
Future of Rice Energy

Rice Energy History

- Initially lacked access to basic amenities (water systems, power lines...etc.)
- Plant behind mech lab used to generate power, transferred through steam tunnels
- Rail line behind mech lab carried soon-to-be burnt coal
- 1926 shifted to natural gas

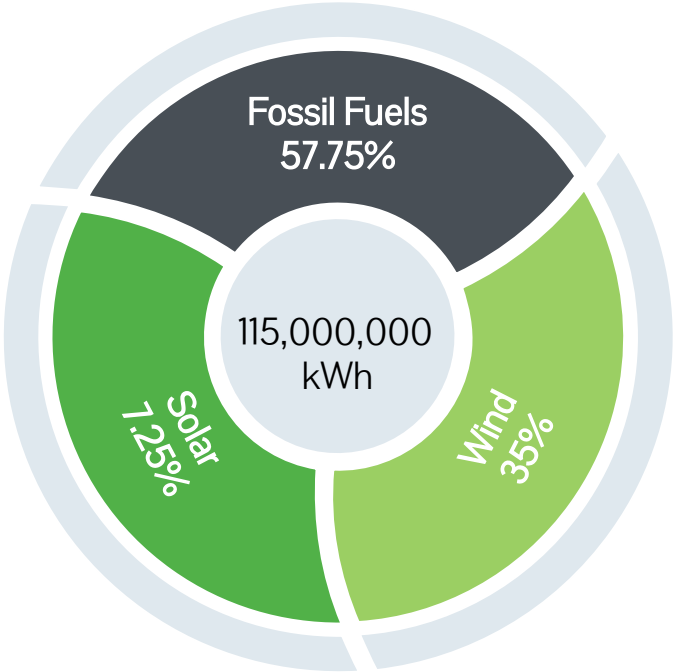
Current Rice Energy Goals

Fast forward to the year 2013, a young, ambitious Richard Johnson, the director of ACSEM, set the goal of having a **carbon neutral** campus by **2038.**

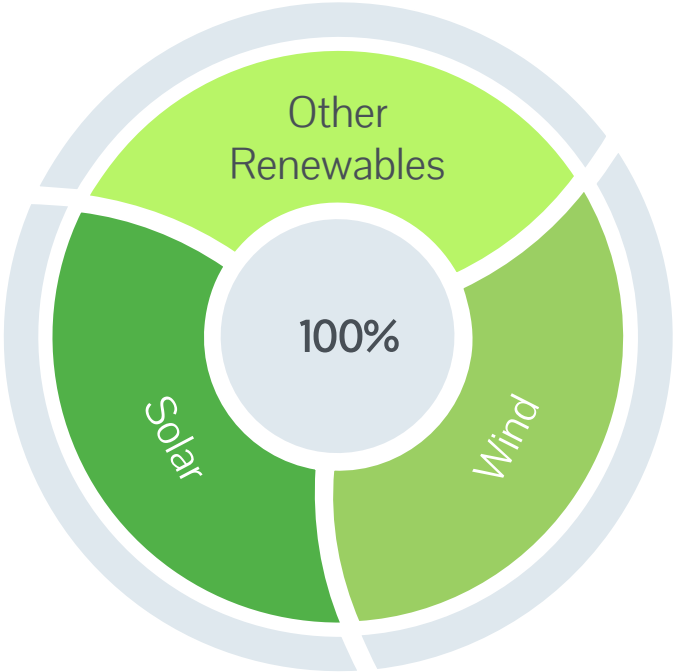
Annual Rice Energy Consumption:

115,000,000 kWh

Present Day



2038



Questions to consider

- Will switching to green infrastructure raise already high tuition rates?
- Can we achieve the best of both worlds?

Future of Rice Energy

I. Renewable Energy Systems
II. Carbon Sequestration
III. Demand Response

I. Renewable Energy Systems

“These projects, when completed, will not only save energy, but also reduce our greenhouse gas emissions”

