

Introduction



Waste Energy



Low Emissions



Live Monitoring

Elevator Pitch:

Waste becomes clean electricity through combustion, steam, turbine rotation, and live monitoring.

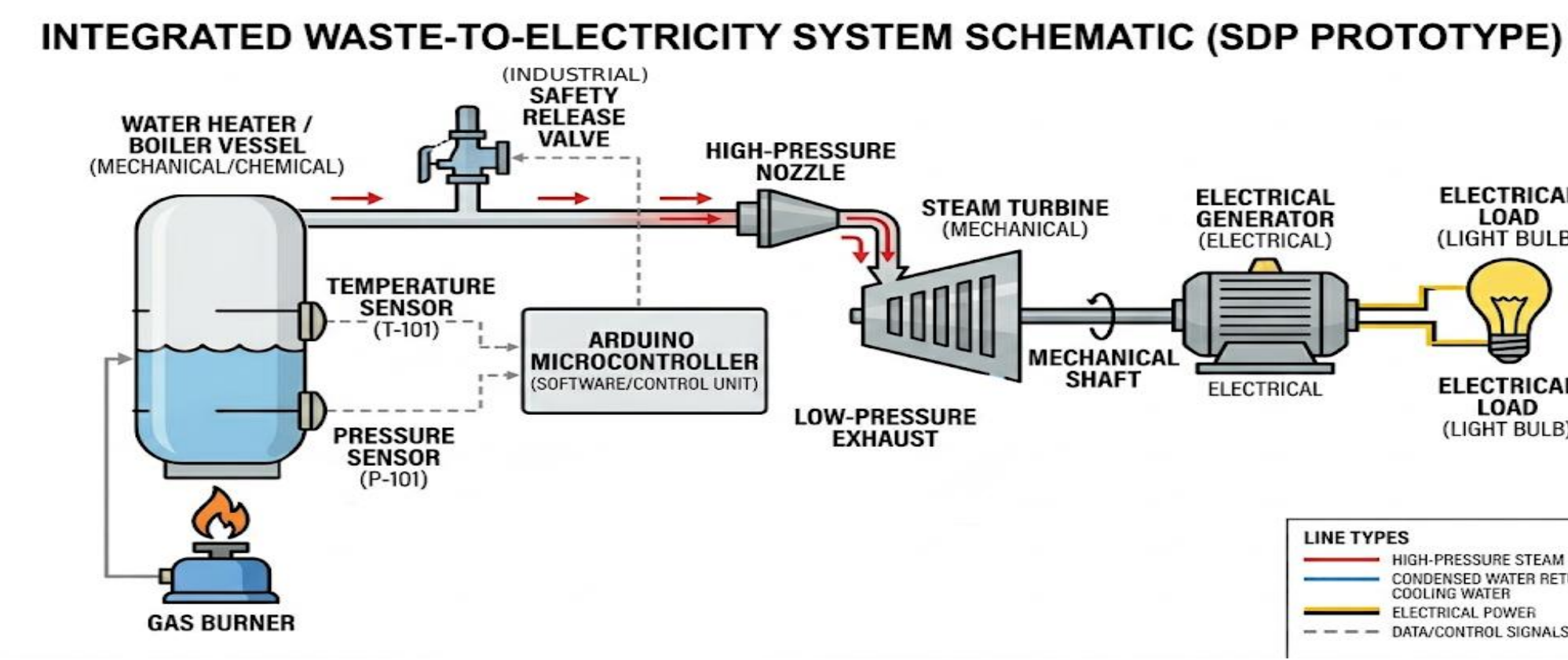
Problem:

- Landfills are filling fast
- Energy is lost in waste
- Emissions need treatment
- Plants need real-time data

Objectives

- Build a safe bench-scale plant
- Show heat → steam → electricity
- Treat CO₂, CO, and NO_x in simulation
- Monitor voltage, pressure, and temperature
- Forecast power locally with ML

