

# HCC 2026

## Prototype Demonstration

### Team

Nathaniel Holguin

Karsten Jones

Anthony Nuzzo

Dawson Stevens

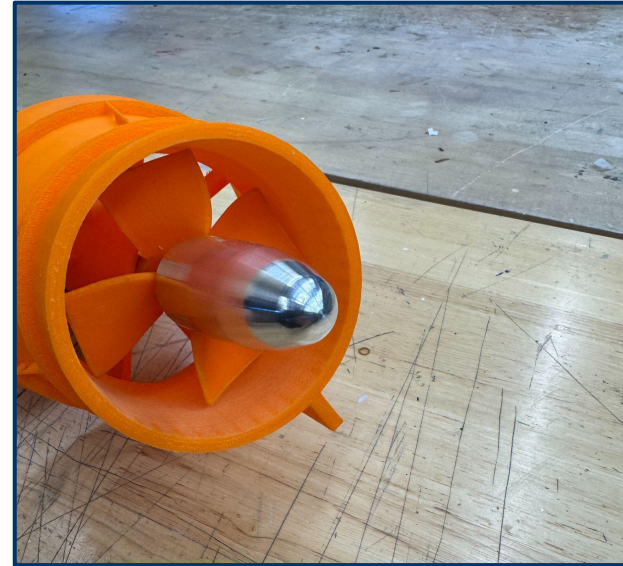
# PHYSICAL PROTOTYPE

- Question: What size Streamdiver is optimal for the John C. Stennis L&D project?
- Crafted from 3d printer filament, glue, and a steel shaft to reproduce a 1: .25 replica of our cad model. Known future modifications include a machined rudder attached to the shaft rather than filament for accurate results.



# PHYSICAL PROTOTYPE

- Answer: This prototype requires more work to be able to accurately test and conclude real results. However expecting to fall into the SD14-90 Voith size specification.



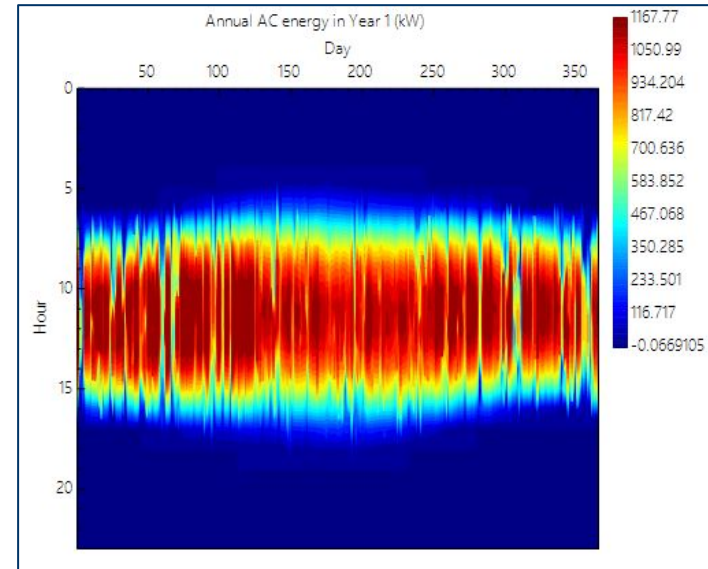
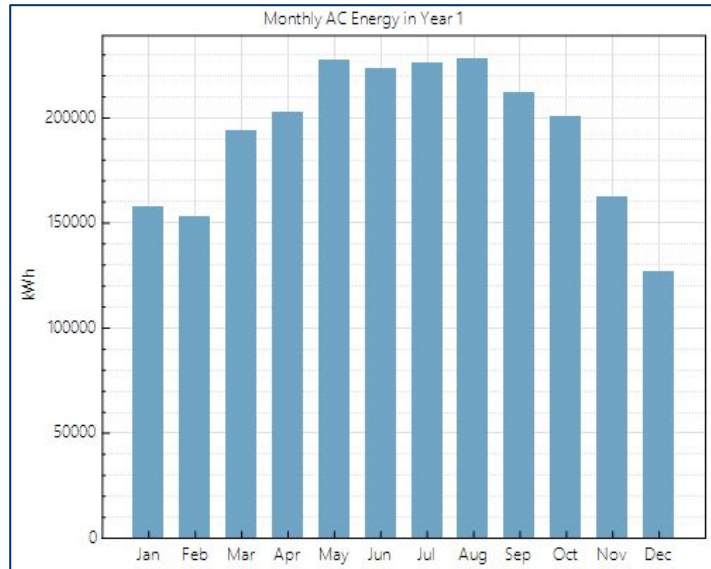
# HOW WILL THIS INFORM OUR DESIGN?