-Richard Johnson

On-Site Solar

Energy Independence

Protected from disruptions to the ERCOT grid such as in extreme events

Cost Reductions

Peak Solar Efficiency = Peak Energy Use

Can sell back to grid or reduce peak energy use costs

Price Decline

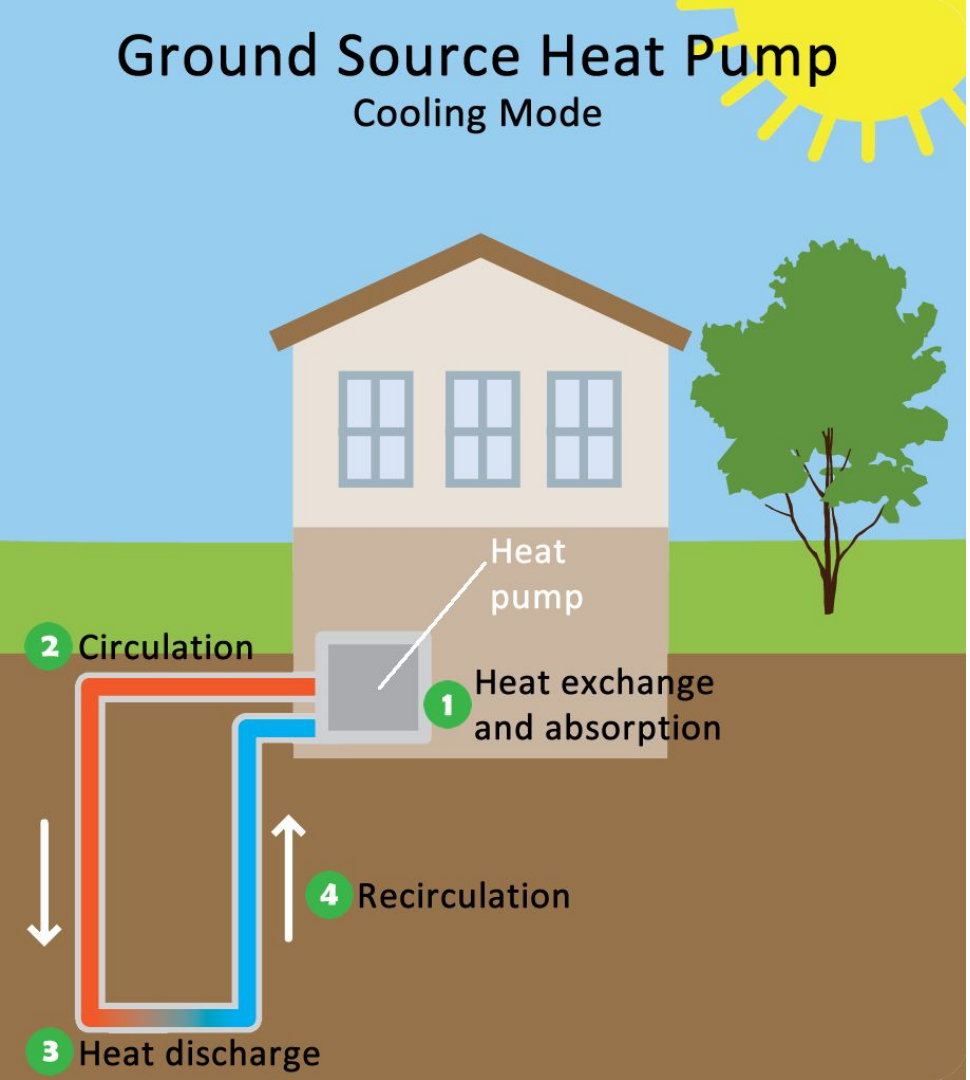
Forbes projection:

Cost of Solar < Cost of Fossil Fuels by 2025

Off-Site Solar Energy

- Current solar array in Fort Stockton, TX via MP2 Energy
- Used to offset fossil fuel consumption
- Electrons are fungible
  - Potentially controversial


Geothermal Heat Pump



Case Study: Ball State University

- $2 Million annual savings in operating costs
- 85,000 Tons of CO2 reduction
- Limited real estate needed

II. Carbon Sequestration

“There’s one issue that will define the contours of this century more dramatically than any other, and that is the urgent and growing threat of a changing climate.”

-Barack Obama at the UN Climate Change Summit

The Rice Land Lumber Company

- Forestry is a long-term investment
  - Sell seedlings
  - Lumber
- 57,640 tonnes of carbon sequestration per year

III. Demand Response

“The building will be an important milestone as we seek to secure Houston's future as a clean, energy-efficient city”

-**David Leebron** on LEED Gold Certified **Duncan College**

More Efficient Buildings

- LEED Platinum
- Green roofs and vines
- Motion sensor thermal control
- Rolling brownouts

Case Study: Thermal Energy Corporation

- Largest in the World, 8.8 million gallon capacity
- Received $10 million grant from U.S. DoE American Recovery and Reinvestment Act
- Saved TMC and its customers $200 million in the first five years

Thermal Battery Storage

Cost Benefits:

- Rice University already has the infrastructure to create chilled water.
- Chilled water made at night when energy is cheap

Renewable Benefits:

- Wind farms generate regardless of demand. Coal fired plants reduce firing capacity based on demand, making the nightly fuel mix higher in renewable energy

Recommendations

Renewables	Sequester Carbon	Demand Response
Cost effective	Revenue	Long-term savings
Energy Independence	Offset carbon use from fossil fuels	Technology improvement
Installation Costs	*Long-term investment*	*Installation Costs*
Not reliable	*Not visible*	*Retrofitting*

"Rice is participating in its **Climate Commitment** not only because it's a learning opportunity for the Rice community and students and because it's economically sensible, **but because it's the right thing to do.**"

-Professor Richard Johnson

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