Prototype Design

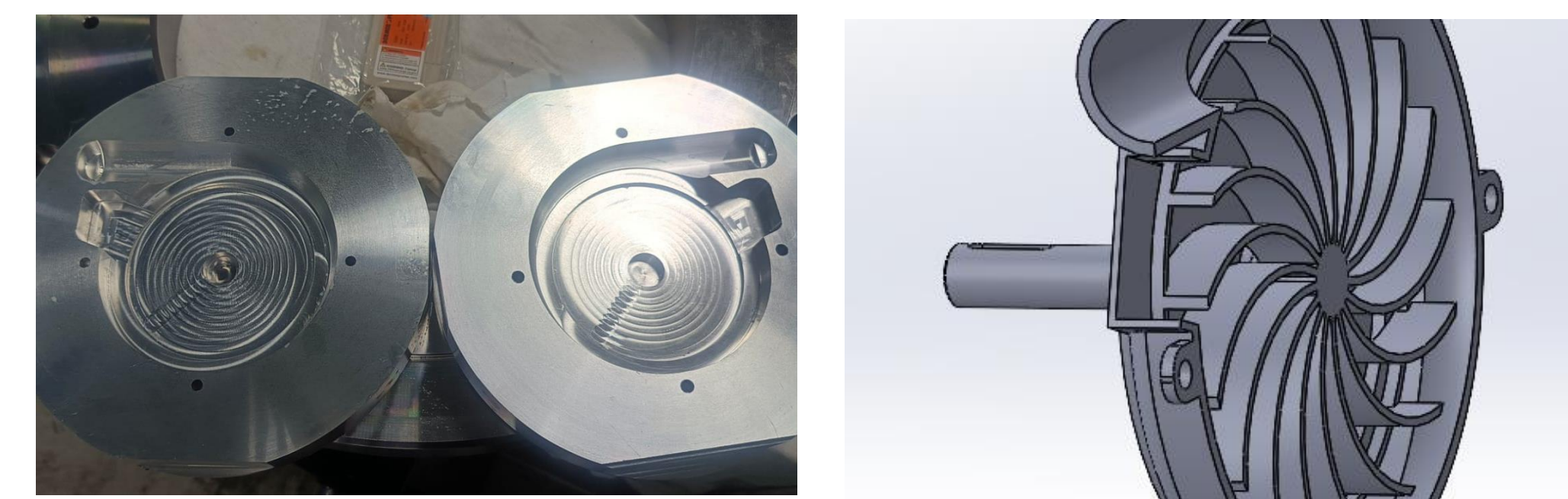
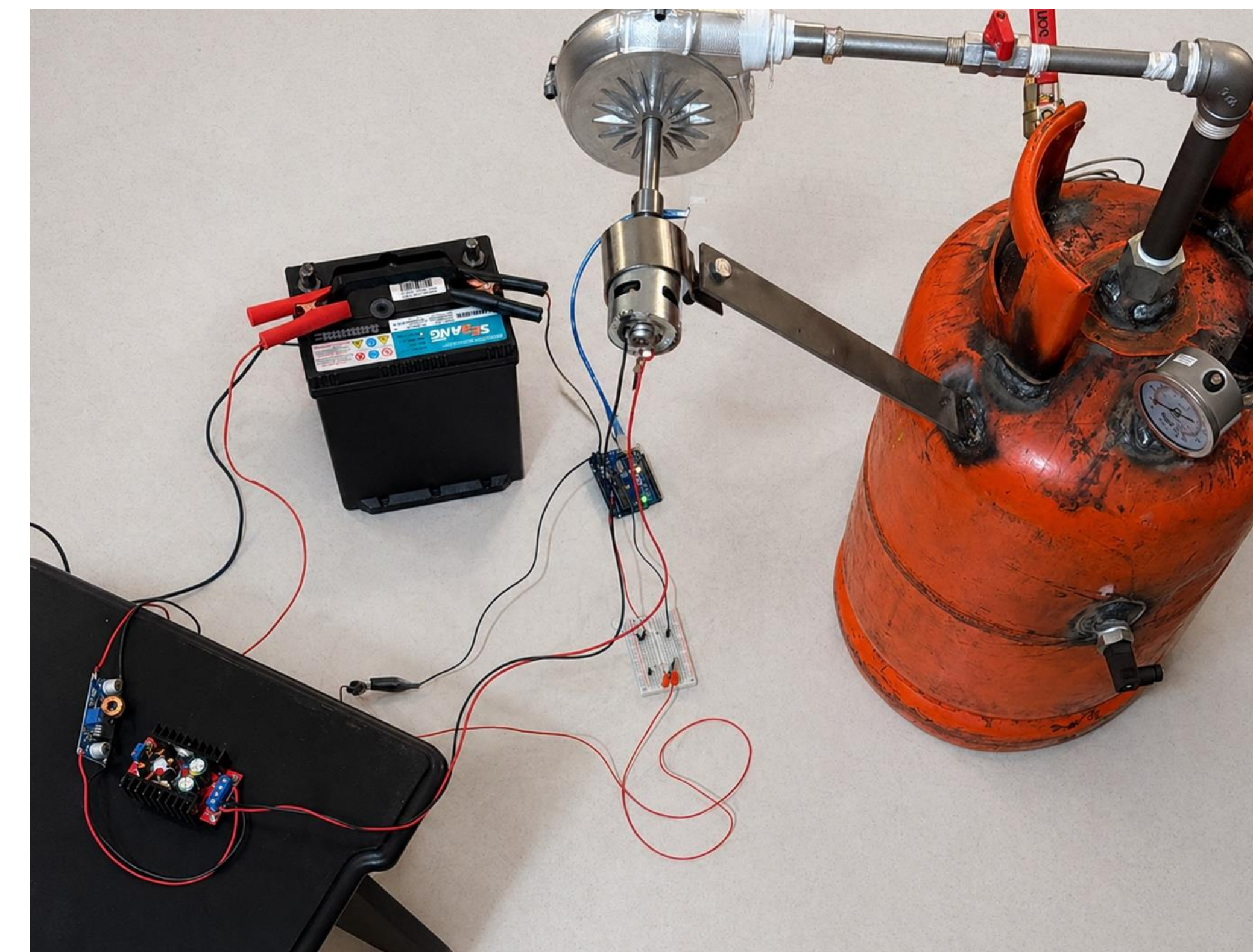


