Summary Notes from **Small Scale and Modular CO2 Capture**

Lawrence Livermore National Laboratory, Livermore, January 18 -20, 2017

Cooperatively hosted by Department of Energy, Gassnova and LLNL under the bilateral MoU between Norway and the US.

Participation from a variety of companies/businesses also not specialized in CO2 capture gave a new and different approach to the topics presented.

Objectives of workshop:

* Where to focus research and funding in the future
* Consider high vs low capture rate
* Specific technologies and solutions fit for specific flue gas sources

Heard during the presentations:

* The bigger the better (historically) vs small is beautiful (now)
* Small scale projects – facilitate a stepwise approach
* Economy of scale vs Economy of mass
* Higher energy efficiency => higher capital cost
* Prefabrication – stepwise equipment sizes/modules
* Adding modules may interfere freedom of dimensions/capacities
* Improve safety by more shop work - less field work
* Learning is faster for smaller things
* Technology sweet spots
  + Solvent – best capex at large size
  + Sorbents – best capex at medium size
  + Membranes – best capex at small size
* Partial capture – seasonal, part time, available energy internally, reduced capture rate, part of the flue gas, part of the stacks
* Membranes – modular in its nature, unit size small enough for one person to lift
* Opportunities – stranded resources and small scale resources

From the discussion:

* Large plants – high cost – high risk
* Do it stepwise – start small scale – reduce risk
* Retrofit on existing large power plants => parasitic load
* New-built integrated plant can be designed from scratch
* For large power plant there is an alternative – renewables
* For industry sources – capture is the only alternative
* Governments to take the initial action and do the infrastructure investment

Concluding remarks:

* Focus on going large by multiplication rather than by size
* Carry out market survey for smaller, modular systems
* Study balance of plant
* Small scale capture in combination with utilization