WATTS FROM WASTE: A SUSTAINABLE FUTURE FOR DATACENTERS

Avery Miller, Connor Dailey, Luke Priest, Jonah Simon

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Introduction

Who are we?

- 11th Grade Dayton Regional STEM students
- Proposing a plan to increase sustainability in Computer Science
- English, Government, Algebra II

What is the OSLN Design Challenge?

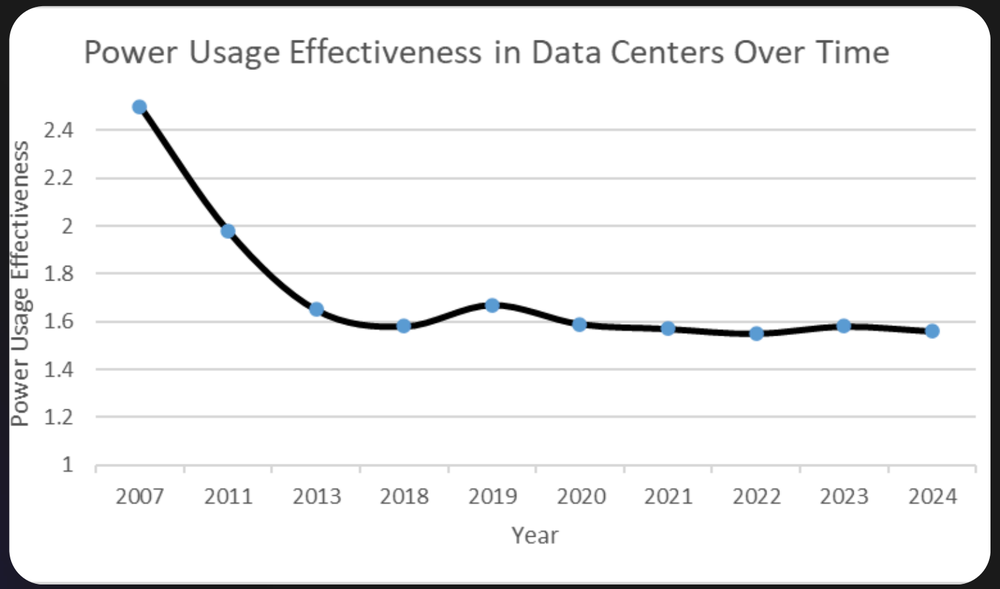
The Ohio State Learning Network

- Sustainability in Aerospace in collaboration with StarLab
- Annual design challenge

Our Goals:

