



Building Commercial Scale Clean Energy Systems Through Deep Decarbonization & GT Scale Carbon Capture Infrastructure

Atanu Mukherjee CEO, Dastur Energy Inc.

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The 70% Emissions Challenge







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Hydrogen, Methanol, Net-negative Gasification & Reforming along with GT Scale Carbon Capture Management are the Building Blocks for Enabling the Low Carbon Industry

Deep Decarbonization of the Industry Requires a Broad Based Systems Approach across the Building Blocks





A Commercial Scale Architecture for Clean Energy Transition of the Industry





Clean Hydrogen Options at Scale also Primes GT Scale Capture





Enabling GT Scale CO₂ Grid through Large Scale H₂ Production



Feedstock Supply Chain

- Variable composition, density, particle size, agglomeration
- Reliable & scalable biomass, plastics & petroleum waste supply chain
- Feedstock blend models

Gasification Technology

- Modular scalable blended feed gasifiers for biomass, plastics, petroleum residues
- Low-cost gas-conditioning and processing circuit design

Sustainability & Techno-economics

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- Net-zero or net-negative emissions plant operations
- Economic target of Clean H₂ at < 1.5 \$/kg LCOH and Methanol at < 300 \$/ton LCOM

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How to Manage CO₂ at GT scale?





Large scale CO₂ collection, aggregation, transport and disposition infrastructure that is economically attractive and operationally seamless for emitters

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Grid prices in or transfers the operating risks of transport & sequestration away from emitters









ADNOC – UAE based 7th Largest Oil Producer in the World











Cleveland Cliffs – Largest Integrated Steel Maker in the United States







Cliffs Burns Harbor CO₂ Capture: System Design & Architecture



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Indian Oil Corporation Limited (IOCL) – Largest Refiner in India









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Bharat Petroleum Corporation Limited (BPCL), Kochi – Largest Public Refinery in India







BPCL Petcoke Gasification and Carbon Capture : System Design & Architecture



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Economic Viability and Environmental Justice

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Economics of Commercial Scale Clean Energy Transition





Environmental Justice: The Socio-Economic Impact of Clean Energy Based Economy







100 Congress Ave Austin, TX 78701

www.dasturenergy.com

abhijit.s@dasturenergy.com atanu.m@dasturenergy.com