

THE POWER OF WATER

Water

Agenda:

Introductions

Theory Part 1

Activity

Theory Part 2

Reflection

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)

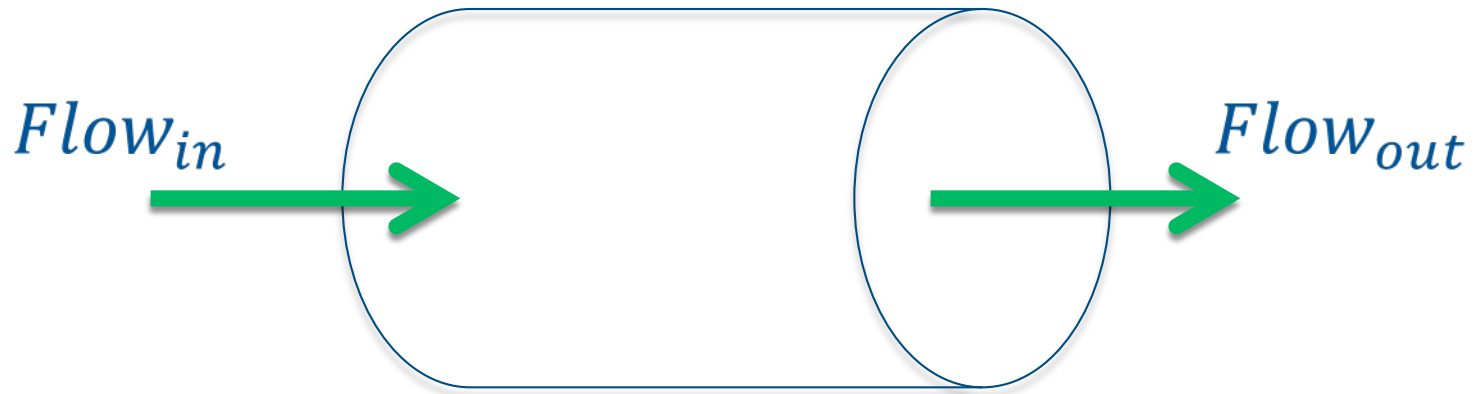
- Flow
 - ▣ Characteristics of water
- Conservation of Energy
 - ▣ Potential Energy
 - ▣ Kinetic Energy

The Theory Part 1 (2)

- Flow
 - ▣ Let's try to describe it?
- Mathematical description?
 - ▣ $\text{Flow} = \text{Area} * \text{Velocity}$

The Theory Part 1 (3)

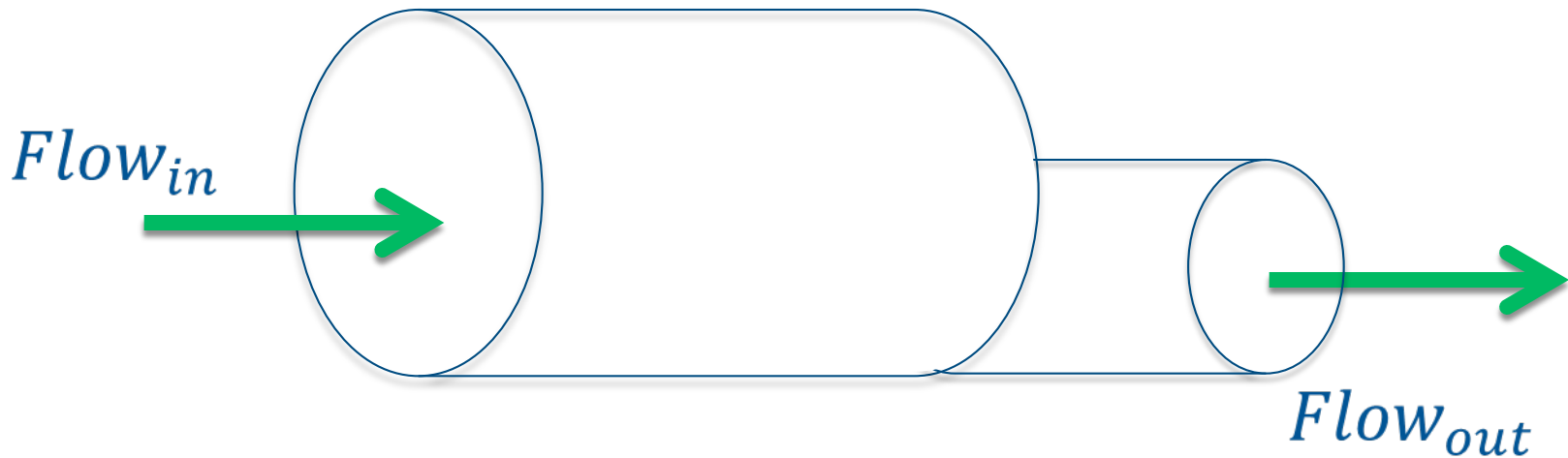
- $\text{Flow} = \text{Velocity} \times \text{Area}$



