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Sustainability Metrics for Energy Systems

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Rationale

- The term “sustainability” is in common use
- Wide variations in its definition and usage
  - different definitions may have different implications on whether a given energy system is sustainable
- Frequently focus on carbon only, often ignoring other environmental, economic, regulatory requirement and societal impacts
- Economic, environmental and societal metrics
- No generally-accepted measure of sustainability

Life Cycle Analysis

- Most LCA methods are limited to environmental assessments.
- Many LCA arrive at misleading conclusions because of inconsistent definitions of the boundaries, different selection of LCA stages, different metrics, or different assumptions about process parameters
- There is need for a well structured, transparent approach for evaluating energy systems that includes the three dimensions of sustainability: environmental, economic and societal.

Objectives

- Assess and select metrics for evaluating sustainability for energy systems
- Develop a simple check-list/guide for energy system LCAs
- Expand LCA technique to reflect sustainability definition(s) and metrics – LCA being used to include environmental, economic and societal measures; update check-list/guide
- Apply the technique to selected test cases
- Explore the need for corresponding standards for an energy system LCA check-list/guide

Issues

- Our target is
  - *Engineering community*
  - *Provide them with straightforward methods to communicate with policy-/decision-makers*
- Should we develop from “scratch?”
  - We could use our “Scorecard” methodology as a basis
- Find out what our societies already have

Status

- Workshop
- Compiled/reviewed descriptions of metrics developed by our societies
- Many developed for specific applications
- Developing screening criteria, eg,
  - Applicability to energy conversion

List of metrics compiled to date

- Three pillars
- BEES
  - Sustainability Metrics for Buildings and Building Elements NIST
- Liquid Biofuels Metrics for Transportation (AIChE)
- ENVISION
  - rating system for infrastructure projects of the Institute for Sustainable Infrastructure (ISI)
- Target Rock (utilities)

List of metrics compiled to date

- EPA Principles and Metrics
  - GHG-focused

Screening for applicability to energy systems

- Clear definition of system boundaries within the lifecycle context
- Clear definition of desired outcomes…business, environmental, social
- Provisions to determine what metrics are meaningful and useful for the intended audience
- Adequate data, qualitative and quantifiable as appropriate
- Feedback provisions and ability to determine influence of final decision based on each individual metric
- Provides value in making a final decision regarding comparative sustainability of energy systems

Next Steps

- Peer review
- List of people
  - How do they carry out sustainability assessments
  - What issues do they encounter
- Across disciplines?