HCC 2026
Prototype Demonstration

Team

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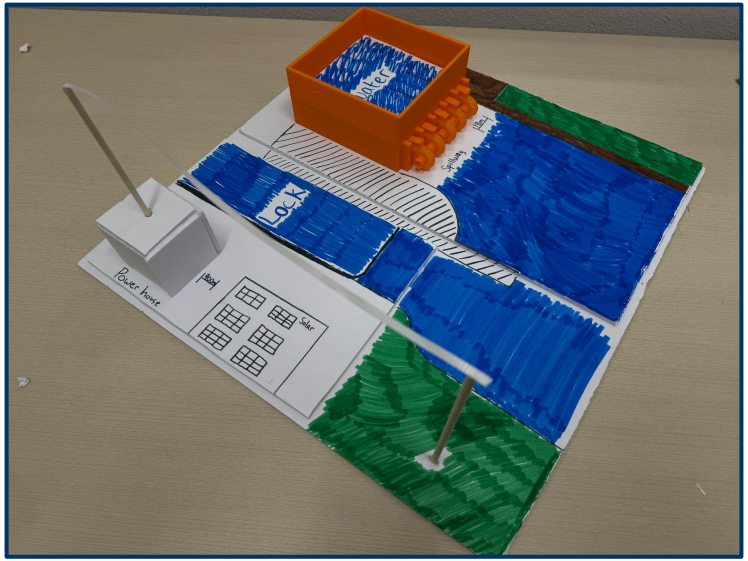
PHYSICAL PROTOTYPE

- **Question:** How well does the proposed turbine geometry conform to the dimensional limits of the Stennis Dam gate bay?
- Prototype was constructed out of PLA filament, poster board, and ribbon.



PHYSICAL PROTOTYPE

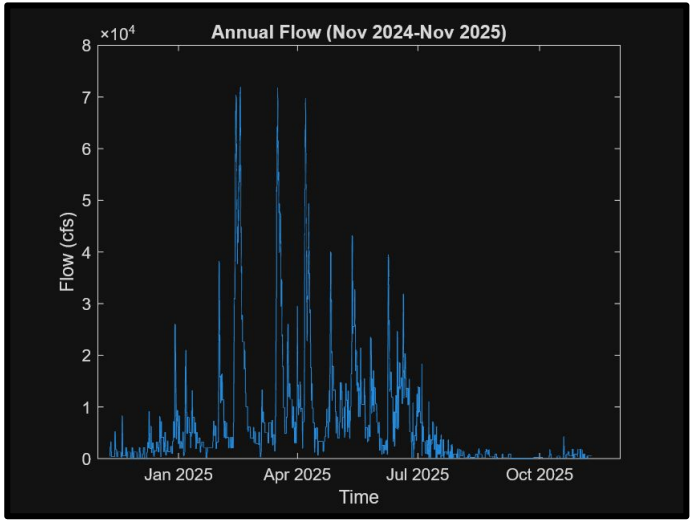
- Dam structure with initial turbine placements.
- Water flows into storage chamber and waits for gates to raise, then water flows into the turbines at the estimated rates.

HOW WILL THIS INFORM OUR DESIGN?

- **Answer:** After completion of prototype and further analysis, this is not most ideal. With the complex geometries of the turbine and gates, improvement can be made with more data. Turbine placement will most likely be on the other side of the gate in the toe of the river format.
- We plan to move forward by meeting with Voith to secure the true turbine dimensions, as well as additional structural/geometrical additions for the turbines.

VIRTUAL PROTOTYPE

- **Problem Statement:** Is the intended turbine setup efficient enough for the project?

