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# More Impact. Better Additionality.

**Current Corporate Initiatives Are Missing Vital Opportunities** 

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\*Support from LIHI included access to Certificate

holders, information on the Certification process, and

insights into information available on their website:

www.lowimpacthydro.org

Corporate sustainability initiatives have been a major driver of new demand for renewable energy procurement in recent years. Decreasing project development costs, coupled with higher-efficiency technological advancements, have made renewable energy purchases an attractive means of meeting sustainability goals. When these purchases take the form of a Power Purchase Agreement (PPA), they also allow purchasers to mitigate future risk to their utility bills by locking in fixed price contracts during our current, historically low power price environment.



An explicit desire to provide "Additionality" has been a crucial variable in Corporate PPA (CPPA) decision-making. This concept is rooted in some of the earliest global sustainability movements, such as the Clean Development Mechanism under the Kyoto Protocol. Broadly, Additionality refers to the respective purchase leading to additive effects beyond the business-as-usual, baseline condition of the market. Thus far in the United States, the interpretation of Additionality has been limited to the CPPA leading to the building of a new power plant, typically solar or wind.

## Limitations to the Current Definition of Additionality

Solar and wind resources have provided the least expensive means to Additionality when measured exclusively in terms of building new megawatts (MW). Strangely, the US interpretation of Additionality has largely gotten stuck there; being limited to the basic inflection point between building or not building new plants. This limited definition misses a variety of crucial instances where deviating from the "business-asusual" is valuable and attractive to the Corporate buyer, their local communities, and our country at large. These broader benefits tend to be foregone for lack of a new generation station to go with it.

With support\* from the Low Impact Hydropower Institute (LIHI), Karbone has constructed this Research piece to illustrate the types of opportunity available to Corporate purchasers who are seeking to have a greater impact on the status quo and who are not limited to "New-Build-Only" Additionality.



## The Case for Low-Impact Certified Hydro

Hydroelectric facilities accounted for 7% of total utility-scale electric generating capacity in the United States throughout 2017, with an average plant age of 64 years. Generation from these projects provides value to the electricity system as a carbon-free and flexible generation source, given less intermittency risk compared to solar and wind. This higher output profile supports a more sustainable grid in regions where hydroelectric generation is feasible. The positive spillover from these plants extends beyond just grid resiliency and carbon intensity, however. When operating using low impact methodologies, hydropower plants also support ecological health, recreation economies, infrastructure sustainability, and jobs.



An important distinction must be made here between "low-impact" and generic hydro projects. Low-impact hydro projects take into consideration the ecological, cultural, and economic effects of their projects, and actively seek to mitigate or otherwise optimize their spillover. These issues are important for Corporate procurement as they embody the kind of qualitative charisma that stands out among voluntary market participants. However, it is difficult, if not impossible, to prove that a project is "low-impact" without third party verification. LIHI is the leading authority on evaluating the impact of the hydropower sector, and its transparent Certification process has standardized what it means to be "low-impact" through a set of tightly monitored ecological and social criteria. For these reasons, this report focuses primarily on low-impact, LIHI Certified projects.

#### **Diverse Additionality Propositions**

We highlight three LIHI Certified hydroelectric facilities that embody the additive economic, environmental, and social benefits associated with low-impact hydroelectric generation.

Project Region	Unique Additional Value to Society?	Shared Additional Value to Society?		
Pacific Northwest (PNW)	• Enables fish migration through legacy dam upgrade & provides flood mitigation	Zero-carbon     electricity     modulation		
New England	<ul> <li>Provides boating, swimming, hiking opportunities as well as 40 acres of wildlife for local species</li> </ul>	<ul> <li>Job creation</li> <li>Enhanced</li> </ul>		
Midwest	<ul> <li>Facilitates municipal water use, local recreation economy, and cooling for energy infrastructure; creates temporary and permanent jobs</li> </ul>	function • Ecological health		



