



FOR A GREENER TOMORROW

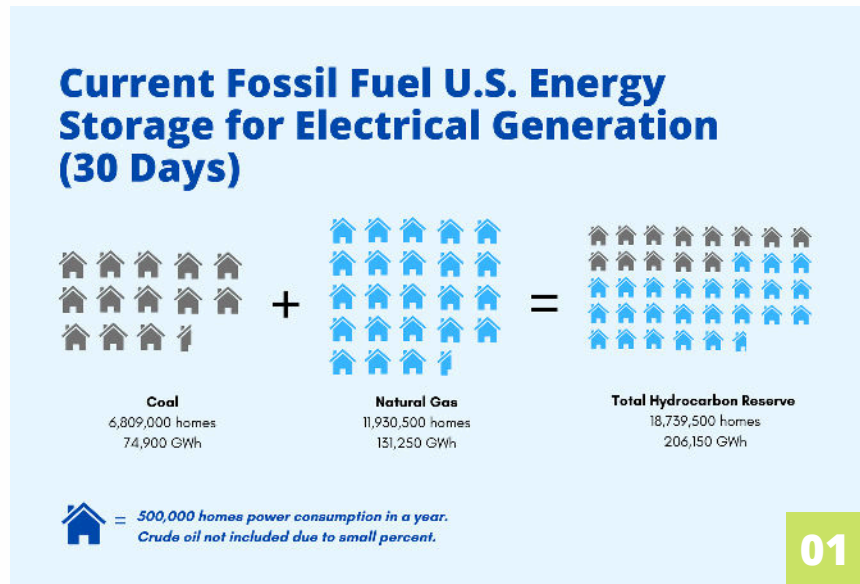
CRCES™ from Fossil Fuel Storage to Clean Energy Storage

RENEWABLE ENERGY requires investments in power generation, transmission, and storage. Storage is the big issue and lagging behind the other renewable building blocks. Lithium-ion and other batteries have a horrible carbon footprint throughout their life cycles.

CRCES™, the Carbon Reduction Clean Energy Storage technology, provides economic solutions for the **clean energy storage** challenge.

Traditionally, energy has been stored as potential energy storage (not to be confused with the engineering term potential energy). Today potential energy storage is provided by piles of coal at power plants, millions of barrels of fuel oil for ships and industry, as well as pipelines filled with natural gas. In our cars, there is gasoline and diesel in the tank ready to go. These examples of potential energy storage incorporate the ability to rapidly dispense energy on demand. Whether going from molecule to electron, or molecule to work, it does not matter, it happens quickly.

Renewable energy will need to move from these potential energy storage solutions. A rough estimate of the U.S. potential energy storage for electrical generation is around 206,150 GWh per month. The vast majority of the potential energy storage is currently provided by coal and hydrocarbons. This massive potential energy storage system enables synchronization of supply with frequent changes in demand. The potential energy storage system of today must be replaced with a



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new green technology to complement existing and anticipated renewable energy sources.

Solar energy has several benefits compared to hydrocarbon generation:

- Everyone with land has access to it
- You can aggregate it or use it locally
- Less manipulation by global politics
- Low carbon footprint
- Neutral BTU impact on the earth

Of course, solar has a glaring issue. There is no potential energy storage of sunlight. Storage systems to help synchronize supply and demand are the major issue for solar and wind. To overcome the potential energy storage issue, the focus has been to utilize batteries for energy storage.

The problem with traditional battery storage, such as lithium-ion, is it offsets many of the benefits solar otherwise provides. It is not clean. Lithium-ion is not renewable, it is subject to manipulation by global politics, and requires vast mines and energy to extract.

CRCES™ technology, battery storage without the battery, will eliminate the problems in traditional batteries and provide **clean energy storage**.

CRCES™ has partnered with AT&V. With over 40 years of experience in designing and constructing energy storage facilities and over 30 years in developing technology to support energy storage, **CRCES™** and AT&V are a great fit.

AT&V will fabricate and house the initial Alpha Unit. Specific fabrication

**U.S. Grid
Stabilization
Installed**



**4.6
GW**

**Needed Grid
Stabilization
to Replace
Hydrocarbons
(24 hr. basis)**



**16,325
GWh**

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facilities will be designed to provide economies of scale and inventories for CRCES™ applications. AT&V will also support CRCES™ site servicing and upgrades. This, combined with other U.S. manufacturers, means all CRCES™ equipment and labor will be U.S. based.

The Alpha Unit under design will operate as a demonstration unit to help customers appreciate performance, stability, and longevity. Commercial units will be built to have a 20-year life, but routine maintenance can easily extend the life. Foreign locations will also be supported by U.S. operations and some U.S. manufacturing content. Economics will be addressed on a case-by-case basis to ensure financial returns.

The prime targets are to support the requirement of on grid bulk clean energy storage and reduce dependence on traditional batteries. Other objectives will utilize CRCES™ technology in new projects within existing terminal operations. This will lead to improved ROI's of existing hydrocarbon terminals. AT&V is already looking at specific applications which support both a good ROI and lower carbon footprint for traditional hydrocarbon terminals.

Massive amounts of energy storage are needed to replace the potential energy storage of today. Balancing the system for efficiency and real carbon reduction requires clean energy storage. CRCES™ is a solution for today to relieve reliance on traditional battery storage, as well as support a goal to repurpose hydrocarbon terminals.

For more information

If you require additional information about CRCES™ Technology, please visit the American Tank & Vessel website at www.at-v.com and click on the Carbon Reduction link. This will provide more information about CRCES™ Technology, as well as technical history and the commercialization process.

If you would like to email us, please use: green@at-v.com.

This article was written by Powell Cutts, International Project Engineer at American Tank & Vessel.

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01 Breakdown of how much energy the United States stores per month and how many homes are powered for a year.

02 Hanley, S. (2022, August 2). Grid-scale battery storage in US tripled in 2021. CleanTechnica. Retrieved September 26, 2022, from <https://cleantechnica.com/2022/08/02/grid-scale-battery-storage-in-us-tripled-in-2021/>

03 CRCES™ process equipment manufactured with only U.S. labor and materials.