A “♪ound” Solution to Rural Electrification ?

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SCORE-Stove™ Thermoacoustic Engine [Sound Power]

1.0 Rural Background

Approximately **1.4 billion** people still **do not have access to electricity**

These communities rely on **wood fire** for cooking, heating and lighting.

Fig. 1: Communities in rural Malaysia dependant on wood fire for their daily living [taken in 2008]

2.0 The “Sound” Solution

The Thermoacoustic Engine

A Thermoacoustic Stove-Engine was developed to be integrated with woodfires such that:

- ✓ Fire us used more **efficiently** for cooking (**save energy**)
- ✓ **Generation** of approximately **50W of electricity**

Advantages of the Thermoacoustic Engine System

- ✓ Operates on **any form of heat source**
  - o Can be made renewable (solar, biomass,etc)
  - o Continuous (not time or season dependant)
- ✓ **No moving parts** (apart from the linear alternator)
  - o Robust
  - o Requires minimal maintainance

Fig. 2: A Thermoacoustic Stove-Engine for cooking and generating electricity

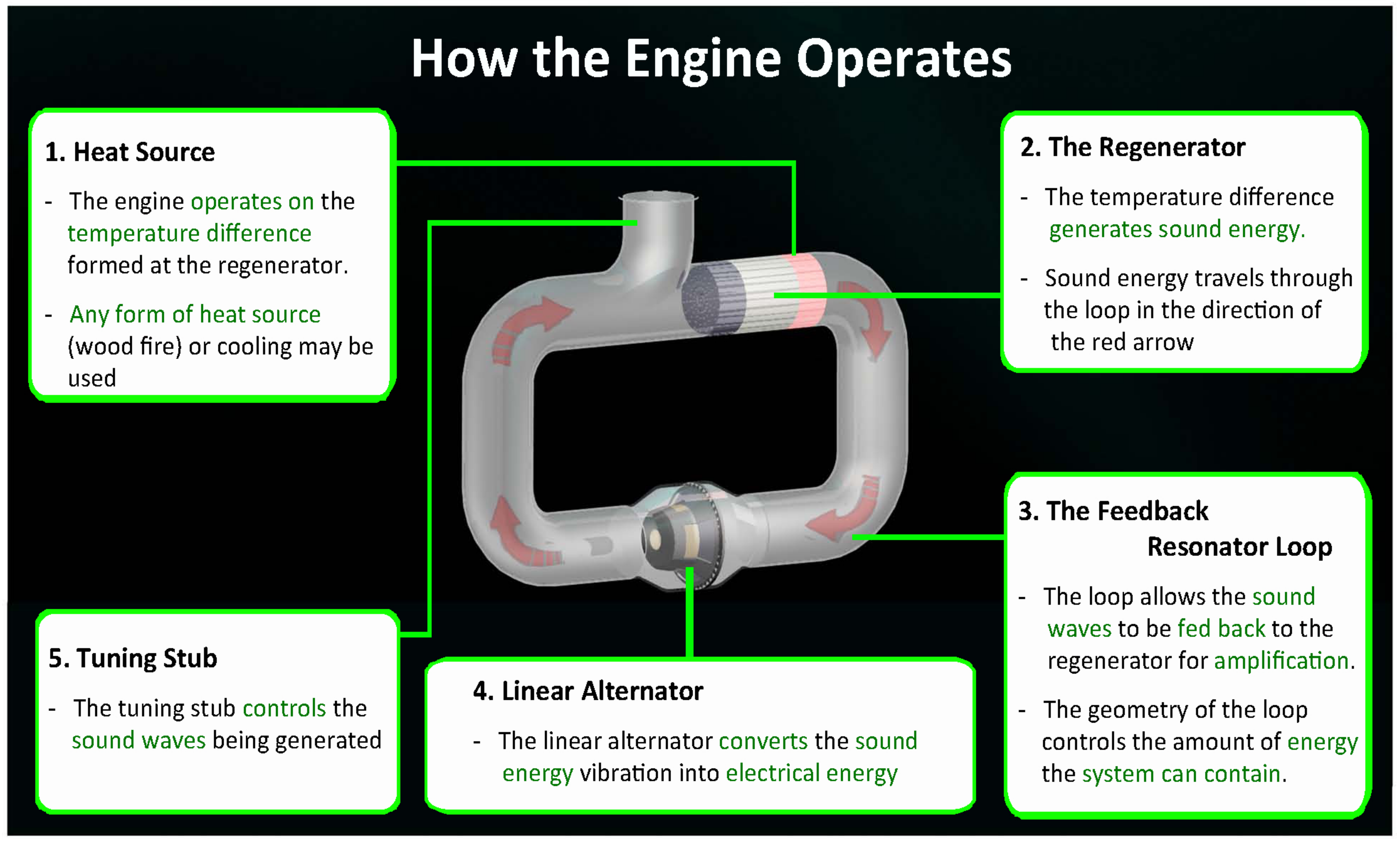

