Renewable Energy

Wind & Solar

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Purpose

- Renewable Energy sources are getting attention because:
  - Economic justification
  - Environmental justification
  - National Security justification

Economic Justification

Fossil fuel costs have increased dramatically making renewable energy (especially Wind) a very viable source.

Fluctuations in pricing makes planning and forecasting of energy costs getting very hard.

Environment Justification

Coal emits 1.8kg of CO_2 for 1kg of coal (2kWh/kg of energy).

Nuclear Energy generation requires safe storage facilities for hundreds of years.

Diesel emissions of NO and CO_2 are as high as coal.

Renewable energy (Wind, solar and geothermal) has zero emissions.

National Security

USA has only 3% of fossil reserves.

Most oil reserves are in geographically and politically opposite regimes to the USA.

USA has a very large and vast reserve of wind energy and can easily supply 20% of needs by 2025 and possibly 100% of needs by 2100.

Renewable Energy
Future (beyond 2008)

- Energy consumption to grow at 1% over next 20 years.
- Renewable energy is at 1.5% of all energy today.
- Renewable energy expected be 20% of all energy use by 2025.
- This is a growth of 1.5% year over year.
- This is an addition of 5000MW every year.

Renewable Energy basics

	Wind	Solar	Geotherm (>200ft depth)
Energy Density (Watts/sq.ft)	35	15	~200
Cost (cents/watt)	3 to 8	15 to 35	5 to 8

Wind appears a better return on investment for today's technology.

With new emerging solar technologies such as CIGS and Cadmium Telluride, this may change.

Geothermal energy is not getting the attention that it can generate.

Mouli Engg Opportunity

Need for asset monitoring, control and real time management of generation and transmission.

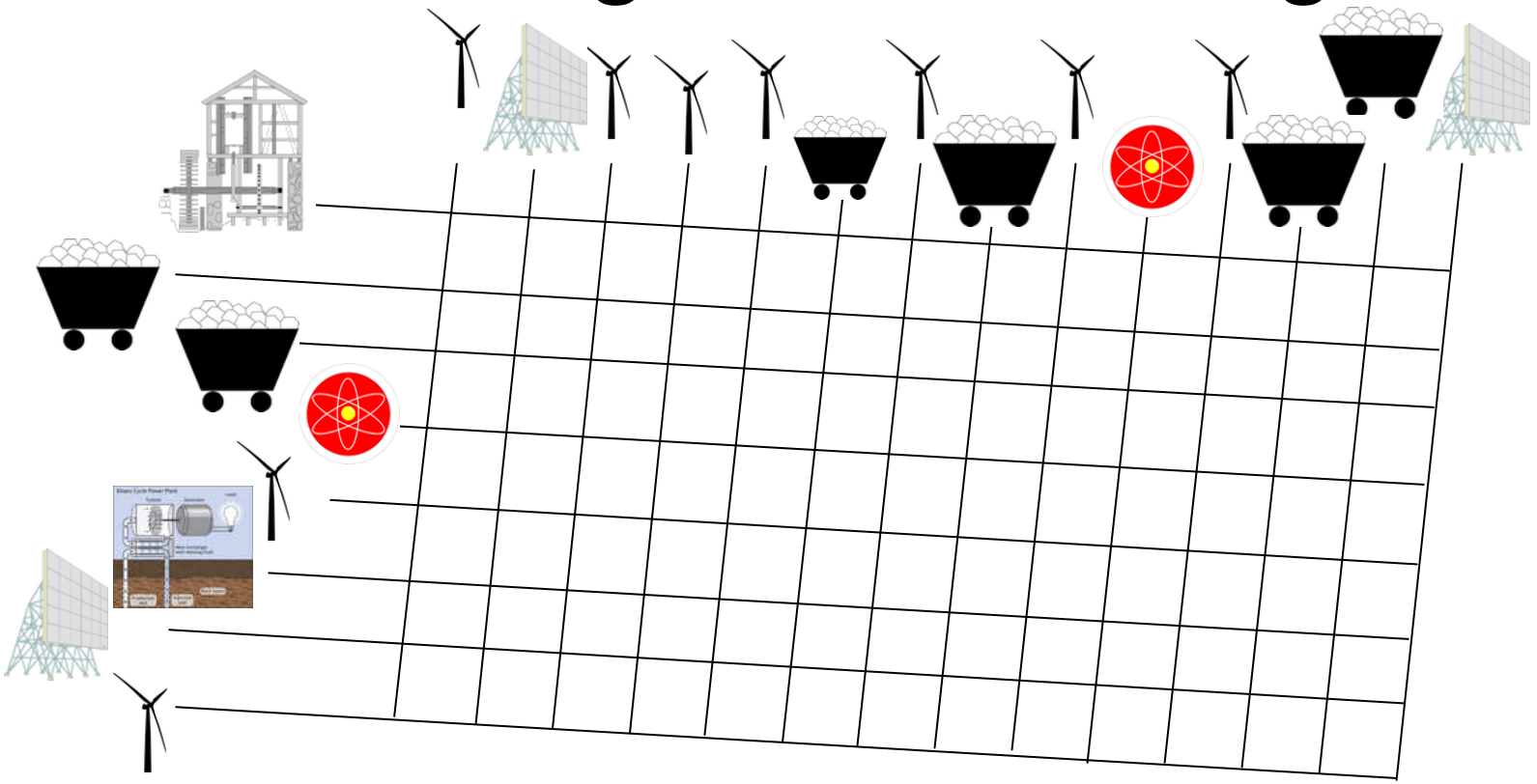
Need for independent evaluation of asset performance.

Value is in maximizing return on investments.

Considerations for Renewable Energy

- Tax credits monetization.
- Capitulation of new technologies.
- Timing of asset financing (crude at $75 or $35/barrel).
- Intelligent selection of execution strategies.

Power grid monitoring



The power grid has several sources and their generation capacities are very different. Hence, grid loading is not even.

Renewable energy generation capacity is also not consistent. This adds more complexity to grid.

Mouli Engg. can provide service in real time monitoring (**smart grid**).