JACOBS

Mark Bastasch, P.E., INCE

PRINCIPAL ACOUSTICAL ENGINEER

Mr. Bastasch has more than 20 years of experience conducting acoustical evaluations and working with multimedia environmental permitting and design teams. For over a decade, Mr. Bastasch has provided technical leadership on acoustical matters related to renewable energy facilities. He has been an invited speaker to organizations such as Harvard Law School's Consensus Building Institute, the U.S. Department of Energy's (USDOE) Wind Powering America, the International Energy Agency/USDOE National Renewable Energy Laboratory, National Wind Coordinating Council, Law Seminars International, Midwest Energy Bar Association, American Wind Energy Association, and USDOE's New England Wind Energy Education Project; and he has served as plenary speaker or session chair at conferences in Australia, Japan, Italy, and England. Mr. Bastasch has acoustical permitting and design experience in the U.S. power and infrastructure sectors and he has supported multiple design and engineer, procure, construct (EPC) efforts both domestically and internationally, each of which has fully complied with applicable regulatory limits. He served as lead acoustical consultant on Australia's largest coal seam, gas-fueled, air-cooled, combined-cycle power plant and on Power Engineering's Best Gas-fired Project for 2013 (the Empire Generating Project in Rensselaer, New York).

Mr. Bastasch's work on wind energy has been cited by officials from Oregon to Maine. He provided acoustical expertise on the first major wind projects in Oregon, including the Stateline facility, which when permitted in the early 2000s was the largest wind project in the world. Mr. Bastasch was also acknowledged by the Oregon Health Authority for providing technical input to their "Strategic Health Impact Assessment on Oregon Wind Energy Developments."

Areas of Expertise

- Specializes in industrial noise measurements, modeling, and control for power, industrial, and transportation clients.
- Has prepared acoustical analyses or expert testimony for more than 15,000 megawatts (MW) from gas-fired power facilities and more than 5,000 MW from wind generation facilities.
- Appointed by Oregon State Board of Examiners for Engineering and Land Surveyors to develop and grade the Professional Engineering (P.E.) exam in Acoustics. Oregon was the only state to issue a P.E. in acoustics.
- Experienced in analyzing noise levels for no-build and build alternatives; supporting feasibility, design, and siting analyses of industrial, high-tech, and data center facilities; and preparing noise and vibration impact assessment reports.
- Has served as an acoustical technical lead for numerous transportation projects in Alaska, California, Colorado, Oregon, Washington, and Idaho; tasks include monitoring, modeling, and mitigation recommendations in accordance with applicable state laws.

EDUCATION/QUALIFICATIONS

M.S., Environmental Engineering, William Marsh Rice University, Houston, Texas, 1997

B.S. (*cum laude*), Environmental Engineering, Cal Poly, San Luis Obispo, California, 1994

PROFESSIONAL REGISTRATIONS

Professional Acoustical Engineer: Oregon (No. 58990AC)

Professional Environmental Engineer: Oregon (No. 58990EN)

Professional Civil Engineer: Oregon, (No. 58990PE)

MEMBERSHIPS AND AFFILIATIONS

Member, Institute of Noise Control Engineering (INCE)

Member, Acoustical Society of America

Organizer, INCE-E Wind Turbine Noise Conference Series

AWARDS/HONORS

2010 CEO Excellence Team Award Winner

2016 CEO Excellence Career Achievement Award Nominee

2018 Joseph J. Jacobs Master Builder Award Project Team Member

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- Has conducted numerous noise studies in conjunction with National Environmental Policy Act (NEPA) documents and the energy facility siting requirements of various states.

Representative Project Experience

Wind and Solar Energy Projects

Lead Acoustical Engineer; South Fork Wind Farm; Deepwater Wind; Offshore Massachusetts, Rhode Island, and New York. Subject matter expert on noise evaluations and documentation. Conducted senior technical review of noise-related impact analysis focusing on in-air noise from the proposed construction and operation activities.

Lead Acoustical Engineer; Stateline Wind Project; Oregon and Washington. Led acoustical analysis for a 263-MW wind farm and prepared environmental documentation to comply with both Oregon and Washington standards. At the time of permitting, this was the largest wind project in the world.

Lead Acoustical Engineer; Biglow Canyon Wind Farm; Orion Renewable Energy and Portland General Electric; Oregon. Provided acoustical analysis and regulatory assistance to support the permitting and construction of the Biglow facilities. Efforts included monitoring, modeling, regulatory review, and preparation of compliance filings.

Lead Acoustical Engineer; Massachusetts Military Reservation, United States Air Force. Prepared acoustical analysis to support NEPA environmental assessments (EAs) for the addition of on-base wind turbines.

