

# An Estimation of Survival & Injury of Fish Passed Through the Hydro Green Energy Hydrokinetic System

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DOE-Aquatic Animal Interaction with Marine and  
Hydrokinetic Devices Webinar

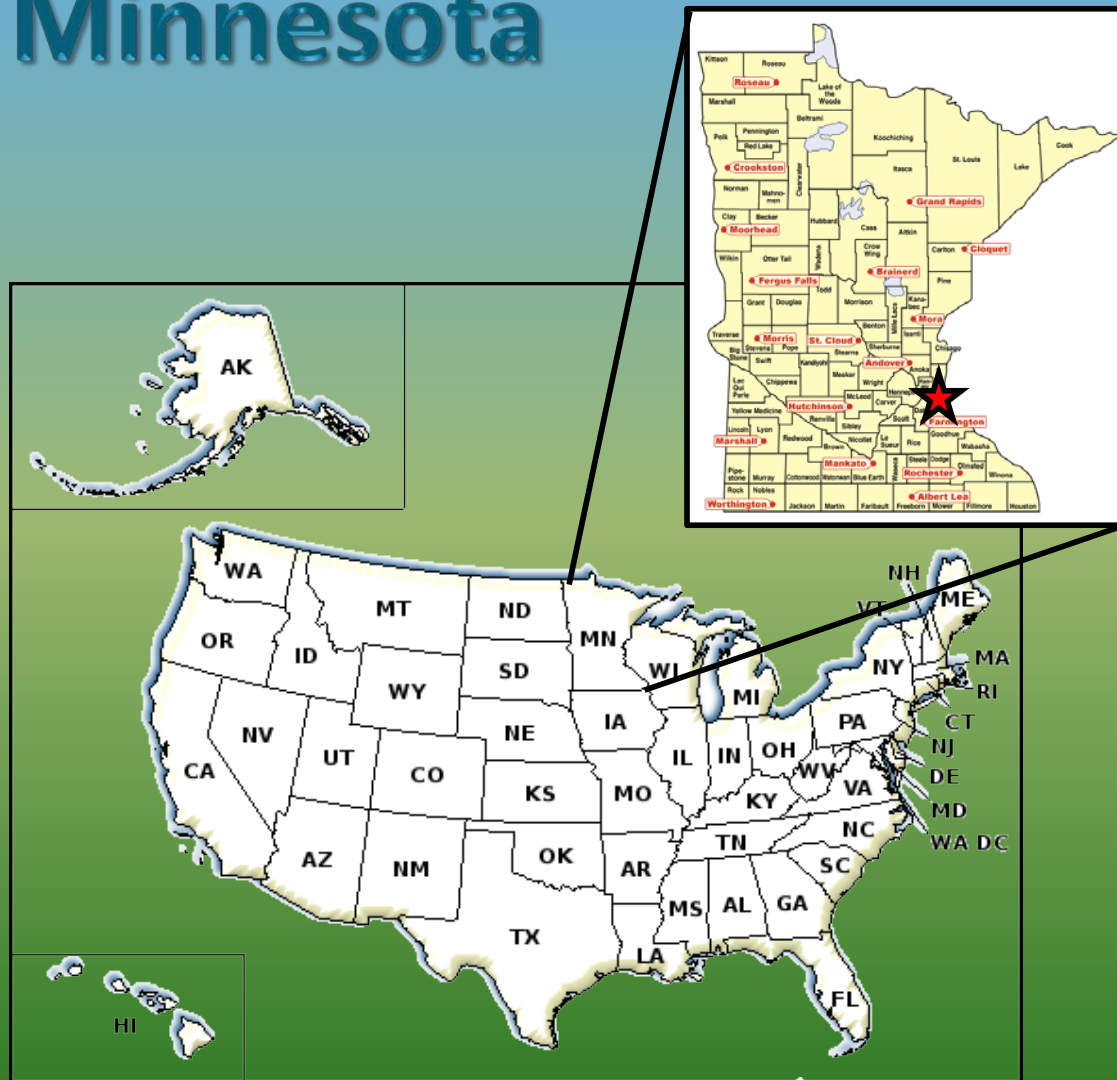
29 August 2011



# Hydro Green Energy

- Renewable energy company with proprietary low-head hydropower technology
- Chicago area headquarters
- New corporate and project level funding secured in May 2011
- Modular, plug-and-play system for cost-competitive and low-impact deployment at non-powered dams
- Technology demonstrator was a system at Hastings, MN
- Preliminary permits for 26 projects in 13 states; 20 pending permits
- Permits in hand have energy output equivalent to ~1,000 MW of solar power or ~800 MW of wind power