- This will establish a physical reference for the turbine count/arrangement and the installation strategy to avoid structural conflicts.
- Will reveal clearance, alignment, and mounting needs for future plans.
- Guides the next iteration by showing us where we need more accurate components, such as a metal rudder, and a potential shaft redesign.



# VIRTUAL PROTOTYPE 1

- Question: Is a solar power plant beneficial to the John C. Stennis L&D project?



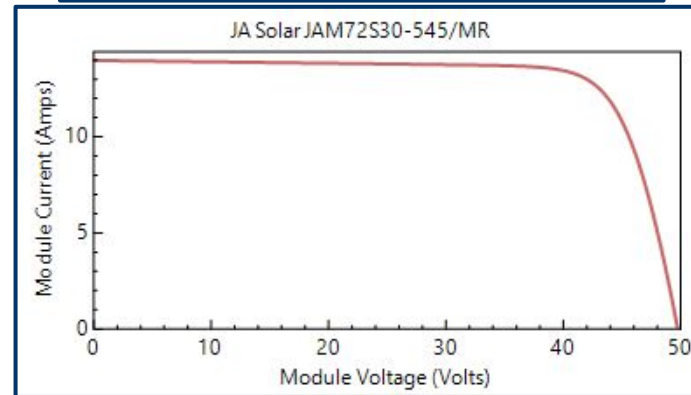
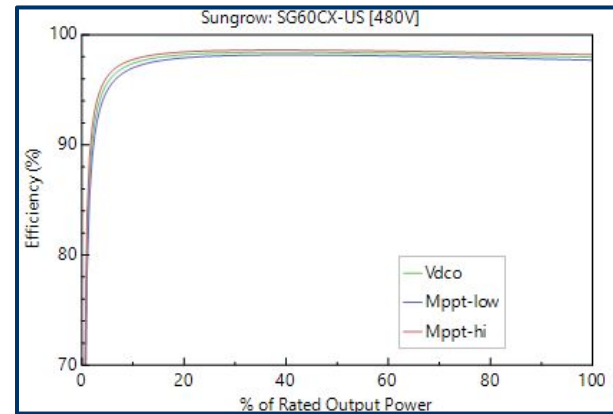
# VIRTUAL PROTOTYPE 1

- Answer: Utilizing an early System Advisory Model(S.A.M.) we estimate:
  - 2,272 Modules
    - 1.5MWdc
    - 1.2MWac
  - JA Solar JAM72S30-545/MR Module
  - Sungrow: SG60CX-US Inverter

Metric	Value
Annual AC energy in Year 1	2,311,302 kWh
DC capacity factor in Year 1	17.6%
Energy yield in Year 1	1,541 kWh/kW
Performance ratio in Year 1	0.81
LCOE Levelized cost of energy	8.24 ¢/kWh

