THE POWER OF WATER

Water

Agenda:

- Introductions
- Theory Part 1
- Activity
- Theory Part 2
- Reflection

IMSA®
Illinois Mathematics and Science Academy

Water

10 min	Introductions
5 min	Theory Part 1
25 min	Activity
5 min	Theory Part 2
15 min	Group Reflection

Introductions

- Energy Center Manager
  - Illinois Math and Science Academy
- Education
  - Undergraduate from U of I
    - Civil Engineer
    - Structural Engineer + Construction
  - Masters from UIC
    - Energy Engineer

The Theory Part 1 (1)

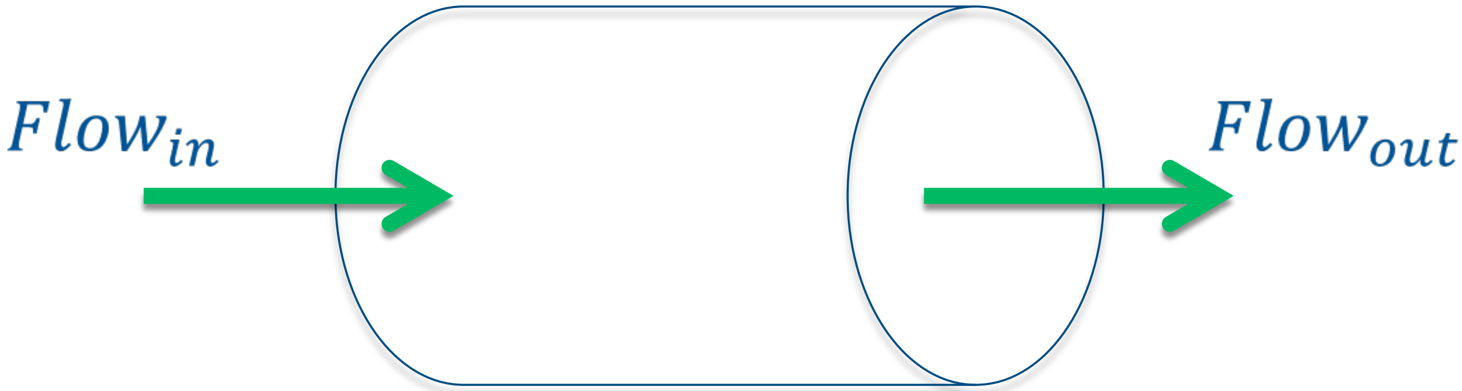
- Flow
  - Characteristics of water
- Conservation of Energy
  - Potential Energy
  - Kinetic Energy

The Theory Part 1 (2)

- Flow
  - Let's try to describe it?
- Mathematical description?
  - Flow = Area*Velocity

The Theory Part 1 (3)

