Powerful partnership

Renewable SEEDS is a joint project of the University of South Florida, Progress Energy Florida, the City of St. Petersburg and the Florida High Tech Corridor.

You can be a part of a brighter energy future. Learn about a career as a power engineer at the University of South Florida Power Center for Utility Explorations: **http://pcue.eng.usf.edu.**

Learn more about innovative renewable energy programs from Progress Energy including:

Solar Water Heating with EnergyWise.[SM] Provides incentives for customers to use renewable energy.

SolarWise for Schools.[SM] Allows customers to support renewable energy education programs and the use of solar energy in schools.

Visit SAVE THE WATTS .COM

Progress Energy

st.petersburg www.stpete.org

USF UNIVERSITY OF SOUTH FLORIDA COLLEGE OF ENGINEERING
Power Center for Utility Explorations
http://pcue.eng.usf.edu/

FLORIDA High Tech Corridor

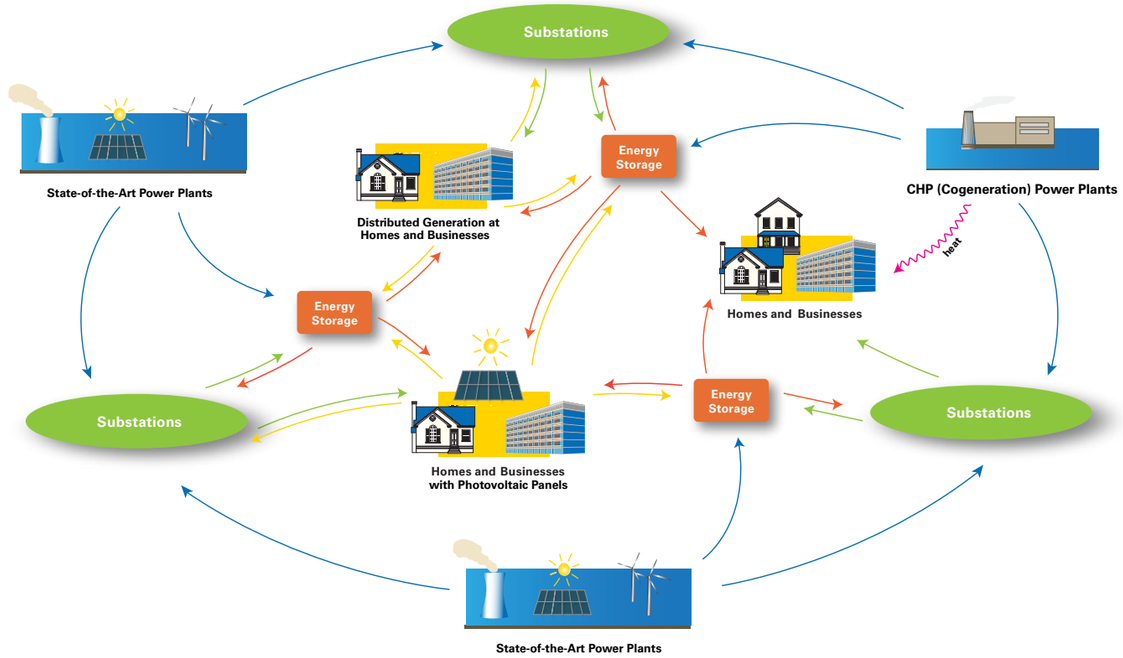
A *bright energy* future

Innovative technology for tomorrow's **Smart Grid**

The **Smart Grid** of the future

Tomorrow's energy systems will be a network of large-scale generating plants combined with local generating sources and energy storage devices. This innovative power grid of the future will be capable of monitoring demand and automatically balancing the flow of energy, making the whole system more reliable and efficient.

Consumers will also be a part of the grid. They will be able to both give and take power as needed and control their own energy consumption with smart appliances.



