Renewable Gas Procurement Standard Workshop

ADVANCED POWER
& ENERGY PROGRAM
UNIVERSITY of CALIFORNIA • IRVINE

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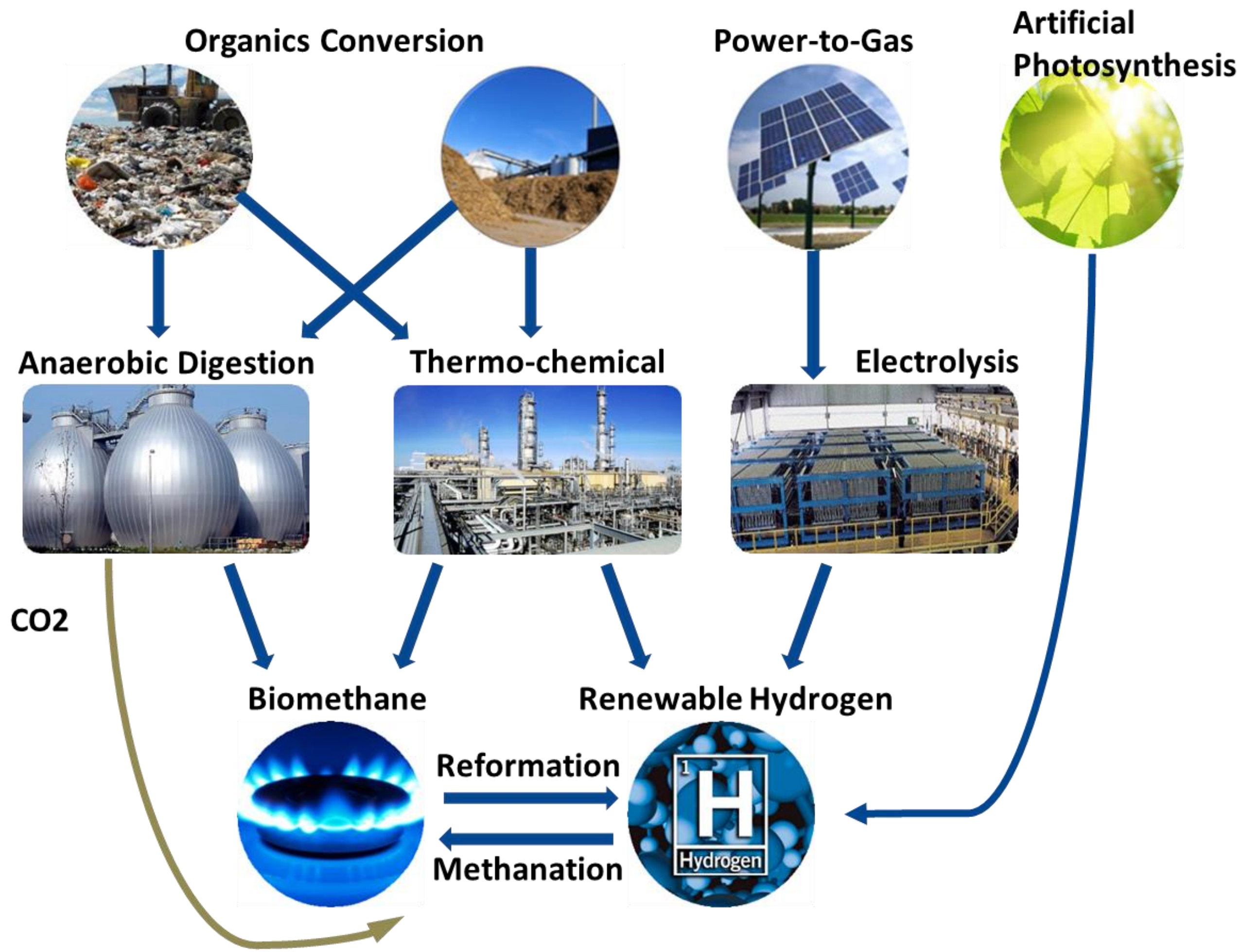
Renewable and Zero-carbon Gaseous Fuel Pathways