# Hastings, Minnesota



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# Mississippi Lock & Dam No. 2 Project



# Mississippi Lock & Dam No. 2 Project

- 23-year license for HK technology
- Installed modular, vertically stackable 100 kW system in 2008
- Generating power at an existing dam
- Worked closely with USACE, FERC
- Received FERC license in 8 months
- Only FERC license for HK in U.S.





# HGE's Patented Design



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# Commissioner Moeller Flips the Switch



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# Hydro Green Energy Hydrokinetic Turbine



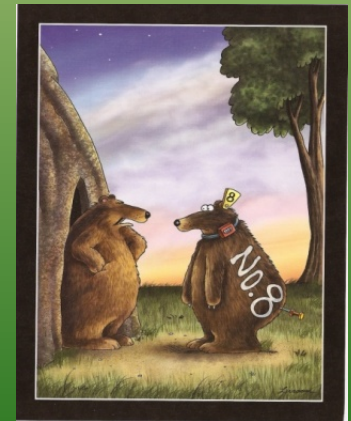
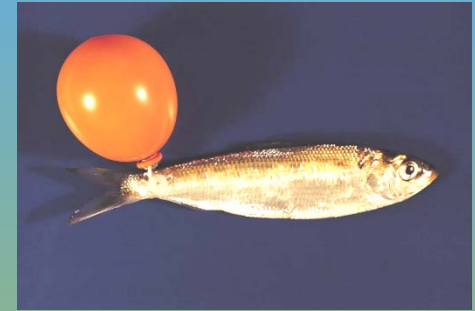
- 12 ft diameter
- 21 rpm
- 3 blades
- No pressure effects (no head)

