

**Contact Information:**

**Naji S. Chamieh, Ph.D., P.E.**

Sustainable Environmental Solutions

Senior Environmental Advisor

Managing Partner

Mobile Lebanon +961 (3)832 281

Email: [nchamieh@ses-lb.com](mailto:nchamieh@ses-lb.com)

## **Ballerina Energy System**

### **Executive Summary**

Heat waves, severe tornadoes, droughts, and flooding are all the results of climate change. We are simply emitting too much CO<sub>2</sub> in our atmosphere as we are consuming more and more energy and specially fossil fuel. In order to benefit more from renewable energy which is so abundant, I designed a new smart and efficient hybrid tracking solar/wind energy system capable of supplying and storing electricity and heat (hot & cold) to individual households.

This product is very useful because it eliminates the need to buy stand alone renewable energy systems that may not be able to communicate and optimize between energy demand and energy supply. It is better than the alternatives because the smart controller optimize how the energy should be collected by using the sun or wind or even both, and how it should be supplied to the user based on his or her daily needs.

The system is designed to give the consumer a clearer picture on how the energy is being tapped, how it is stored, and how it is being consumed. The visual display of the energy consumed for every routine he or she performs in the house would allow the user to modify his/her behavioral change toward energy efficiency hence allowing the household user to minimize his or her total energy usage, save money, and hence reduce CO<sub>2</sub> pollution.

The conceptual design of the Ballerina Energy System has been completed with assistance of a US industrial design firm and a provisional US patent has been applied for. The next step would be to raise funding to properly simulate, model, engineer, and cost this system in order to develop a working prototype and move to the commercial level at the next stages.

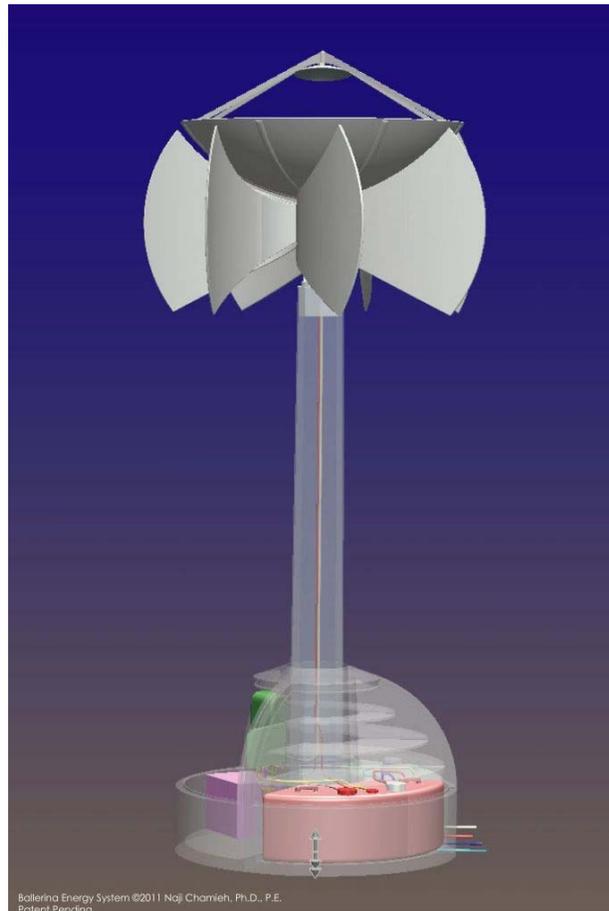
## **Innovative Solution within the Competitive Landscape**

The Ballerina Energy System is a Hybrid Solar/Wind Generator of Energy (electricity, hot water, ice storage), with internal storage capabilities. This proposed renewable energy system that is being developed would be more efficient than a standalone PV or Solar Hot Water systems as those systems lacks the proper communication control tools between supply and demand. As a simple example, many solar water heaters are being installed on the roof of buildings serving hundreds of thousands of users. On sunny days those systems may achieve their full performance within couple of hours leaving valuable remaining sunny hours untapped. Our hybrid energy system would include a smart control system which would let the system supply either heat or electricity depending on the consumer need.

The ballerina can be used to store energy at night taking advantage of the reduced kWh rates, especially when the supply of renewable energy was not sufficient due to weather conditions (i.e. lack of sun and/or wind).

The ballerina energy system would also complement the future household charging stations for the new electrical cars that are slowly entering the market and which would cause a major energy demand and stress on the grid.

The sun tracking system incorporated with a concentrated PV and heat plate module would give the device 30% more efficiency in terms of energy generation along with the additional small micro windmill that would allow the system to benefit with some additional energy from wind loads especially when the system is installed on higher grounds such as roof tops. It is expected that this system would provide more than 50% of the energy loads needed for a typical low income household of six persons.



