BlueWave Energy, Inc.

Vulcan Mass Storage System

5/15/2008

1.1 Vulcan mass storage system

BlueWave Energy has designed the Vulcan Energy Storage System (patent pending) to compete in the distributed and bulk energy storage market. The Vulcan system stores masses at a height above the ground (thus have potential energy) for releasing of that energy at a later time. The potential energy of the masses that are stored is turned into kinetic energy when the masses are released and allowed to fall back to their original starting point using a vertical conveyor system. This system can store large amounts of energy for later release. It can be used to store the masses during off peak hours and release them during peak hours, thus offsetting the expense of peak electricity production. The Vulcan mass storage system can also work with renewable energy systems to maintain a baseload of power to the grid by storing excess energy when available and releasing that excess energy when it is needed to the grid.

2.1 Design of the system

BlueWave Energy designed the Vulcan Energy Storage System to be able to store large and small amounts of energy in facilities to accommodate the needs of the renewable and distributed energy markets. BlueWave Energy has designed a unique storage and retrieval system to allow for efficient movement of the masses. This efficiency and ability to keep the size of the facility to a minimum is what gives the Vulcan Energy Storage System its greatest advantage – a green storage system with competitive costs of per kW and per kWh.

Figure 1

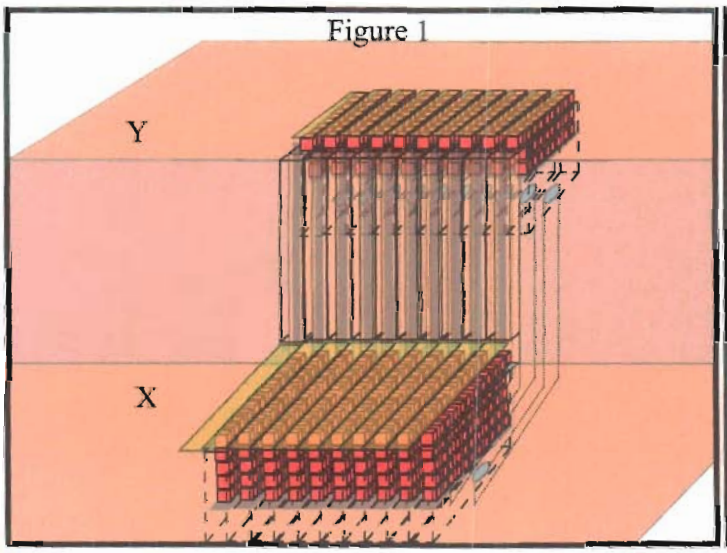


Figure 2

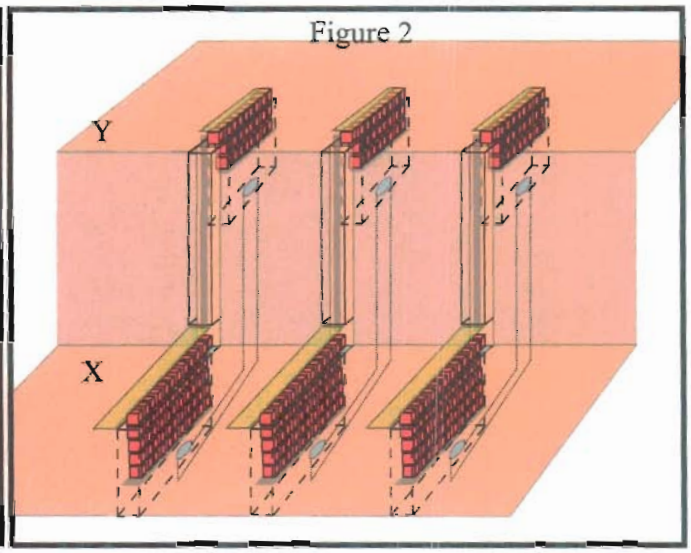
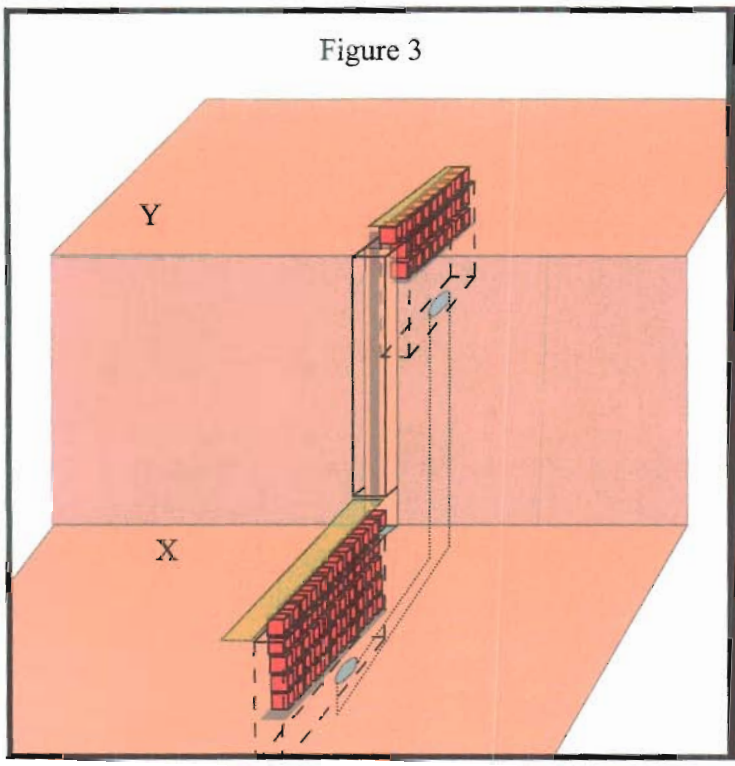


Figure 1 and 2 represent a typical, large storage unit. This system has 10 units working together to store energy. The lower plateau (in foreground, X) has many masses stored (red boxes) in underground storage areas (dashed lines). Figure 2 separates the units and then the proceeding figures zoom in on one unit and how it functions.



