FISHERIES STUDY ON MITIGATING IMPACTS RELATED TO ADAM CREEK

Presented to the MECC

by

SENES Consultants Limited

May 7, 2013

Adam Creek Spillway

8 spillway gates that each have the capacity to pass 600cms each. Total spill capacity of 4870cms (1.3 million gallons per second or 111 billion gallons per day). Average spring spill at Adam Creek 1250cms (330,215 gps or 28.5 billion gpd).

Issue

- **When the Adam Creek spillway is operated at various times of the year sturgeon become susceptible to entrainment and there are other issues as well.**

- **High flows - No flows**
- **Entrainment (lake sturgeon)**
- **Erosion / Sedimentation**

Objective

- Review and assess potential fisheries impact mitigation options, including benefits and costs.
- Options include measures suggested in the RFP and additional measures proposed by SENES.
- Assessed options will relate to mitigating the current problems of releasing water down Adam Creek and fish protection.

Approach

- **Detailed international literature and technology review of the options assessed and the feasibility of these options for fisheries impact mitigation at Adam Creek.**
- **Review all possible options - In the box and out of box solutions**
- **Traditional knowledge - use of knowledge on fish behaviour – past/present**

First Nation Engagement

Traditional Knowledge

- **Consultation with FN MECC and EWG members on availability of information from elders and interviews with people originally living in area to provide additional information on Adam Creek impacts and fisheries.**

Outcome of Work

- **Review what has been done, search out new information studies and determine what are best options.**
- **Mitigation options will be narrowed down for potential application at Adam Creek including conceptual designs.**
- **Potential future study to assess narrowed-down options in more detail (e.g., detailed designs and engineering requirements).**

Proposed Schedule

Item	Task/Deliverable	Scheduled Completion
1	Project kickoff	May 7, 2013
2	TOC`s (Table of Contents)	May 10, 2013
3	Submit Interim Progress Report and Present Results to the MECC Outlining the Current Progress of the Study and Preliminary Mitigation Solutions	June 17, 2013
3	Submit Final Report and Present Results to the MECC	July 17, 2013

