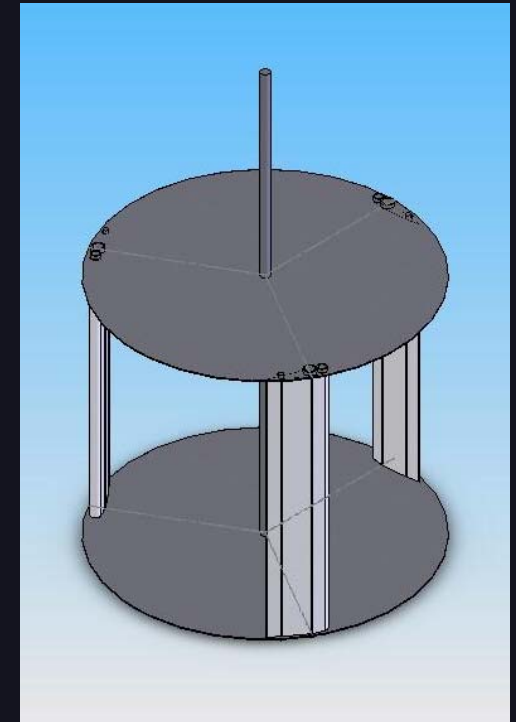


# Design Review (April 25<sup>th</sup>, 2005)



## Micro-Hydro Power

### Renewable Energy for Sub-Saharan Africa

Victoria Tai | Kaia Dekker | Matt Zedler | Marion Dumas

Matt Orosz | Kurt Kornbluth | Kate Steel

# Problem Statement

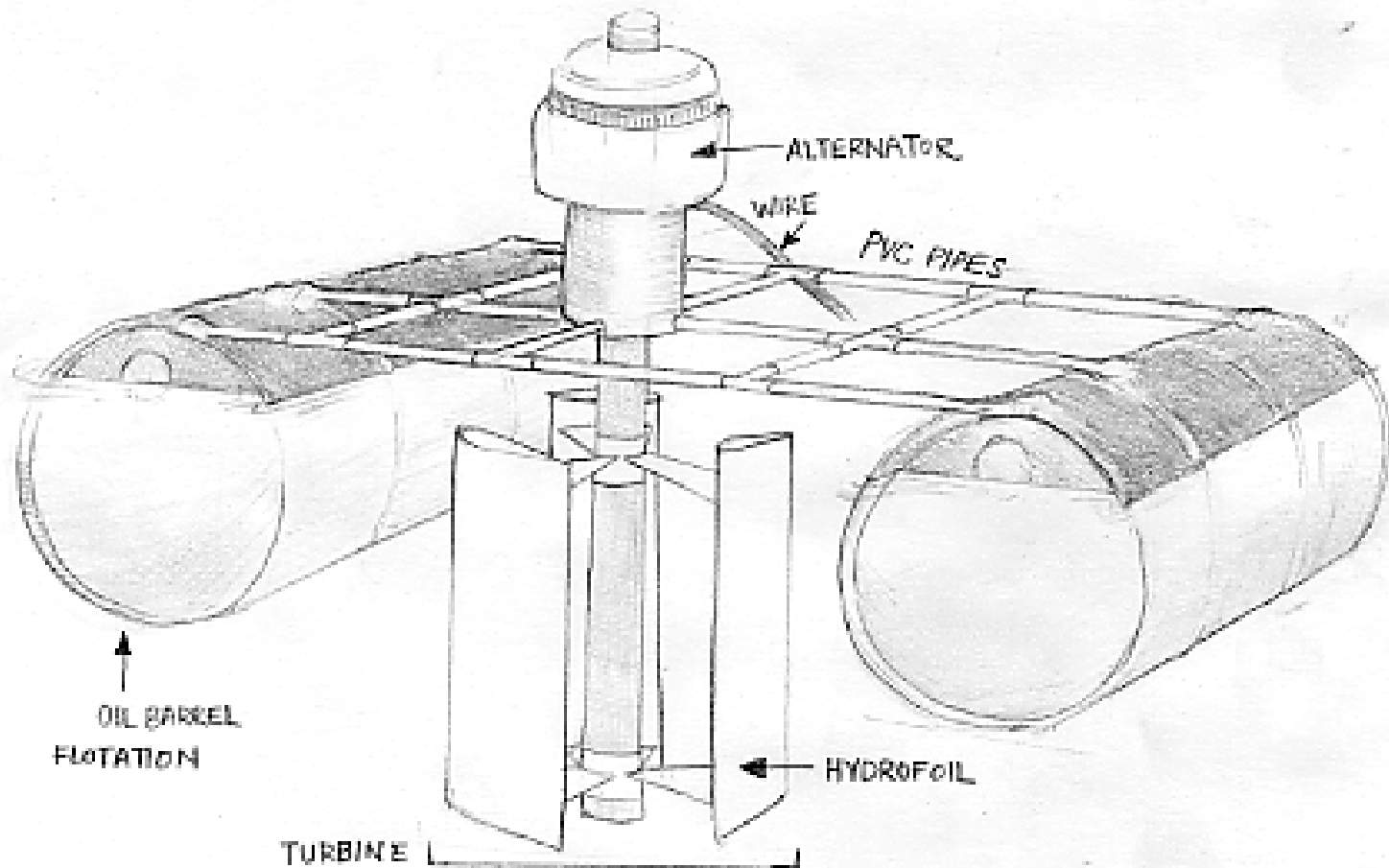
**To develop an affordable, locally serviceable, off-the-grid generating unit that will provide electricity at the village scale with minimal environmental impact.**