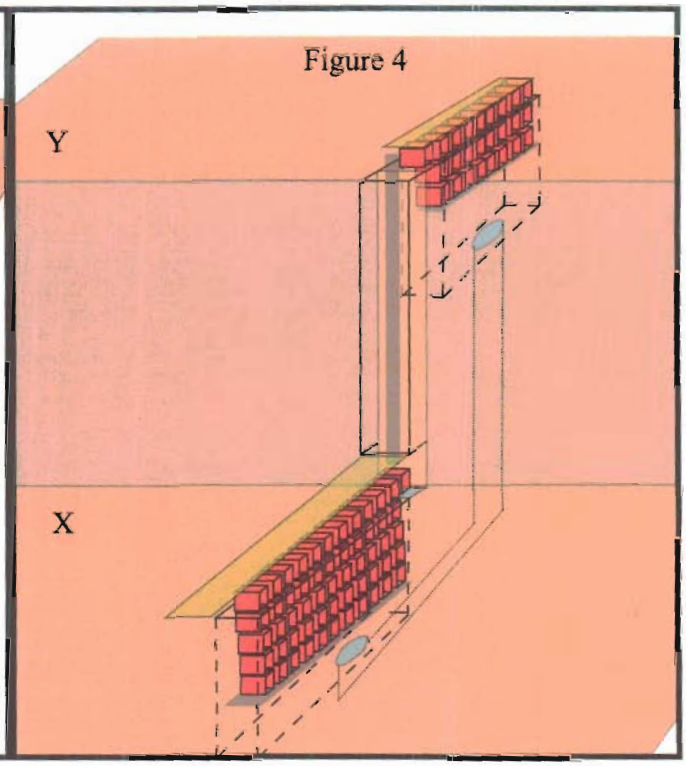
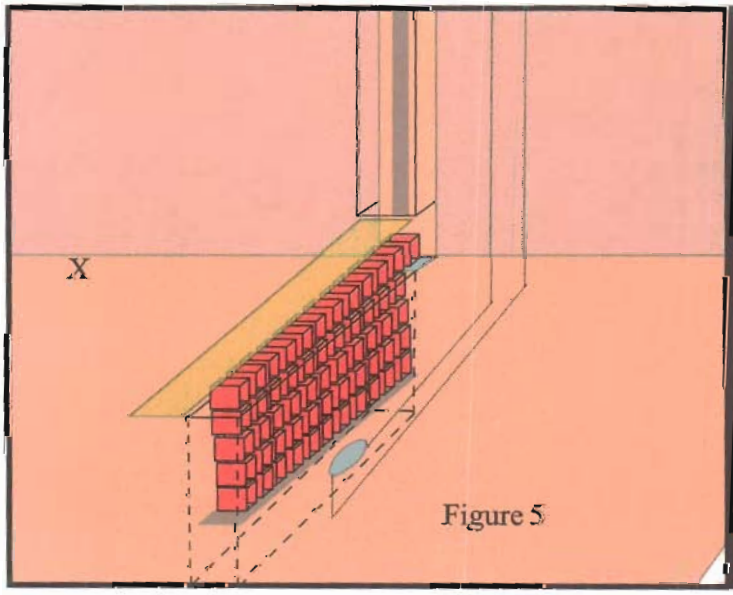


Figure 3 and 4 show a single unit. Figure 4 zooms in on one unit. The yellow strip on the lower plateau (X) is the horizontal conveyor that carries the masses (red boxes) from the storage area (dashed line) to the vertical conveyor (gray). The yellow strip on the upper plateau (Y) is the horizontal conveyor that moves the masses into storage.



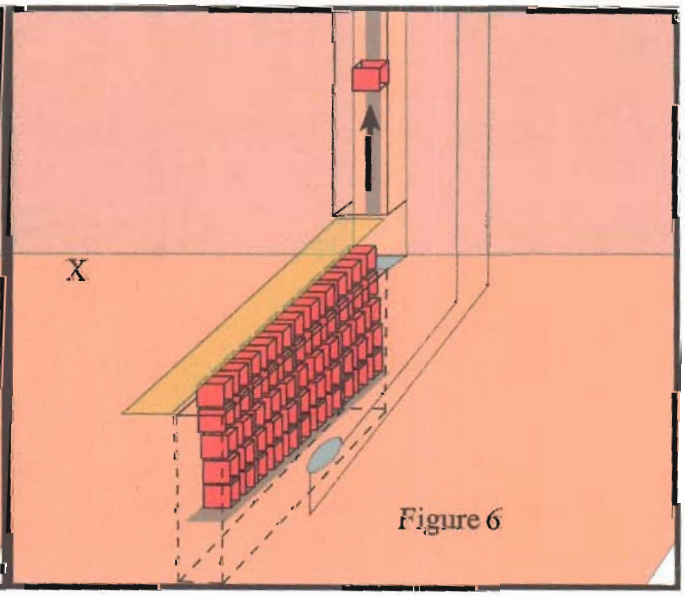


Figure 5 and 6 focus on the lower plateau (X). There is a mass (red box) ready to be lifted by the vertical conveyor (gray) and stored in the upper plateau (not shown).

