy production and net capacity factor estimates, and computer modeling of site wind resources.

Landfill Gas to Energy Due Diligence, Confidential Client: United States

2007

Technical Consultant

Performed independent LFG forecast for large landfill in the Midwestern US as a subcontractor to Black & Veatch Corporation. The proposed project included gas cleanup for either pipeline sale or compressed natural gas sale. Existing gas forecast models were reviewed and compared against the independent model.

Wind Turbine Patent Review, Confidential US Turbine Designer

2007

Wind Energy Analyst

Reviewed domestic and foreign patents related to wind energy systems. Nearly 2000 patents were included in the review. Patents were categorized by technology and design type and the abstracts were summarized with remarks regarding each patent relative to the current status of the wind industry. All the individual patents were catalogued and filed in an organized database for the client.

Wind Power Output Simulation, Confidential US Wind Developer

2007

Wind Energy Analyst

Created simulation models for individual turbine and total wind farm power output variability based on several years of wind data collected on site. The models provided an accurate estimation of the variance in the turbine and wind farm output for power purchase scheduling purposes.

Landfill Gas to Energy Due Diligence, Confidential Client: United States

2007

Technical Consultant

Provided review of landfill gas (LFG) resource forecast as part of due diligence review for the potential acquisition of 15 different LFG projects, as a subcontractor to Black & Veatch Corporation. Verified landfill gas (LFG) resource assessment and projections against independent projections.

Transportation Fleet Analysis, Confidential Southwest Municipal Water District

2007

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Technical Consultant

Provided analysis of transportation fleet options for the district as a subcontractor to Black & Veatch Corporation. The project included review and analysis of the district's vehicle fleet, comprising over 80 different vehicles of a wide range size, type, and duty. Alternative transportation technologies and fuels were reviewed including traditional ICE vehicles as well as flex-fuel, hybrid, plug-in hybrid, electric, fuel cell, compressed natural gas, biodiesel, and ethanol. Recommendations on potential fleet changes or vehicle conversions were made and associated emissions reductions and economic impacts were calculated.

Wind Modeling Software Comparison, Chinook Wind/AWEA WindPower Conference 2007

Wind Energy Analyst

Supported a review and comparison of different modeling software including flow models such as WAsP and MS-Micro as well as two different CFD (computational fluid dynamics) software packages. The project provided a comparison of the relative accuracy and correlation between the results using each software package. Wind data from a large site with ten meteorological towers was used as input so that the predicted wind speeds from each of the software packages could be compared with the measured data. The results were presented at the 2007 AWEA Wind Power conference.

Wind Project Research, Confidential US Wind Developer 2007

Wind Energy Analyst

Supported the review and characterization of all existing and proposed wind development sites in the Western United States. Project specifics such as location, transmission, ownership, permitting, etc. were catalogued and capacity factors and other data were estimated. This database was used to assess competition in various markets.

Renewable Energy Strategic Development Planning, Orlando Utilities Commission 2006

Project Coordinator and Lead Technical Consultant

Assessment and preliminary siting of potential renewable energy projects and development of the Utility's renewable energy development plan. Performed site identification and detailed analysis for several potential development sites in the Orlando area and throughout the state of Florida. Tasks included site identification, data collection and analysis, resource modeling, and estimation of project economics, with consideration for both utility-owned projects as well as power purchase from a privately developed facility. Recommendations of the most promising sites for project development were provided.

Due Diligence Proposal Evaluation, Kauai Island Utility Cooperative 2006

Technical Consultant

Assessment of proposed renewable energy projects. Performed due diligence review of proposed projects, including resource assessment, technology assessment, site evaluation, and verification of proposed project performance and economics.

Renewable Energy Project Development Strategy, confidential Midwestern US Utility 2006

Project Coordinator and Lead Technical Consultant

Assessment of biomass resources and potential for project development throughout

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several Midwestern states. Performed high-level resource assessment and reviewed existing biomass energy plants in the region to determine the challenges and recommendations for utility-scale development of biomass energy. Worked closely with the Utility to develop stakeholder workshops intended to promote biomass energy development.

Renewable Energy Consulting and Engineering, Los Angeles Department of Water and Power

2004 – 2006

Technical Consultant

Conducted consulting services for LADWP for a wide variety of projects including wind, biomass (including landfill gas), geothermal, solar, small hydro and other renewable sources. Services under the contract include RPS least cost planning support, RFP development and evaluation, project due diligence, technology evaluation, feasibility studies, and project engineering services.

Renewable Energy Project Development Support, Colorado Springs Utilities

2006

Study Coordinator and Lead Technical Consultant

Coordinated detailed biomass resource assessment to support cofiring at the Utility's plant as well as stand-alone power plant development. Fuel supply for the plants includes urban wood wastes, sawmill residues, and wood derived from forest thinning for forest fire threat reduction.

Bid Evaluation, Confidential Southwestern US Utility

2006

Technical Consultant

Assessment of proposed renewable energy projects. Performed general assessment to verify the performance and financial projections for projects proposed to the utility under power purchase agreements.

