



# CRCES™ Technology Frequently Asked Questions

## **Frequently Asked Questions (FAQs)**

AT&V's answers have been simplified for this publication. If your question is not listed, please contact us at [green@at-v.com](mailto:green@at-v.com) for more feedback.

### **1. How long does it take to build 300 Megawatt-hour (10 hours at 30 Megawatt) distribution CRCES™ facility?**

Independent of the time required for permitting, the construction of a project is approximately (18) months from the date of funding. This example is based on U.S. construction.

### **2. Does CRCES™ technology apply to my specific application?**

AT&V has built a short document, "Scoping Study Data Sheet", to be executed by customers and returned to AT&V. After receiving the document AT&V runs an analysis and may ask additional questions to help describe the performance and cost that CRCES™ could deliver. This process helps customers to identify whether CRCES™ technology is a good fit.

### **3. What kind of performance levels can I anticipate from CRCES™?**

This is a very broad question, but AT&V's Newsletter Volume 1 identifies a specific PV with lithium-ion battery project for comparison to thermal solar and CRCES™ technology. In general, it compares and reviews CAPEX, OPEX, land use, and a variety of other factors. The current simulation supports a higher efficiency as compared to the one presented in Newsletter Volume 1. AT&V used this conservative performance with our calculations for comparison. If your project is appropriate for CRCES™ technology, a specific performance level will be generated for the project.

### **4. Will performance guarantees be made a part of a contract?**

Yes. AT&V will develop specific performance levels for each application, and these will become a part of the contract with negotiated bonuses and/or penalties for performance and/or lack thereof.

### **5. Why buy CRCES™ technology?**

3 Reasons: Economics, Environmental, and Policy. Many applications that have quality waste heat or require lithium-ion battery storage will find improved economics in capital, long life, operations and ease of maintenance utilizing CRCES™ technology. The carbon footprint associated with CRCES™ technology is greatly reduced compared to PV cells and any type of lithium battery. A real comparison between the carbon footprint of CRCES™ technology and lithium batteries is impossible to calculate today because of limited dates on batteries. Dealing with policy people should select CRCES™ because it is US content, and because it has a good ES&G history.

### **6. Have you built a unit?**

No. A physical unit has not been built by AT&V, only computer simulations. However, the technologies that we deploy are all existing and have been used for other purposes and applications. In addition, an independent engineering company is currently running models of the

CRCES™ technology to verify cost, performance levels, and ease of operation. An independent certification of the process technology should be available in 4-6 weeks.

### **7. Where do you use CRCES™ technology?**

First, we would direct you towards our Alpha Application Partners (AAPs) list. After that, CRCES™ is ideally applied when you have low quality waste heat and/or require electrical energy storage such as batteries, etc.

### **8. How much physical space does CRCES™ require?**

This question comes down to three issues: One, the energy acquisition side, Two, the storage side, and Three, the energy (outbound) rate. Newsletter Volume 1 gives you specific areas for comparison. In addition, compared to lithium batteries, the CRCES™ footprint is smaller for modest size units such as 100 Megawatt-hours and significantly smaller when you get larger such as a Gigawatt-hours of storage.

In some applications AT&V is just delivering the storage aspect, while in other projects we install thermal solar fields to acquire the energy or a front-end package to help manage waste heat. Whether it is turnkey or simply the storage aspect, AT&V will support our customer's needs.

### **9. Does AT&V support other technologies for EES?**

Yes. AT&V has been engaged in manufacturing air separation plants and building the storage applications for air separation plants for over (20) years. Therefore, solutions using air separation or cryogenic storage are very traditional to AT&V. In addition, Molten Salt tanks, pressurized storage, and even penstock work for hydro lift applications are all technology that AT&V supports today.

### **10. Where does CRCES™ get the energy to store?**

The most valuable energy to CRCES™ is heat. Waste heat of low quality such

as 160°F can be utilized and at the same time, electricity, which converts to heat at almost 100% efficiency is also a great source. Therefore, a wind farm, PV field or even cheap power off the grid can all be energy that CRCES™ can acquire for high efficiency storage.

### **11. What type of energy do you get back from CRCES™?**

The unit can be built to yield heat, cooling, and/or electricity. Each has a different performance level, but all performance levels are quite high versus many industry standards.

### **12. How small or large a unit can be built?**

CRCES™ technology can be an economic winner as small as storing 100 Megawatt-hours that needs to be distributed over 10 hours. Therefore, 10 Megawatts / hour over a 10-hour period. Dealing with large scale there is no real ceiling. \_\_\_\_\_CRCES™ technology can store a Gigawatt that is distributed over many hours. Even multiple Gigawatts per project.

### **13. Do you see the cost coming down in the future?**

Yes. AT&V's current examples of economic performance are based on our current designs combined with fabrication supported by AT&V.

Future improvements will include:

#### Near Term Improvements

- Specialized fabrication for components
- Modular design for reduced site construction and minimized service costs
- A.I. deployment with real-time management of the source, storage, and supply operations

#### Long Term Improvements

- Economic streamlining for storage components at AT&V's fabrication facilities
- Inventory control of components
- International sourcing of fabrication for economic benefit
- Process equipment improvements

### **14. Why is AT&V in this technology?**

AT&V has been involved in new energy storage technology development since 1991, with many applications being proprietary and/or patented. AT&V is involved in CRCES™ technology because it deploys special storage tanks that are current designs by AT&V, as well as process equipment where 80% can be fabricated within AT&V's existing facilities.

### **15. Will there be a test unit?**

Yes. A unit has been designed for a location owned by AT&V in Mississippi. The unit will be commercial size and help establish the performance levels of different configurations of PV panels a thermal solar panels. In addition, the unit will be utilized for a remote operating system and to deploy AI technology.

### **16. How does CRCES™ work?**

AT&V has filed for U.S. patents but has not completed the process of filing for international patents. Therefore, detailed process discussions must be very limited without an NDA. AT&V has executed NDAs with trusted companies to get into details of performance and a cost. Potential customers that have an interest in CRCES™ for application can request an NDA. Once executed, AT&V's process engineers will work with their team to further disclose the technology. (Also, see De-risking CRCES™ Technology)

### **17. Is the CRCES™ technology unit dangerous or hard to run?**

No and no. The unit is no more complex to run than a simple gas plant and utilizes materials that are readily available and/or utilized in many of our process facilities in America today. In addition, CRCES™ units will be supported by a remote operation center to ensure that it is running at optimal levels and to provide backup operational support to any customer's location.

#### **FOR MORE INFORMATION**

If you would like more details or have

your own questions, please feel free to email [green@at-v.com](mailto:green@at-v.com). Additional information on CRCES™ technology is available on AT&V's website at [www.at-v.com](http://www.at-v.com). Select Carbon Reduction or select News & Media, then Publications. Thank you in advance for taking the time to read this newsletter and please forward us any questions you would like us to answer and expand on.