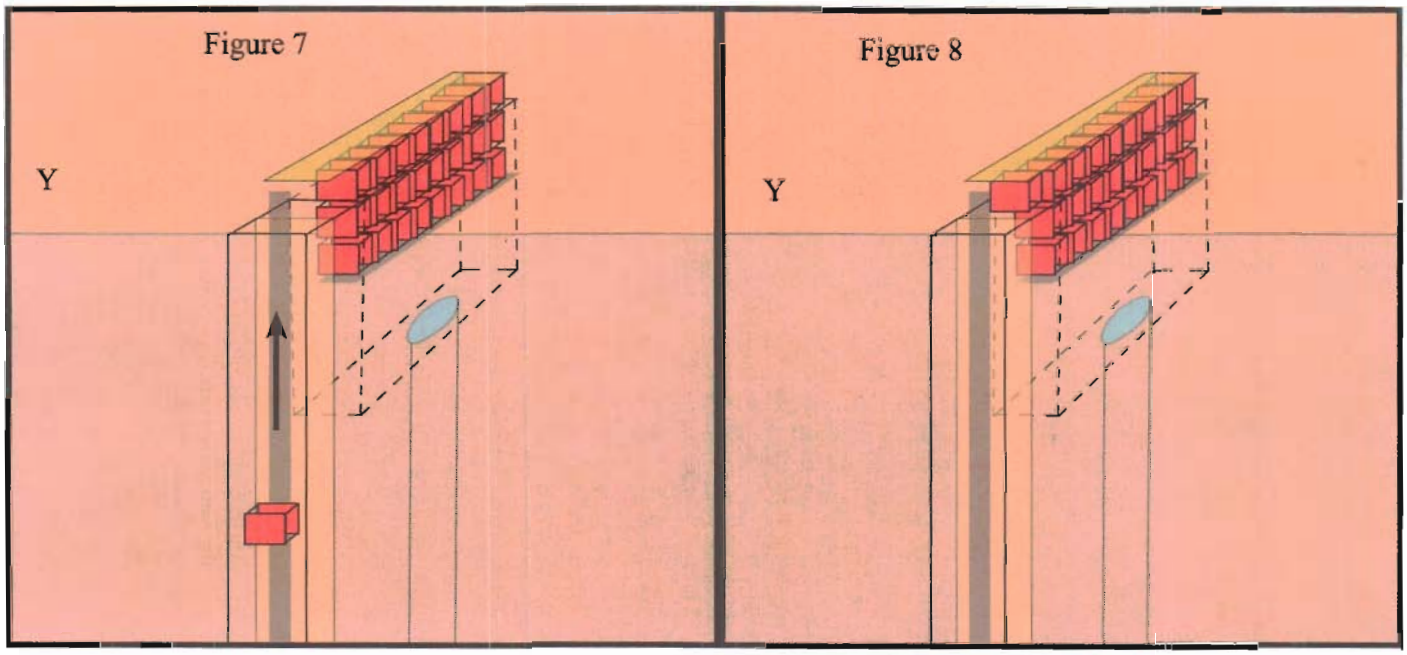
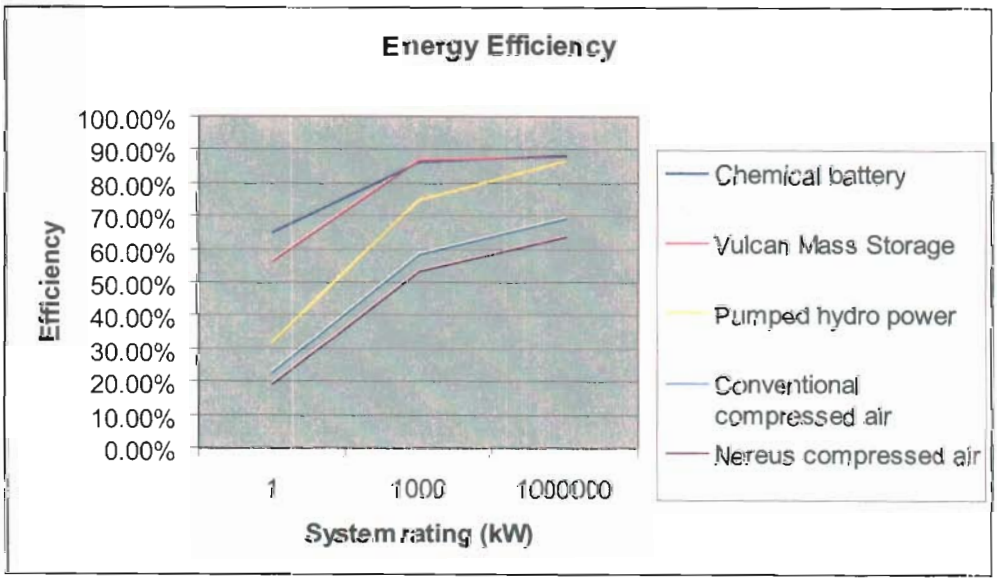


Figure 7 and 8 represent the mass (red box) ascending to the upper plateau (Y) for storage. As the mass reaches the top it is moved to the horizontal conveyor (yellow) and stored.

3.1 Power Output

BlueWave Energy has done extensive testing of this system as well as had the systems efficiency analyzed by an independent company. We tested our prototype system at 100W of power while the independent analysis calculated efficencies at 1kW, 1MW and 1GW with storage times of 10hrs.

System rating (kW)	1	1000	1000000
Chemical battery	65.60%	86.70%	88.50%
Vulcan Mass Storage	56.90%	87.20%	88.20%
Pumped hydro power	32.10%	74.50%	86.70%
Conventional compressed air	23.30%	58.80%	69.40%
Nereus compressed air	19.40%	53.50%	63.70%



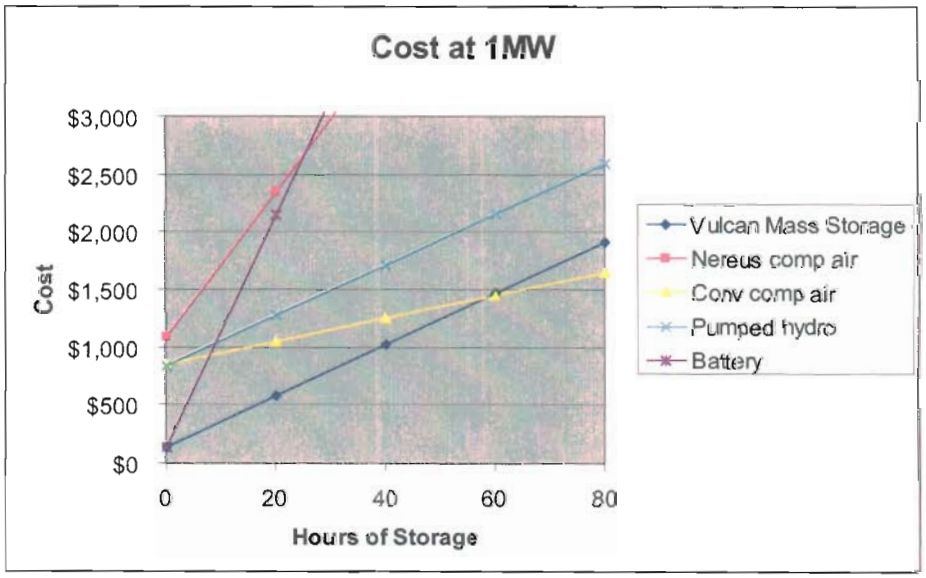
From the table and graph it can be seen that the Vulcan energy storage system has an efficiency similar to chemical batteries. The Vulcan system is well above other bulk energy storage systems (Hydropumping and CAES) at every level of output. The Nereus Compressed Air System (also designed by BlueWave Energy) has the lowest energy efficiency, but it has other advantages (see Nereus Compressed Air System information for more detail).

3.2 Cost Analysis

BlueWave Energy has put together a cost analysis of the Vulcan Energy Storage System from physical testing of the system and data derived from theoretical scaling analysis of the system. From this data an economic report can be generated to allow clients to see how much capital will go into the system and what the ROI will be.

	$/kW			$/kWh		
System rating (kW)	1	1000	1000000	1	1000	1000000
Vulcan Mass Storage	$400	$150	$150	160	22	7
Nereus comp air	$1,282	$1,090	$2,386	6	63	16
Conv comp air	$1,250	$850	$550	40	10	1
Pumped hydro	$1,250	$850	$550	238	22	7
Battery	$500	$150	$100	200	100	100

The above table represents the cost per kW and cost per kWh of the Vulcan Mass Storage system compared to other conventional storage systems. The storage systems were compared at 1kW, 1MW and 1GW to find the cost associated at these levels of power output.