Renewable Technologies Assessment, Board of Public Utilities, Kansas City, Kansas

2006

Technical Consultant

Assessment of potential renewable energy projects for the Board of Public Utilities. Performed general assessment of biomass, solar, wind, and hydro resources, including identification and detailed analysis of landfill gas development opportunities in the Kansas City Metro area.

Statewide Resource Assessment, Florida Department of Environmental Protection

2006

Project Coordinator and Lead Technical Consultant

Assessment of biomass resources and project economics in the state of Florida. The project was intended to promote the use of biomass resources in the state by providing useful resource data and economic analysis. An online GIS-based resource map was created to help users determine the best opportunities for biomass development in their region.

Landfill Gas to Energy Due Diligence, Confidential Client: United States

2006

Technical Consultant

Examined the technical capabilities of a distributed generation company, which designs, constructs and operates its own generation facilities. Performed landfill gas (LFG) resource assessment and projections for 5 existing sites as well as 4 potential development sites totaling over 100 MW. Projected LFG generation data was used to

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verify inputs to the equity firm's financial model. The company's business plan for expanding LFG operations in other regions was evaluated by analyzing specific environmental constraints and market conditions.

Landfill Gas to Energy Due Diligence, Confidential Client: United States
2006

Technical Consultant

Advised confidential client on technical issues for acquisition of 29 landfill gas projects in the United States totaling nearly 150 MW. Verified landfill gas (LFG) resource assessment and projections against independent projections at all the sites.

Poultry Litter Combustion Project Due Diligence, Confidential Utility: United States
2005

Technical Consultant

Provided a due diligence review of a large poultry litter combustion project. Completed comprehensive review and analysis of the fuel acquisition, transport, and processing plan for the plant, with final recommendations provided to the utility.

Community Wind Collaborative, Massachusetts Technology Collaborative
2004-2005

Technical Consultant

Performed feasibility studies into community wind energy projects at three locations in Massachusetts. Developed visual simulations for potential wind turbine sites.

Regional Renewable Energy Assessment and Website Development, European Bank for Reconstruction and Development: Eastern Europe & Former Soviet Union
2004-2006

Project Coordinator

Project Coordinator for major evaluation of renewable energy resources in 27 countries of Eastern Europe and the Former Soviet Union, such as Azerbaijan, Russia, Poland, Czech Republic, and Albania. Responsibilities include update of previous Black & Veatch study reports on renewable energy assessment for the 27 countries, and development and coordination of project website (www.ebrdrenewables.com). Website tasks required integration of the latest web development tools as well as resource and information coordination for the 27 countries. The website represents one of the most comprehensive sources of information on renewable energy development and policy in this region.

Poultry Litter Gasification Project Due Diligence, Confidential Client: United States
2005

Technical Consultant

Provided a due diligence review of a proposed 30 MW poultry litter gasification project for power generation at a US military base.

Biomass Technology Review, Confidential Developer
2005

Technical Consultant

Conducted consulting services including technology review and analysis for available biomass energy conversion technologies including several different gasification and combustion systems. For each technology, commercial vendors were identified and evaluated for a number of applications and biomass fuel choices including wood and wood waste, municipal solid waste, sewage sludge, cow manure, and poultry litter.

Biomass Resource Assessment: Confidential Client
2005

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Technical Consultant

Performed detailed biomass resource assessment of forest residue, primary wood industry residue, crop residue, livestock manure, urban wood waste, and sewage sludge within a 100 radius of project site to determine availability of resources for coal fuel replacement.

Numeric Conservation Goals Filing, OUC and JEA: Florida

2005

Analyst

Black & Veatch assisted Orlando Utilities Commission and Jacksonville Electric Authority with the Numeric Conservation Goals filing process with the Florida Public Service Commission. The assignment included the collection and economic analysis of demand-side management (DSM) measures for residential and commercial applications. Responsibilities on this project included the collection and analysis of DSM measure information, and the preparation of report documents for submittal to the Florida Public Service Commission.

Renewable Technologies Assessment, Kauai Island Utility Cooperative: Hawaii

2004

Technical Consultant

Supported the assessment and preliminary siting of renewable energy projects to support Kauai Island Utility Cooperative's Integrated Resource Plan.

SOFC Life Cycle Assessment, University of Washington

2004

Research Scientist

Contributed to Solid Oxide Fuel Cell Life Cycle Assessment project at the UW's Mechanical Engineering Design for Environment Laboratory. Individual responsibilities focused on SOFC technology and material review, cell failure habits, and end-of-life options.

Hydrogen and Electricity for Transportation, Institute for Lifecycle Environmental Assessment

2002-2004

Research Assistant

Conducted Research in support of ILEA's publication, "Carrying the Energy Future: Comparing Hydrogen and Electricity for Transmission, Storage and Transportation" (ilea.org). Authored "Energy and Land Use Impacts of Sustainable Transportation Scenarios", published by *The Journal of Cleaner Production*, 2005.

Solar Resource Assessment, University - National Park Energy Partnership

2001

Research Assistant

Evaluated solar resource as contribution to UNPEP project to provide power to National Park facilities in the North Cascade Mountains, Washington.