Small Hydropower In The United States Info Ornl

Small hydropower, defined in this report as hydropower with a generating capacity of up to 10 MW typically built using existing dams, pipelines, and canals has substantial opportunity for growth. Existing small hydropower comprises about 75% of the current US hydropower fleet in terms of number of plants. The economic feasibility of developing new small hydropower projects has substantially improved recently, making small hydropower the type of new hydropower development most likely to occur. In 2013, Congress unanimously approved changes to simplify federal permitting requirements for small hydropower, lowering costs and reducing the amount of time required to receive federal approvals. In 2014, Congress funded a new federal incentive payment program for hydropower, currently worth approximately 1.5 cents/kWh. Federal and state grant and loan programs for small hydropower are becoming available. Pending changes in federal climate policy could benefit all renewable energy sources, including small hydropower. Notwithstanding remaining barriers, development of new small hydropower is expected to accelerate in response to recent policy changes.

Water energy resource sites identified in the resource assessment study reported in Water Energy Resources of the United States with Emphasis on Low Head/Low Power Resources, DOE/ID-11111, April 2004 were evaluated to identify which could feasibly be developed using a set of feasibility criteria. The gross power potential of the sites estimated in the previous study was refined to determine the realistic hydropower potential of the sites using a set of development criteria assuming they are developed as low power (less than 1 MWa) or small hydro (between 1 and 30 MWa) projects. The methodologies for performing the feasibility assessment and estimating hydropower potential are described. The results for the country in terms of the number of feasible sites, their total gross power potential, and their total hydropower potential are presented. The spatial distribution of the feasible potential projects is presented on maps of the conterminous U.S. and Alaska and Hawaii. Results summaries for each of the 50 states are presented in an appendix. The results of the study are also viewable using a Virtual Hydropower Prospector geographic information system application accessible on the Internet at: http://hydropower.inl.gov/prospector.

Congress is examining numerous energy sources to determine their contribution to the nation's energy portfolio and the federal role in supporting these sources. Hydropower, the use of flowing water to produce electricity, is one such source. Conventional hydropower accounted for approximately 6% of total U.S. net electricity generation in 2010. Hydropower has advantages and disadvantages as an energy source. Its advantages include its status as a continuous, or baseload, power source that releases minimal air pollutants during power generation relative to fossil fuels. Some of its disadvantages, depending on the type of hydropower plant, include high initial capital costs, ecosystem disruption, and reduced generation during low water years and seasons. Hydropower project ownership can be categorized as federal or nonfederal. The bulk of federal projects are owned and managed by the Bureau of Reclamation and the U.S. Army Corps of Engineers. Nonfederal projects are licensed and overseen by the Federal Energy Regulatory Commission (FERC). Considered by many to be an established energy source, hydropower is not always discussed alongside clean or renewable energy sources in the ongoing energy debate. However, hydropower proponents argue that hydropower is cleaner than some conventional energy sources, and point to recent findings that additional hydropower capacity could help the United States reach proposed energy, economic, and environmental goals. Others argue that the expansion of hydropower in the form of numerous small hydropower projects could have environmental impacts and regulatory concerns similar to those of existing large projects. Congress faces several issues as it determines how hydropower fits into a changing energy and economic landscape. For example, existing large hydropower infrastructure is aging; many of the nation's hydropower generators and dams are over 30 years old. Proposed options to address this concern include increasing federal funding, utilizing alternative funding, privatizing federally owned dams, and encouraging additional small-capacity generators, among other options. Additionally, whether to significantly expand or encourage expansion of hydropower is likely to require congressional input due to the uncertainty surrounding the clean and renewable energy portfolio within power markets. Potential expansion of hydropower projects could take place by improving efficiency at existing projects or by building new projects, or both. Congressional support for this approach is evident in the House passage of the Bureau of Reclamation Small Conduit Hydropower Development and Rural Jobs Act of 2012 (H.R. 2842). Senate activity on this matter includes the Hydropower Improvement Act of 2011 (S. 629), which proposes to establish a grants program for increased hydropower production, and to amend the Federal Power Act (FPA) to authorize FERC to exempt electric power generation facilities on federal lands from the act's requirements, among other things. Another issue is the rate at which FERC issues licenses for nonfederal projects, which is slower than some find ideal. The licensing process can be delayed significantly as stakeholders and the approximately dozen federal and state agencies involved give their input. FERC responded by developing a more streamlined licensing process in 2003. Still, some object to “mandatory conditions” that federal agencies can place on new or renewed hydropower facilities. The 112th Congress has introduced roughly 25 bills regarding hydropower, a quarter of which are state- or site-specific legislation.~

With many states recently enacting either renewable energy mandates or goals, the small hydropower industry has a unique opportunity to supply a growing portion of U.S. electricity supply. But the procedure to obtain a license for project development is unwieldy, increasingly wrought with regulatory hurdles at both the state and Federal levels. Government incentives exist that promote the development of small hydropower, but are insufficient to overcome the regulatory barriers faced by the industry. Although it is possible for small hydropower to supply a growing share of energy production in the U.S., it is unlikely that the full potential will be realized without substantial changes to the renewable energy regulatory system. This study describes the current state of the regulatory system governing the development of small hydropower facilities in the United States. A basic overview of hydroelectric technology is discussed, followed by a detailed description of the process through which a project developer must apply for a Federal license to construct and operate a hydropower project. The current state of the U.S. small hydropower industry is examined, considering the potential opportunity for the industry to supply a growing share of the U.S. electricity supply. This analysis is supplemented by a discussion of the costs of project construction and an investigation into the regulatory barriers to project development.