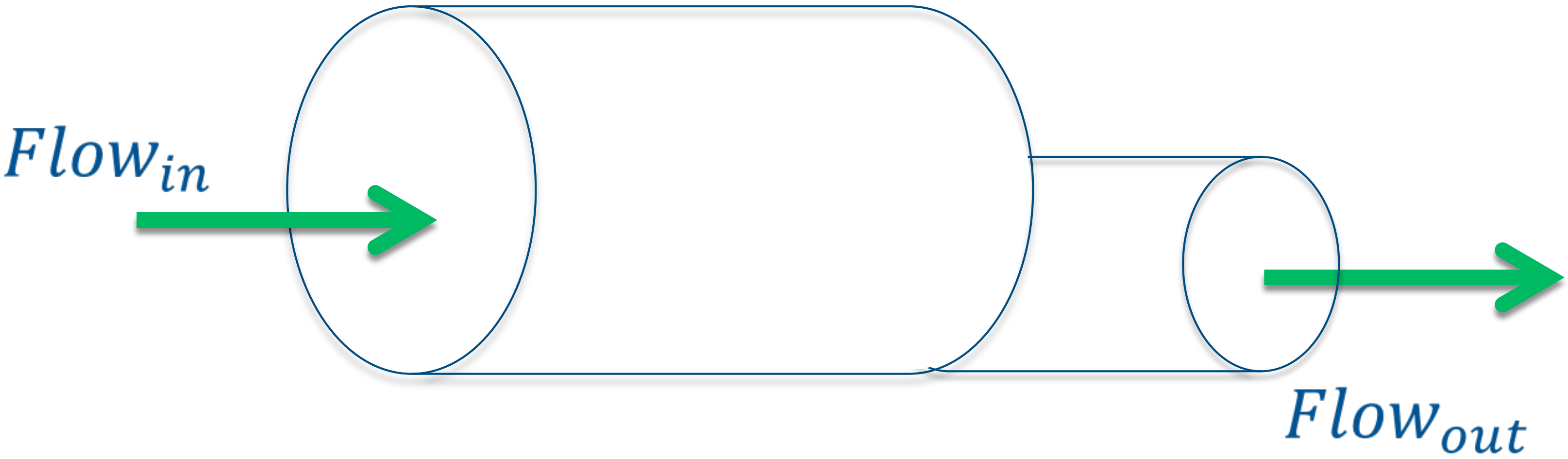
- Flow = Velocity*Area



- Area = Constant
  - What would you expect for the velocity?

The Theory Part 1 (4)