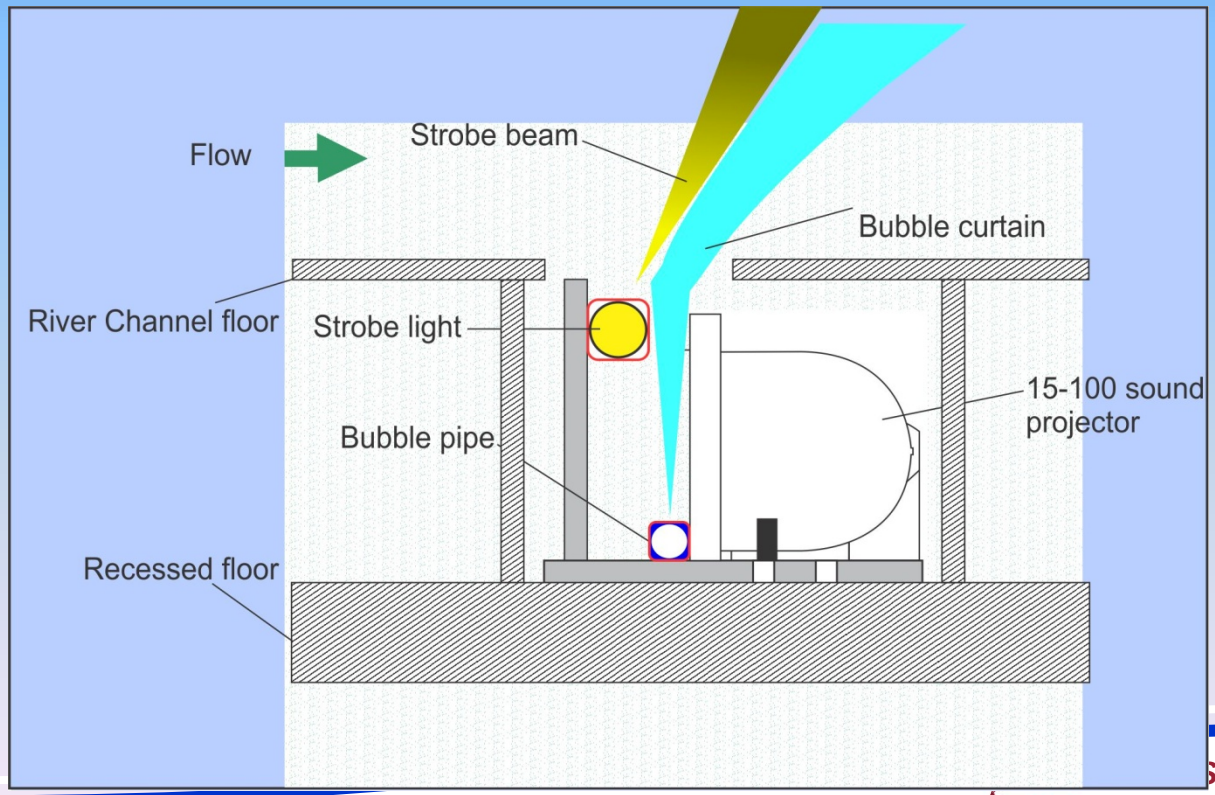
SOME PRELIMINARY RESULTS TO DATE- TECHNOLOGIES

BIOACOUSTIC FENCE (ENGLAND, US)

- **Acoustics**
- **Air Bubbles**
- **Strobe Light**
- **Integrated System**

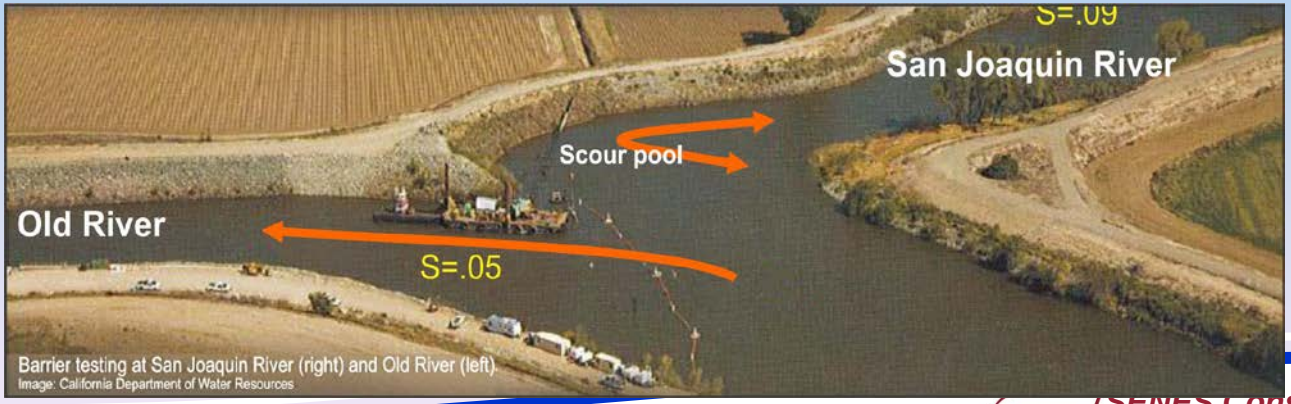
Bio-Acoustic Fish Fence (BAFF) – 2009-2012

- Acoustic/bubble/strobe light barrier.
- E.g., Georgiana Slough, USA



BAFF – Georgiana Slough, USA

- Declining population of chinook smolts.
- BAFF set at confluence of Old River and San Joaquin River to deter smolts from entering Old River, and guide them towards San Joaquin River.
- 2009: Overall deterrence efficiency = 81.4% before predation by striped bass at scour pool (dry year).
- BAFF had little impact on other river uses (e.g., fishing, boating).



Barrier testing at San Joaquin River (right) and Old River (left)
Image: California Department of Water Resources