## **Business Plan**

The market for renewable energy products is on a constant demand as the cost of electricity is going up with the rise of fossil fuel prices and with the expected introduction of new carbon

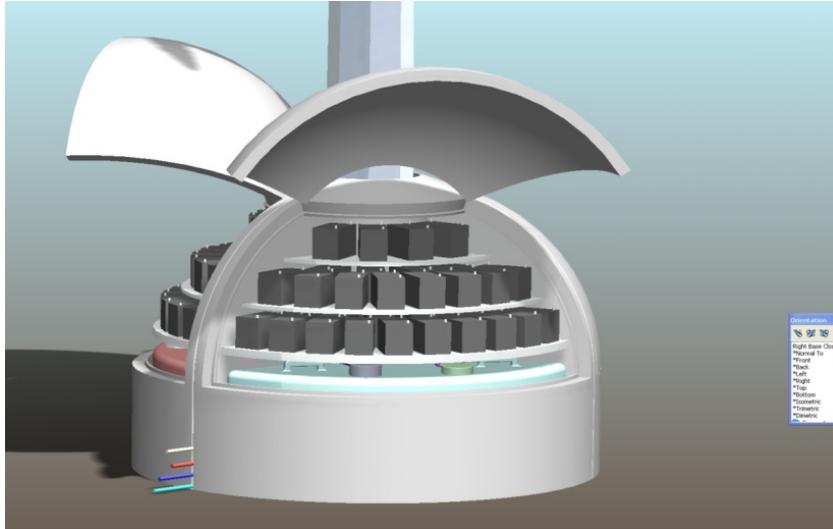
tax laws. The targeted market is the middle-class regular household users living in the Middle-east, Africa, India, and China. A large percentage of their yearly expenditure goes into buying energy. The payback time for a complete 3 KW PV renewable energy systems that sells around 20,000\$ could reach up to 15 years. It is the purpose of this project to cut down the payback time by at least one-half allowing more users to invest in Renewable Energy products.

The marketing strength of the Ballerina Energy System which would support the sale's strategy is based on the different energy features incorporated in it namely:

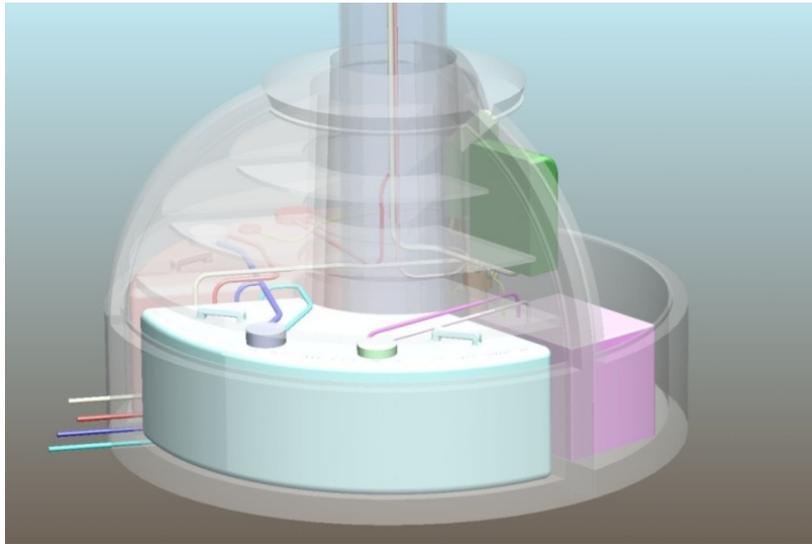
It's Solar hot plate is used for Hot Water Generation, the Concentrated Photovoltaic (CPV) is used for Hot Water and for Ice Storage Generation, the CPV is also used for Power Generation, and the Wind Power used for Hot/Ice Cold/or Electricity Generation, and finally the Smart Control System used for Energy Optimization between supply and demand. In addition the Smart Control System would show the consumer the Real Time Household Consumption and System Functions and performance and the real time energy storage. The Ballerina Energy System could also be linked to the local weather conditions which would predict ahead of time the energy mix needed for the household.

### **Scaling Plan**

Optimization and efficiency are keys to lowering the cost of any renewable energy (RE) product. The Ballerina Energy System controls and monitors how the energy is being managed by the user for the appliances and lighting fixtures, for heating and/or cooling and finally for the supply of hot water. By incorporating a smart control system such an RE product would be more competitive and would create a stronger demand by consumers. The development of such a system will also push the innovation of key components within the system such as the battery storage and the material used to store heat and cold. With a good marketing strategy, the sales of such a system may reach tens of thousands of consumers as many of them may also begin to replace their old systems with a more efficient and versatile ones.



Electricity Storage System



Energy (Hot/Cold) Storage Systems

### **Originator of the Ballerina**

Dr. Naji Chamieh is a professional engineer registered in the State of California. He is a graduate from UCLA and a holder of three US Patents. A US Provisional Patent has already been applied for. Dr. Chamieh has more than 25 years experience in the environmental domain in the Middle East and the US. He is currently managing an environmental firm in Beirut Lebanon called Sustainable Environmental Solutions.