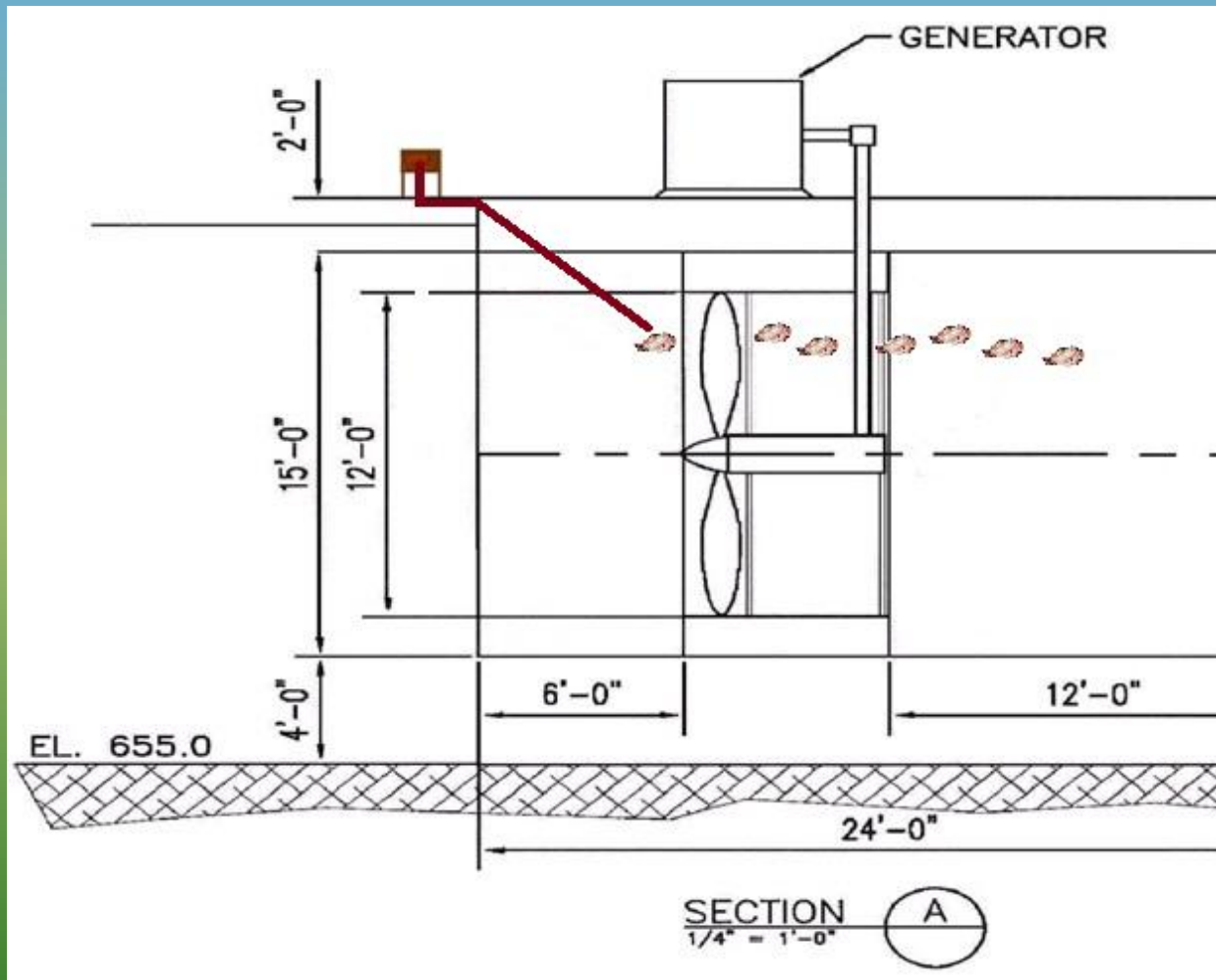




# Survival/Injury

- Used “Hi-Z Turb N’ Tag” (i.e., balloon tag) methodology
  - Control and treatment groups
  - Both groups marked with a deflated balloon tag, radio tag, and a VI or Floy tag
  - Treatment group passes through turbine, control group passes around turbine
  - Balloon inflates, fish are recovered downstream
  - Injuries and latent effects assessed







