A CLEAN ENERGY FUTURE FOR LIQUID TERMINALS

COVER STORY

Full containment clean energy storage.

W.T. Cutts, American Tank & Vessel Inc. (AT&V), USA, outlines the opportunities available for existing liquid storage terminals to benefit from the energy transition.

Almost everyone in the liquid terminal industry would agree that resolving the energy trilemma (affordability, energy security, and environmental sustainability) may take up to 20 years. At the same time, investors are starting to distance themselves from the hydrocarbon industry, and publicly traded companies are faced with the challenge of satisfying a broad range of investors on the path forward. Therefore, the liquid terminal industry needs a plan to support positive economic results during the energy transition.

The good news is that there are many opportunities to reformulate existing hydrocarbon liquid storage terminals in order to profit from a clean energy future. The solutions incorporate emission reductions, storage of products generated through renewable efforts, optimisation, and new technologies that take advantage of existing terminal infrastructure, systems, and locations. The top eight technologies are listed in Figure 1, but the most obvious technology for liquid terminals to embrace is flow batteries, utilising bulk storage with low or no emissions, and supporting electrical energy storage (EES). Flow batteries would truly be a windfall for the tanks and terminals industry if they were economical today. However, even with an efficient flow battery solution, the equation is not complete without energy generation. The complete solution needs to harness the terminal assets that are already in place, store energy, and at the same time capture a renewable means of power generation. The combination of these efforts paints a picture of transition success accepted by the industry and the most aggressive investors.

As a reference point for terminal storage competition, one need not look any further than lithium-ion batteries for EES. When it comes to power generation, solar and wind are the systems to beat. The liquid terminal industry can surpass the use of photovoltaic (PV) solar with batteries for reasons such as long-duration energy storage (LDES), lower EES cost, lower carbon footprint, etc.

Embracing new technology

From an investor perspective, there are plenty of selling points, but the big challenge is favourable economics. The solution lies in relatively new technology formulated to fit the liquid terminal industry. Taking advantage of the location of many terminals and their proximity to industry and power grids are key elements of success.

American Tank & Vessel Inc.'s Carbon Reduction Clean Energy Storage (CRCES™) technology is as simple as waste heat recovery and clean bulk energy storage, and can compete with

solar, wind and batteries. It offers unlimited life cycles, no cost of future battery replacement, a smaller area requirement for energy storage, and efficient LDES. The technology also has faster project timelines, and provides more local jobs compared to deploying batteries. The unit also has a lifespan of 20+ years.

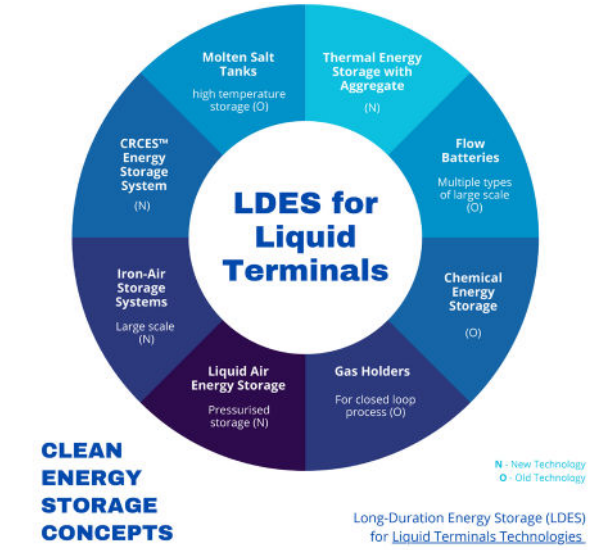

Figure 1. Chart of long-duration energy storage (LDES) for liquid terminal technologies.

Figure 2. Clean energy process piping.

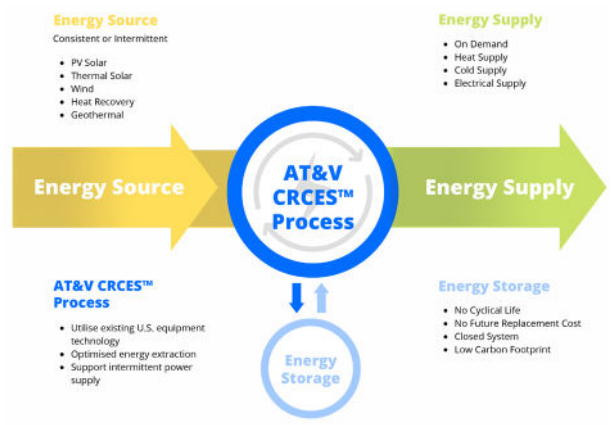

Figure 3. Flow chart of the CRCES process.

Moving forward

The realisation of these benefits requires a commitment to working with the power community and industries in the vicinity of the existing liquid terminal. One source of energy is low-quality waste heat. Most industries have already utilised waste heat in a variety of manners but still have low-quality waste heat within their operations. Typical operations consume water, power, chemicals and land area to expel this low-quality waste heat. Technologies are available today to utilise low-quality waste heat, as well as convert tanks and systems to act as energy storage. A level one front end engineering design (FEED) study can identify the resources that can be utilised for energy acquisition, storage and distribution. Terminal companies that embrace the concept are underwriting their future by:

- Promoting a path to clean energy storage with investors.
- Adding long-term sources of revenue.
- Reducing local industries' consumption of water.
- Expanding relationships with local industries.
- Stabilising the power grid with clean energy.

Utilising terminal assets

Storage of clean energy in liquid hydrocarbon terminals can be accomplished through a number of applications that incorporate technology that has been around for 30 years, and others which promote technology that is still incomplete. A review of these applications shows that many do not take advantage of the traditional hydrocarbon terminal's assets. For applications to have a good fit, the projects need to utilise current physical assets, support deployment, leverage existing staff and systems, acquire low-cost energy, incorporate good economics, show flexibility for future transitions, and minimise the land required for new equipment.

Most clean energy storage is either burdened with incomplete technology or limited by rare materials. The CRCES technology is available for commercialisation, and has the benefit of storing energy from low-quality waste heat sources. CRCES storage technology can utilise the traditional storage tanks found in liquid terminals with modifications, while full utilisation of most tanks can be realised. Not only are the assets of the liquid terminal utilised, but the terminal's current management systems are appropriate to operate the facilities described. Many liquid terminals operate propane facilities or blending, which is of similar complexity to operating the facility supported by CRCES. In addition, most liquid terminals are located in areas where it is easy to tie into the electrical grid, support a substation, generate behind the meter, or work through an electrical broker to sell power.

Conclusion

Transitioning liquid terminals to support clean energy will start with aggregating low-quality waste heat from local operators for clean energy generation, storage of energy from renewable sources for grid stabilisation, and storage of electricity from the grid to support peak shaving and/or back-up systems. Other key factors will include supporting ammonia for bunker fuel demand, and establishing a path to the hydrogen economy.

Whether the terminal is driven to have a green initiative or generate additional revenue streams, the solution is at hand. T&T