CLEAN AIR TASK FORCE

Pulp and Paper Tool Scoring Methodology

Clean Air Task Force has developed an exploratory mapping tool to illustrate the pulp and paper sector's potential to pursue carbon management strategies. The tool evaluates existing pulp and paper facilities along five criteria: (1) Cost of capture (2) Capture potential/ volume (3) Storage cost (4) Clustered infrastructure and (5) Environmental and social co-benefits. Using GIS analysis and overlays, spatial statistics, and cost modeling, the tool scores every pulp and paper facility in the U.S. in each of the criteria above to identify high-opportunity facilities and evaluate regional, spatial, and socioeconomic considerations for decarbonization.

Scoring Methodology

I. **Capture cost**: (Score 1-3) A financial model and cost estimation analysis were used to generate unit capture costs for each facility, based on systems modeling for point source capture from the National Energy Technology Laboratory.

   i. Capture costs greater than $120/MT = 1

   ii. Capture costs between $85/ton and $120/MT = 2

   iii. Capture costs less than or equal to $85/MT = 3

II. **Capture potential**: (Score 0.5-3) Each facility is scored based on total capturable emissions, including biogenic and non-biogenic sources, from the latest data from the Environmental Protection Agency's Greenhouse Gas Reporting Program (2023).

   i. Emissions less than 500,000 MT = 0.5

   ii. Emissions between 500,000 and 1,000,000 MT = 1

   iii. Emissions between 1,000,000 and 2,000,000 MT = 2

   iv. Emissions greater than 2,000,000 MT = 3

III. **Storage cost**: (Score 0-3) Estimated cost range based on mean project-based cost from the Livermore Lab Foundation's Roads to Removal report.

   i. No or limited storage window = 0

   ii. Storage costs greater than $40/MT = 0.5

   iii. Storage costs between $16/MT to $40/MT = 1

   iv. Storage costs between $9/MT to $15.99/MT = 2

   v. Storage costs less than $9/MT = 3

IV. **Cluster potential**: (Score 0-3) Measures potential for shared infrastructure networks with other industrial emitters. Calculated using the Getis-Ord Gi* spatial statistic that measures spatial clustering of other industrial facilities that qualify for the 45Q tax credit. Higher Gi*

scores indicate areas with statistically significant spatial clustering of industrial facilities. A hex map was generated for the entire United States with underlying Gi* scores; each pulp and paper facility was then assigned a score based on the Gi* value in which they are located.

i. Gi score 0 = 0

ii. Gi score 1 = 1

iii. Gi score 2 = 2

iv. Gi Score 3 = 3

V. **Co-benefits potential**: (Score 0.5-3) Based on county-level indices that merge geospatial data on variables relevant to geologic storage projects into a single index value to identify counties that could maximally benefit from storage projects, while also storing maximal amounts of carbon affordably; and geospatial data on variables relevant to dry waste and woody biomass carbon removal and storage (BiCRS) feedstock to identify areas that could maximally benefit from feedstock sourcing and BiCRS facilities. Geospatial data containing these indices are from the Livermore Lab Foundation's Roads to Removal report, and each pulp and paper facility was assigned a score based on their respective county's total for geologic storage and BiCRS dry waste and forestry indices. Benefits include employment opportunities and workforce development, potential for publicly owned pore space and land, and air quality impacts.

i. Cumulative geologic storage and BiCRS score less than 0.25 = 0.5

ii. Cumulative geologic storage and BiCRS score 0.25 – 0.4 = 1

iii. Cumulative geologic storage and BiCRS score 0.4 – 0.6 = 2

iv. Cumulative geologic storage and BiCRS score greater than 0.6 = 3

Individual and cumulative scores are intended to be illustrative of key factors that must be considered to decarbonize a representative U.S. pulp and paper facility. Further detailed analysis that considers plant-specific operations, engineering, and configurations would be needed to understand the feasibility of carbon management applications and retrofits for individual facilities. Nevertheless, the tool offers a first step in evaluating the decarbonization potential for a critical industrial sector.