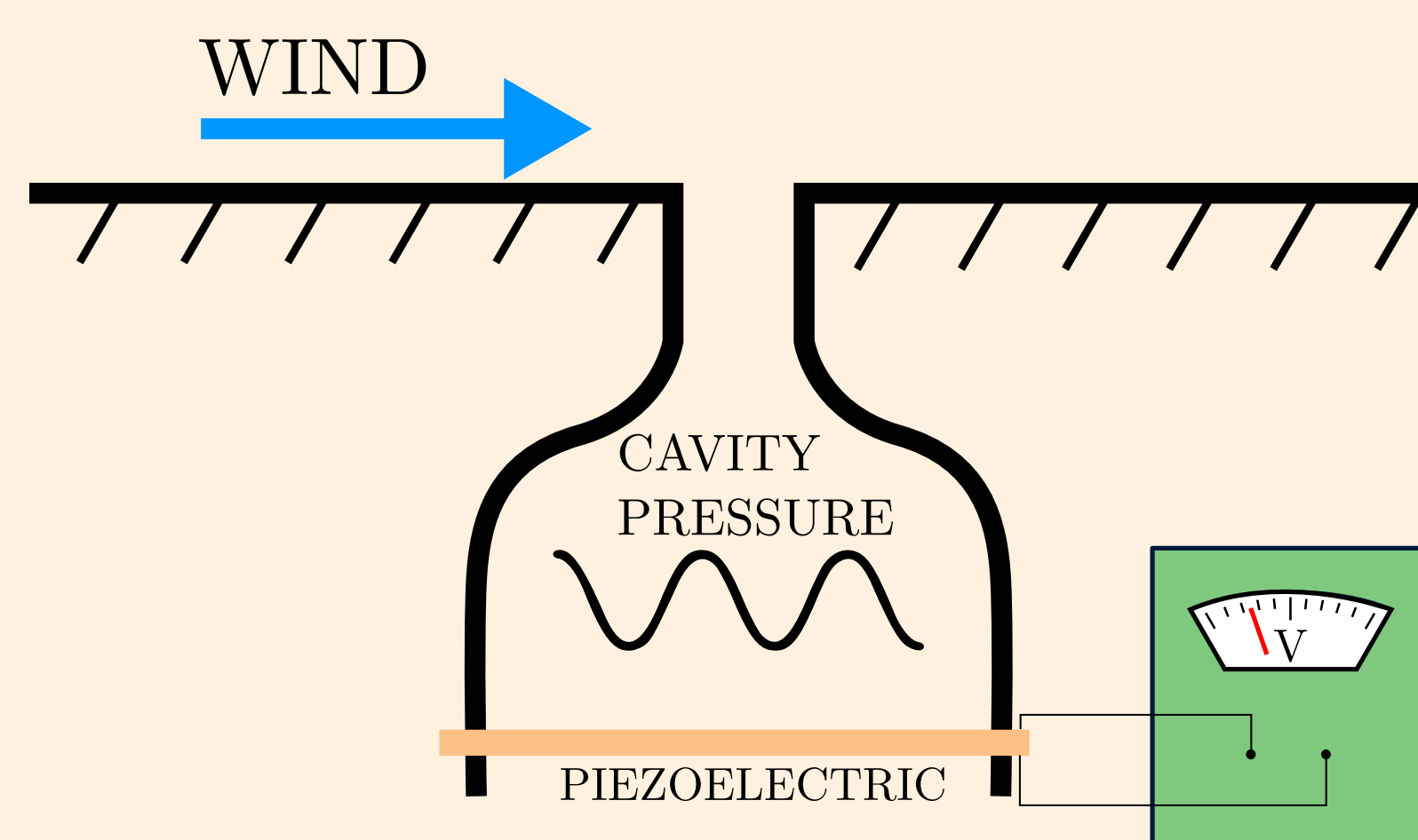


Harvesting wind energy using piezoelectrics excited by Helmholtz resonance

Tyler Van Buren and Alexander Smits

We propose an alternative method for the collection of wind energy on a smaller scale. It combines Helmholtz resonators with Piezoelectrics for novel and efficient wind energy collection.