**It should be easy to implement unit in low-head, variable flow, high erosion permanent rivers using locally available technologies.**

# Top Design Specifications

- 1 kilowatt generation system
- Can survive in velocities ranging from 1 m/s to flood velocities
- Can be lifted, installed, maintained, and removed by two people
- Uses local materials, tools, and skills
- Operation cost: 10 cents per kWh
- Requires less than \$5,000 capital

# Design Schematic



# Design Process

## **FALL 2004**

Amy Smith's D-Lab course

## **JANUARY 2005**

Lesotho site visit

## **FEBRUARY 2005**

Decision to develop a one kilowatt in-stream generator

## **MARCH 2005**

Brainstorming and networking.

Problem statement and design concepts specified.

Conceptual designs made and critiqued.

Focus on mechanical aspects of system.

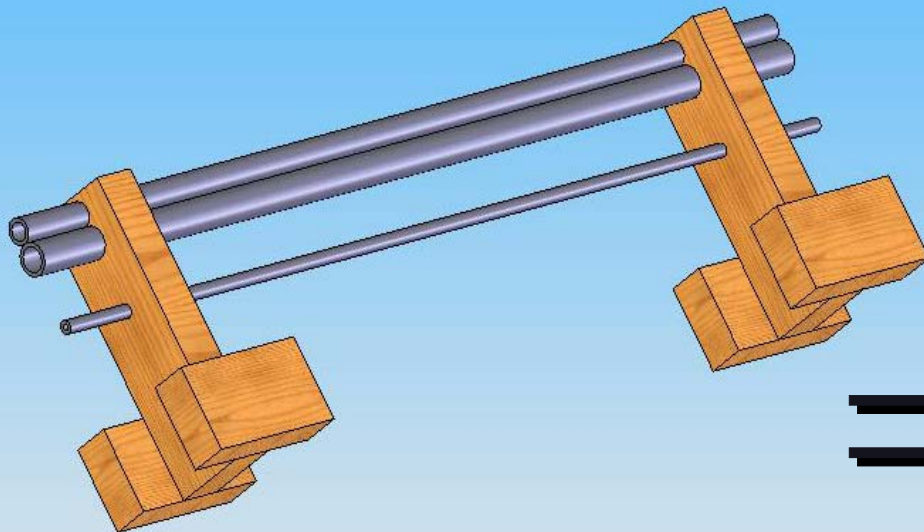
## **APRIL 2005**

Testing concepts.

Continued dialogue with community partner.

# Innovation

- Reduce and eliminate moving parts
- Allow for locally available materials and manufacture
- Built in failure modes
- Replicability



# What We Learned

- Bending steel easier than expected
- Raw materials not precise
- Wooden jigs not precise
- Tool dimensions vs. planned dimensions
- Hand tools vs. power tools
- Machining difficult to do as group
- Machining takes about three times as long as expected



# Low Cost Local Manufacture

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copyright reasons.

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copyright reasons.