$/kW for full system	Hours of storage				
Rating = 1 MW	0	20	40	60	80
Vulcan Mass Storage	$150	$591	$1,033	$1,474	$1,915
Nereus comp air	$1,090	$2,350	$3,610	$4,870	$6,130
Conv comp air	$850	$1,050	$1,250	$1,450	$1,650
Pumped hydro	$850	$1,287	$1,723	$2,160	$2,597
Battery	$150	$2,150	$4,150	$6,150	$8,150

The graph and table show the Vulcan Mass Storage system compared to other energy storage systems at 1MW and storing energy ar 20hrs, 40hrs, 60hrs and 80hrs, respectively. As can be seen from the graph and table, the Vulcan Mass Storage has the lowest cost storage up to 60 hrs of storage at a 1MW power rating.

3.3 Size of the system

From the analysis data, the size of a storage system can be calculated to give an approximation on how the system will fit into prospective clients needs. The table generated below is an approximation of the dimensions a facility would be if constructed to produce the power that is rated for 10hrs.

System rating (kW)	Length	Width	Height
1kW	16.28	7.64	17.00
1MW	176.73	85.87	152.00
1GW	19392.76	9693.88	452.00

*All measurements are in meters.

The table shows that a facility of 16m length, 7m width and 17m height would produce (569W x 10hrs) 5.69kWh of electricity (569W is used because the system is 56.9% efficienct at 1kW of power output). A facility of 176m length, 86m width and 152m height could produce (872kW x 10hrs) 8.72MWh of electricity. BlueWave Energy has designed most of its facilities so that the storage units for the masses are underground, but a facility can be designed to meet the clients needs.

4.1 Conclusion

The Vulcan system can store energy over an indefinite period of time without loss of power. The system is green, easy to use and efficient because it uses only gravity as its main source for storing energy. Because the system is green it provides tax incentives for companies utilizing the technology. The system has proven to be almost 90% efficient and can be tailored to meet the smallest to the largest needs of the renewable, distributed and bulk energy markets.

BlueWave Energy has a team of experts ready to help companies install the Vulcan Mass Storage System so they can become more efficient and profitable. By providing BlueWave Energy with the specifications for the desired amount of energy to be stored and the parameters for discharging the energy, BlueWave Energy will produce a cost capitalization and utilization analysis as well as a detailed assessment of the companies Return on Investment (ROI) the Vulcan system can provide. BlueWave Energy is dedicated to providing the best customer service and technical support to make the Vulcan system work as efficiently as possible and maximize the return on assets to the companies using the system.

If interested in an assessment of the system for utilization by your company or further information about the system please contact:

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BlueWave Energy, Inc.