CONCEPT

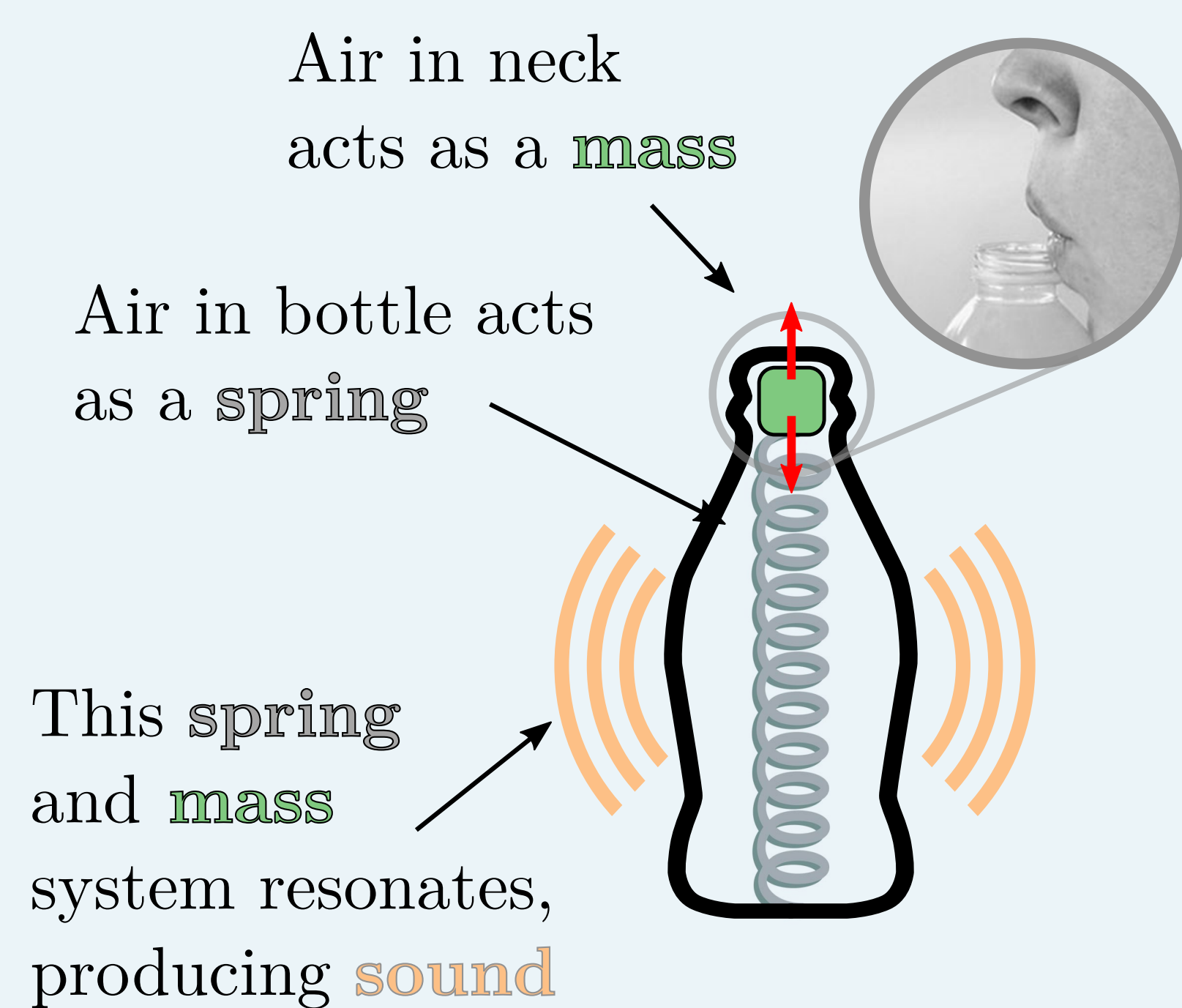


Early tests indicate the available energy in these systems exceeds even our best wind farms. This technology could be used on buildings in urban environments or to power remote devices.

