Hybrid Renewable Energy

Prepared by

Omed B. Hussein

Mech. Engineer

Kurdistan Engineering Union card No. 3365

Introduction…..

The decades past and continues suffering for long-term power presence especially for basic home appliances e.g. lightening rooms and atmosphere conformability , heating and cooling, have concrete demands to oversee for a proper device and mechanism which might hold the burden off and radically solve the case of Energy Lack and lead to robust strategy for providing sufficient power in the region against its various types and strength especially as electricity when focus could be sighted on rural areas in terms of the recently improvement inside city centres .

The combination of diesel generators with second and third power source with regular storage entitled as Hybrid is come to enforce the idea and to put practical steps by several international industries and lots of university studies served in due concern to reach sustainable technology parallel to the human prospective and requirements.

Accordingly in this research we will try to discuss how the Hybrid methodology will trigger this ambitious into practical touch in our realistic life, depend on the existing mathematical analysis for major collected theoretical data based on adjoining Solar panel (photovoltaic) as second power source beside the Diesel one, despite that and as better sample the worldwide vehicle manufacturers have already upgraded the technologies and paced forward by producing Hybrid- Electric vehicles (HEVs) in which combine the benefits of gasoline engines and electric motors that can be configured to obtain different objectives, such as improved fuel economy, increased power, or additional auxiliary power for electronic devices and power tools.

What are Hybrid Generators!

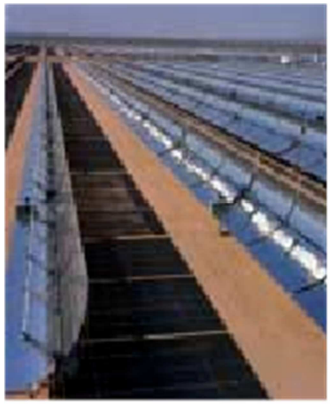
Hybrid generators are located within hybrid power systems and include another form of energy production, such as solar (photovoltaic), wind or hydro energy. The two systems, work together to gain the maximum amount of energy, and include a computerized controller (which controls the operation, usage and energy production), batteries (where the energy is stored), combustion engine, DC generator, and a DC to AC Inverter (which allows the energy form either the wind/solar/hydro power to be connected directly to the generator).

Types of Hybrid Generators

There are two types of hybrid generators that we can use depend on the need; Grid-assisted and off-grid. The Grid-assisted hybrid systems use both electrical grid and alternative energy sources, storing the extra energy in the batteries. The best part about grid-assisted hybrid systems is that even if there's no sun, wind or water to pull energy from, the generators can gain power for the energy stored in the batteries. Off-grid hybrid systems provide alternative energy separate from the grid and are the sole provider to the amount of energy stored in the batteries. They are great for remote locations, and don't rely on utility companies or grids to be close. Plus they don't consume electrical energy, which is awesome for the eco-friendly user. The only downfall to these systems is that you do rely on the sun, wind or water constantly, so hopefully we will be in a location that receives one of these alternative sources frequently.

Hybrid Renewable Energy System



Presentation Outline

- Why Hybrids?
- Hybrid Definitions
- Hybrid Types
- Hybrid Study
- Conclusion

Hybrid Systems Definition

Hybrid power systems combine two or more energy onversion devices, or two or more fuels for the same device, that when integrated, overcome limitations inherent in either.

Hybrid systems can address limitations in terms of fuel lexibility, efficiency,reliability, emissions and / or economics.

Distributed Hybrid Systems Definition

Characteristics of Distributed Energy Resources:

- Located at or near Point of Use
- Locational Value
- Distribution Voltage

Microturbine/Storage

Microturbine/Chiller

Wind/Engine

Focus of a new Hybrid Systems Initiative

Technology Programs

Program Goals

A ¢/kWh

B ¢/kWh

C ¢/kWh

C-B ¢/kWh

D$/kW

A hybrids program can create market opportunities for emerging technologies before they are mature.

Power Quality

Village Power

Power Parks

Hybrid System Applications

Value Propositions

Renewables

Storage

Hybrid System

Value Propositions:

High Efficiency

High Reliability

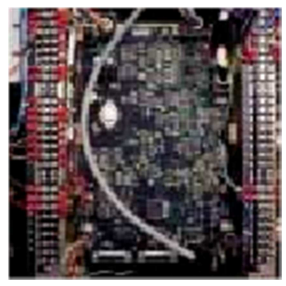
Low Emissions

Acceptable Cost

The whole is greater than the sum of its parts.