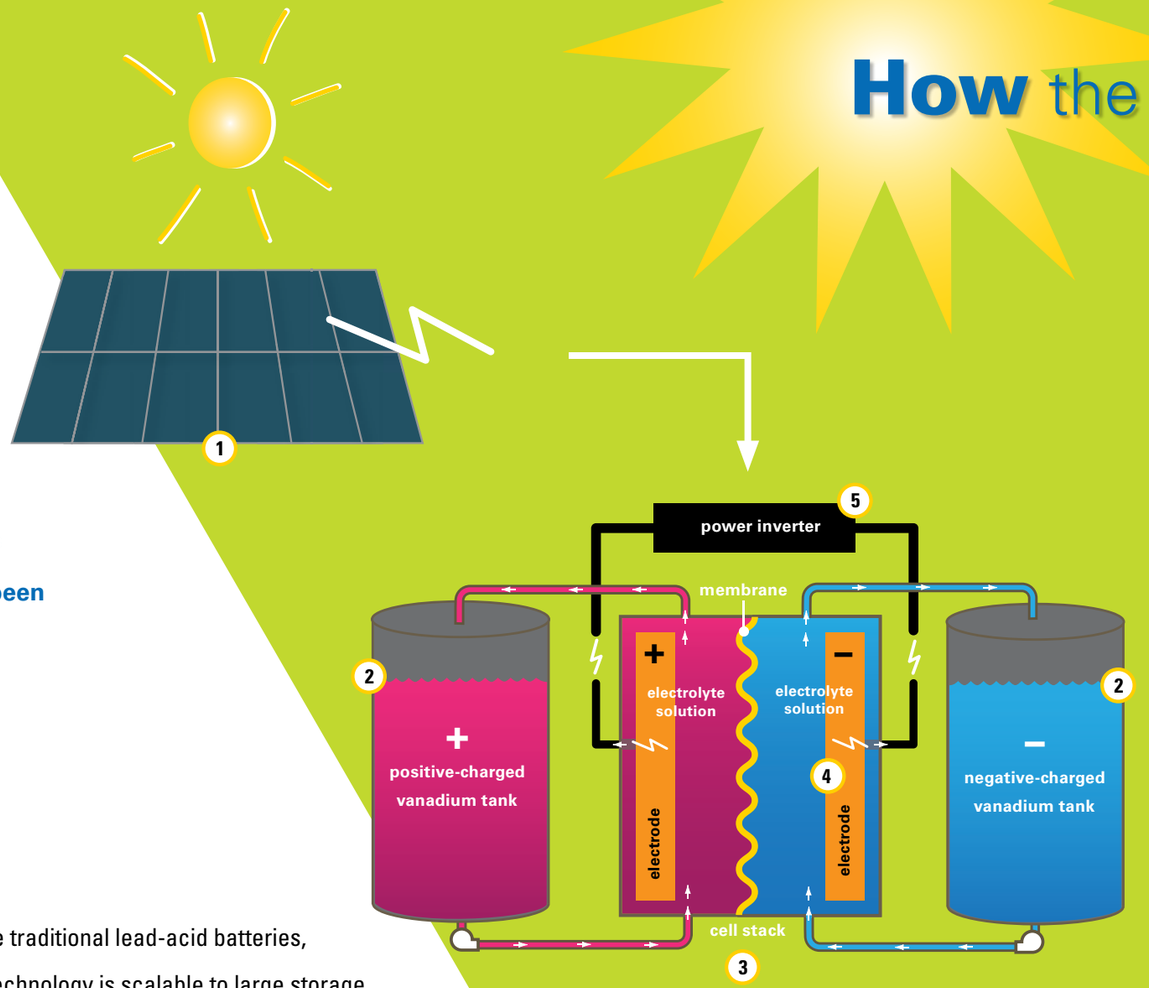
SEEDS

To provide the necessary energy storage for tomorrow's Smart Grid, an exciting advance in energy storage has been developed through a research project called SEEDS – Sustainable Electric Energy Delivery System.

At present, there is no efficient way to store electricity that is compatible with the needs of the Smart Grid. But with this technology, power collected from renewable sources, such as solar or wind, or generated by power plants during periods of low demand could be stored until needed using the naturally occurring element vanadium.

Unlike traditional lead-acid batteries, this technology is scalable to large storage capacity, has a long lifetime and is capable of fast charge and discharge – all of which make it much more suitable to the energy needs of tomorrow's Smart Grid.

How the technology works



1. In this installation, photovoltaic panels collect sunlight and convert it into electricity, which then charges the energy storage system.
2. The electricity is stored in an electrolyte solution containing the metal vanadium in two tanks, one with a positive charge, the other negative. The charge is determined by the number of electrically charged particles or "electrons" in the solution.
3. Electrolytes from the two tanks are pumped through a cell stack. This is where the transfer of energy into and out of the storage system takes place. Each cell includes a positive half cell and negative half cell separated by a proton exchange membrane.
4. Electrodes at the end of the cell stack collect the energy to be stored or delivered.
5. The system is connected to the power grid so that stored energy can be used when needed. It can also store energy produced by power plants during periods of low demand for use during periods of high demand. This process can be repeated as needed to support the Smart Grid.