Reduce thermal waste and increase efficiency in data centers

Problem Statement



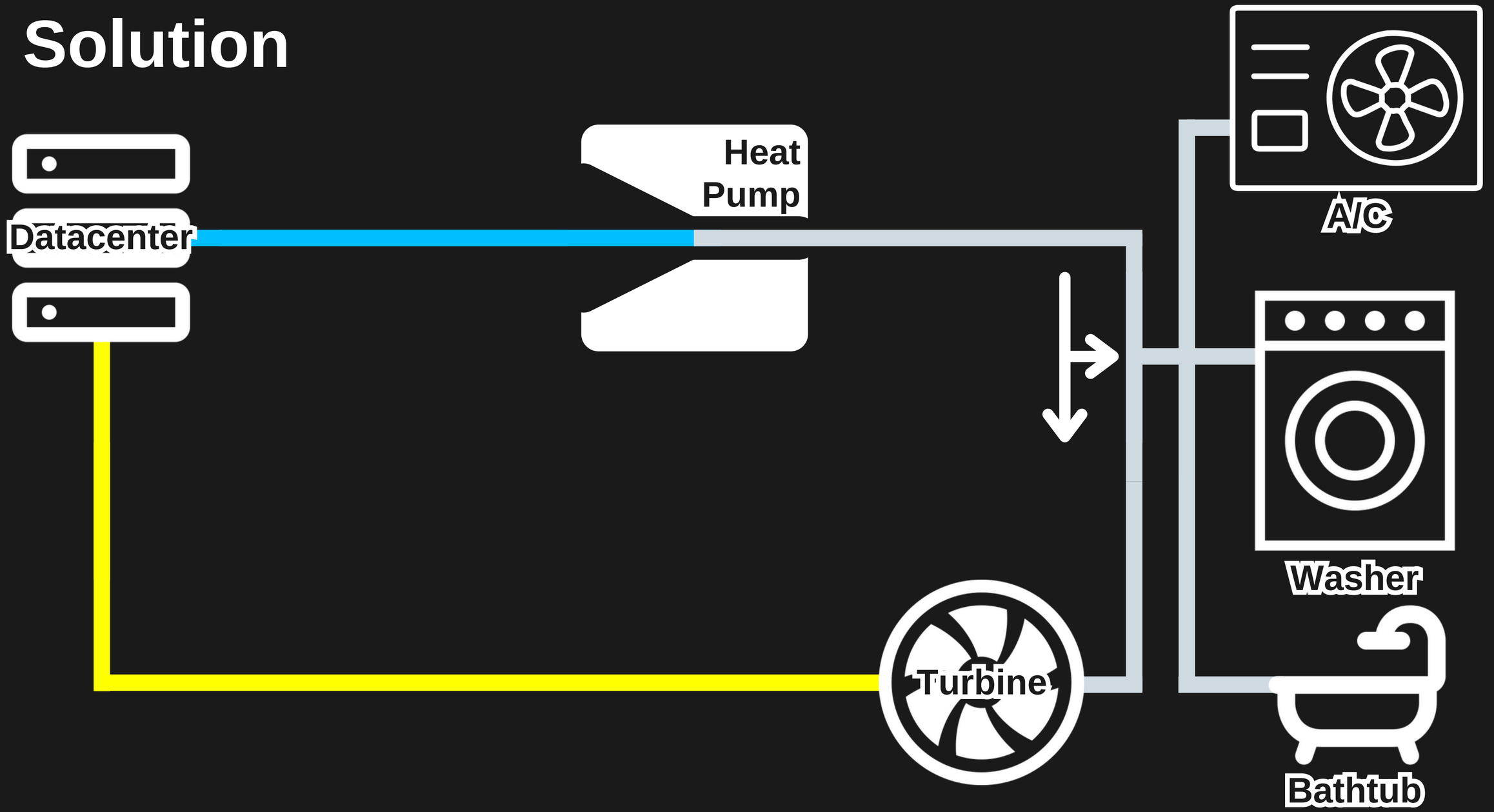
Current Problems

- Our solution is not used very much, and right now, we are wasting possible reuseable energy

Current EPA Policies

- There is no current EPA Policies on our current problem

Solution



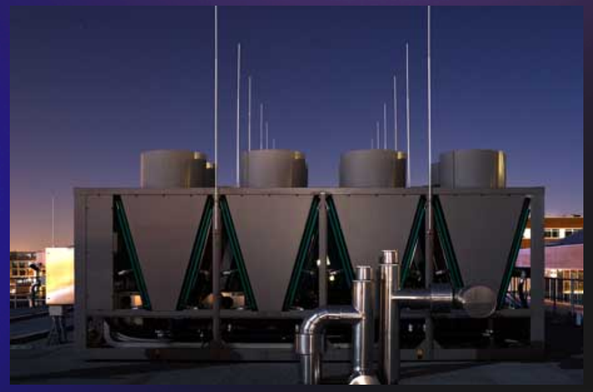
Solution Description

- Water is first pumped to the servers, transferring the heat of the servers to the water
- Once the water is heated up, it passes through a heat pump, increasing the temperature enough to boil
- After this step, the hot water can be directed to two destinations
  - The first destination is moving the water to local houses and buildings, using it to heat any appliance or machine that requires hot water
  - The second destination is to a turbine
  - The water boils and generates steam, going through a turbine to produce electricity, reusing a little bit of the power consumed by datacenters

How Will This Help Sustainability?

- Reducing data-center cooling
- Reusing energy leads to less fossil fuels
- Maintaining a data center becomes more economical
  - Cheaper services
  - Creates more services
- Renewing excess thermal energy will reduce waste
- Reduce thermal pollution in the air

Analysis of Alternatives

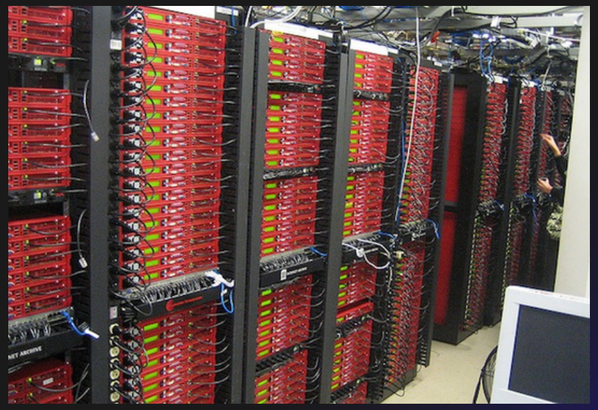


Heat pumps

- To produce energy through heating up water
- Reduce thermal waste

Green rooms

- One of our first alternatives was to use the heat generated from servers to keep a green room at a good temperature
- Our solution is better because it is easier to regulate temperatures using heat pumps than just by server heat



Server rooms

- Our second alternative was to use the heat created in server rooms to boil water (without using heat pumps) so we could transfer it into energy
- The new solution is better because ours operates at higher temperatures (using a heat pump) which allows for more efficient energy production

Conclusion

Data centers produce a large amount heat and use a large amount of energy

- What we can do with the heat they produce:
  - Generate - Use the heat to generate power using steam power generation.
  - Reuse - Use the heat in local air conditioning, washing, and shower/hot water applications
  - This will reduce the energy used to cool datacenters + reduce the energy that they use to run

Reflection

Our Initial Solution

- The use of heat pumps to bring heated water to a boil for power generation and residential water usage

Feedback

- Math data needs to be highlighted
- The presentation needs to be more professional
- Some steps are unclear and need to be rewritten
- Need more info on if a system like this is feasible

Changes That Would be Made

- Get more expert opinions on solutions
- Test the solution in some ways
- More in depth solution visualization
    - Maybe a 3D model

Works Cited

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