

## CASE STUDY

BENEFITS FROM THE WHOOSH H FISH TRANSPORT SYSTEM EXTEND BEYOND SAVING SALMON POPULATION:

Hydropower Industry to Enjoy Additional Revenue from Conserved Waterflows



### CLIENT

Whooshh Innovations Inc.  
(Whooshh)

### PRODUCT

Waterless fish passage portal that moves live fish over obstacles

### TARGET MARKET

Federal authorities, hydropower dams' owners and operators

### TARGET GEOGRAPHY

The Columbia River Basin in Washington state (USA)

### PROJECT OBJECTIVE

Quantify economic benefits to the hydropower sector from the Client's technology

## Business Opportunity

Whooshh is the creator of a ground-breaking technology that passes fish safely over barriers and obstacles. After establishing itself in various fish transport applications, from seafood processing to hatchery operations, the company started exploring the economics for operators in the hydropower sector. The core objectives of this study was to examine the economic benefits realized if conventional fish ladders currently utilized by hydropower dams were replaced with the waterless Whooshh Passage Portal™.

The company was seeking qualified data to substantiate its message to the hydropower sector. OVG was engaged to conduct waterflow savings economic analysis, and assess other benefits from Whooshh technology for the hydropower industry.

## Methodology

Assessment of waterflows which are currently stranded to support the conventional fish ladders' operations was conducted in a hypothetical setting.

It was assumed that the existing fish ladders will be replaced with the Whooshh Passage Portal, freeing up waterflows and allowing the water to be re-directed to power generation turbines to produce electricity. This additional electricity, when sold in regional power markets, becomes the source of additional revenues for hydropower generators.

For this proxy analysis, OVG chose eight federally-owned hydropower dams located on the Columbia and Snake rivers and examined the following publicly available data:

- daily counts of migrating salmonid at each dam;
- power generation waterflows, electricity production, and specifications of fish ladders' design and operations on each hydropower dam; and
- wholesale prices in the regional power markets (Mid-C, NP-15, SP-15).

Analysis is based on 58 public data sources, daily data of 2016- 2017.

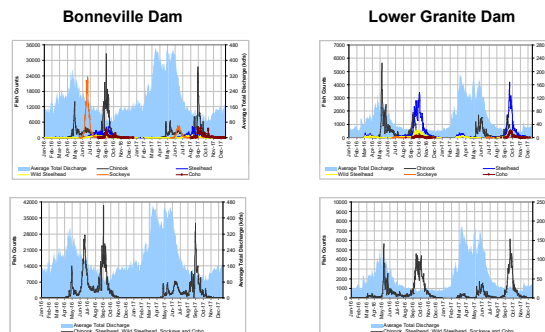
## Observations

Analysis revealed that seasonal decreases of waterflows usually overlap with salmon runs. The peak for salmon dam crossings occur in the fall when there are receding water levels. Scarcity makes hydro resources highly valuable during salmon migration.

The regional hydropower generation sector relies on these same waterflows. There is a heightened demand in electricity, with the electricity prices rising on all regional trading hubs, that occurs during the peak of salmon migration, which is already strained by water shortage.

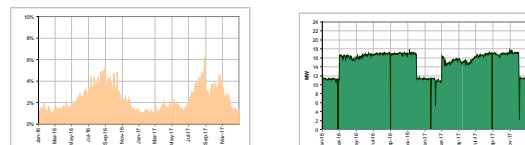
Analysis of the hydropower dams' electricity production patterns and specifications of fish ladders' design and operational profiles revealed that waterflows currently used for adult fish passing can contribute significantly to power production. Results, however, vary by dam.

Fish Migration Patterns (by species and cumulative) vs. Power Generation Waterflows



Surplus waterflows can add from 1.6% to 10.6% to the dam's power generation capacity. If realized, it could have accounted up to the total of 125 MW of generation on all eight hydropower dams in 2016 and 130 MW in 2017.

Surplus Generation from the Fish Passages Waterflows in the Dalles Dam (% , MW)

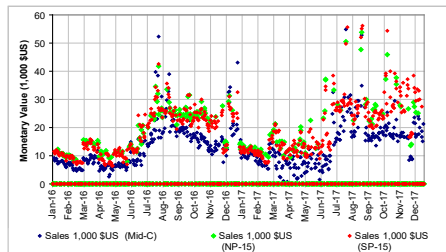




EXAMPLE: if water savings from John Day dam were traded entirely on either of three regional power market hubs in 2016 during High Load Hours, the surplus electricity volumes could have yielded up to \$4.3M (sold from John Day Dam on SP-15 hub).

Estimated projected future revenues on all facilities in 2018 were expected to range between \$10.6M with all electricity traded on NP-15 hub and \$21.8M - on SP-15.

Revenues from Selling the Hydrogeneration Surplus from John Day Dam



## Results

Analysis of the hydropower facilities operations, in conjunction with the salmonids' migration patterns and local power markets price patterns, led to the conclusion that Whooshh technology can help solve the double conundrum of seasonally low water levels during fish migration and high electricity demand in the region.

The Whooshh fish passage solution eliminates the need to direct waterflows to support operations of adult fish passage, freeing hydro that can be utilized to generate electricity, much needed and valued, especially during critical seasons of salmon migration. It can add up to 10% of generation capacity to generation profiles on some dams.



*"We were very happy with the substantive and timely analysis prepared by OVG Consulting. Their independent assessment helps us make a powerful economic argument to our customers and is persuasive to managers and regulators when combined with our collective biological studies confirming that our selective fish passage system is also smarter for native fish recovery efforts. As a result, our message to the hydropower industry and its regulators is accelerating deployment decisions around the world. We will definitely engage with OVG in the future when assessing options for our customers through Whooshh Consults."*

Vincent Bryan III  
CEO, Whooshh Innovations Inc.

**The Client has been utilizing this study to successfully promote Whooshh technology to different parties of interest, including federal regulators.**

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OVG Consulting Inc. is a management consultancy providing financial evaluation of businesses and markets, forecasts, economical modelling, regulatory and market analysis, and market entry advising.