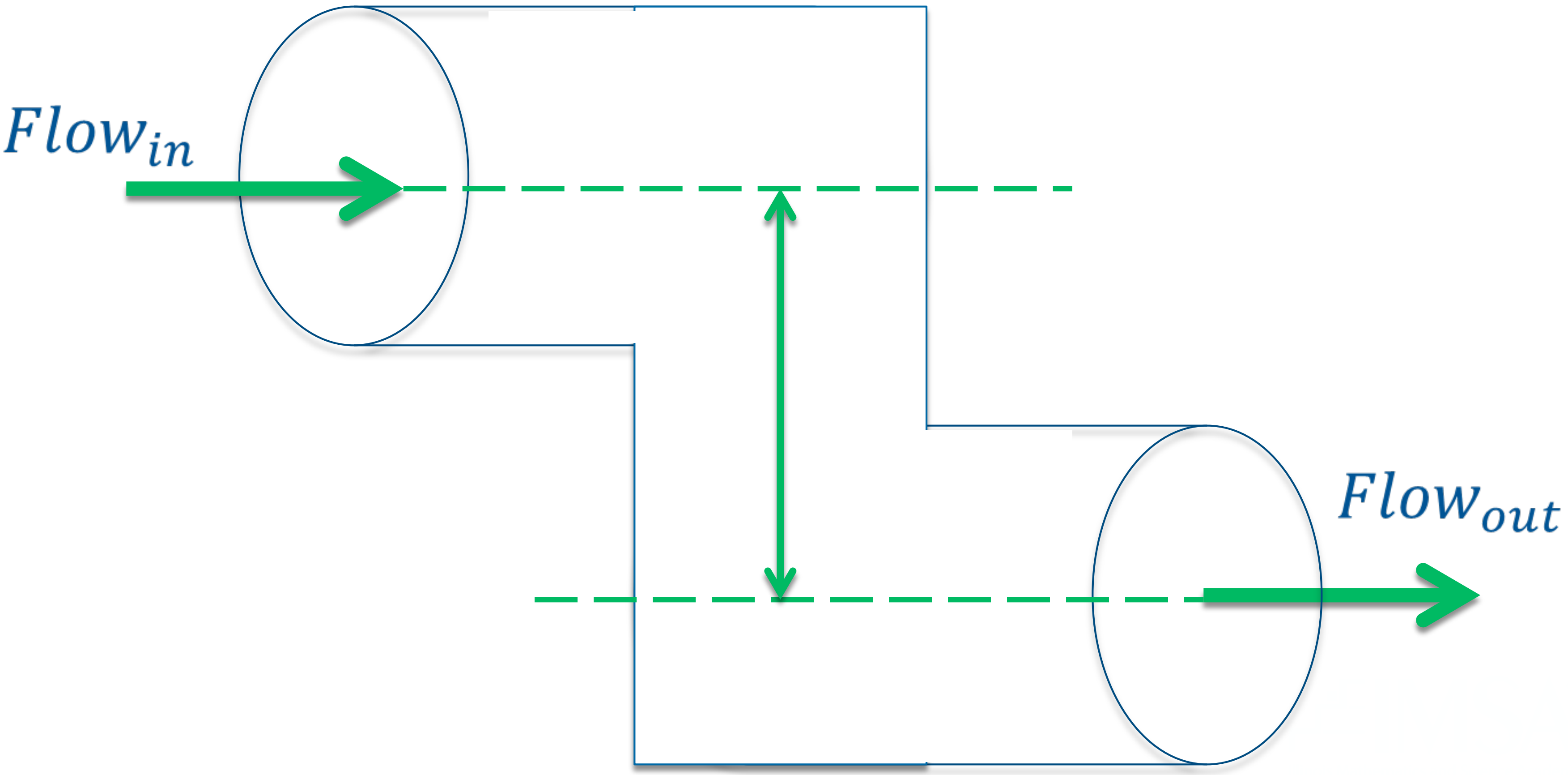
- Flow = Velocity*Area



- Area changes
  - What would you expect for the velocity?

The Theory Part 1 (5)

- Flow = Velocity*Area
- Can we measure the potential energy in the water?

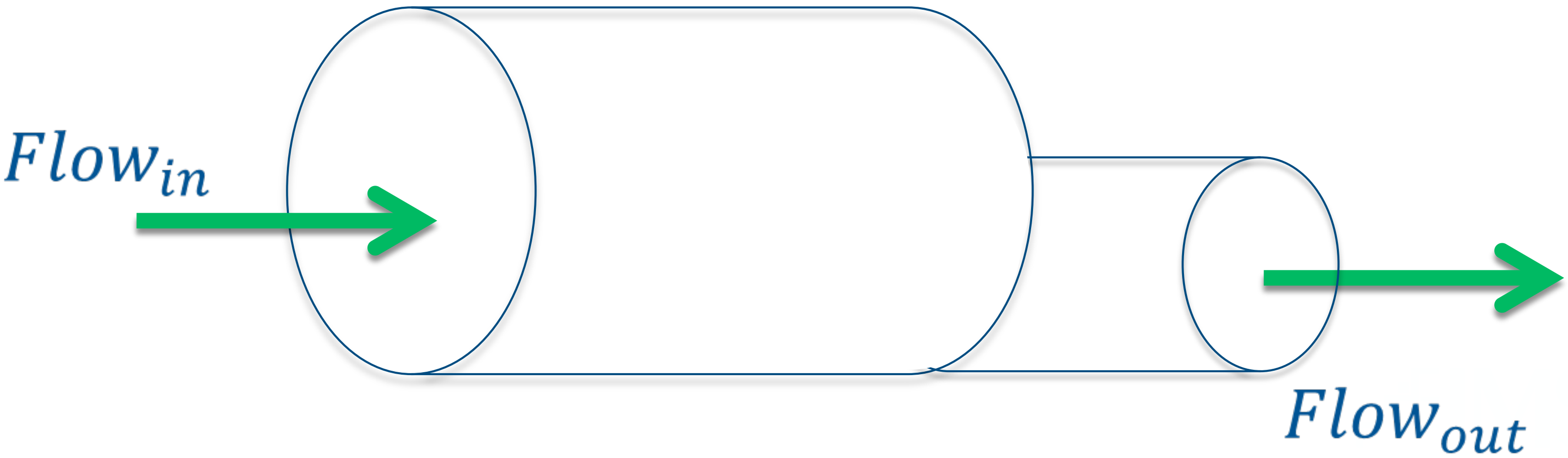


Activity

- Work Book
- Project Based Activity
- Challenge Question
  - Can you measure the power of water?