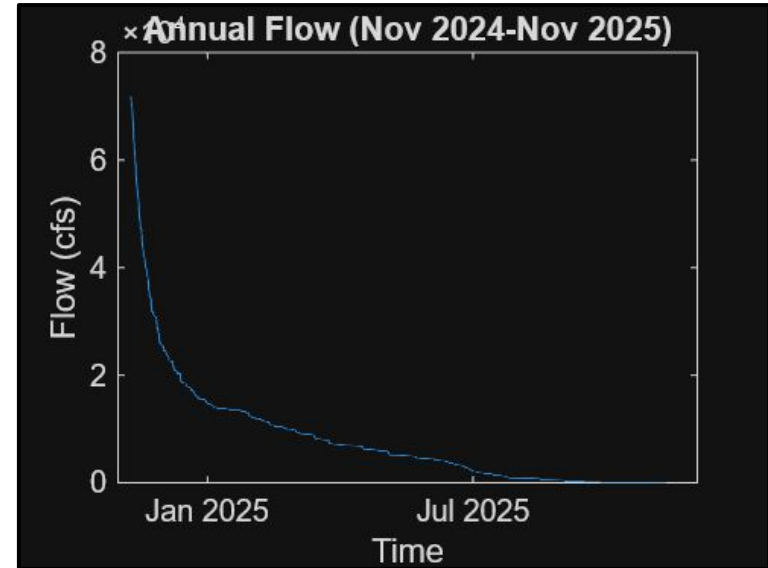
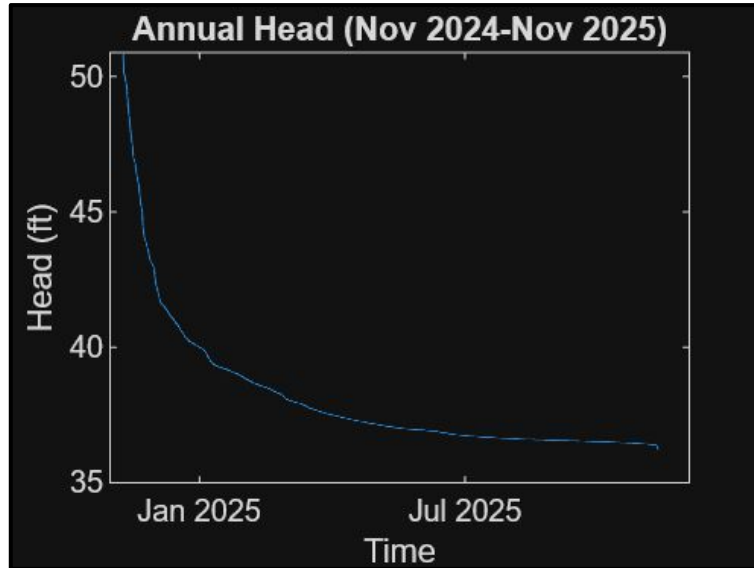
# HOW WILL THIS INFORM OUR DESIGN?

- Utilizing county specific weather data, we believe to generate between 1.2-2.2MWh per year
- Fits within the plan to add solar integration at John C. Stennis L&D, requiring about 4 acres of land readily available in vacated sections of the dam.
- Estimated capital cost is around \$1.7M, which is within the scope of the project.



# VIRTUAL PROTOTYPE 2

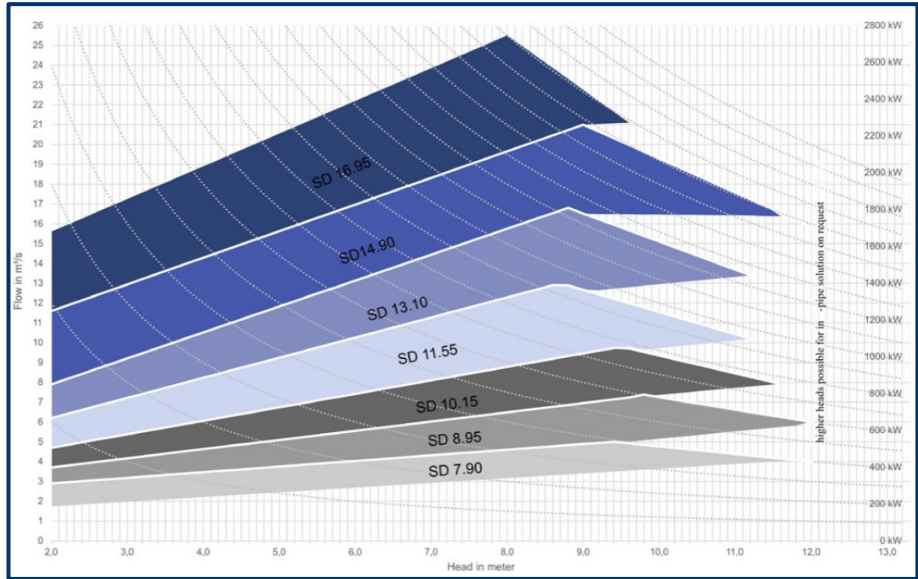
- Question: How much energy can be collected from the dam?





