Future of Our Salmon Workshop

March 2014
Welcome and Introduction

- Salmon viewpoint: [http://youtu.be/meNouB_3u2w](http://youtu.be/meNouB_3u2w)

- Goal: Build interest in testing system within Treaty Phase II

- Interactive and engaged conversation – ask questions!
Who is Whooshh

We’re changing fish passage, fish rescue, and fish processing … forever

- The Company develops and makes “Whooshh” transport systems
- Whooshh products enable the automated transport of highly intensive hand labor and haul applications where product is sensitive to bruising, stress, or other damage/waste.
- It is fast, requires far less water and energy than other systems, and is cost effective when compared against all other alternatives
- Installations in 2013 in U.S. and Norway
- Patented transport system for singulated transport conduit
Whooshh™ Fish Transport Tubes

**Patented pneumatic technology platform** takes advantage of pressure differentials to move objects gently over distance

A pressure differential is introduced which creates a motive force which push/pulls objects from the higher pressure region to the lower pressure region

- Utilizes linear, flexible, and novel transport components

Unlike traditional pneumatic systems, the Whooshh Systems are:

- **Linear** – It can move multiple objects in line one at a time
- **Asymmetric** – It can move objects of differing size and shape
- **Atraumatic** – It moves objects gently so as not to bruise or damage
- **Flexible and High Speed** – Objects are self propelled at a rapid rate
Who is Whooshh

• Technology Overview: http://youtu.be/ubPnh5phrXQ

• Applications:
Standard Whooshh Transport System

Automatic or Manual Feeding
- High throughput
- Feeds 40 fish per minute
- Speed of 10 meters per second

Easy to Install
- Flexible configurations
- Systems available up to 200 meters
- Custom-designed systems

Simple to Operate
- Efficient, gentle
- Hygienic
- FDA-certified materials
- Low maintenance
Whooshh Accomplishments in Fisheries

- **Four years of design and engineering**
  - $3.5 million development spend
- **CRRL testing and Mesa article**
  - 50 ft system including tube, tank and blowers delivered free of charge
  - CRRL “like in kind” contributions of labor, fish, evaluation
  - Article published in November 2013
- **Norway installation**
  - 230 ft system delivered including tube, motor, blower delivered free of charge
  - Partner “like and kind” contribution of labor, fish, evaluation
- **Roza installation**
  - 40 ft system including tube, motor, blower delivered free of charge
  - Yakama “like and kind” contribution of labor, fish, evaluation
  - Physiological findings reported after Spring Chinook run
Yakama Nation’s Roza Facility

- Roza Specifics: http://youtu.be/YaT3GM1cWqq
  - What we have learned?
  - Where are we going?

- Volitional Entry: http://youtu.be/-EwM0GPXhGE
Columbia River Gorge Demonstration

- 250’ Tube Length
- 100’ Vertical
- Tension Cable Hanger System
- 20 kW blower
- Multiple fish loaded simultaneously
- ~7s transit time
- Video: http://youtu.be/kbsSJTQOi9I
We need help taking it from here

Columbia Treaty Consideration:

- Is the Whooshh system beneficial
- Can it be tested and implemented within the pre-treaty process
Work together on phased projects to answer your questions:

- Any practical limitations?
- Volitional Entry?
- Operational?
- Physiological/biological effects/behavioral changes?
Treaty Phase II Projects

Test 1 – Experimental pilot project – near term

- **Design Parameters**
  - 200 ft x 50 ft vertical
  - Volitional entry

- **Location**
  - Roza, Willamette, Wanapum and/or Rock Island

- **Participants and Responsibilities**
  - Whooshh, Tribes and/or PUDs, CRRL, USBR, USACE, NOAA/NMFS, USFW

- **Costs**
Test 2 – large scale pilot – longer term

- **Design parameters**
  - 1,000 ft x 236 ft vertical
    - ~25s transit time
  - Three lane volitional entry

- **Location**
  - Chief Joseph, Other?

- **Participants and Responsibilities**
  - Whooshh, Tribes and/or PUDs, CRRL, USBR, USACE, NOAA/NMFS, USFW

- **Costs**
## Briefed State and Federal Agencies and Entities

<table>
<thead>
<tr>
<th>Federal Agencies</th>
<th>Congressional Offices &amp; Other</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bonneville Power Administration</strong></td>
<td><strong>Senator Patty Murray and Staff</strong></td>
</tr>
<tr>
<td>NOAA and National Marine Fisheries</td>
<td><strong>Senator Maria Cantwell Staff</strong></td>
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<tr>
<td><strong>NW Power &amp; Conservation Council Staff</strong></td>
<td><strong>Former Congressman Norm Dicks &amp; Staff</strong></td>
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<tr>
<td>U.S. Army Corps of Engineers</td>
<td><strong>Congressman Doc Hastings and Staff</strong></td>
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<td><strong>U.S. Bureau of Reclamation</strong></td>
<td><strong>Congressman Dave Reichert Staff</strong></td>
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<tr>
<td>U.S. Department of Interior</td>
<td><strong>Colville Nation</strong></td>
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<td><strong>U.S. Fish &amp; Wildlife Service</strong></td>
<td><strong>Columbia River Inter-Tribal Fish Council</strong></td>
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<tr>
<td>U.S. Geological Survey, Western Fisheries Research Center and Columbia River Research Laboratory</td>
<td>WA State Department of Fish and Wildlife Yakama Nation</td>
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<td><strong>National Hydropower Association</strong></td>
<td><strong>Yakama Nation</strong></td>
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# Fish Transport System Specifications

<table>
<thead>
<tr>
<th>Key Specifications</th>
<th>Deployed</th>
<th>Potential</th>
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<tbody>
<tr>
<td><strong>Maximum Length</strong></td>
<td>~250 ft</td>
<td>2000+ ft</td>
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<tr>
<td><strong>Maximum Height</strong></td>
<td>100 ft</td>
<td>1000+ ft</td>
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<tr>
<td><strong>Maximum Incline</strong></td>
<td>45 deg</td>
<td>90 deg</td>
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<tr>
<td><strong>Minimum Corner Radius</strong></td>
<td>7 ft</td>
<td></td>
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<tr>
<td><strong>Maximum Feed Rate</strong></td>
<td>1.5 s/ fish</td>
<td>Dependent on Pump Size</td>
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<tr>
<td><strong>Fish Size Range per tube</strong></td>
<td></td>
<td>Range from 30% of largest size to be transported</td>
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<tr>
<td><strong>Fish tube sizes available</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Maximum Pressure</strong></td>
<td>4 psi</td>
<td></td>
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<tr>
<td><strong>Average Pressure</strong></td>
<td>1 psi</td>
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<tr>
<td><strong>Power Consumption</strong></td>
<td>5-15 kW</td>
<td></td>
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<tr>
<td><strong>Cleaning Time</strong></td>
<td>30 minutes</td>
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Conclusion

Thank you