

TECHNICAL ARTICLE

Renewables I: 3 Ways to Go from Petrochemical to Renewable

The Energy Industry is Changing – We Need to Be Ready

For over 100 years, the petrochemical industry has designed, fabricated, installed and operated process facilities. While plant and facility control and operation has become increasingly more automated and sophisticated, the nuts and bolts are pretty much the same as they have been. Steel and structural elements are still welded together, piping and vessels are still connected with flanges and bolts, and all that kit is still painted or coated to protect it from the environment. In short, we have a solid framework on which to build and operate the hydrocarbon energy economy.

But energy is changing. Because of the increasing threat of the consequences of a warming planet, new sources of energy are being developed that are expected to slow this planet-wide change. Some of these are well-known, such as nuclear, wind and solar, while others require more work, such as hydrogen, 3rd generation concentrated solar and fusion.



In addition, there are challenges the hydrocarbon energy industry faces. There is clear recognition that the production and emission of greenhouse gases (CO₂, CH₄, etc.) must be significantly slowed.

The purpose of this and future Arrows is to highlight the types of renewable energy and supporting systems that are being developed, where further technical development is required, and how to meet the design, execution, commissioning, and operational needs of these new components of our energy infrastructure. Indeed, many of the skills, safety processes and expertise used in the petrochemical market today can easily transition into these new energy markets.

Technologies for A Renewable Energy Future

First, we'll look at the major areas of renewable energy development. These are:

- Solar energy, including concentrating solar power (CSP) systems
- Wind energy
- Hydrogen energy

Accompanying these low-carbon energy production technologies is the need to reduce the release of greenhouse gases into the environment. This is where Carbon Capture and Sequestration (CCS), comes into play. However, CCS also has technical challenges similar to those of existing oil, gas, and petrochemical systems.

There are certainly other energy systems that will be a part of our future energy mix, including:

- Nuclear energy
- Hydroelectric power
- Marine (tidal/wave) turbines
- Utility-scale energy storage:
 - Batteries
 - Compressed air storage
 - Liquid air storage
 - Flywheel energy storage

Four Energies We Can Concentrate on Now

Let us concentrate on the four technologies mentioned at the beginning – solar, wind, hydrogen, and carbon capture. These are all being used to some extent and have the advantage that the existing power generation and distribution infrastructure, such as existing electrical grid and transmission/distribution pipelines, can be used without significant modification.

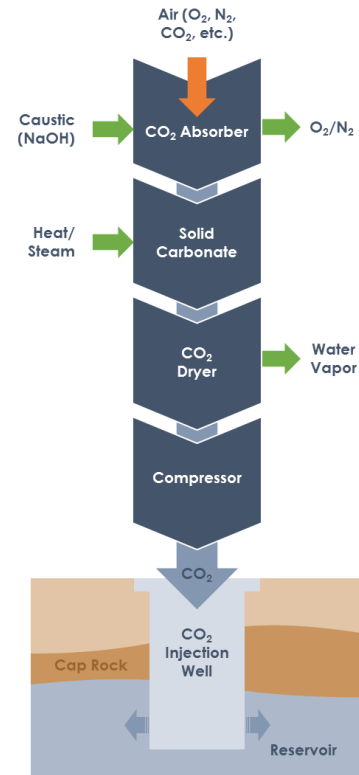


Figure 1: General Process – Direct Air Capture for CCS



Figure 2. CSP System

In the next several Arrows, we will highlight each of these types of systems and lay out the design decisions and operating concerns that will be necessary for the safe and efficient construction and operation of these technologies.

The solution to our joint energy future will not be just one thing, but the thoughtful and careful application of existing engineering and operating philosophies that allow for the safe application of multiple energy generation technologies.



Figure 3: Wind Energy

GATE Energy Can Help

With our legacy of experience in process design, materials selection, risk assessment, and systems analysis, we can provide effective and efficient design, fabrication, and operational support as the energy industry moves into a renewable future.