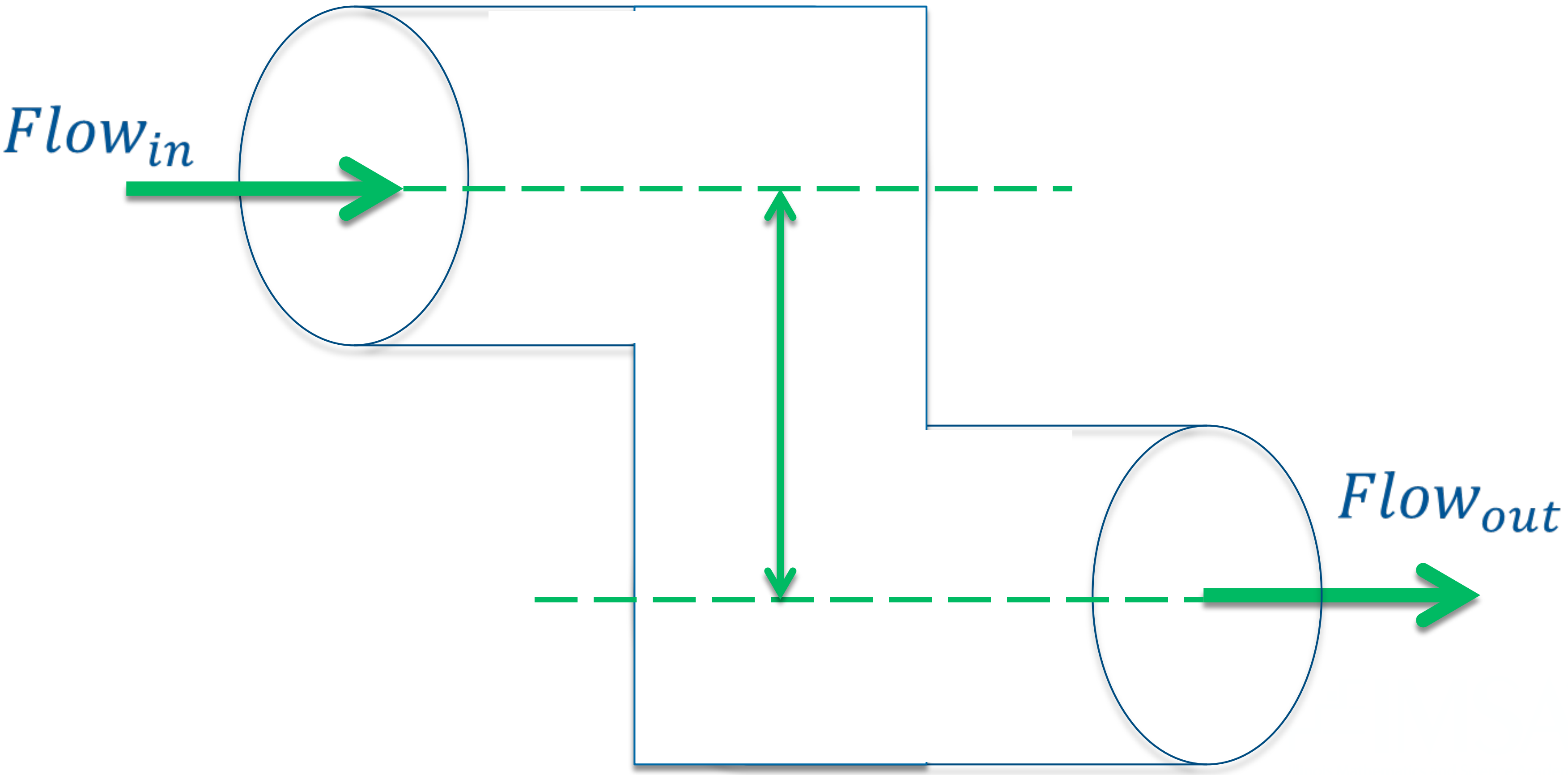
The Theory Part 2 (1)

- Flow = Velocity*Area
- Area reduction = velocity increase
- Can we calculate the energy due to increase in velocity?