## ADDTIONALITY CASE: Enabling Eco-Friendly, Climate- Resilient Processes

**Ecologically-oriented upgrades and management practices** help reduce the environmental impacts from older hydroelectric generation. Our Research Group flags the changes made to a legacy dam system in the Pacific Northwest. Originally completed in 1961 with a generating capacity of nearly 700 MW, the Early Action Program (EAP) needed for the facility's LIHI Re-Certification focused on protecting and restoring fish habitats. This voluntary action resulted in a diverse set of accomplishments that included:

- 1. Direct investment of nearly \$4 million dollars with another \$4.5 million from matching funds and grants;
- 2. Acquisition of 14,044 acres of high-quality fish habitat;
- 3. Restoration of existing and planting of native vegetation to reduce erosion and recreate a natural estuary;
- 4. Funding more than \$1 million in direct research studies on native fish species in the watershed;
- 5. Hiring of full-time fish biologists to oversee research and restoration in the watershed.

The same upgrades also enabled the local municipality to **avoid the negative effects of extreme climate events**. For example, the dam mitigated the fallout from a 10 year flood that occurred in 2017 by capturing 35,000 of 44,000 cubic feet per second. In this way, adaptive management practices have lowered the long term cost of mitigation, while ensuring that these facilities remain in operation and by addressing the concerns regarding the hydro dams' impact on local ecology.

ADDITIONALITY CASE: Public Recreation Opportunities

America's recreation economy, which produces more than 7 million jobs, has a growing mandate for policymakers to create and protect public spaces for a variety of activities. Impact-oriented upgrades to hydroelectric generators can further **support** the growth of the recreation sector. Our Research Group highlights a LIHI Certified facility in New England that is addressing the potential environmental impact associated with the facility while preserving recreation opportunities for the community. Impact-oriented upgrades to the 16.8 MW facility have been able to mitigate effects on local eel passage, resulting in the highest levels of fish passage in recent history of the facility, while preserving the continued use of boat launches, playground areas, and multiple miles of trails for the local population.

Recreational Resource	Miles/Acres		
Trails	5 miles		
Parks	4 acres		
Wildlife Area	40 acres		
Playground Areas	4 acres		
Marina	2 acres		



## ADDITIONALITY CASE: Socioeconomic Spillover

Impact-oriented hydroelectric facilities can also offer multi-tool solutions at the municipal level. We analyzed a smaller LIHI Certified project (5-10 MW) in the SPP region that has been able to finance upgrades after demonstrating its importance to the local economy. The facility **maintains the water pool** at a level necessary for adequate water storage, consumption, and transportation for the local municipality while also providing cost-effective cooling for a upstream powerplant. By maintaining a stable upstream pool, the facility enables a local recreation economy around rowing and fishing, and itself employs both temporary and permanent personnel.

This project highlights how impact-oriented hydroelectric generation can play a crucial role in addressing pressing infrastructure concerns surrounding the nation's waterways and reservoirs, while delivering emission-free electricity to the grid.

Interestingly, in this instance the Additionality of the project was recognized, such that the project was able to **finance upgrades to the facility's equipment due to these positive economic spillovers** that have been realized by local stakeholders.

## Upgrades, Expansions and Continuous Operations Are at Risk

Ironically, much of the time the added value of hydropower is overlooked by the market. The inclusion of hydroelectric facilities in state-level Renewable Portfolio Standards (RPS) programs depends on a variety of factors including project age, size, technology, and ownership. Large-scale dams are often deemed ineligible by State RPS programs to generate renewable energy credits (RECs), a significant revenue stream for most renewable projects. Certain dams and run-of-river projects do qualify for REC generation in regions like the Mid-Atlantic (PJM). There are even a few RPS programs that have institutionalized a home for low-impact hydro, most notably in New England (NEPOOL), where **key RPS markets require LIHI Certification** to gain access to high value, hydro-specific REC carve-outs.