Nereus Compressed Air Storage System

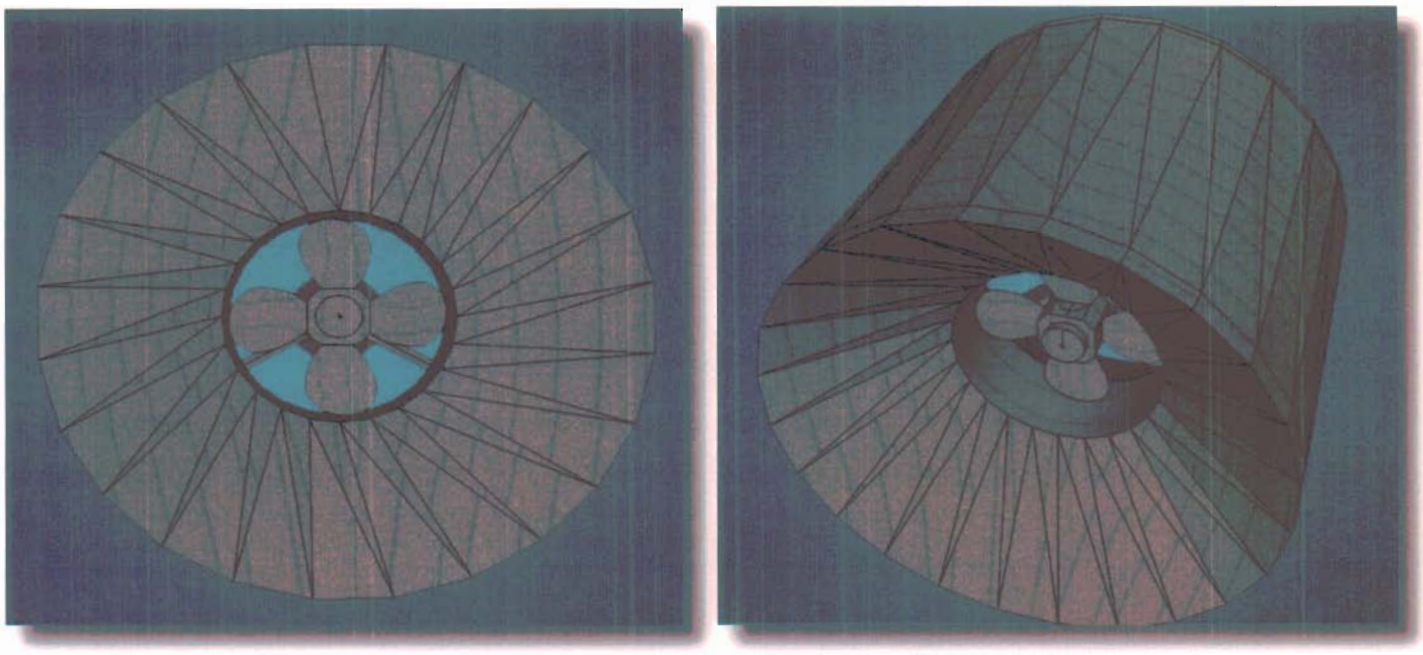
6/2/2008

1.1 The Nereus Compressed Air System

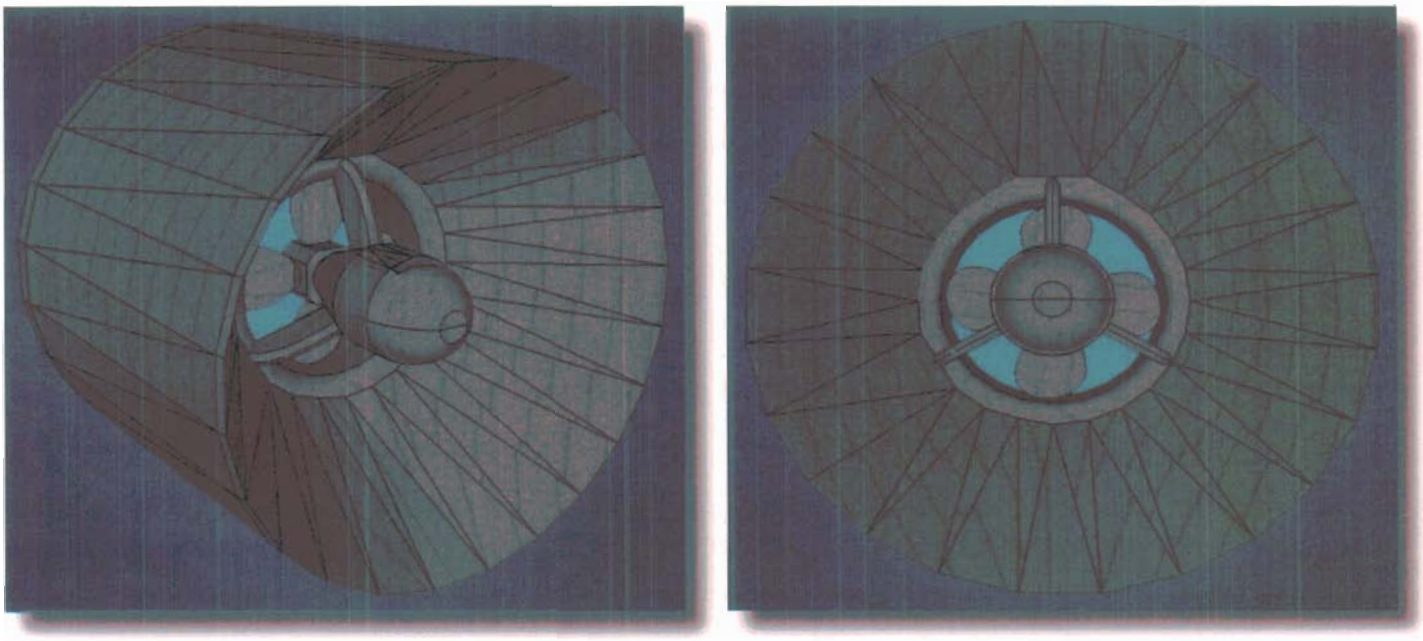
The Nereus compressed air system (patent pending) was designed by BlueWave Energy as a system that could store energy in the form of compressed air and release that energy by cycling a buoyant vehicle up and down in water. The system could be used with renewable energy systems (solar, wind, etc.) to store excess energy when the sun is shining or the wind is blowing and release that energy when it is not. BlueWave Energy has also worked to design the system so that it could compete in the distributed energy storage market by offsetting peak electricity cost storing off-peak electricity. The Nereus compressed air system was designed to make renewable energy systems and conventional energy systems more efficient by providing a reliable energy storage system that is environmentally friendly.

2.1 Design of the system

The Nereus compressed air system takes advantage of the positive and negative buoyancy within a buoyant vehicle. As the vehicle cycles up and down in the water, electricity is generated by spinning a propeller. In the CAD drawings below, the design of the vehicle is shown. To increase the flow of water past the propeller and enhance the movement of the vehicle in the water, BlueWave Energy has designed the vehicle to funnel the water toward the middle as it descends and ascends in water.

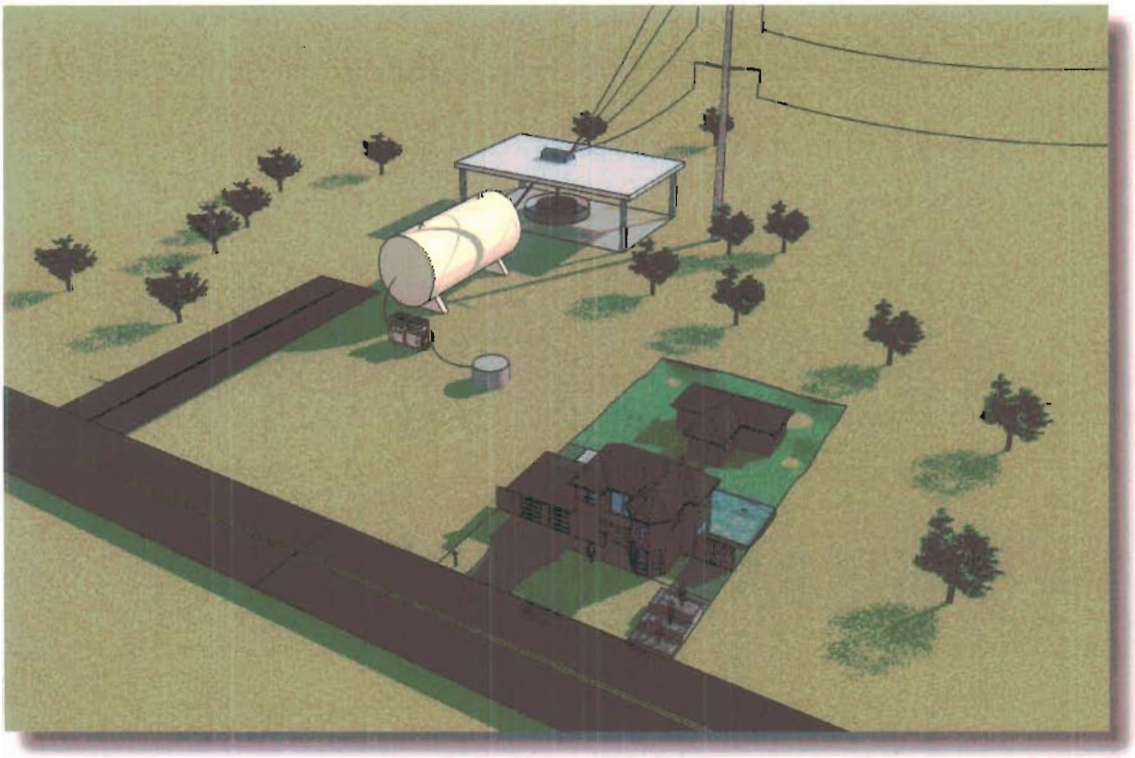


(fig. 1a – CAD drawings showing the bottom of the vehicle. The propeller and generator are centered to the vehicle. Water flows through the center of the vehicle which spins the propeller, the propeller in turn spins the generator.)