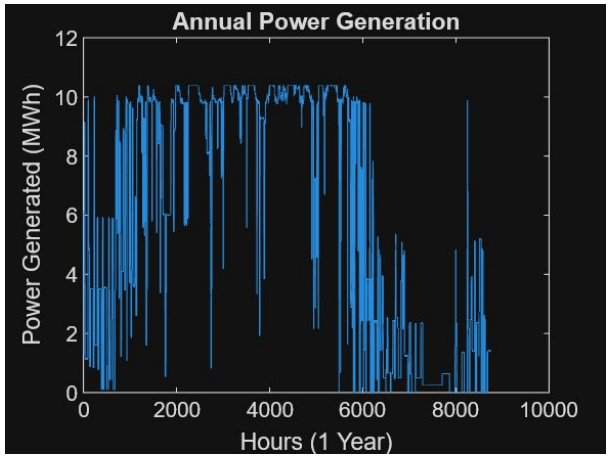


Input	Simulation	Output
Import annual flow and head data	Run data through a function to find instantaneous power generation at each data point	Display output data in easily readable formats

VIRTUAL PROTOTYPE

- **Answer:**
  - **Ran using a 5 turbine layout**
  - **Capacity is slightly out of range**
    - **Capacity will slightly decrease as design is fleshed out**
  - **~⅓ of the year generates less than 1 MW**
    - This is not necessarily an issue as long as the dam remains justifiable and has an in range capacity

Measure	Value
Mean	4.48
Median	2.44
Min	0.00
Max	10.38
Annual GWh	53.31



HOW WILL THIS INFORM OUR DESIGN?

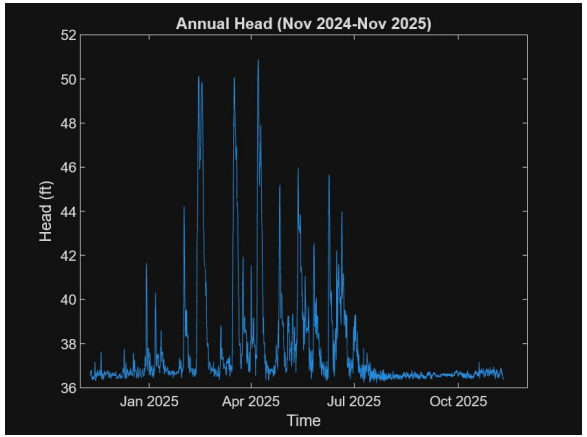
- Confirms the viability of the site with real-world data
- Gives us areas to look into
  - **How much capacity will decrease from ideal simulation**
  - **How the seasonal drop in flow could affect the design/output**
- Additionally, the prototype can easily be modified to account for more or less turbines and be improved for better accuracy

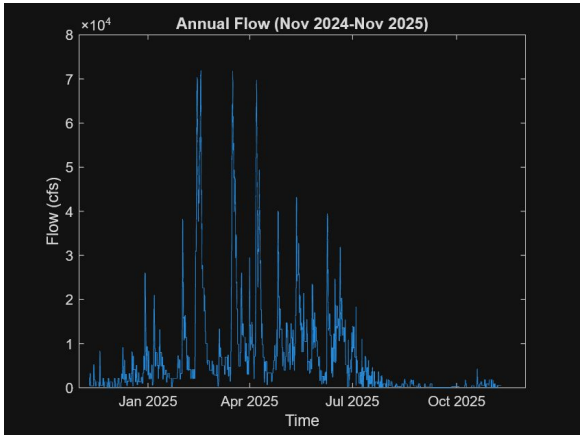
APPENDIX

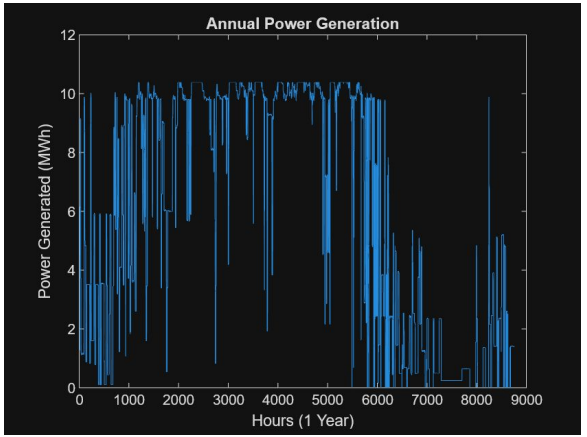
Appendix A: First interactive prototype

APPENDIX

Appendix B: Plotted Data from Digital Prototype







THANK YOU!

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