


Design and Testing of a Small Human-Powered Generator for Developing Rural Communities

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Outline

- Motivation
- Concept
- Human Engine
- Generator Construction
- Test Results
- Demonstration
- Conclusions


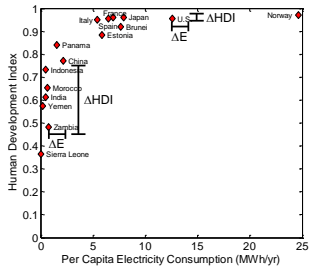
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Motivation

- Access to reliable and affordable electricity remains unavailable to approximately 1.5 billion people

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Motivation

- Zambia:
 - +12 million people
 - +8 live in rural communities
 - 50% of rural population have electronic devices
 - 4% have access to electricity

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Concept

- Design a small human-powered generator
- Use local materials, lay manufacturing processes

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The Human Engine

2350 kcals (2.73 kWh)

digestion (10-20%)

resting metabolic function (60-75%)

available for motion 500 Wh

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The Human Engine

- Car Battery: 0.9 to 1.6 kWh (12 V)
- Cellular Phone Battery: 2.6 to 4.8 Wh (3.7 V)

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The Human Engine

Movement	Power (W)	Device
Squeezing Crank	12	Clock Radio
Rotating Handle	28	DVD Player
Foot Pedaling	>100	Color Television

Human efficiency during movement is roughly 20%

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Generator Construction

- Materials and tools limited to those found in a hardware store
- Assembled with skill of a bicycle mechanic