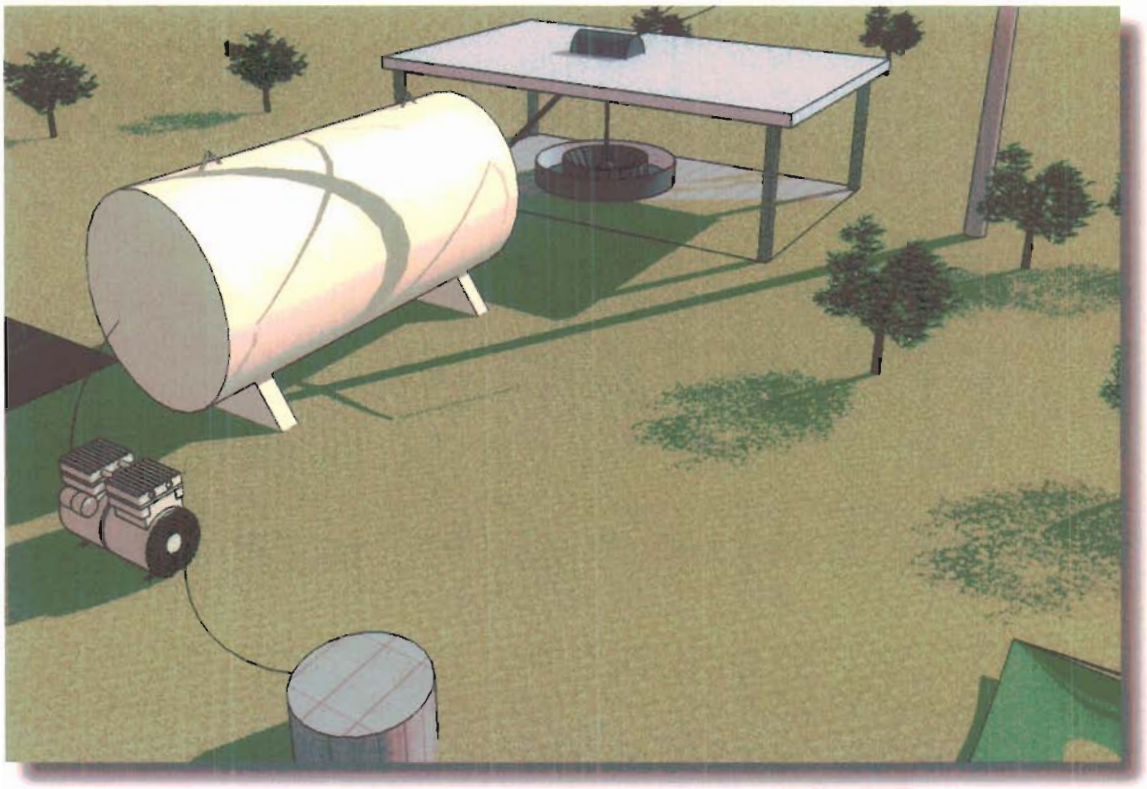


(fig. 1b – CAD drawings showing the top of the vehicle. The generator is connected to the ballast system with extension arms.)

The figures below (fig. 2a and 2b) show an in-ground water tank that is using the Nereus system. The air is compressed and stored in the surge tank during off peak hours or in the case of solar and wind power, when excess electricity is being produced. The compressed air in the surge tank can then be released either during peak hours or when electricity is needed to offset demand.

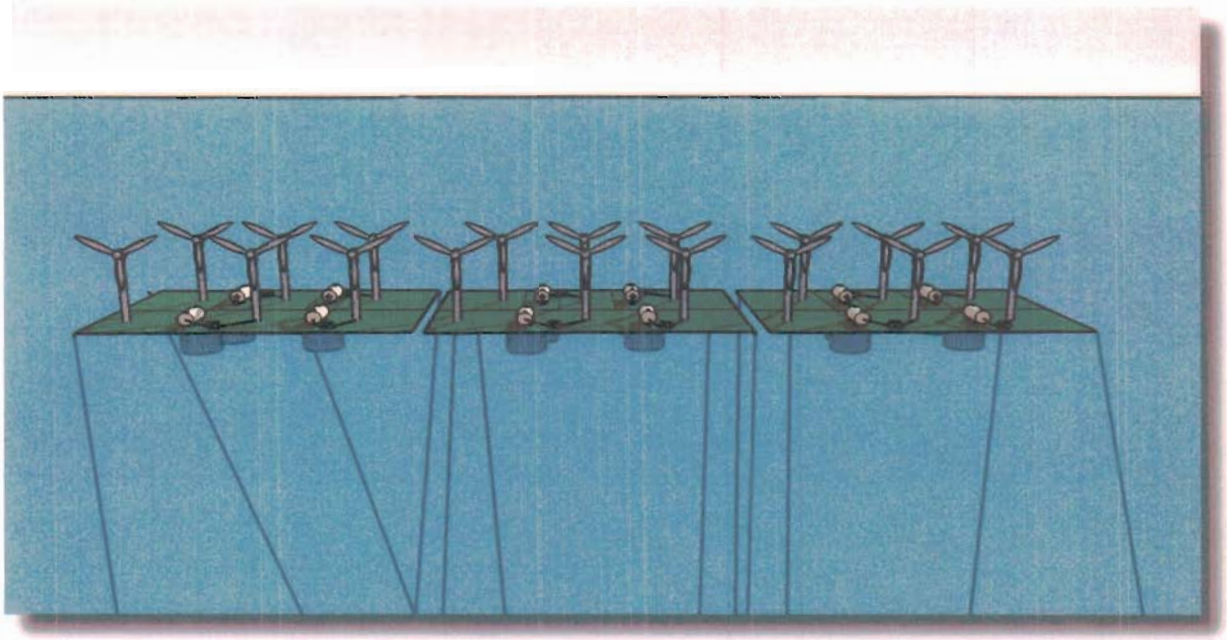


(fig. 2a - A CAD drawing showing a Nereus Compressed Air System storing and releasing energy for a residential area.)