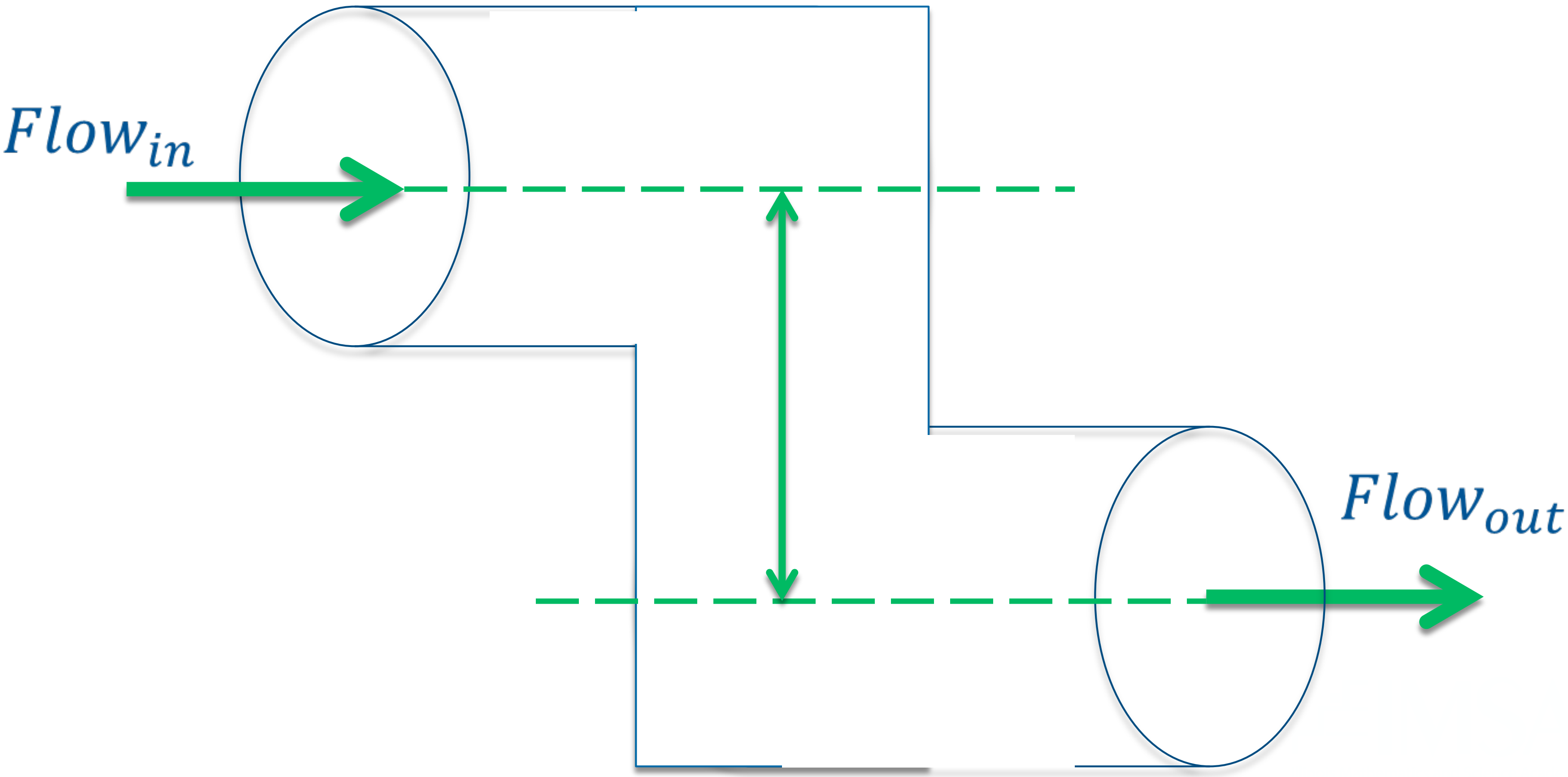
The Theory Part 2 (2)

- Flow = Velocity*Area
- Can we measure the potential energy in the water?



The Theory Part 2 (3)

- Flow = Velocity*Area
- Force = Pressure/Area
- Can we measure pressure within the pipe?



The Theory Part 2 (4)

- What is Energy
- Energy is Work
- $W_{net} = \Delta PE + \Delta KE$
- $\Delta PE = mgh$
- $\Delta KE = \frac{1}{2}mv^2$