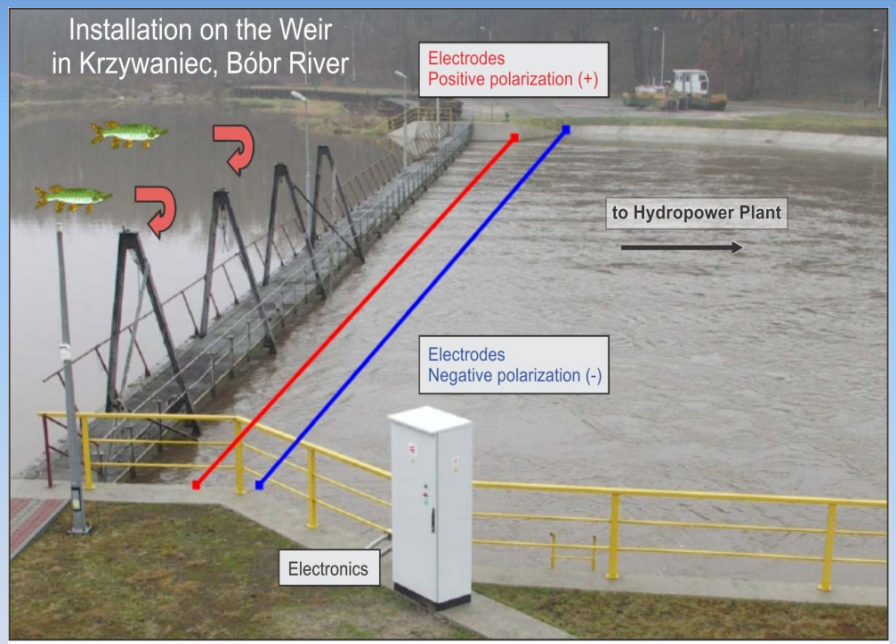
ELECTRIC BARRIERS

- **Smith Root (US)**
- **Bilfinger (Germany)**
- **NEPTUN (Poland)**

NEPTUN Electric Barrier (2007-2012)

- Electric gradient: electric field increases from positive (away from facility) to negative (closest to facility) electrode.
- Non-linear distribution of electric field diverts rather than stuns fish.
- Random alternating electric field to prevent adaptation by fish.
- Easy installation; low power consumption; low O&M; durable; remote operation.
- Other work conducted on sturgeon suggests feasibility of low frequency electric fields (Basov 1999, 2007).

NEPTUN – Dychow Hydroelectric (Poland)