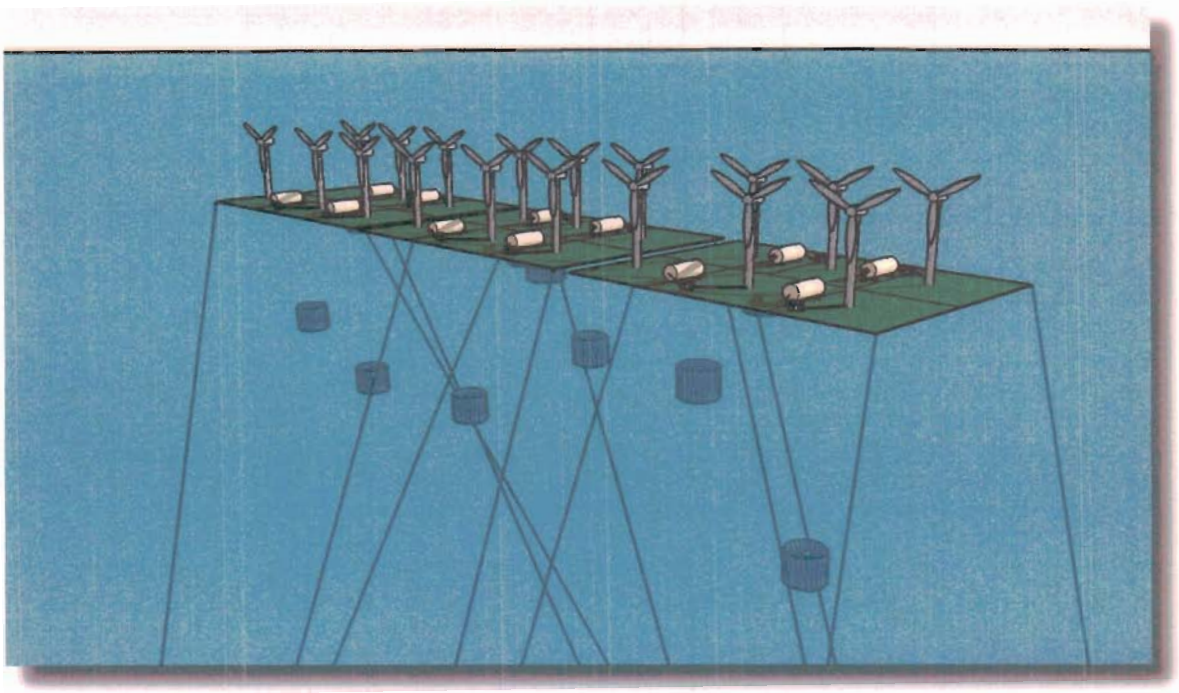


(fig. 2b - A CAD drawing showing a Nereus Compressed Air System storing and releasing energy for a residential area.)

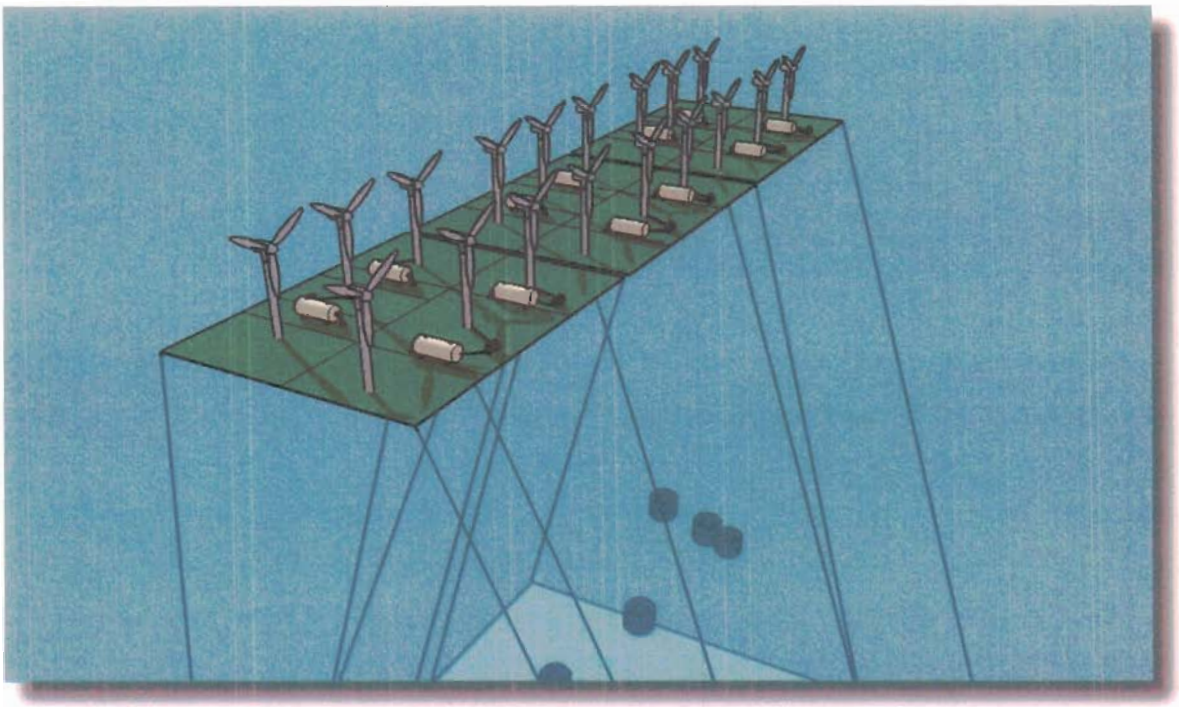
In fig. 3a, 3b and 3c the Nereus system is coupled with an offshore wind turbine. The wind turbine would compress air when excess electricity is being produced and release that energy when the wind turbine is not producing enough electricity to meet demand.



(fig. 3a - A CAD drawing representing the Nereus system working with an offshore wind farm. The Nereus system stores compressed air on the deck of the platform.)



(fig. 3b - A CAD drawing representing the Nereus system working with an offshore wind farm. The Nereus system begins to descend producing electricity.)

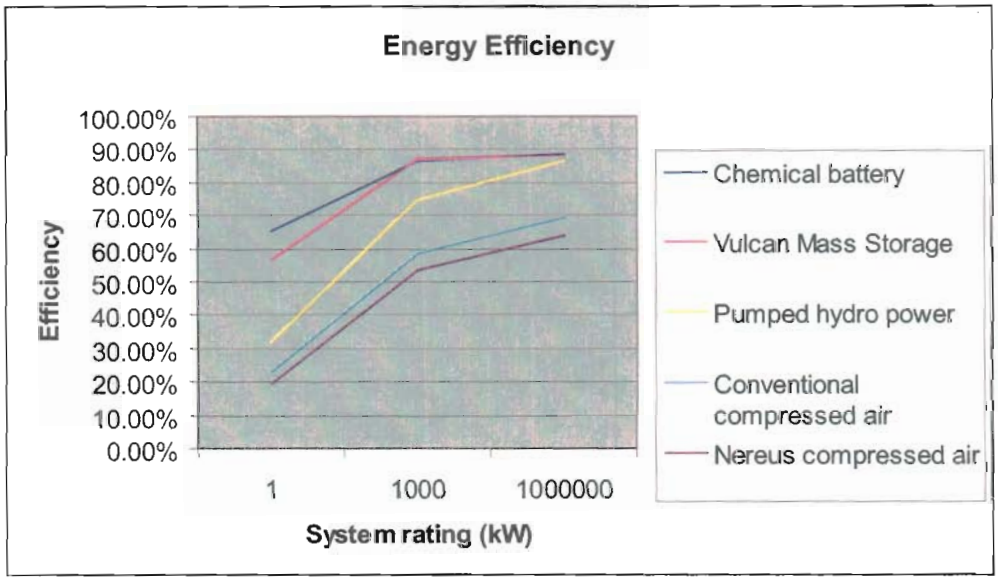


(fig. 3c - A CAD drawing representing the Nereus system working with an offshore wind farm. The Nereus system ascends and continues its cycling until the demand for power has leveled off.)

3.1 Power Output

BlueWave Energy has done extensive testing of this system as well as had the systems efficiencies analyzed by an independent company. We tested our prototype system at 100W of power while the independent analysis calculated efficencies at 1kW, 1MW and 1GW with storage times of 10hrs.