INTRODUCTION

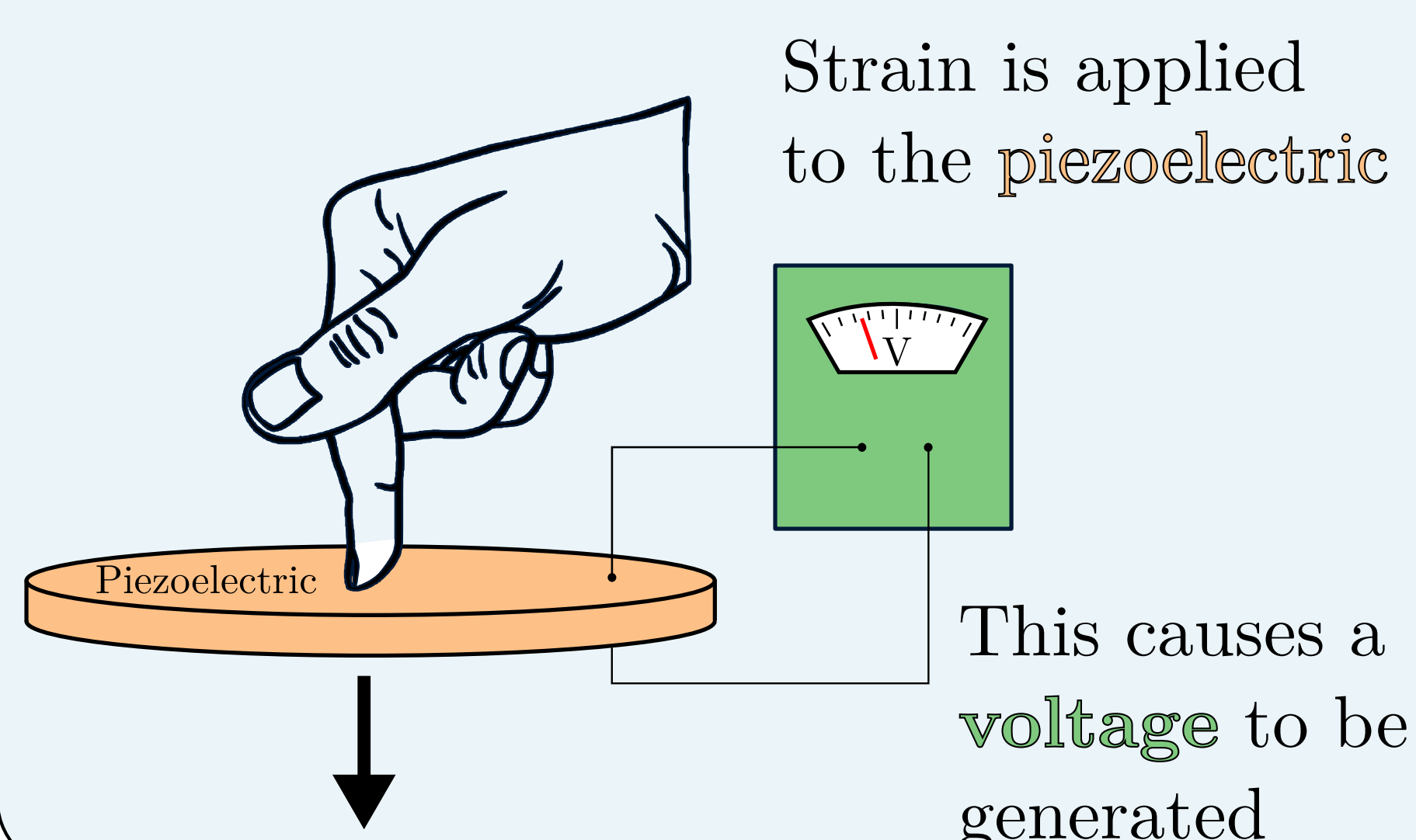
When you blow air over a soda bottle, you hear a musical note due to Helmholtz resonance. This resonance also occurs when a soda bottle is exposed to the wind. The sound produced is collectible energy.

Helmholtz Resonance



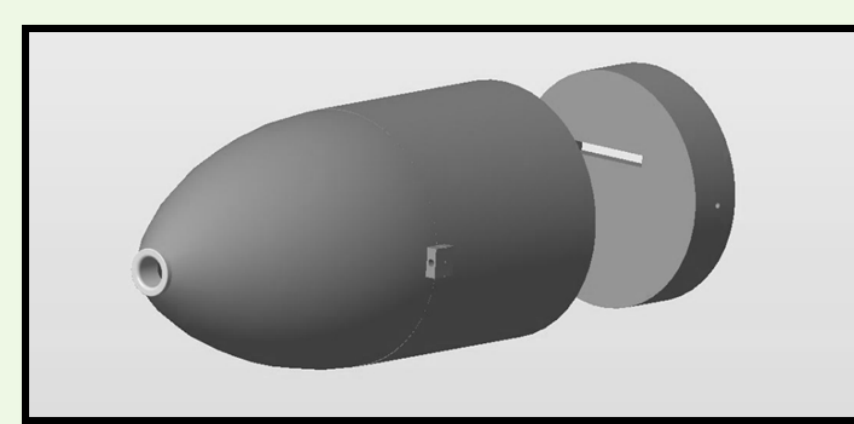
We can use the piezoelectric effect to collect the sound energy, like a reverse speaker. Piezos are a crystal that emits voltage when under strain.

