Improvements of the TIAM

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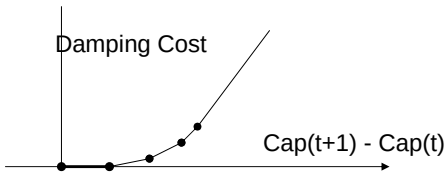
Energy model improvements

1. Introduce main pollutants (NOx, SO2, ..) plus transport of pollutants between regions
   - Effort: average to large
   - Importance: depends on type of application envisioned
2. Explore ways to implement modal split between rail and truck (freight), and between mass transit and car (urban)
   - Difficulty: keep model linear or convex (see work by Denise)
   - Effort: ? Average ? (if feasible)
3. Introduce damping costs for changing total capacity of new technologies (resistance to change, hidden costs). Model stays linear.This approach is preferable to growth constraints.
   - Effort: low to average (but data?). Use MARKAL-MACRO experience
   - Importance: high



Energy model improvements

4. Add feature to VEDA interface for using TIMES as a ‘ What If ’ model (like LEAPS, but with additional equilibrium power)
   - Effort: probably average to high, but first investigate desirable design, assess feasibility, and make detailed proposal
   - Importance: to be assessed collectively

Climate Module improvements

5. Introduce climate-to-climate feedbacks: investigate the link between some parameters of the climate equations (Cs, Lag, etc.). Recent research shows that these parameters do not vary independently. Furthermore, the values of some parameters are subject to re-evaluation because of recent assessments of:
   - THC instability (may provoke extra temperature change)
   - Rapid melting of ice cap and Greenland glaciers (increases heat exchange rates and decreases albedo)
   - Effort: uncertain but not trivial, due to lack of confirmed theories
   - Importance: high
6. Introduce climate-to-emissions feedbacks: for example:
   - Increased CH4 emissions from melting pergelisol
   - Increased methane hydrates emissions from ocean floors
   - Effort: low if data available, but is it ?
   - Importance: average to high

Climate Module improvements

7. Introduce climate-to-energy system feedbacks:
   - Altered potentials for hydroelectricity
   - Altered tree growth due to CO2 concentration
   - Increased forest fires (more CO2, less wood)
   - Increased space cooling demands
   - Decreased space cooling demands
   - Linearization procedure for radiative forcing equation
   - Effort: large data characterization effort, plus additional effort for new equations
   - Importance: average to high

Comments

- Technical:
  - Keep model linear (make appropriate approximations)
- Procedural:
  - ETSAP to assess desirability of improvements (Summer 2006)
  - ETSAP to tentatively decide budget allocations over time (2006)
  - One team to be constituted for each type of improvement + Coordination team (Fall 2006)
  - Work begins (Fall 2006 or Winter 2006-2007)