Lead Acoustical Engineer; High Plains Wind Project, Seven Mile Hill Wind Project, and Glenrock Wind Project; Wyoming. Prepared technical noise analysis for submittal in support of the Industrial Development Information permitting process. Developed noise models and contours to assess potential acoustical compliance with multiple turbine types and layouts.

Lead Acoustical Engineer; Kittitas Valley Wind Project; Washington. Led the successful filing of an acoustical analysis for the Washington Energy Facility Siting Evaluation Council (EFSEC) for a 121-turbine wind energy project. This was the first time Washington's EFSEC siting process had been used for a wind project. Provided expert testimony at state and local level. Project permit was upheld by State of Washington's highest court.

Lead Acoustical Engineer; Wild Horse Wind Project; Washington. Led environmental and engineering noise studies to support a 158-wind-turbine project with an installed nameplate capacity of up to 312 MW and associated transmission, substation, roads, and operation and maintenance facility.

Lead Acoustical Engineer; Palouse Wind Project; First Wind; Washington. Prepared acoustical analysis in support of State Environmental Policy Act Environmental Impact Statement (EIS) and Conditional Use Permit application efforts for this 100-MW project in Whitman County. Tasks included public meeting attendance, preparing expert witness testimony, and supporting public hearing.

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Lead Acoustical Engineer; Lower Snake River Wind Project; RES Americas and Puget Sound Energy; Washington. Prepared permitting analysis, expert reporting, and testimony to support the permitting of this 1,400-MW wind farm. Tasks included supporting extensive public outreach at various open house and other forums as well as responding to multiple acoustical comments from the public and agencies during the permitting process. The second phase of this project was recently constructed and is now owned by Portland General Electric.

Lead Acoustical Engineer; Boardman Solar Energy Facility; Invenergy, Oregon. Prepared acoustical analysis for the 800-acre Boardman Solar Energy Facility, which is a 75-MW, photovoltaic solar energy generation facility. Authored Exhibit X, Noise, for the facility's Application for Site Certificate to the Oregon Energy Facility Siting Council. Responded to agency information request. The Site Certificate was issued for the facility in February 2018.

Acoustical Engineer, Carty Generating Station and Carty Solar; Portland General Electric; Boardman, Oregon. Responsible for developing the acoustical analysis to support Exhibit X for the proposed expansion of the Carty Generating Station and Carty Solar, a 50-MW photovoltaic project.

Power Plants

Lead Acoustical Engineer; Application for Certification; Alamitos Energy Center; AES Southland Development LLC; California. Authored acoustical analysis for a 1,040-MW repower of the existing Alamitos Beach Generating Station located within the coastal zone of Long Beach, California. Tasks included ambient monitoring, acoustical modeling of operational and construction noise, regulatory evaluation, and participation in California Energy Commission (CEC) workshops. The CEC issued the final decision for the project in May 2017.

Lead Acoustical Engineer; Application for Certification; Huntington Beach Energy Project; AES Southland Development LLC; California. Authored acoustical analysis for an 840-MW repower of the existing Huntington Beach Generating Station located within the coastal zone of Huntington Beach, California. Tasks included operational monitoring, acoustical modeling of operational and construction noise, regulatory evaluation and participation in CEC workshops. Mobilized team to provide expert testimony on potential impacts of sound levels on sensitive species. The CEC issued the final decision for the project in May 2017.

Acoustical Engineer; Empire Generating Project; Rensselaer, New York. Comprehensive acoustical analysis, design, specification and compliance assessment of the new 535-MW combined-cycle Empire Generating Plant engineered and constructed by CH2M HILL. The project, formerly known as BESI Corp., was named the Best Gas-Fired Project by Power Engineering in 2013. The project underwent extensive permitting under New York's Article X, which required detailed analysis during the bid, design, construction, and compliance phases.

Acoustical Engineer; Port Westward Generating Project (1 and 2); Portland General Electric; Oregon. Comprehensive acoustical permitting and compliance assessment of a new 425-MW combined-

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cycle facility and subsequent amendment for 200-MW additional peaking capacity. Provided owners acoustical engineering services in support of the Port Westward combined-cycle facility and peaking facility. Project experience included facility noise modeling and operational compliance assessment for submittal to the Oregon Energy Facility Siting Council. After the successful operation of the combined-cycle facility, multiple options for peaking options were evaluated. Developed acoustical mitigation in consultation with OEMs and PGE to satisfy overall facility permitting requirements.