**Before  
Release/Inflation**

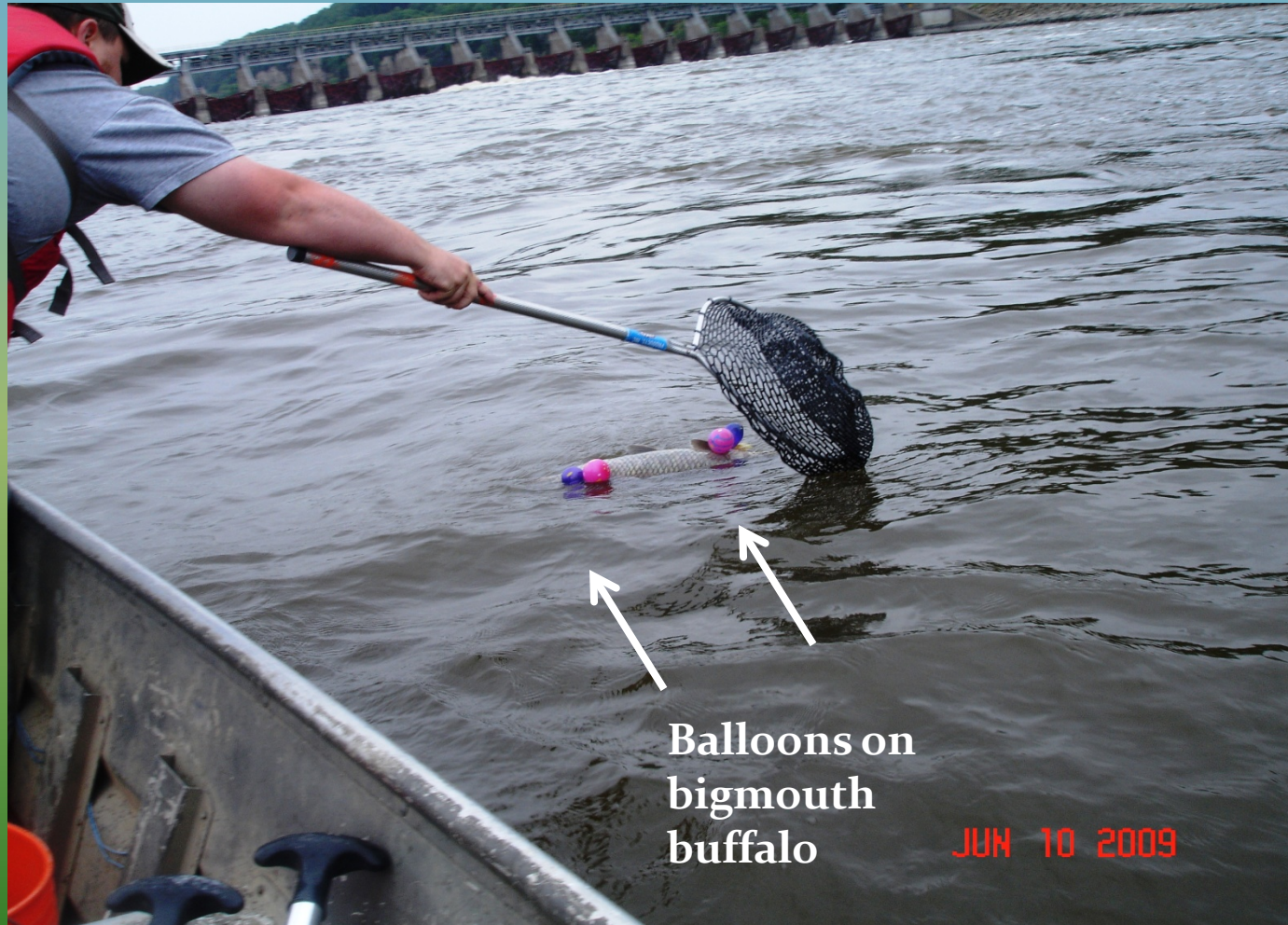


**After Inflation &  
Recapture**





# Recapture of buoyed fish



Balloons on  
bigmouth  
buffalo

JUN 10 2009



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# Hydro Green – Hydrokinetic Turbine Passage Survival Results

48 hrs	Yellow Perch	Bluegill	Catfish	Smallmouth Buffalo	Bigmouth Buffalo
Relative Survival Point Estimate	100%	100%	100%	98.1%	99%
90% Conf. Intervals	95.9 – 100%	96.3 – 100%	98.3 – 100%	95 – 100%	97 – 100%
Mean Fish Length (in) (~Range)	~6 (4.5 – 9.5)	~5 (4.5 – 8.5)	~21 (17.5 – 25)	~24 (16.5 – 28)	~17 (15.5 – 19)

**No Injuries Observed**



# Hydro Green Today

## Similarities of new low-head hydro projects to HGE

### Hastings, MN Project:

- At USACE Lock & Dam/existing infrastructure
- In USACE security zone
- Modular, vertically stackable system
- Designed to work without any interference to navigational operations
- Designed to be installed and work without placing load on USACE facility
- Fabrication off-site and delivered via barge for wet installation
- Easy, nearby grid access







Follow-up:

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