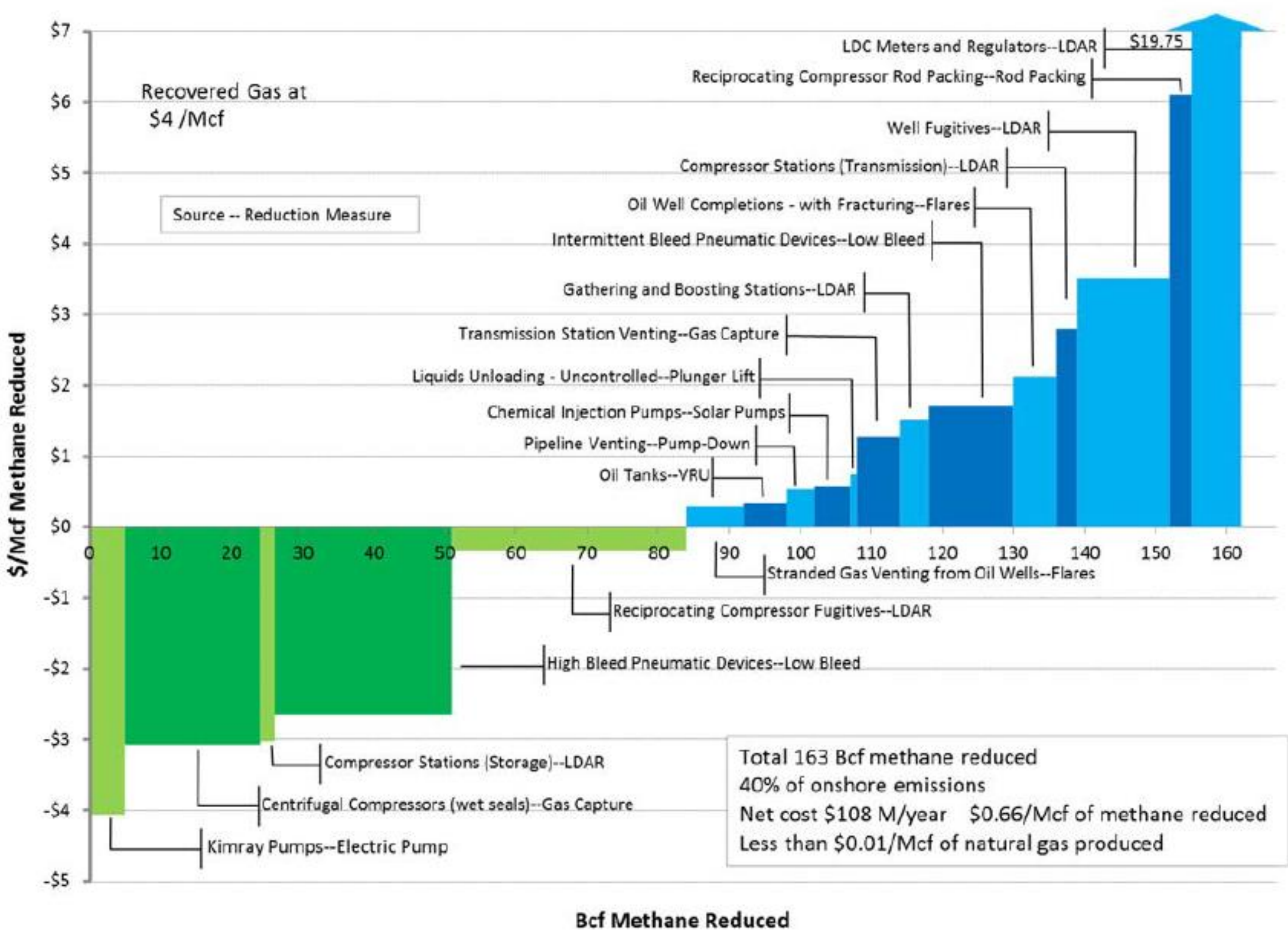
- Note that renewable hydrogen is not a GWG so contributes significantly to SLCP reduction when used as a blend stock by reducing fugitive methane emissions (reduced methane on NG system)
- Renewable gas of all types increases resilience and can provide firm renewable power

