

Modeling to meet multiple goals

Greenhouse gas mitigation to drive development

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To set the context, two quotes...

A theme of climate change debate is exposing investment strategies to reduce greenhouse gas emissions and simultaneously accelerate development. "Put simply, effective climate action must be "mainstreamed" to re-orient development paths toward those that are most climate-friendly" (Heller and Shukla, 2003)

One of the major criticisms in the analysis of energy issues is the failure to integrate a wider ranges of environmental, economic, and social perspectives into ongoing policy analysis (Laitner and Hogan, 2000; and Laitner et al., 2000)

Approach

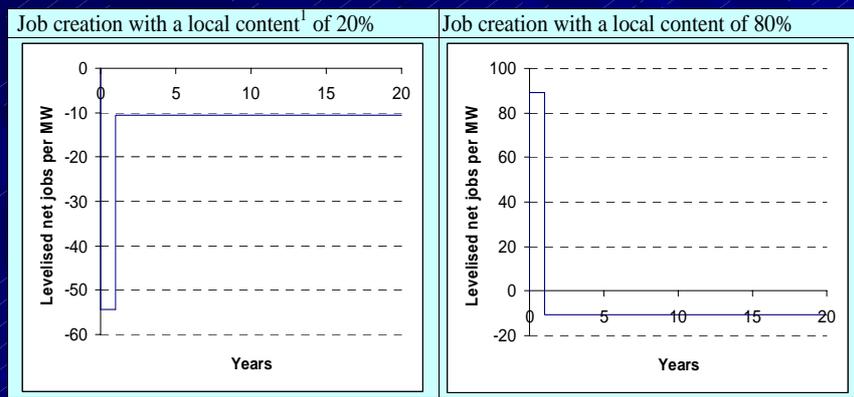
- Investigate energy-GHG mitigation measures and their wider development impact
- New goal programming formulation of MARKAL (Goldstein 2003) integrated with a I/O model aspects
- Investigate (BUA;) perturbations to a business as usual scenario
- Short to medium term
 - Not structural changes as GHG mitigation options
 - Amenable to policy in the context of developing country needs

GHG Mitigation and development

- For this work limited system:
 - Consider (electrical) energy efficiency measures
 - and PPA wind
- Consider solving for (the minimization of) multiple goals:
 - Gaseous Emissions (CO₂, SO_x, NO_x, PM)
 - Water usage,
 - Total system cost (and “efficiency”),
 - Reliance on local technology,
 - Job losses

GP MARKAL:

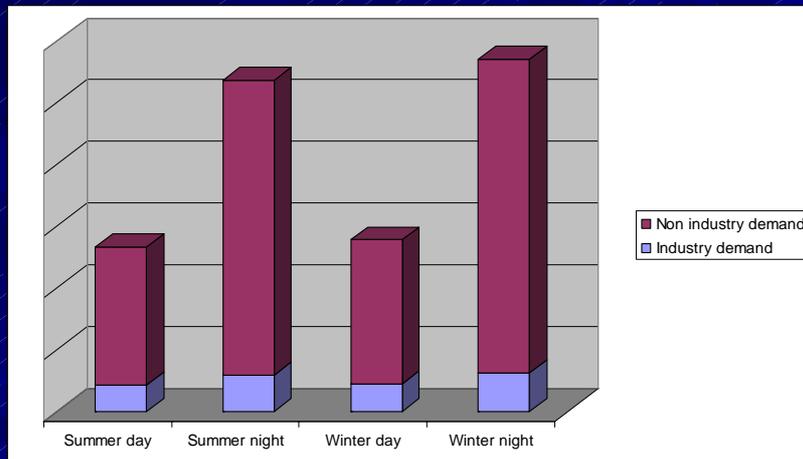
Integration with I/O economic model for Job creation and “takeback”



- Local content
- Effects of increasing cost
 - Opposite effect for decreasing cost

GP MARKAL:

Integration with I/O economic model for Job creation and “takeback”



- Peak demand
- Endogenous elasticity

Scenarios

- Changing of the hurdle rate of energy efficient technologies to reflect current penetration rates

In this scenario we shall reduce the hurdle rate from one that is reflective of current practice to one that is economically efficient and report the benefits.