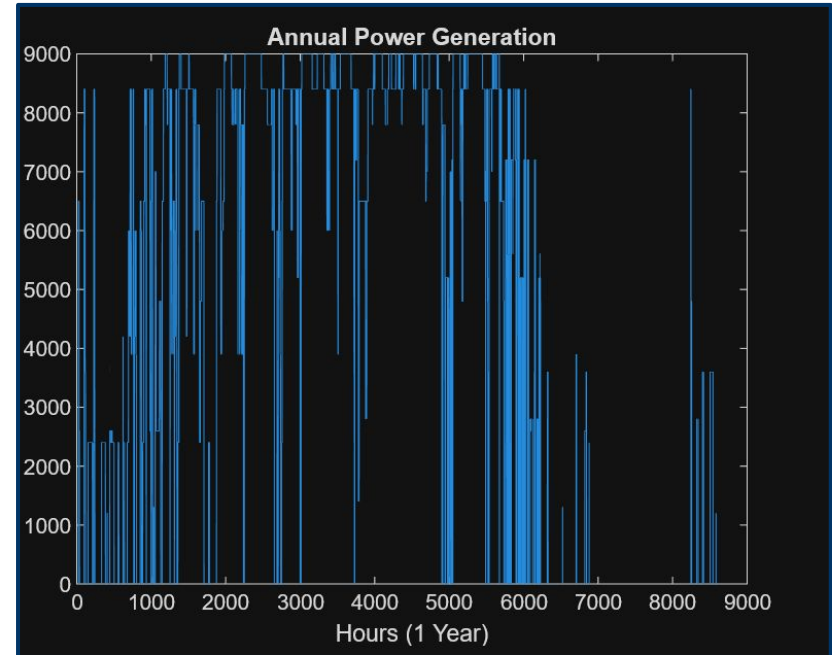
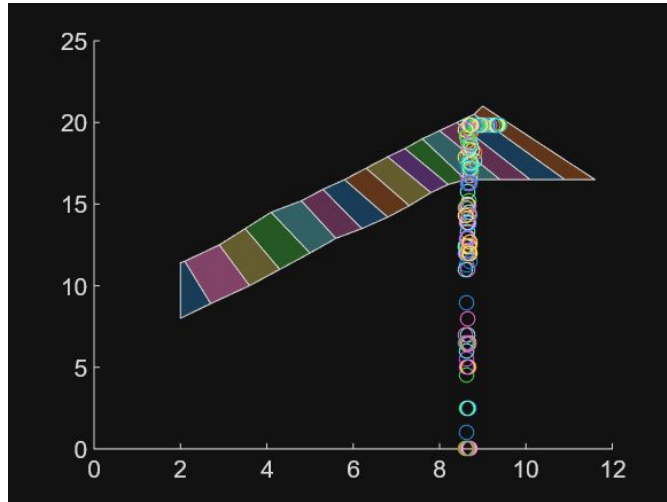
# VIRTUAL PROTOTYPE 2

- Advisor wanted a more refined model
- Instead of using  $P = \mu Qgh$ , the StreamDiver 14-90 Power Curve was approximated
- Answer: 38.96 GWh per year (~4.45 MW)



# HOW WILL THIS INFORM OUR DESIGN?

- Gave us a better approximation of power output.
- Added an extra turbine (5  $\rightarrow$  6)
- Maximum Capacity is  $\sim 9$  MW



# THANK YOU!