System rating (kW)	1	1000	1000000
Chemical battery	65.60%	86.70%	88.50%
Vulcan Mass Storage	56.90%	87.20%	88.20%
Pumped hydro power	32.10%	74.50%	86.70%
Conventional compressed air	23.30%	58.80%	69.40%
Nereus compressed air	19.40%	53.50%	63.70%



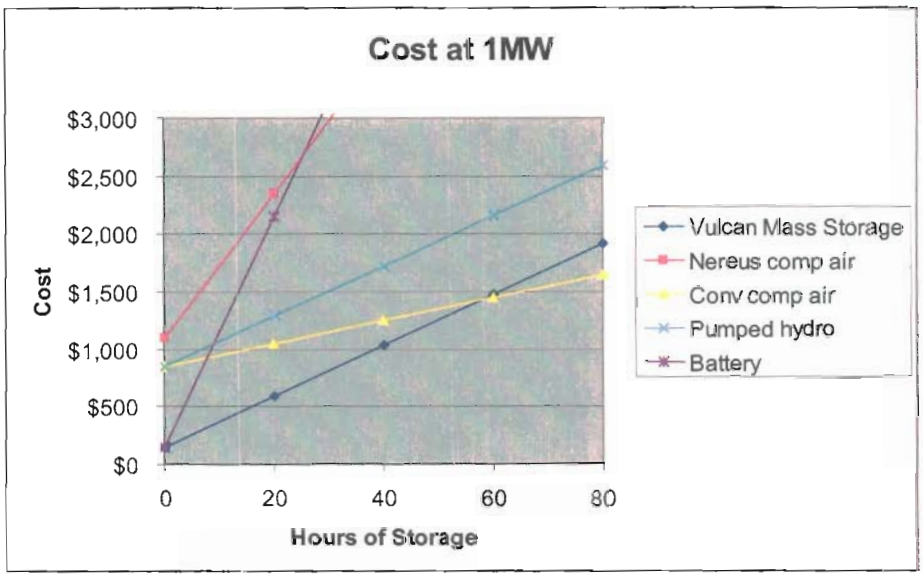
From the table and graph above it can be seen that the Nereus Compressed Air Systyem is similar to conventional compressed air and pumped hydro in efficiency. The Nereus Compressed Air System has several advantages over other conventional energy storage systems such that it can be scaled easily, is environmentally friendly and an efficient use of space. These advantages are reflected in the cost per kW and cost per kWh of the system. The Vulcan Mass Storage System on the above list was also designed by BlueWave Energy and has many advantages over other conventional energy storage systems as well (see Vulcan Mass Storage report for more detail).

3.2 Cost Analysis

BlueWave Energy has put together a cost analysis of the Nereus Compressed Air System from physical testing of the system and data derived from theoretical scaling analysis of the system. From this data an economic report can be generated to allow clients to see how much capital will go into the system and what the ROI will be.

	$/kW			$/kWh		
System rating (kW)	**1**	**1000**	**1000000**	**1**	**1000**	**1000000**
Vulcan Mass Storage	$400	$150	$150	160	22	7
Nereus comp air	$1,282	$1,090	$2,386	6	63	16
Conv comp air	$1,250	$850	$550	40	10	1
Pumped hydro	$1,250	$850	$550	238	22	7
Battery	$500	$150	$100	200	100	100

The above table represents the cost per kW and cost per kWh of the Nereus Compressed Air Storage system compared to other conventional storage systems. The storage systems were compared at 1kW, 1MW and 1GW to find the cost associated at these levels of power output.



$/kW for full system	Hours of storage				
Rating = 1 MW	**0**	**20**	**40**	**60**	**80**
Vulcan Mass Storage	$150	$591	$1,033	$1,474	$1,915
Nereus comp air	$1,090	$2,350	$3,610	$4,870	$6,130
Conv comp air	$850	$1,050	$1,250	$1,450	$1,650
Pumped hydro	$850	$1,287	$1,723	$2,160	$2,597
Battery	$150	$2,150	$4,150	$6,150	$8,150

The graph and table above shows the Nereus Compressed Air Storage system compared to other energy storage systems at 1MW and storing energy ar 20hrs, 40hrs, 60hrs and 80hrs, respectively. As can be seen from the graph and table, the Nereus Compressed Air Storage system is comparable to other storage systems in cost and efficiency at lower storage times. From the data it can be seen that the Nereus system works well as a distributed generation system as well as in special applications such as an energy storage system for offshore wind farms and renewable energy systems where many of the Nereus systems advantages are more pronounced.

3.3 Size of the system

From the analysis data, the size of a storage system can be calculated to give an approximation on how the system will fit into prospective clients needs. The table generated below is an approximation of the dimensions a facility would be if constructed to produce the power that is rated for 10hrs.

System rating (1kW)	Length	Width	Height
Surge Tank	3.7	3.7	3.7
Water Tank	1	1	10
Land (all components)	5	5	10

*All measurements are in meters.

System rating (1MW)	Length	Width	Height
Surge Tank	19.5	19.5	19.5
Water Tank	30	30	100.00
Land (all components)	50	50	100

*All measurements are in meters.

System rating (1GW)	Length	Width	Height
Surge Tank	19.5	19.5	19.5
Water Tank	32	32	300.00
Land (all components)	1500	1500	300.00

*All measurements are in meters.

System rating (kW)	Length	Width	Height
1kW	5	5	10
1MW	50	50	100
1GW	1500	1500	300

*All measurements are in meters.

The table shows that a facility of 3.7m length, 3.7m width and 10m height would produce (194W x 10hrs) 1.94kWh of electricity (194W is used because the system is 19.4% efficienct at 1kW of power output). A facility of 50m length, 50m width and 100m height could produce (535kW x 10hrs) 5.35MWh of electricity. BlueWave Energy has designed its compressed air facilities so that the surge tank and air compressor can be installed underground, but facilities can be changed to meet the clients needs.

4.1 Conclusion

The Nereus system is environmentally friendly, easy to use and efficient because it uses gravity and buoyancy as its main source for storing energy. Because the system is green it provides tax incentives for indivduals and companies utilizing the technology. The system has proven to be almost 50% efficient and can be tailored to meet the smallest to the largest needs of the renewable, distributed and bulk energy markets.

BlueWave Energy has a team of experts ready to help companies install the Nereus Compressed Air Storage System so they can become more efficient and profitable. By providing BlueWave Energy with the specifications for the desired amount of energy to be stored and the parameters for discharging the energy, BlueWave Energy will produce a cost capitalization and utilization analysis as well as a detailed assessment of the individual or companies Return on Investment (ROI) the Nereus system can provide. BlueWave Energy is dedicated to providing the best customer service and technical support to make the Nereus system work as efficiently as possible and maximize the return on assets to the individual or company using the system.

If interested in an assessment of the system for utilization with your residence or facility, or further information about the system please contact:

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