Fossil Fuel Generators

Power Electronics



Value Proposition – Higher Efficiency

Incorporating heat, power, and highly-efficient devices (fuel cells, advanced materials, cooling systems, etc.) can increase overall efficiency and conserve energy for a hybrid system when compared with individual technologies.

Combining heat and power systems, can greatly improve overall energy efficiency.

Value Proposition – Enhanced Reliability

Achieving higher reliability can be accomplished with redundant technologies and/or energy storage. Some hybrid systems typically include both, which can simultaneously improve the *quality* and *availability* of power.

The PV/Propane/Battery hybrid significantly increas the reliability of the power system.

Value Proposition – Lower Emissions

Hybrid systems can be designed to maximize the use of renewables, resulting in a system with lower emissions than traditional fossil-fueled technologies.

The solar energy generating system, solar thermal power plants produce far fewer emissions than traditional electricity generation technologies.

Value Proposition - Acceptable Cost

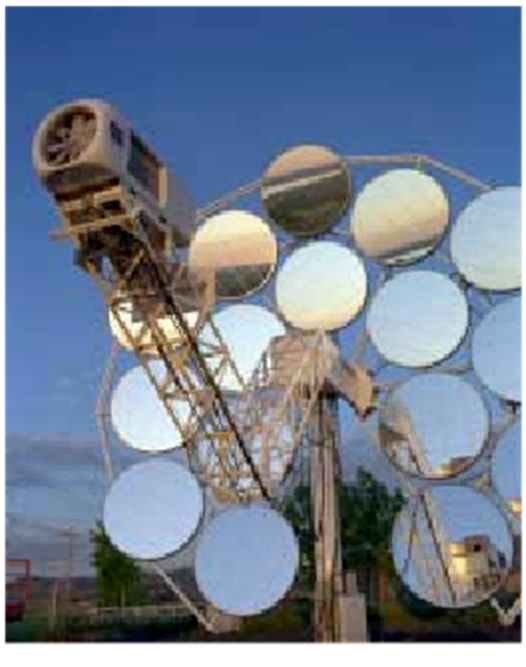
Hybrid systems can be designed to achieve desired attributes at the lowest acceptable cost, which is the key to market cceptance.

By cutting diesel fuel consumption, run-of-the river hydroelectric plant and battery system reduced electricity costs for the town's residents.

THE SunDish

- 25 kW CSP dish/Stirling engine system
- Provides power during low insolation by burning liquid or gaseous fuel

– Natural gas
– Hydrogen
– Landfill gas



- Benefits of hybrid system

Reliable, continuous power maximizing renewable usage

Wind/Diesel Village Power

- High penetration – 130kW wind added to existing 365kW diesel
- Benefits of hybrid system:

  1- Reduced fuel consumption 50-60%, requiring less diesel storage

  2- Diesel generator provides continuous power in absence of wind

PV/Batteries/Propane

- Benefits of hybrid system:
  - Eliminated risk of diesel spills
  - Reduced annual fuel usage
  - Reduced operating costs
  - Increased reliability

- Benefit of hybrid system:

  Allows dispatchable generation (including periods when the sun does not shine) while maximizing renewable resource usage.