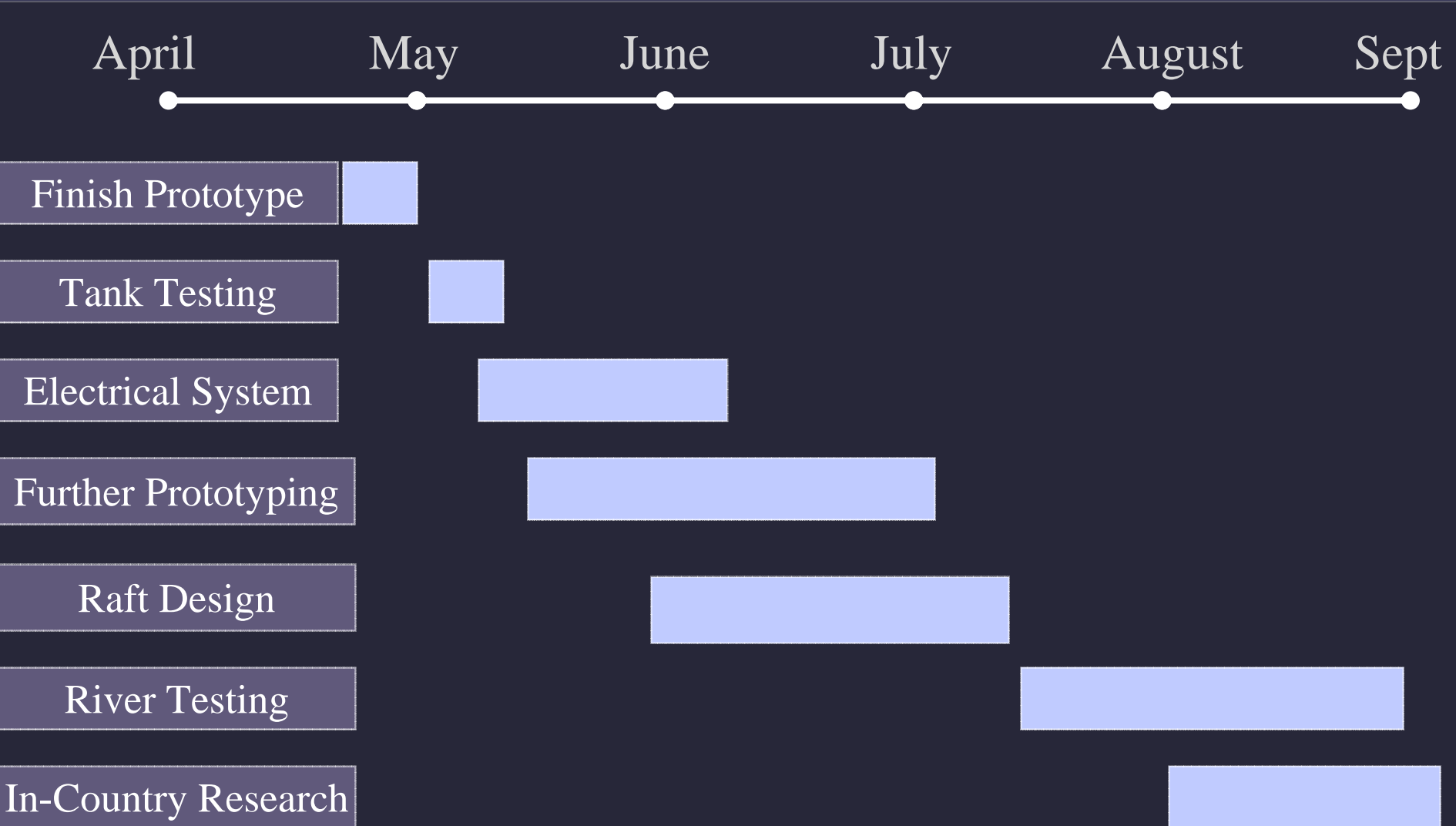
Can our system be  
constructed in a  
rural workshop?

Can we reuse materials?

# Moving Forward

- Finish prototype by second week of May
- Test turbine in tank
- Standardize the assembly process
- Evaluate material options
- Prototype alternative designs and construction methods
- Develop educational supplement

# Tentative Timeline



# Questions / Comments?