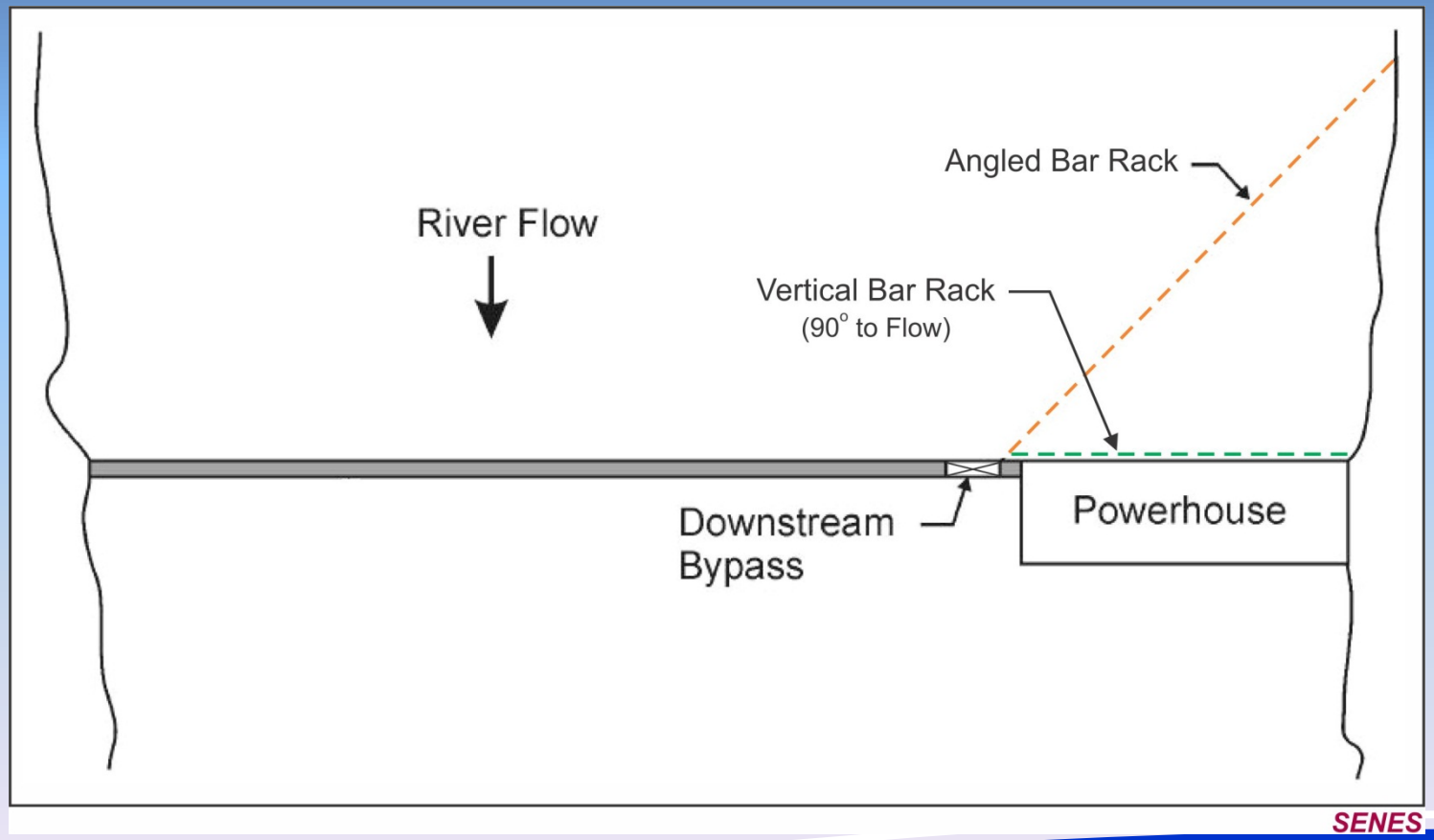
Source: Fishways Global, 2011

- Lab and Field testing
- Hydroacoustics to determine effectiveness
- Barrier “On”: 10 fish seen within electrodes.
- Barrier “Off”: 283 fish seen within electrodes.
- Statistically significant results suggests avoidance response.
- Basov (1999, 2007) avoidance low frequency electric fields (sturgeon)

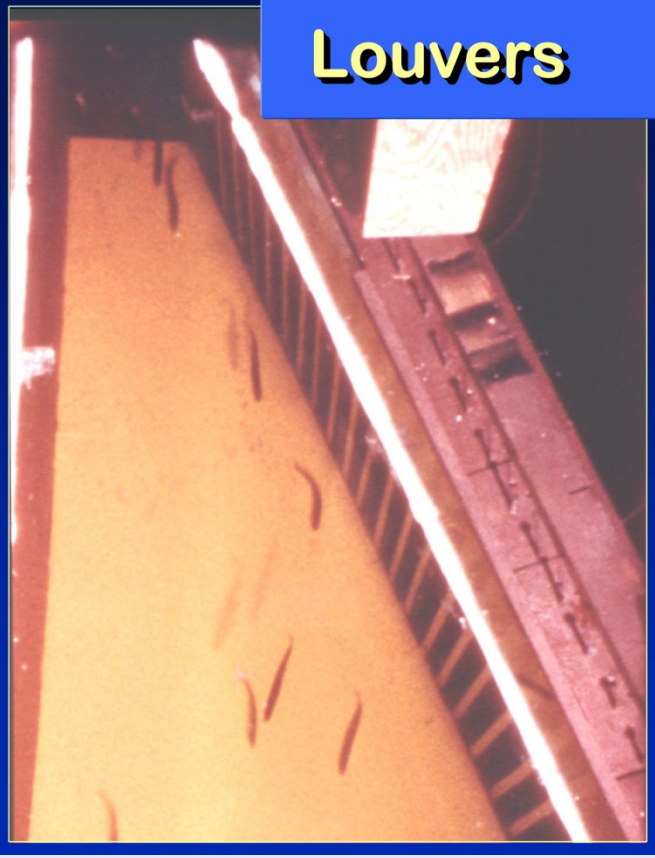
ANGLED BAR RACKS OR LOUVERS

- Lab and field results (Aldens Labs)
- USFW (NEW Hydro)using angled bar racks for sturgeon as a technology on Menominee River in 2014-15 (Utrup 2013)
- Ist Sturgeon bypass in NA

Trash (Bar) Racks



Louvers



Fish Guiding Along Louver System

REVERSED LOUVER- SLAT ANGLE, SLAT WIDTH AND DEPTH

FISH GUIDANCE SYSTEM (WEST COAST US)