Piezoelectric Effect



FEASIBILITY

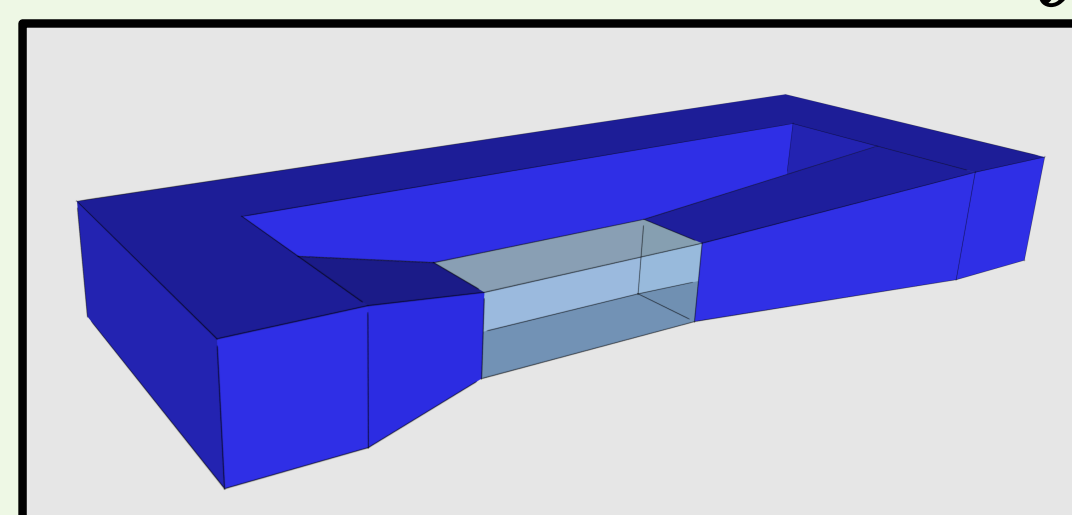
Test Apparatus



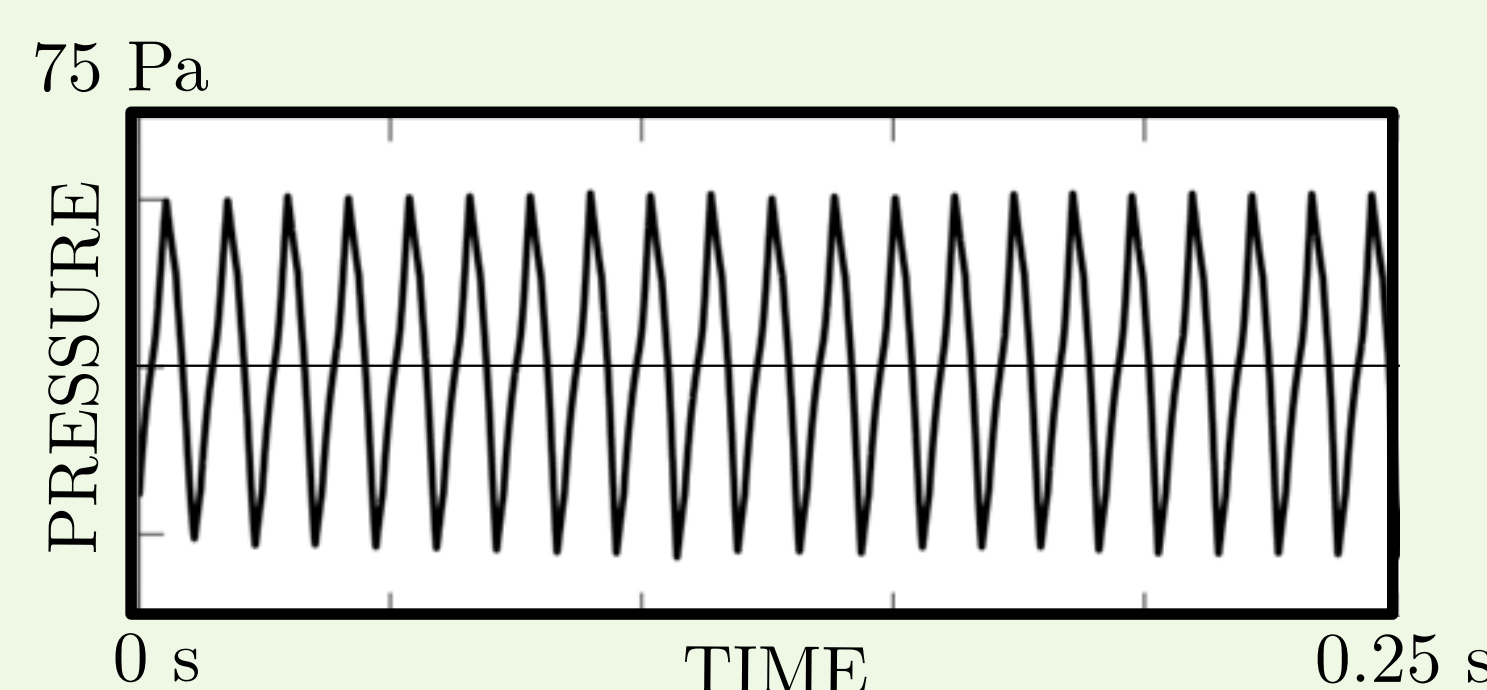
- Adjustable neck and cavity volume
- Pressure port access for measurements