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

The Theory Part 1 (4)

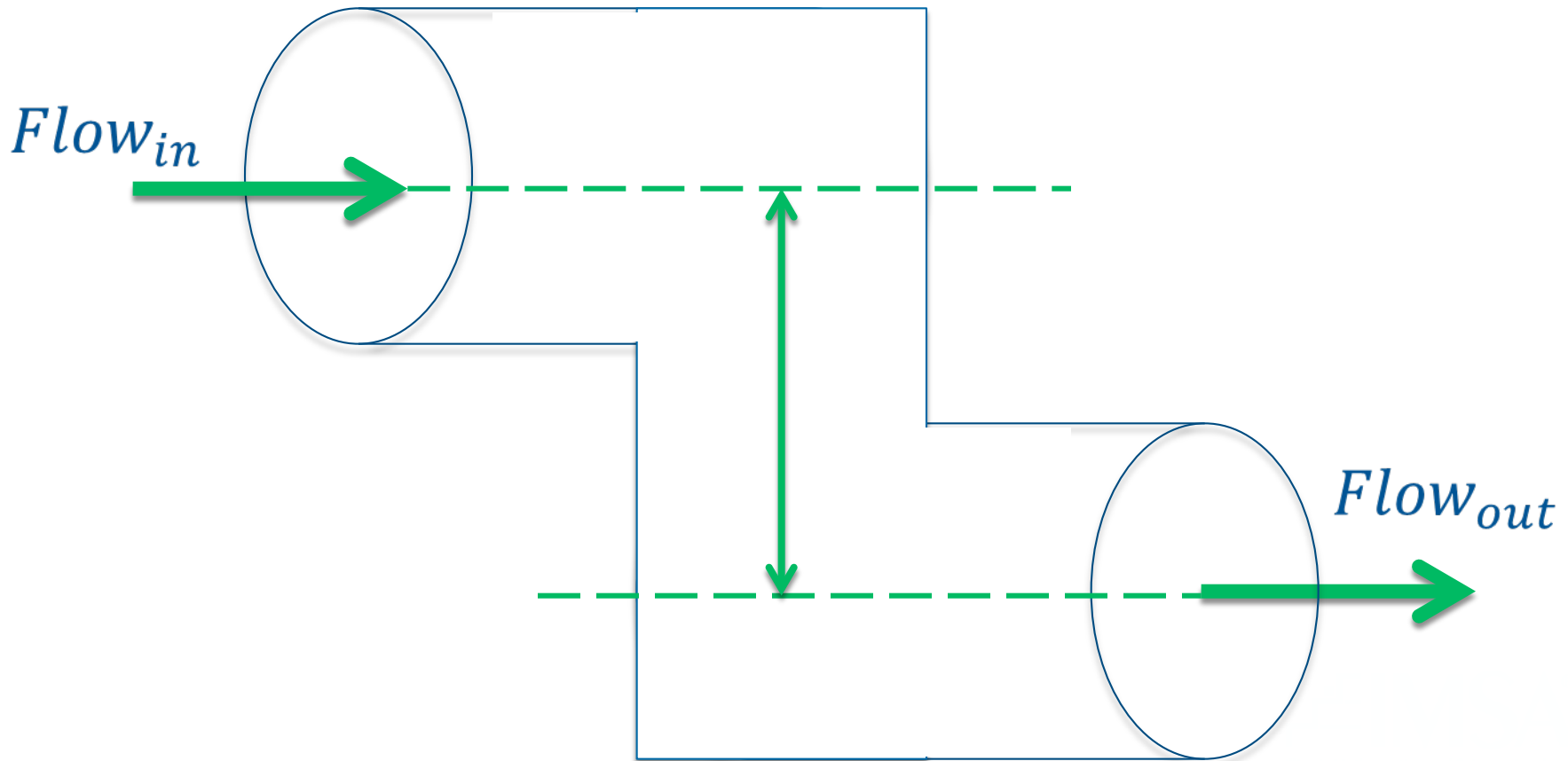
- $\text{Flow} = \text{Velocity} * \text{Area}$