Lead Acoustical Engineer; Licensing and Permitting for San Francisco Electric Reliability Project (SFERP); San Francisco Public Utilities Commission. Led acoustical tasks to develop a 145-MW simple-cycle plant in southeast San Francisco, using three LM 6000 turbines.

Lead Acoustical Engineer; Hermiston Power Project, Calpine Corporation, Hermiston, Oregon. Conducted acoustical and vibration monitoring to determine if steam turbine generator, heat recovery steam generators, stacks, and combustion turbine generators complied with warranted levels within a time critical schedule. Prepared detailed environmental noise monitoring to demonstrate that the facility complied with permit conditions and minimized the time full load operation was needed during off-peak hours. Oregon Department of Energy accepted the report without comment.

Lead Acoustical Engineer; Walnut Energy Center; Turlock Irrigation District; Turlock, California. Led acoustical tasks for a combined-cycle power plant, which included developing detailed noise model; comparing expected noise levels with the city of Turlock, County of Stanislaus, and the CEC's noise guidelines; preparing Application for Certification and subsequent amendments submitted to the CEC.

Lead Acoustical Engineer; MEGS; Modesto Irrigation District; Ripon, California. Led acoustics for a LM6000 (Norway package) power plant. Tasks included coordinating measurements of operating Norway Package with General Electric; developing detailed noise model; comparing expected noise levels with the City of Ripon, County of Stanislaus, and CEC noise guidelines; preparing Application for Certification and subsequent amendments submitted to the CEC; and review of Conditions of Certification, testimony at CEC evidentiary hearings.

Lead Acoustical Engineer; Humboldt Bay Repowering Project; Pacific Gas & Electric; Humboldt, California. Prepared application for certification to the CEC. Facility is a load-following power plant consisting of 10 natural gas-fired Wärtsilä 18V50DF 16.3-MW reciprocating engine-generator sets and associated equipment with a combined nominal generating capacity of 163 MW. Developed and executed operational compliance monitoring strategy. Compliance assessment was accepted by the CEC without comment.

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Transportation

Lead Acoustical Engineer; Interstate 5 Delta Park to Lombard; Oregon Department of Transportation; Portland, Oregon. Prepared noise analysis, technical report, and input for the EA/EIR as well as final noise wall design for this heavily traveled section of interstate highway.

Lead Acoustical Engineer; Reconstruction of Hyampom Road; Shasta Trinity National Forest; Trinity County, California. Prepared noise analysis, technical report, and input for the EA/EIR for the Federal Highway Administration Central Federal Lands Highway Division. Analysis cost and timeline was reduced by performing a desktop analysis given remote project site, low traffic volumes, and few residential receptors.

Lead Acoustical Engineer; Idaho 16, I-84 to SH-44 Environmental Study; Idaho Transportation Department. Led noise review on this highly visible project with a 3-year accelerated schedule studying a new 6.5-mile route connecting I-84 to SH-44. The project encompasses a river crossing and connections across the valley with impacts to farmlands, residential subdivisions, wetlands, and commercial areas.

Task Manager; Huffman Road Reconstruction Project Noise Studies and Mitigation Design; Alaska Department of Transportation and Public Facilities. Prepared preliminary noise analysis for noise measurements collected at seven locations in the project area. Estimated future build noise levels and developed preliminary mitigation measures in accordance with the Alaska Department of Transportation and Public Facilities.

Noise Analysis for Various Sectors

Acoustical Engineer, General Dynamics Electric Boat Project, Groton, Connecticut. Prepared acoustical analysis to support the design and permitting of an additional manufacturing facility for construction of the new Columbia class of submarines. Analysis was reviewed by the Authority Having Jurisdiction (AHJ) as well as their acoustical consultant and no changes were requested. Project was approved.

Acoustical Engineer, Boardman to Hemingway Transmission Line Project, Idaho Power, Oregon. Responsible for preparing an updated acoustical analysis of this 500-kV transmission line between Boardman, Oregon and Melba, Idaho. Provided senior review for Exhibit AA (EMF) and DD (Induced Currents) and facilitate appropriate level of acoustical discussion in other exhibits.

Acoustic Lead, Embarcadero-Potrero 230 kV Transmission Project. PG&E, San Francisco County, California. Acoustical technical lead for the development and filing of the Proponent's Environmental Assessment (PEA) for a new 3.5-mile 230-kV underground and submarine cable. This critical infrastructure project is designed to maintain power to San Francisco under a major seismic event scenario.