$$W = mgh + \frac{1}{2}mv^2$$

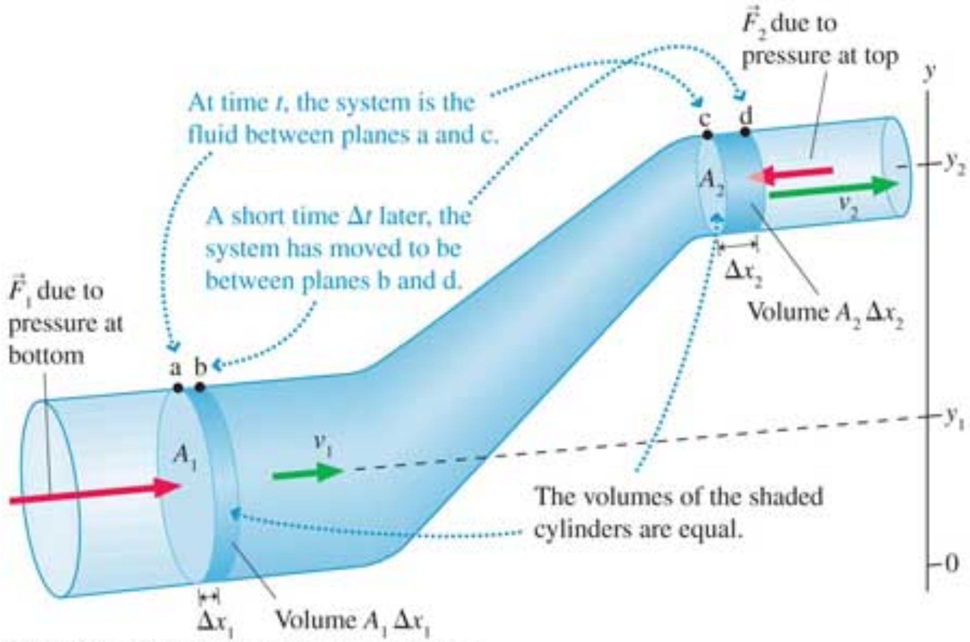
$$\downarrow \qquad \downarrow$$

$$\Delta PE \qquad \Delta KE$$

Reflections

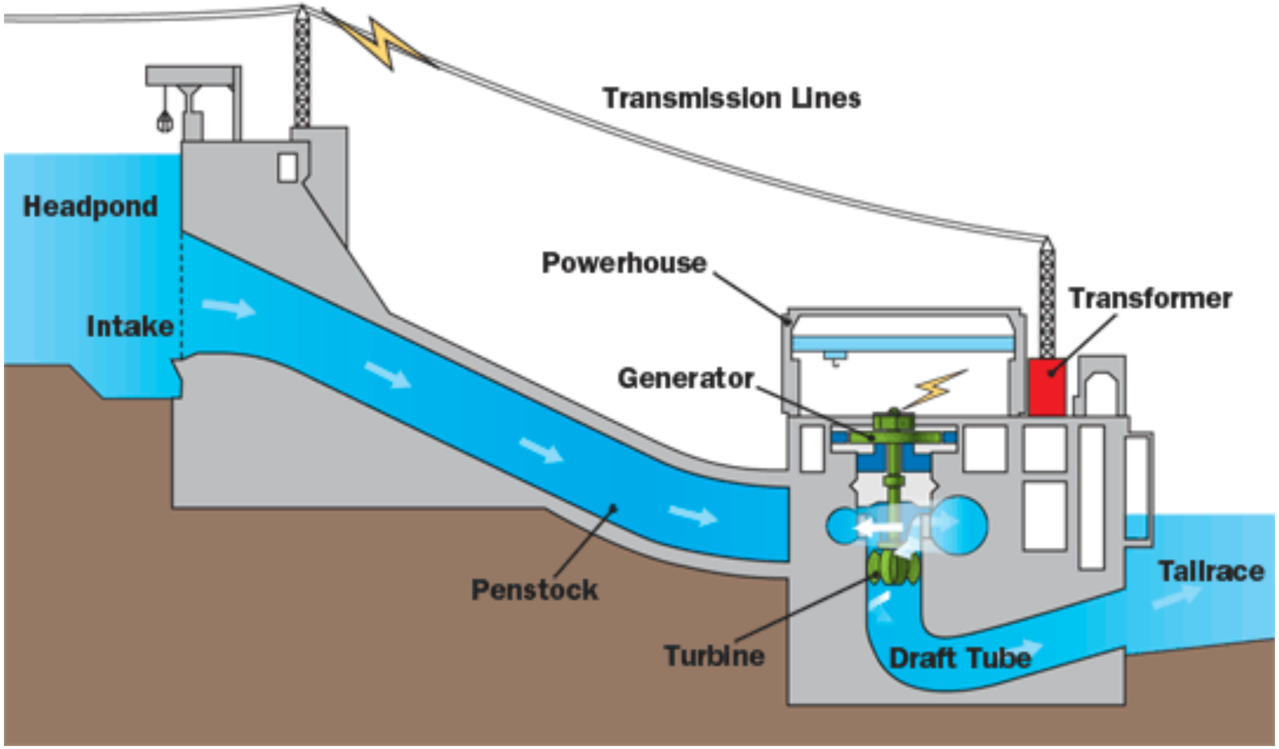
- Let’s reflect on the activity as a group
- Applications examples

The Theory Part 2 (5)



Applications (1)

- Conventional (Dams)



Applications (2)

- Tidal Wave generation