Design Path: MSW → Steam → Turbine → Generator → Dashboard

Constraints & Specifications

<p>C1 Bench scale lab only</p>	<p>C2 Ventilation emission control</p>	<p>C3 ≤20 V safe output</p>
<p>C4 ≤30 kg portable turbine</p>	<p>C5 Local ML no cloud</p>	<p>C6 Utilization ≥2 simulation use</p>
<p>S1 >3M tons/yr MSW capacity</p>	<p>S2 CO₂ • CO • NO_x treated in sim</p>	<p>S3 ≥5 W prototype output</p>
<p>S4 ±10% voltage sensing</p>	<p>S5 <1 s alert safety response</p>	<p>S6 ≤10 SAR/kWh cost target</p>

Prototype



CNC turbine + model show manufacturable design

• **Integrated Chain:**
Boiler → Turbine → Generator → Battery → Dashboard

Key Build:

- CNC aluminum turbine
- Arduino voltage monitoring
- Low-voltage lab operation

Validation & Results



8.32 W output



94.26% ML accuracy



0.88 SAR/kWh

Waiting Time

	Average
Ash handling.Queue	510.14
Boiling and steam.Queue	419.12
Combustion.Queue	96.0373
Gas Treatment.Queue	0.8956
MSW drying from liquids.Queue	687.22
Turbine generates energy.Queue	16.9622



Conclusions

- Heat-to-electricity chain worked
- ≥5 W target achieved
- Local ML dashboard verified
- Scenario 2 selected: 2 dryers + 1 incinerator
- Supports Vision 2030 waste-to-energy goals