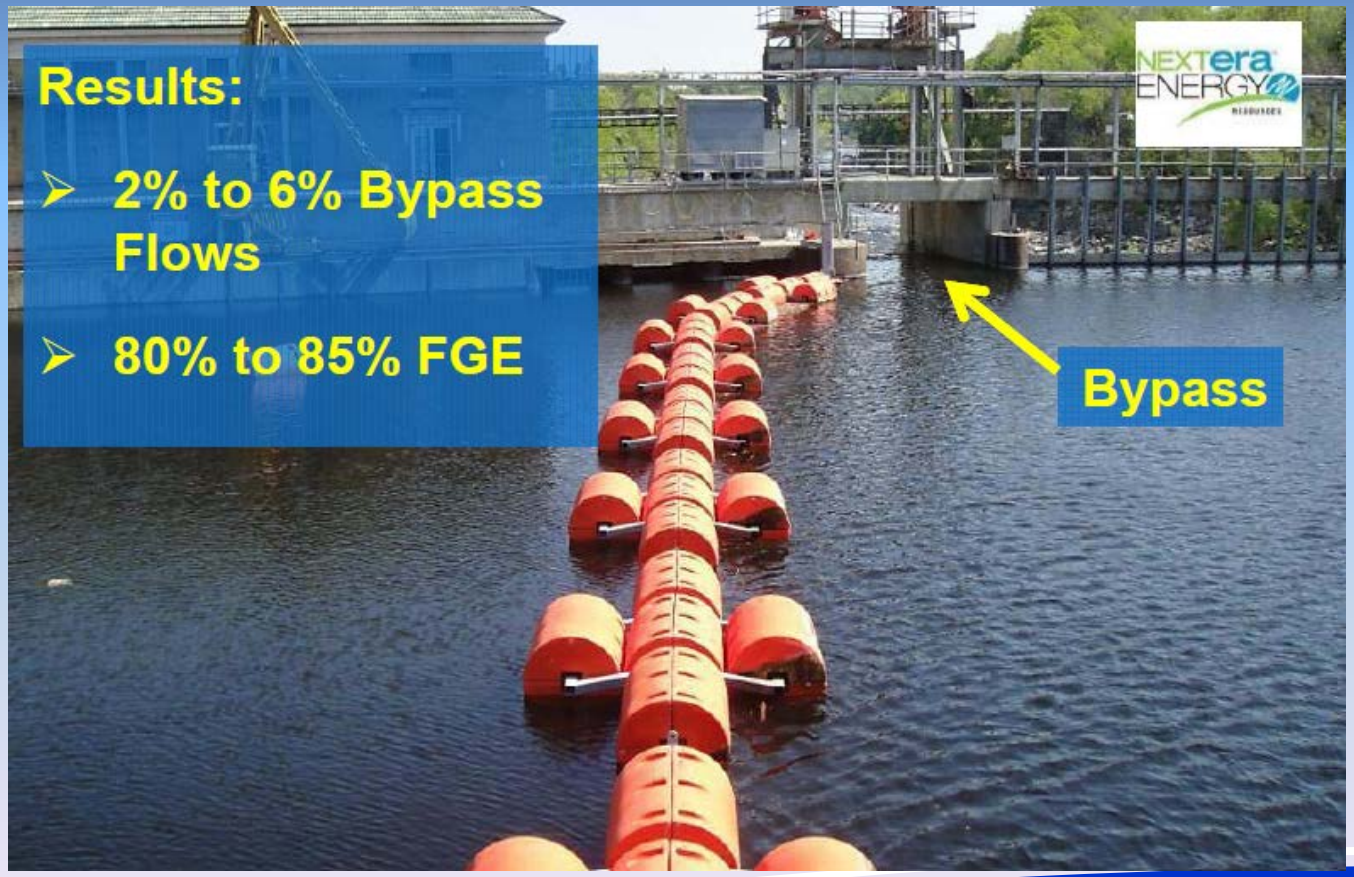
Fish Guidance System (FGS) (Boom Extension) (2012)

- FGS comprises a series of floating panels anchored across the river channel.
- FGS units consist of top floats, perforated steel screen and gapless connectors.
- For use in low and high velocity environments.
- Provides cue to affect migratory behaviour (physical, visual, hydraulic).
- FGS designed to speed up migration, minimize entrainment, and reduce mortality and stress.
- Improves juvenile fish passage survival.

FGS: Cowlitz Falls Dam, Cowlitz River, WA

Source: Scott (2012).

FGS: Weston Station, Kennebec River, ME



Source: Scott (2012).

NEW ENGINEERED GATES

- **Fish Protection incorporated into design**
- **Hamilton Company- feasibility**

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Questions