Fig. 3: The operating principal of the Thermoacoustic Heat Engine

3.0 Research Objectives

Optimisation of Thermoacoustic system

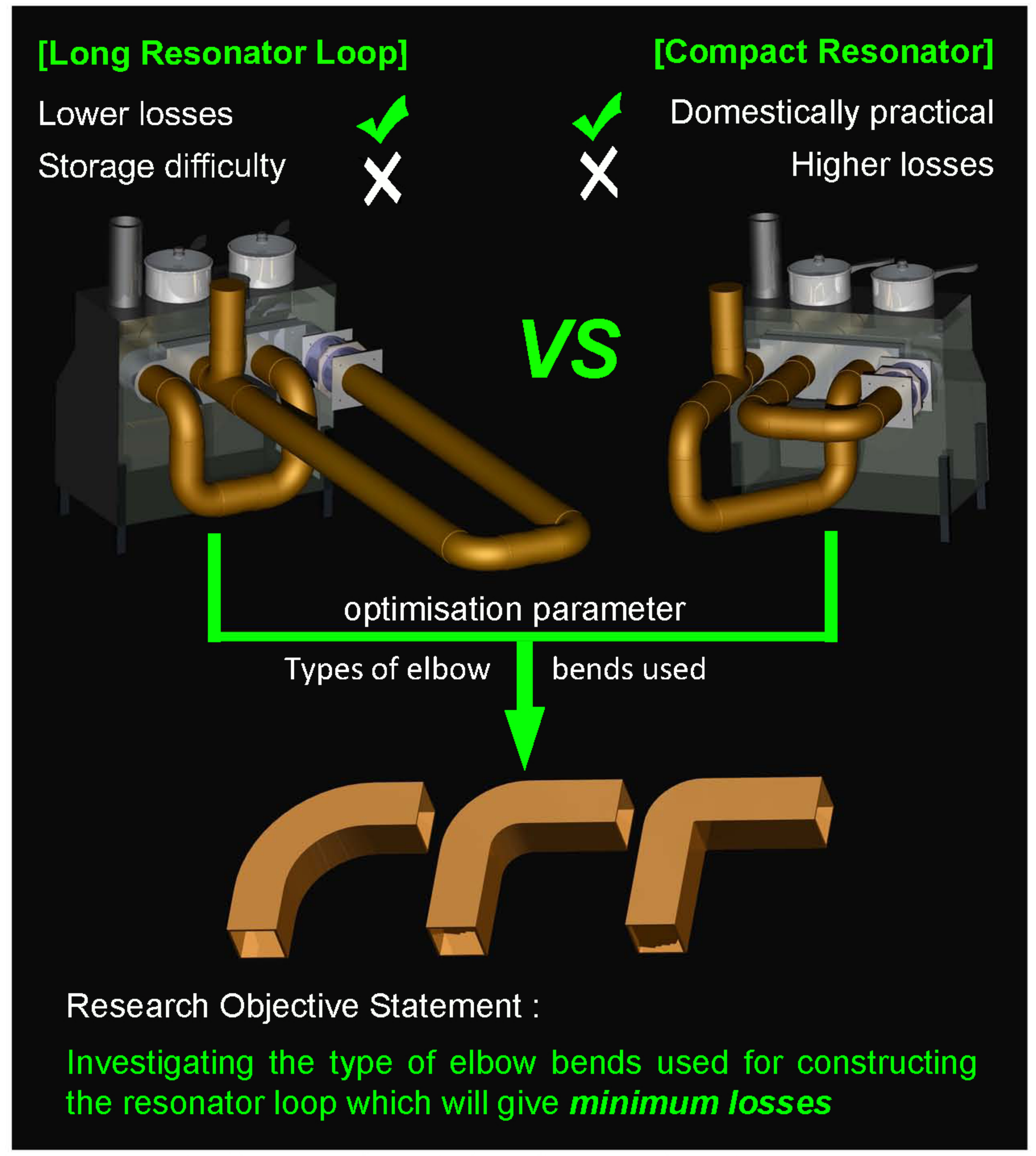

Fig. 4: Challenges faced developing the Thermoacoustics Engine and research objectives.

4.0 Research Results & Conclusion

A **Thermoacoustic Stove-Engine** has been developed to be integrated with woodfires used by rural communities which will allow a more efficient use of the fire as well as **generate 50W of electricity** for the communities.

The **Acoustic Dean Equation** has been developed to **predict the sound power losses** through bends

$$De_{acoustics} = \left(\frac{u}{c}\right)^2 \left(\frac{\omega}{8\upsilon R}\right)\left(\frac{32r^5}{R}\right)^{\frac{1}{2}}$$

Legend

- r = hydraulic radius (m)
- R = radius of curvature of elbow(m)
- u = RMS particle velocity (ms^{-1})
- c = speed of sound (ms^{-1})
- ω = angular frequency (s^{-1})
- ρ = density (kg/m^3)
- v = kinematic viscousity (m^2s^{-1})

This is an **important** parameter for the **design** and **optimisation** of **future Engine systems.**

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