Wind Tunnel Facility

- Velocities up to 50 m/s
- Access to PIV and hotwire

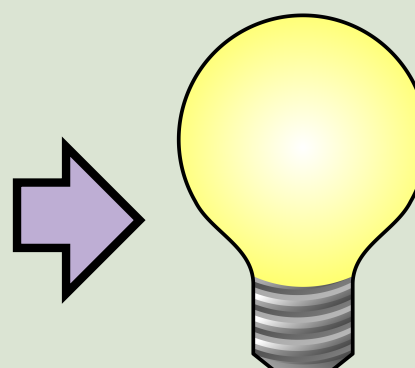


Preliminary Results



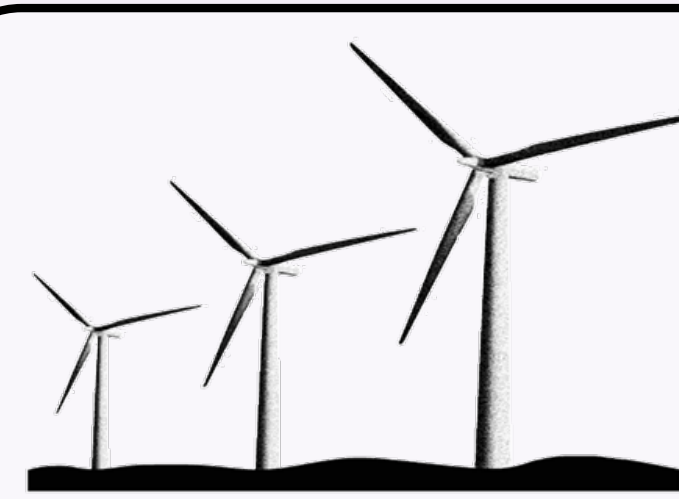
UP TO

6 W/m²



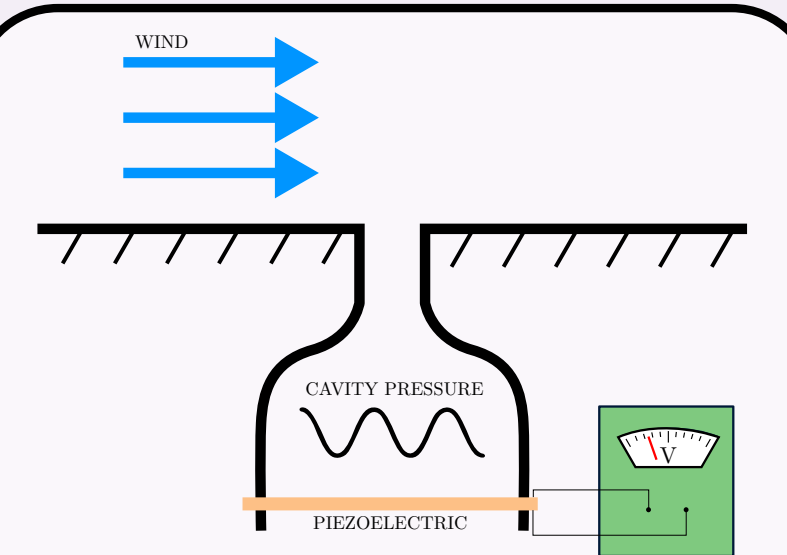
DOES IT COMPETE?