Cost Effectiveness in SLCP / GHG Reduction

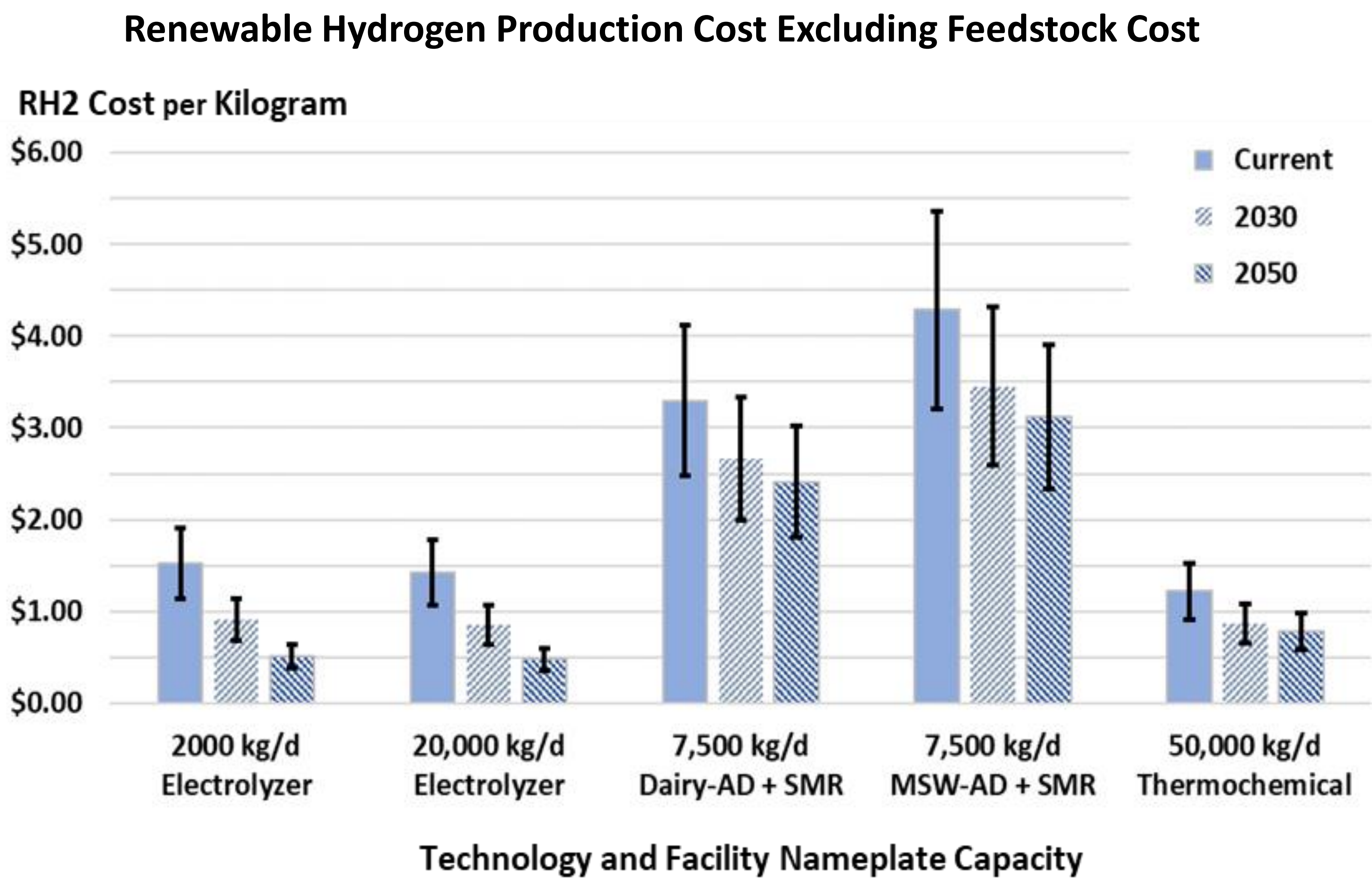
- Over-arching principle is least cost to achieve a unit of incremental SLCP or GHG reduction (marginal abatement cost) – based on full-cycle carbon emissions and internalized environmental costs such as criteria pollutant emissions
- When specific climate pollutants and applications are considered, the calculation can be very different (e.g. LCFS credit around 10x “ordinary” GHG credits because transportation decarbonization has higher abatement cost)
- Renewable gas can address difficult to decarbonize applications on the gas grid such as space heating, cooking and water heating in existing buildings, firm renewable generation capacity and process heat applications -- abatement cost comparisons should be based on those applications
- Technology and market maturity need to be taken into account -- cost-effectiveness should be assessed in the context of foreseeable reductions in cost. The RPS and storage procurement programs both apply mandates to drive market adoption in view of future cost reduction without explicit cost-effectiveness standards. Cost effectiveness deemed a priori at program inception.
- Where a firm mandate exists, cost effectiveness is, by definition, the least cost to meet the mandate – for policy purposes, is 40% SLCP reduction by 2030 a goal or a mandate?
- Co-benefits such as risk reduction through technology diversity, increased resilience and others should be considered in RGS program design and cost effectiveness assessment