- 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?

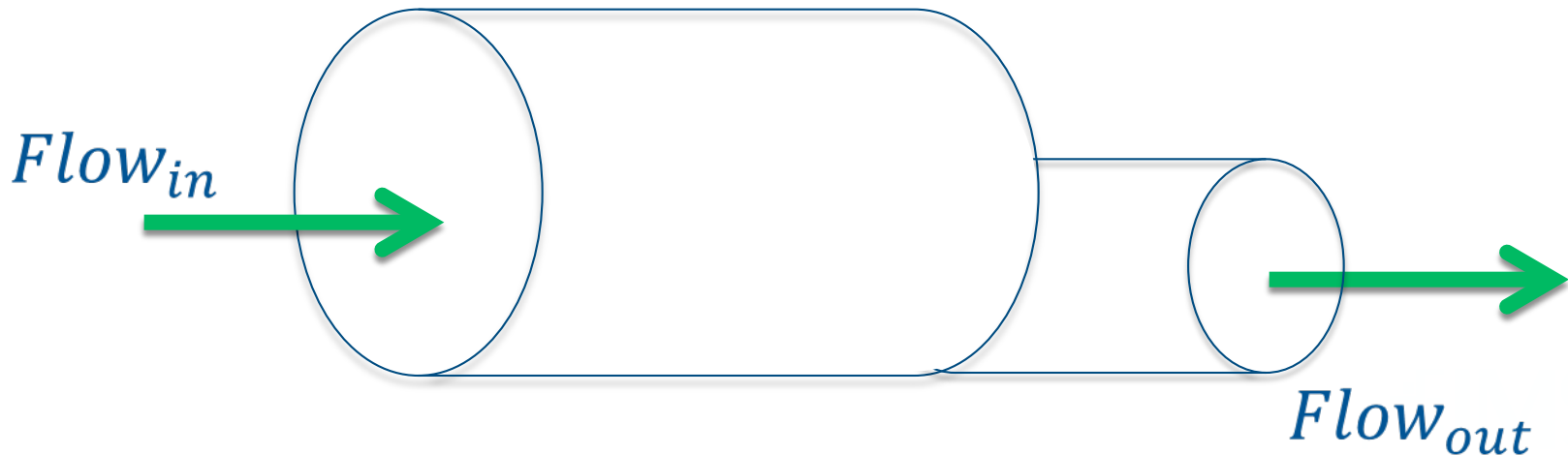


Activity

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

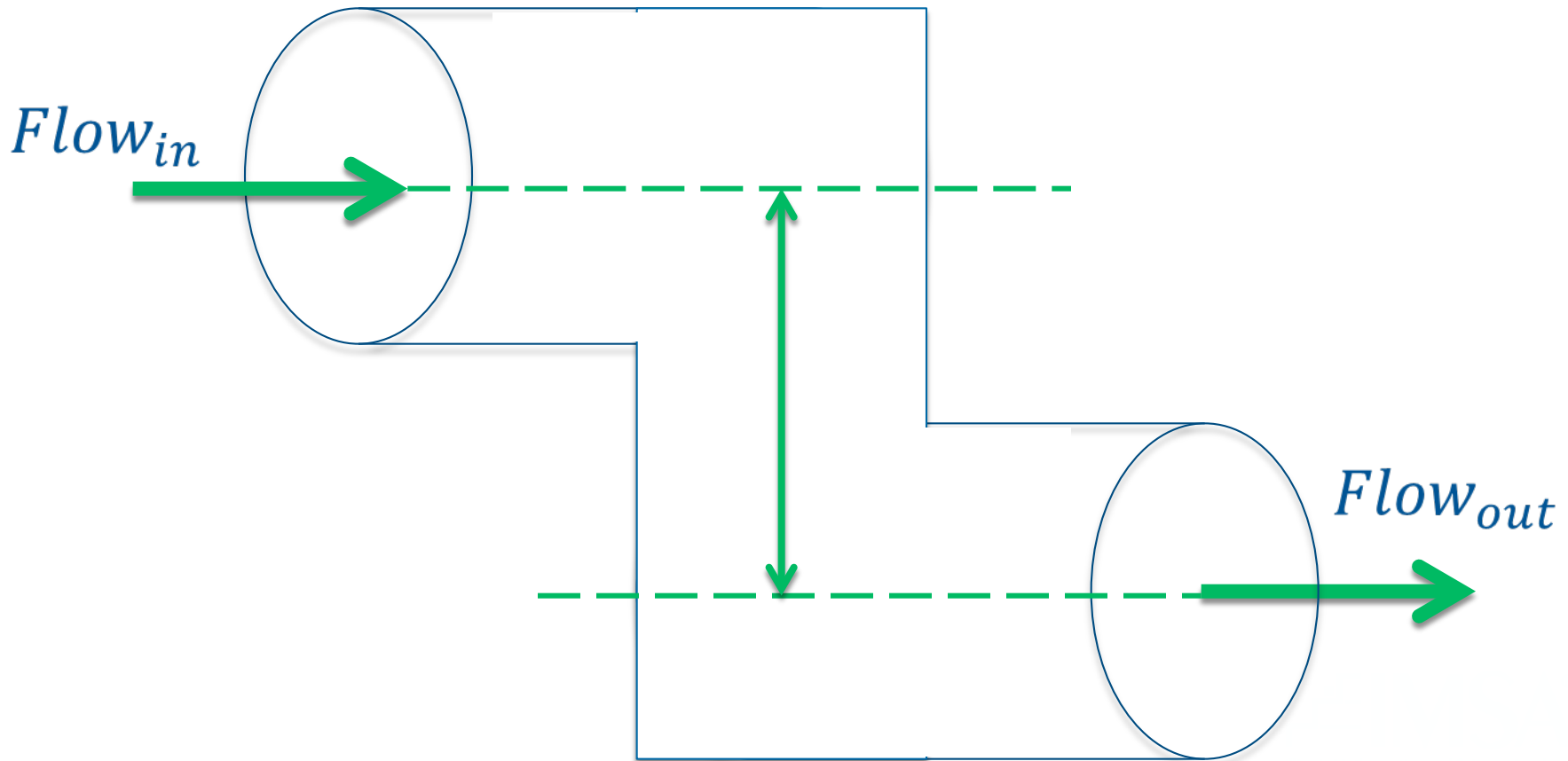
The Theory Part 2 (1)

- $\text{Flow} = \text{Velocity} * \text{Area}$
- Area reduction = velocity increase
- Can we calculate the energy due to increase in velocity?