These cases are the exception though, not the norm. Current prices in most markets across the US jeopardize any potential upgrades or expansions to the hydropower fleet. In some cases where repairs, overhauls, or relicensing are needed, even the continued operations of existing projects are at risk.

Revenue	NEPOOL	PJM	PNW	Costs	Low	High
REC (MWh)	\$20.00	\$5.00	\$1.00	OPEX (kw-mo)	\$1.25	\$2.50
Power (MWh)	\$25.00	\$20.00	\$15.00	CAPEX	\$25,000	***
Capacity (MW-Year)	\$60,000	\$27,000	\$-	Discount Rate	7%	

*\*\*\*Note: CAPEX required for hydro projects varies widely depending on what repairs/relicensing may be needed, or new build/expansion projects may be planned.* 

Using a basic set of regionalized revenue and cost assumptions from Karbone's Brokerage Desks and Capital Advisory Group (per the above), we analyzed a sliding scale of returns to a generic 5 MW hydroelectric project, operating at 45% capacity factor, on a 20 year financing term, at a discount rate of 7%. These assumptions are highly generalized whereas the hydro project landscape is very subjective. Nonetheless, the results are striking and make a strong case for Financial Additionality within the sector.



A hydro project with minimal CAPEX needs over its financeable lifetime can generally make for an attractive investment. The moment any sort of repairs are needed, however, there may be trouble. More importantly, for any project whose owners or community could benefit from ecological upgrades, infrastructure improvements, or expansion of the plants, the returns are extremely hard to justify at prevailing rates.

Revenue (\$/Year)									
All In Costs (\$/Year)	IRR	\$300,000	\$400,000	\$500,000	\$600,000	\$700,000	\$800,000	\$900,000	\$1,000,000
	\$100,000	11%	19%	27%	35%	45%	57%	70%	86%
	\$200,000	1%	6%	10%	14%	18%	22%	26%	30%
	\$300,000	-3%	1%	4%	7%	10%	12%	15%	17%
	\$400,000	-5%	-2%	1%	3%	5%	7%	9%	11%
	\$500,000	-7%	-4%	-2%	1%	2%	4%	6%	8%
	\$600,000	-9%	-6%	-3%	-1%	0%	2%	4%	5%
	\$700,000	-10%	-7%	-5%	-3%	-1%	0%	2%	3%
	\$800,000	-11%	-8%	-6%	-4%	-2%	-1%	0%	2%
	\$900,000	-11%	-9%	-7%	-5%	-4%	-2%	-1%	0%
	\$1,000,000	-12%	-10%	-8%	-6%	-4%	-3%	-2%	-1%

What's needed to tip this scale toward the green is exactly what US corporations have been providing to new solar and wind: Recognition of the value that impactoriented hydro projects provide to society above and beyond the "business-asusual" scenario, in the form of an additional bump of revenue.

In Conclusion: Consider the Benefits of a More Holistic Idea of Additionality

Without a doubt, supporting New-Build solar and wind is an important movement toward modernizing our grid and improving the sustainability of our economy. Our point here is that this is not the entire story, nor is the prevailing definition of "Additionality" capturing the entire picture. A number of organizations, including the Center for Resource Solutions, the World Resources Institute, and others, have flagged this issue, and have been seeking to shift the Corporate emphasis from "Additionality" towards "impact".

From our vantage point as an active participant in the renewable energy marketplace, the state of impact-oriented hydro-power plants is certainly a clear example of where "new-build-only Additionality" falls short.

Impact-oriented upgrades, improvements, and expansions to the existing hydropower fleet support ecological health, infrastructure resilience, local economies, and jobs. Corporate buyers who understand these vital benefits would face a wide set of opportunities to provide more impact in the form of keeping flexible renewables on the grid, supporting local economies beyond simple power generation, and driving demand for more hydro to pursue low-impact methodologies like those required for LIHI Certification.

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