Methane Marginal Abatement Cost by Technique

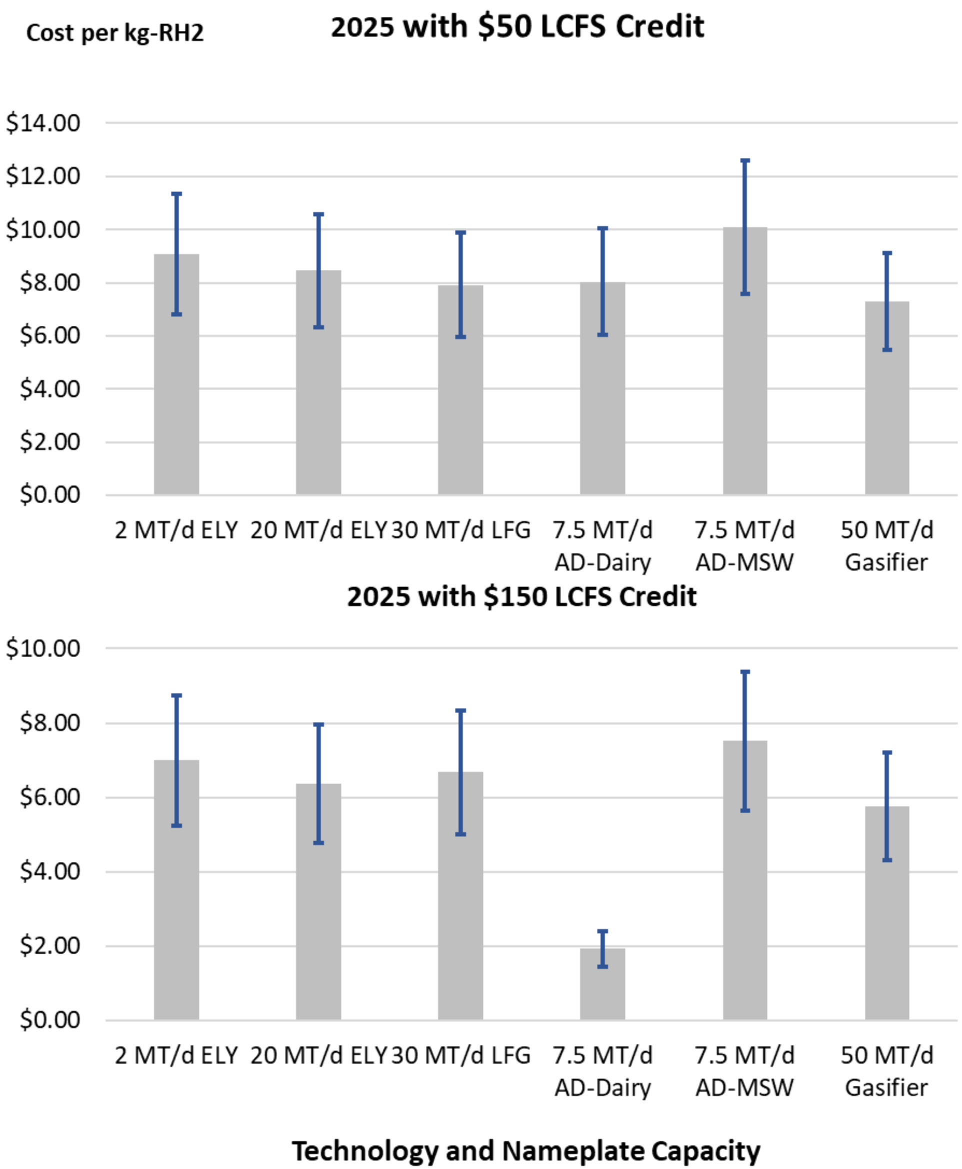
Figure 1-1 - Marginal Abatement Cost Curve for Methane Reductions by Source



Forward-looking Perspective on Cost is Critical for Emerging Technologies



Carbon Value is a Major Factor in Relative Cost Effectiveness of RG's



Other Questions

- **How might we consider procurement targets or goal development?**
  - The goal should be developed based on a rigorous analysis of the time required to build capacity to meet the standard and the quantities of RG that are expected to be available at cost-effective price points ($/ton metric to be determined and likely escalating over time)
  - Competing demand from the vehicle fuel markets should be considered in assessing available supply
  - Given the goal to reduce GHG by 40% by 2030, the initial steps should be material but initially small enough to avoid a major impact on customer bills– perhaps 5% of core throughput
  - Off-ramp triggers (e.g. price cap) reducing or deferring the procurement obligation should be considered
- **How might we consider achieving these targets or goals, i.e., what procurement strategy might we consider and why?**
  - The RPS process has worked well including the use of Procurement Review Groups
  - Companion programs such as voluntary tariffs should be considered to mitigate cost impact on general core rates (e.g. allow non-core (generation or transportation fuel) customers to by RG at $x/MMBtu)
  - Expanding the eligible renewable gas pathways to include electrolytic methane and hydrogen will improve cost effectiveness
  - Standard offer or feed-in tariff similar to BioMAT should also be considered
  - Utility-owned facilities should be eligible to compete under the program