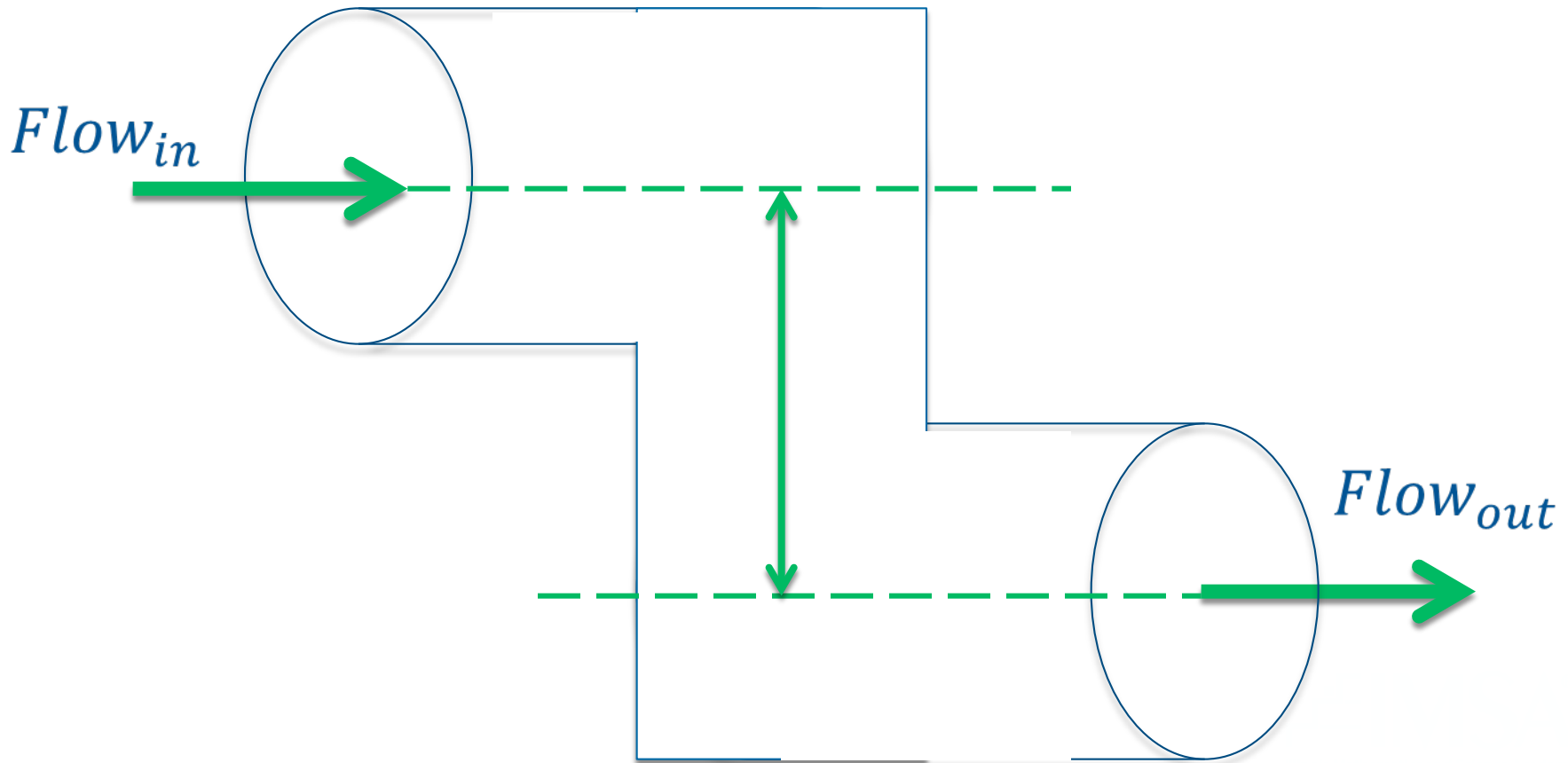
The Theory Part 2 (2)

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



The Theory Part 2 (3)


- $\text{Flow} = \text{Velocity} \times \text{Area}$
- $\text{Force} = \text{Pressure} / \text{Area}$
- Can we measure pressure within the pipe?



The Theory Part 2 (4)