Turbine Farms



- Power: 1-5 W/m² (typical farm value)
- Large
- Limited to open area
- Respond slowly to changes in wind

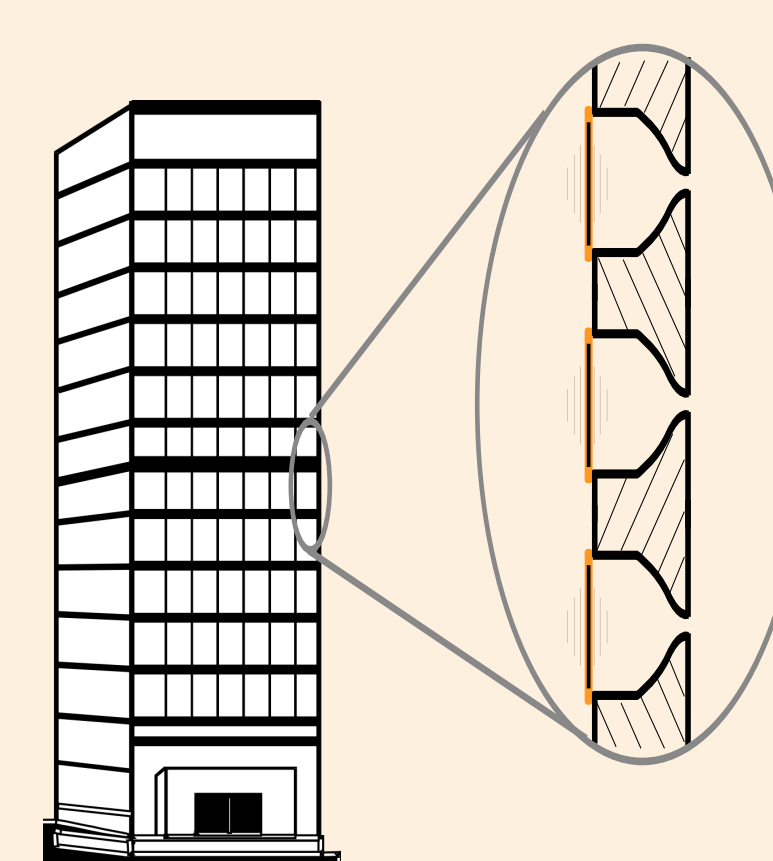
Resonators



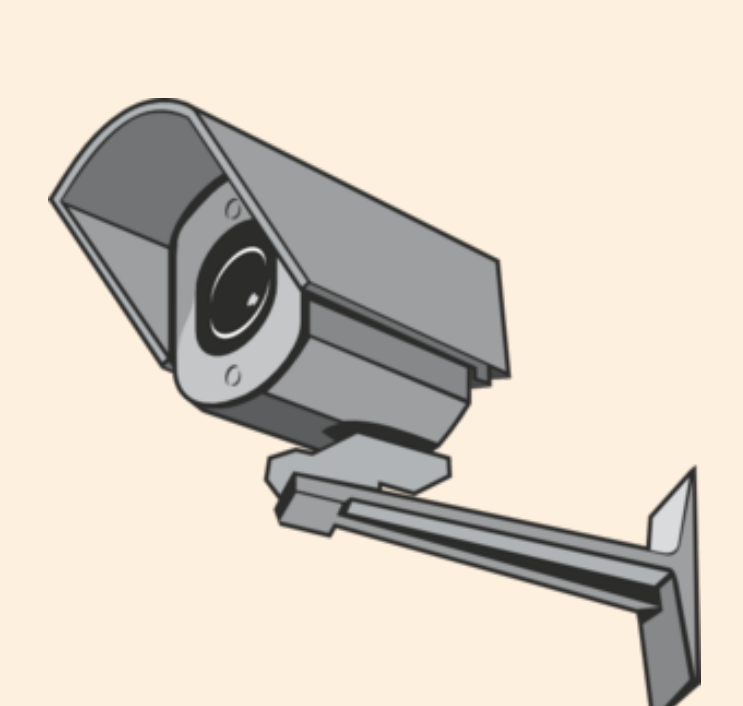
- Power: up to 6 W/m² (so far!)
- Small/compact
- Used in tight spaces (urban environments)
- Omni-directional & quick response