Lead Acoustical Engineer; Oregon LNG Bidirectional Terminal and Pipeline Project, Oregon. Acoustical engineering lead supporting permitting and preparation of numerous applications to federal, state, and local permitting agencies. The project consists of a liquefied natural gas

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(LNG) terminal with a base load liquefaction capacity of 9.6 million metric tons per year requiring and a base load regasification capacity of 0.5 Bscf/d. The terminal included a slip and berth for loading and offloading LNG carriers, and onshore facilities consisting of natural gas pretreatment, natural gas liquefaction, LNG vaporization, LNG storage, and associated support facilities. Prepared the requisite environmental resource reports in support of the project application to the Federal Energy Regulatory Commission as well as acoustical analysis in support of the biological assessment of marine and terrestrial species submitted to National Marine Fisheries Service and U.S. Fish and Wildlife Service.

Lead Acoustical Engineer; Tacoma LNG Project; Puget Sound Energy; Pierce County, Washington. Responsible for supporting acoustical permitting aspects related to the construction and operation of an LNG fueling facility to serve various industries in the Pacific Northwest. The proposed project includes the LNG fueling facility on approximately 36 acres and numerous improvements to an existing natural gas distribution system throughout Pierce County, Washington. Tasks included supporting a Supplemental Environmental Impact Statement in compliance with the Washington State Environmental Policy Act.

Acoustical Engineer; Water Storage Reservoir; Windsor, California. Prepared acoustical analysis of the construction and operation of the reservoir to support the supplemental environmental impact report for CEQA compliance. Also developed responses to comments received during the permitting process. Project involved comprehensive preliminary engineering and environmental services for a new water storage reservoir to provide seasonal storage needed by the Town's recycled water system.

Acoustical Task Leader; Tehachapi Transmission Line; Southern California Edison; California. Prepared acoustical analysis to support regulatory permitting requirements. This multimillion-dollar proponent's environmental assessment (PEA) included preparation of and support activities for a PEA submitted to the California Public Utilities Commission for an approximate 170-mile transmission line and substation project on federal, state, and private property.

Acoustical Task Lead; Odessa Environmental Impact Statement; Eastern Washington. Prepared acoustical analysis to support regulatory permitting requirements. Tasks included modeling and preparing required environmental documentation. The EIS evaluated alternatives to deliver surface water from the Columbia Basin Project to irrigated lands that currently rely on a declining groundwater supply from the Odessa Groundwater Management Subarea in eastern Washington.

Representative Publications and Presentations

Moderator, Conference Organizer, and Instructor for "Introduction to Acoustics" at INCE-Europe Wind Turbine Noise 2017. Rotterdam, Netherlands. May 2017.

Plenary Speaker. Acoustics 2016. "Wind Turbine Sound: Past, Present and Future." Brisbane, Australia. November 2016.

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"Glad to Hear It! A Brief Update on Wind Turbine Sound." Canadian Wind Energy Association Annual Conference. Calgary, Alberta. November 2016.

"Glad to Hear It! Wind Turbine Sound." American Wind Energy Association Wind Power Project Siting and Environmental Compliance Conference and Wind Power Conference. March and May 2016.

Wind Turbine Noise Topic Organizer. InterNoise 2014. Melbourne, Australia. November 2014.

Plenary Speaker. INCE-USA Noise-Con 2013. Denver, Colorado. August 28, 2013.

Instructor: "Introduction to Acoustics." INCE-Europe Wind Turbine Noise 2013. Denver, Colorado. August 27, 2013.

"Criteria." Wind Turbine Noise. Bowdler & Leventhall, editors. Multi-Science Publishing Co. Ltd. ISBN 978-1-907132-30-8. January 2012.

"AWEA/CanWEA Expert Sound Panel and Wind Turbine Sound Regulations." University of Tokyo, Tokyo, Japan. September 12, 2011.

"Wind Turbine Sound." Consensus Building Institute Workshop of Facilitating Wind Energy Siting, Harvard Law School, Cambridge, MA. March 23-25, 2011.

"Wind Turbine Sound and Health – An Expert Panel Review." American Wind Energy Association, Windpower 2010. Dallas, TX, May 24-27, 2011.

"Wind Turbine Noise." American Wind Energy Association Wind Power Project Siting Workshop, Milwaukee, WI. February 28 – March 2, 2007.

"Wind Turbine Noise – An Overview." Mark Bastasch, Jeroen van Dam, Bo Søndergaard, and Anthony Rogers. *Journal of the Canadian Acoustical Association*. June 2006. Vol. 34 No. 2.

"Wind Turbine Generator Noise Prediction - Comparison of Computer Models." Tickell, C. E., J. T. Ellis, and M. Bastasch. Proceedings of ACOUSTICS 2004, 3-5 November 2004, Gold Coast, Australia.