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

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

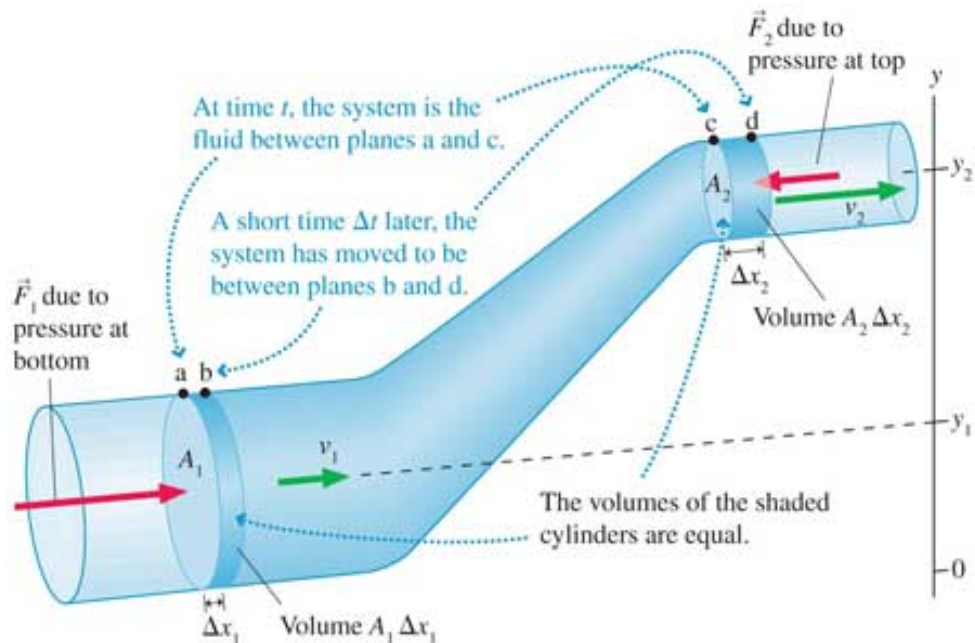


ΔPE ΔKE

Reflections

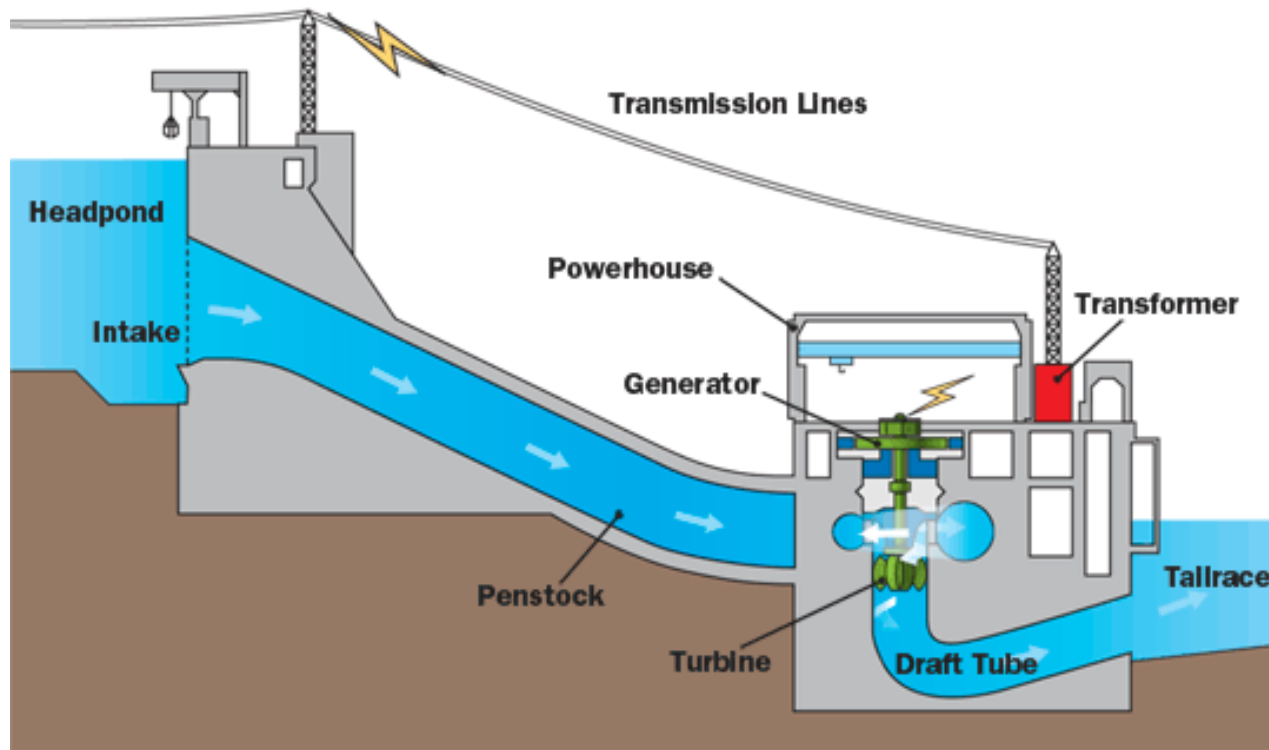
- Let's reflect on the activity as a group
- Applications examples

The Theory Part 2 (5)



Applications (1)

□ Conventional (Dams)



Applications (2)

- Tidal Wave generation

