Hydropower Development on the Mississippi River

Executive Summary

American Rivers

This paper describes the existing hydropower generation on the Mississippi River and looks at what may be coming down the pipe. It also provides an overview of early concerns regarding power development and provides recommendations on river management from an energy development perspective.

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Photo of Mississippi Lock & Dam No. 2 Hydropower Project Courtesy of Thomas O'Keefe

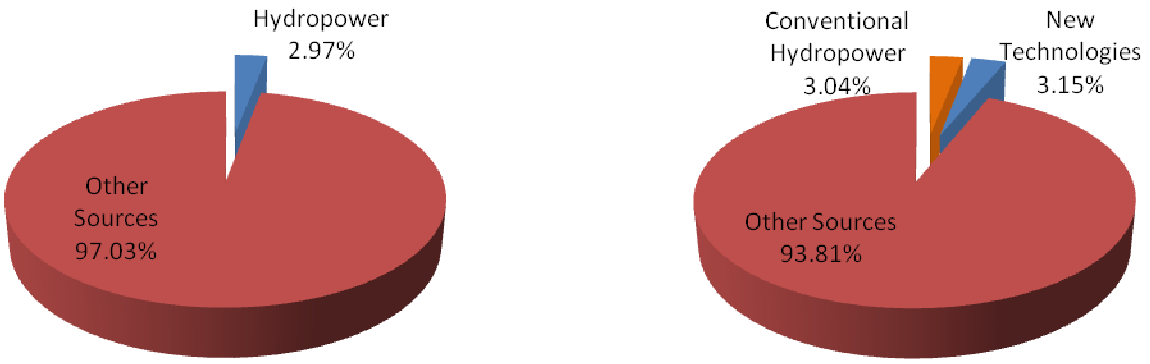
Executive Summary

The Mississippi River is a working river that has long been used to generate power. There are currently 20 conventional hydropower projects on the Mississippi River with 157 megawatts (MW) of power generation capacity. Eight of these dams are managed by the U.S. Army Corps of Engineers, while the remaining twelve are owned and operated by private companies or municipalities.

Recently there has been a surge in interest in new hydropower development on the Mississippi. Some developers want to add hydropower to the river's existing non-powered dams, while others are proposing to build projects that use new dam-less hydrokinetic technologies. A variety of developers have obtained a total of 97 separate federal permits (23 dam retrofits and 74 hydrokinetic projects) to assess the feasibility of developing at their proposed sites.

If all of these proposed projects were constructed, the total hydropower capacity on the Mississippi River would jump from the current 157 MW to nearly 6603 MW, a more than forty-fold increase. For the nine states along the Mississippi that are included in this study, total hydropower capacity (including dams on other rivers) would more than double, providing over 12,018 MW of total capacity. This increase must be taken in context, however; hydropower currently accounts for only 2.97% of power generation capacity in the region. Doubling that capacity would still leave the region with a hydropower capacity of only 6.19%, which is less than the national average and still a fairly small portion of the region's total energy mix.

(a) **(b)**



Comparison of (a) the region's current hydropower energy capacity, with (b) the potential capacity including the proposed hydrokinetic and conventional hydropower developments.

Of course, the financial value of these proposed projects lies less in the total amount of megawatts than in the type of generation it would provide. This development is primarily being driven by state and federal energy policies designed to encourage the production of new renewable energy. These projects would qualify as renewable energy in many of the states where they will be located. While the proposed projects would contribute relatively little to the overall capacity of the states' electricity generation capacity, their ability to qualify as 'renewable' adds significantly to their value. Utilities may be willing to pay a significant premium for the power generated from these projects in order to meet their mandated renewable energy targets. Alternatively, developers may sell the power to other states to get premium rates or may profit from trading credits from their generation in various renewable energy markets.

Conventional hydropower has a well-documented set of environmental impacts, including: 1) harming fish and other aquatic species, both by damaging fish that pass through the turbines or get pinned against its intake screens, and by creating a barrier that cuts off fish habitat; 2) degrading water quality; and 3) impairing recreation. Fortunately, retrofitting existing dams with new hydropower capacity is generally considered to be a relatively more benign way to develop hydropower since they involve dams that are already in place and existing dam operations that are unlikely to change (and in some cases, may change for the better). However, in the case of the proposed Mississippi projects, the scale and number of projects offer additional dangers when you consider their combined or cumulative impacts.

New hydrokinetic technologies, however, are relatively untested and have raised significant concerns. These new dam-less hydropower technologies are analogous to wind turbines submerged under water. Developers have proposed to attach individual turbines or arrays of turbines to the riverbed, the riverbank, bridge pilings, or the underside of a barge. There are 74 proposed hydrokinetic sites on the Mississippi River, with a total proposed capacity of 6,124.2 MW. Most of these projects are the work of a single developer.

Very little is known about their impacts on the environment since no full-scale project has been completed yet. State and Federal resource agencies, along with conservation groups, have voiced concerns about the potential impacts of these new technologies. Many are worried about the impacts that hydrokinetic turbines might have on aquatic species, recreational uses of the river, and on water quality. The U.S. Army Corps of Engineers has raised serious concerns about the uncertainties associated with the potential impacts that free-standing underwater turbines might have on navigation. Most importantly, the cumulative impacts associated with adding all of these developments to a river already highly stressed by human activities are unknown, and federal regulators do not seem intent on taking a basin-scale, comprehensive view of these projects.

The success of the proposed new hydropower projects – in terms of both development and environmental performance – will ultimately be determined by developers' ability to make the technology work, secure finances, and ease stakeholders' concerns about impacts to natural resources. These challenges are especially difficult for hydrokinetic developers, where uncertainties – and the costs associated with addressing them – are greatest. Some developers are more sophisticated and better equipped to succeed than others. Of all the proponents of hydropower projects on the Mississippi River, only one (Free Flow Power, which is proposing to develop both conventional and hydrokinetic projects) seems to be making real progress, and is investing heavily in the technical and environmental studies that are a necessary part of permitting a modern hydropower project.

Conservation groups and resource agencies are concerned about the impacts of these hydropower projects, but often lack the resources or expertise necessary for significant involvement to advocate for environmental protection measures. Such advocacy can require a substantial time commitment over the long haul: a quick assessment of various proposals suggests that none of these projects is likely to complete the regulatory process before 2016, and it could be closer to 2020 before the Mississippi River sees any new hydropower projects completed and generating power. However, involvement in the intervening years, during the complex permitting and environmental assessment phases, is critical to ensure that any new development causes the least amount of harm.

The Mississippi is a highly stressed river, and adding either conventional hydropower dams or hydrokinetic projects will have environmental impacts. Not all of the proposed hydropower development is likely to occur, but those proposed projects that do go forward will impact the Mississippi River's natural resources. Before responsible hydropower development can occur, it is critical that these additional stresses be understood and either be prevented or mitigated appropriately. We must ensure that regulators understand the cumulative impacts of all of the proposed developments and ensure the river is managed for all of its many uses, including for recreation and habitat. We must balance the opportunity of new renewable energy development with the overall needs of the Mississippi, its citizens, and its wildlife, in order to be good stewards of this great river.