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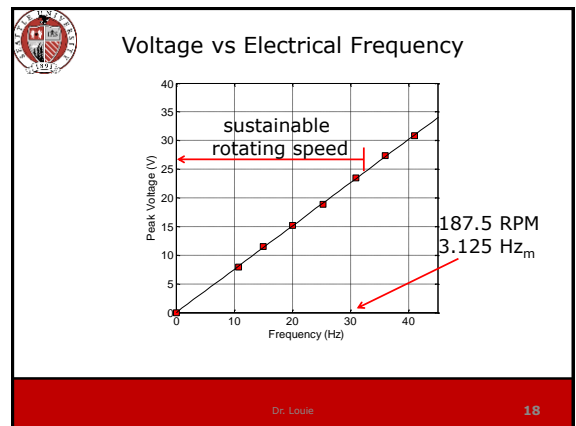
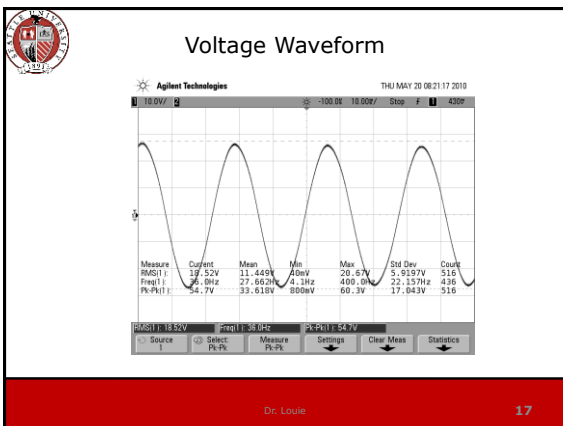
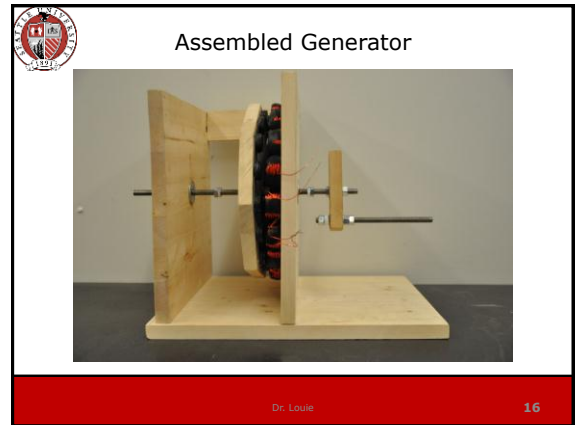
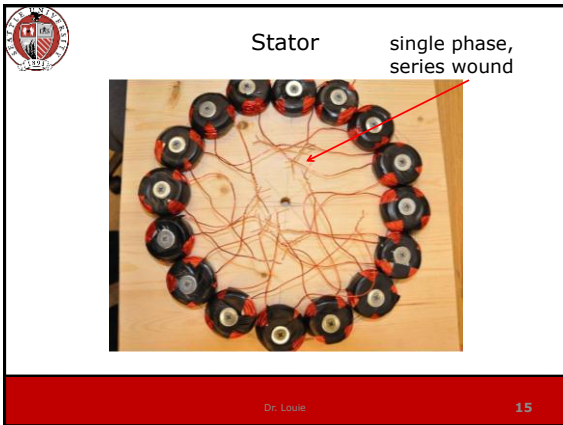
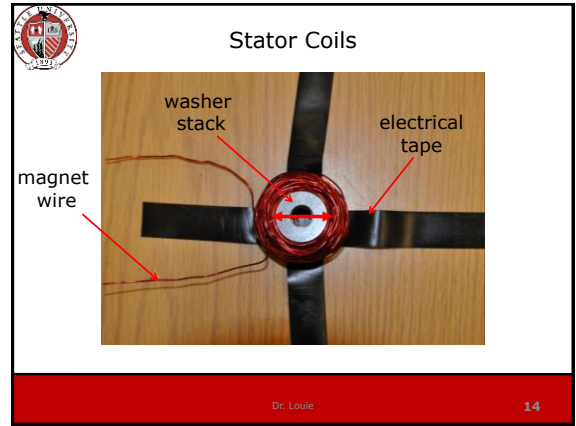
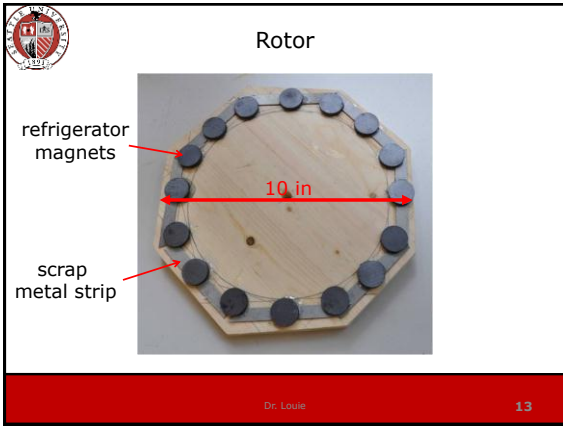
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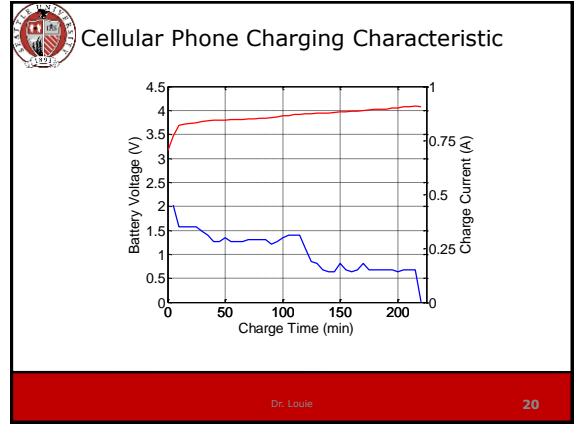
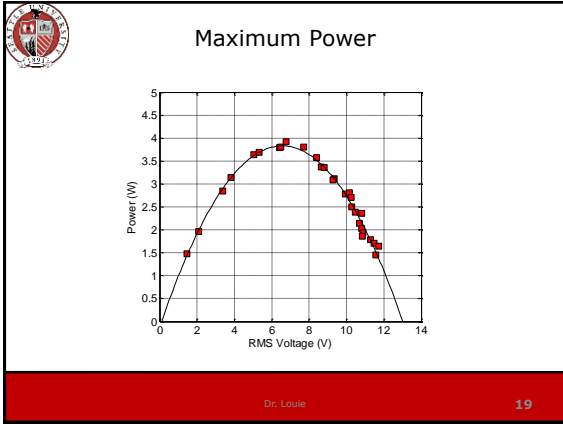
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- Conclusions and Future Work**
- Small human-powered generator is feasible
 - AC voltages up to 30V peak
 - Peak Power 4W @ 30 HZ
 - Overbuilt, could be 25-50% smaller
 - Cost is still high
 - Rare Earth magnets (NdFeB) would increase performance
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