Small Hydropower in the United States

Featuring contributions from worldwide leaders in the field, the carefully crafted Electric Power Generation, Transmission, and Distribution, Third Edition (part of the five-volume set, The Electric Power Engineering Handbook) provides convenient access to detailed information on a diverse array of power engineering topics. Updates to nearly every chapter keep this book at the forefront of developments in modern power systems, reflecting international standards, practices, and technologies. Topics covered include: Electric power generation: nonconventional methods Electric power generation: conventional methods Transmission system Distribution systems Electric power utilization Power quality L.L. Grigsby, a respected and accomplished authority in power engineering, and section editors Saifur Rahman, Rama Ramakumar, George Karady, Bill Kersting, Andrew Hanson, and Mark Halpin present substantially new and revised material, giving readers up-to-date information on core areas. These include advanced energy technologies, distributed utilities, load characterization and modeling, and power quality issues such as power system harmonics, voltage sags, and power quality monitoring. With six new and 16 fully revised chapters, the book supplies a high level of detail and, more importantly, a tutorial style of writing and use of photographs and graphics to help the reader understand the material. New chapters cover: Water Transmission Line Reliability Methods High Voltage Direct Current Transmission System Advanced Technology High-Temperature Conduction Distribution Short-Circuit Protection Linear Electric Motors A volume in the Electric Power Engineering Handbook, Third Edition. Other volumes in the set: K12648 Power Systems, Third Edition (ISBN: 9781439856338) K13917 Power System Stability and Control, Third Edition (ISBN: 9781439883204) K12650 Electric Power Substations Engineering, Third Edition (ISBN: 9781439856383) K12643 Electric Power Transformer Engineering, Third Edition (ISBN: 9781439856291)

Hydropower has been considered as a great renewable energy resource for decades and provides enormous clean and renewable energy every year. In terms of generation, hydropower is the primary source of renewable energy in the United States, delivering 48% of total renewable electricity sector generation in 2015, and roughly 62% of total cumulative renewable generation over the past decade (2006-2015). However, recently, the large hydropower project is questioned because of the concerns of the large reservoir, dam, and the water channel on the local environment. Due to the smaller scale, short development time, and low environmental impact, the low-head small hydropower system gains increasing attention from the industrial and academic community. The low-head hydropower has the potential to generate a significant amount of electricity from rivers that traditionally were unsuitable for developing hydraulic power plants and supporting the resiliency of the U.S electricity system. Based on the 2016 Hydropower Vision Report, across the U.S, approximately 65.5GW of new stream-reach hydropower capacities are available. These new stream-reach resources are characterized by low-head, varying flows, and highly valued river functions, including fish preservation, sediment transport, and recreational usage. The development of those resources could be possible only if the technologies for low-head hydropower that balance efficiency, economics, and environmental sustainability were developed. The traditional hydropower design method was limited to the new challenges of the low-head application. Therefore, a new Standard Modular Hydropower Technology (SMH) was proposed by the U.S. Department of Energy (DOE) in 2017. This new concept offers a new perspective for small hydropower technology developments based on the premise that standardization, modularity, and preservation of stream functionality must become essential and fully realized features of next-generation hydropower technologies and project designs, and consists of three major modules: Generation Module, Passage Modules, Foundation Modules. Based on the needs for the new design method suitable for the SMH, this research focuses on developing a new design methodology for the Generation Module, which is a low impact, damless Kaplan turbine system, suitable for the low-head new stream-reach sites application. With extensive numerical simulation results and flexible geometrical configuration methods, the new design methodology can balance the performance, economics, and environmental sustainability and provide new perspectives for the future low-head hydropower system designs and developments.

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Covers hydropower, wind energy, solar-thermal electricity, ocean energy systems, geothermal energy, gasification biomass power, fuel alcohol, and solar hydrogen

Hydropower provides a complete discussion of the most up-to-date considerations of this method of creating renewable energy. After introducing the method's history, the author explores various considerations for engineers, planners and managers who need to determine the best placement and size of a plant. The book then presents various types of hydropower systems, such as Run-of-River Schemes and various types of Dam and Turbines, also considering the important economic, environmental and geological impacts of each. Those involved in the planning, design and management of hydropower systems, such as engineers, researchers, managers and policymakers will find this book a very valuable and insightful resource. Explores different types of dams and turbines set alongside easy-to-understand diagrams, such as Embankment Dams, Concrete Arch Dams, Reaction Turbines and Francis Turbines Considers various economic and environmental factors significant for this type of project, such as resettlement, biodiversity and greenhouse gases Discusses best practices for locating a hydropower site and how to make important decisions regarding placement and method

Photo book, American Distributed Hydropower, offers an informative and captivating look into American hydropower. By Gravity Renewables, Inc. Hardback 8.5" x 8.5"

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