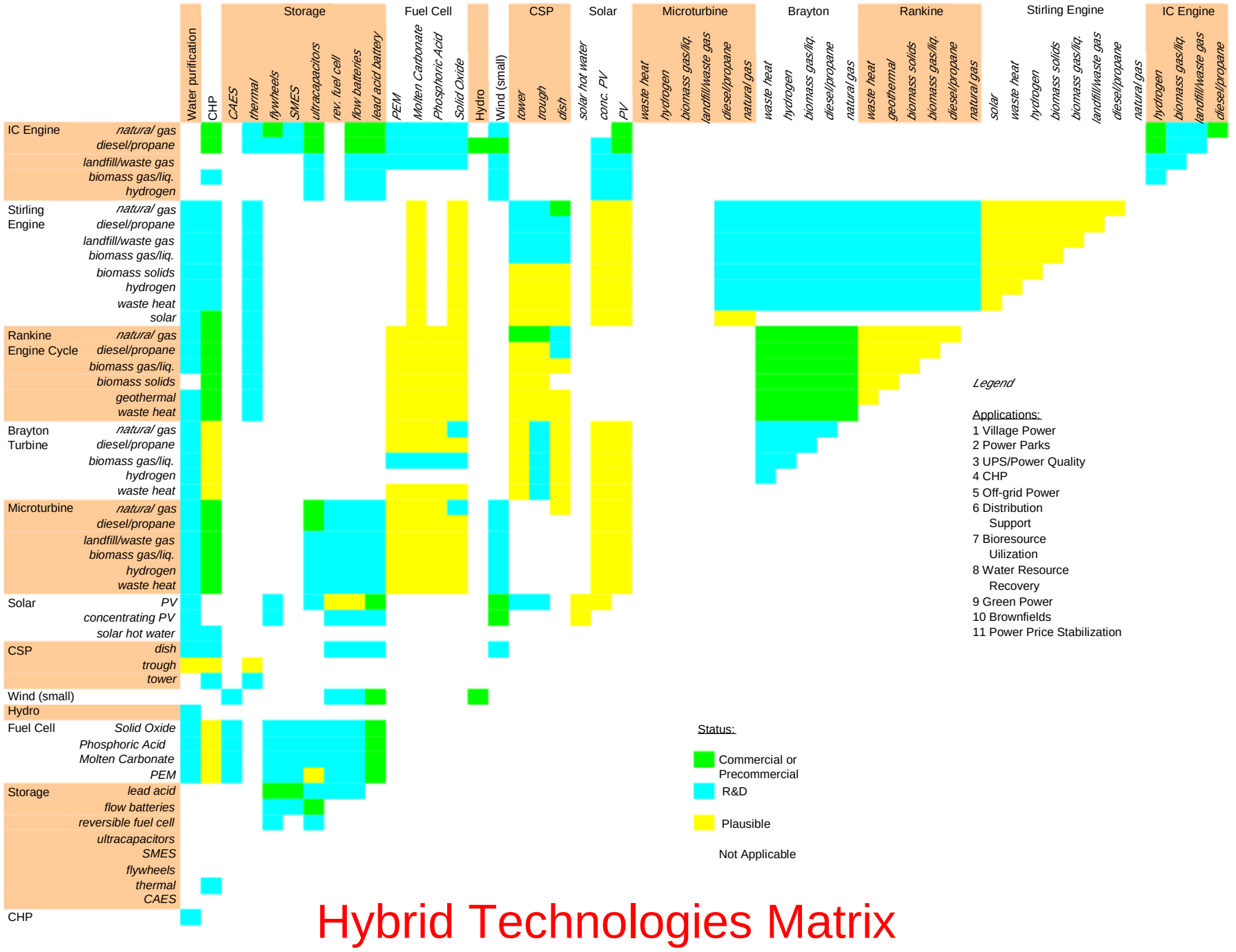
Pieces of the Puzzle

Fossil Fuel Engines
- I C Engine
- Stirling Engine
- Rankine Engine Cycle
- Turbine
- Microturbine

Renewables
- PV, Concentrating PV
- Solar Hot Water
- Concentrating Solar Power
  - Trough
  - Dish
- Wind
- Geothermal
- Hydro

Fuel Cells
- Solid Oxide
- PEM
- Phosphoric Acid
- Molten Carbonate

Storage
- Lead acid batteries
- Flow batteries
- Reversible fuel cells
- Ultra-capacitors
- SMES
- Flywheels
- Thermal
- CAES



Hybrid Technologies Matrix

Applications

- Village Power
- Commercial Power Parks
- Industrial Power Quality
- Integrated Building Efficiency
- Remote (Off-Grid) Power
- Distribution (Grid) Support
- Water Resource Management
- Green Power
- Brownfields (to Brightfields)
- Power Price Stabilization

Hybrid Power Systems Report Objectives

1- Define the thrust of a new program:

a- Compile a set of activities that may tap into existing technology programs to “fill in the gaps”

b- Coordinate but not overlap with technology programs

c- Stimulate innovative thinking that leads to creative business pportunities

d- Encourage cross-programmatic interactions and benefits

2- Define how a hybrid power program will accelerate introduction of all DER technologies that include renewables.

3- Make determination on the need for an integrated distributed hybrid power program.

Conclusion

1- Hybrid power systems can offer solutions and value to customers that individual technologies cannot match.

2- Hybrids offer market entry strategies for technologies that cannot currently compete with the lowest-cost traditional options.

3- Some renewable hybrid power systems are commercially available today and could be outsourced to our region for further study & instant utilization especially for the rural areas.

4- Initiative with an emphasis on distributed applications that currently existing in parallel to the main technology focus & design.

5- For minimum coherence with the new technology focus, it could be a considerable challenge to study it within university courses for new engineering generation.

Indexes

Hybrid Renewable Energy in brief

References

1- Colorado USA Renewable Energy Workshop/ US Department of Energy 2001

2- Third Annual UN Hybrid Conference and Workshop 2003

3- Toyota Hybrid System Technical Training Course