APPLICATIONS

Urban Environment



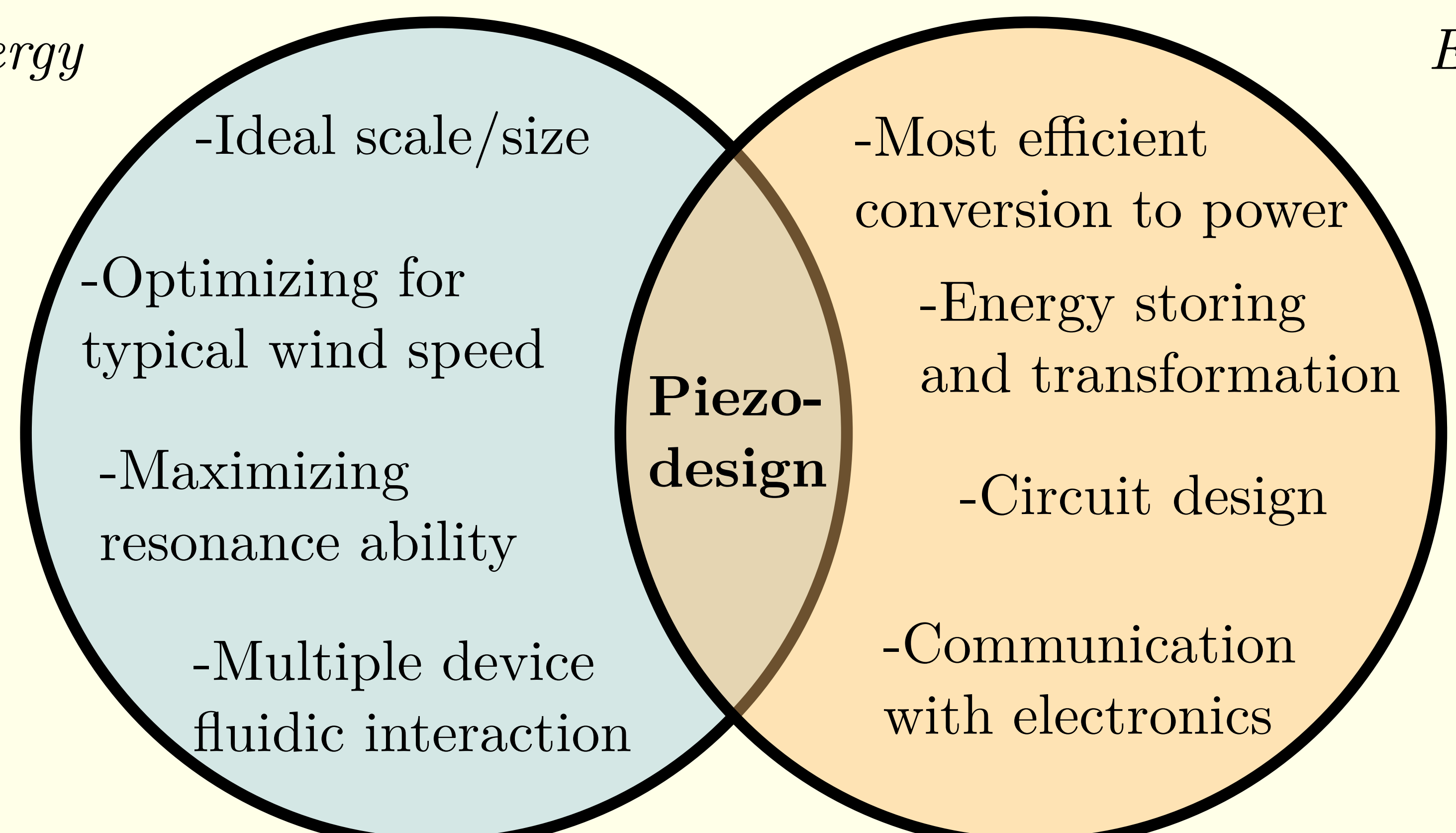
Remote Devices



WHAT NEXT?

Fluid to Mechanical Energy

Mechanical to Electrical Energy



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