Scenarios

■ Development scenarios

In these scenarios, we wish to determine optimal levels attributes of the energy-economy by considering different weighting to development objectives. We consider three scenarios (Howells and Laitner 2003), with the first two not including any weighting attached to GHG mitigation.

- Government goals, based on current government spending which is skewed heavily toward job creation.
- Industry goals, based on increased ease of implantation and increased profitability.
- And green goals, based on increased environmental improvement in the system.

Results

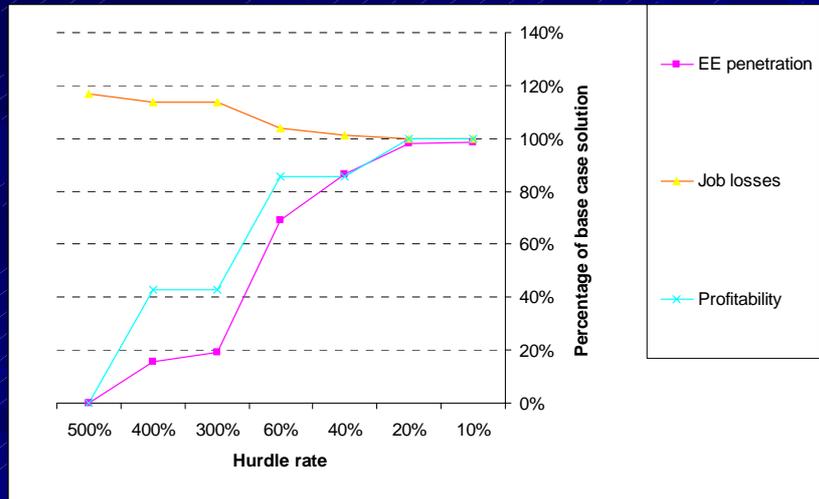
■ Moving from current practice to an economically efficient hurdle rate

- Uptake of energy efficient technology
- Wind only at very low (not competitive rates)

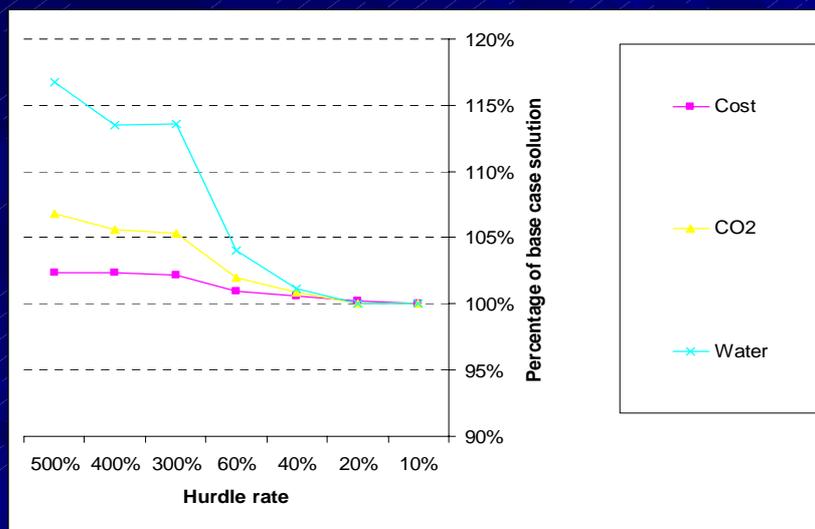
■ Optimizing for “development scenarios”

- Relative to current practice
- All depend on industrial energy efficiency
- Trade off between jobs and increased environmental protection “green goals”

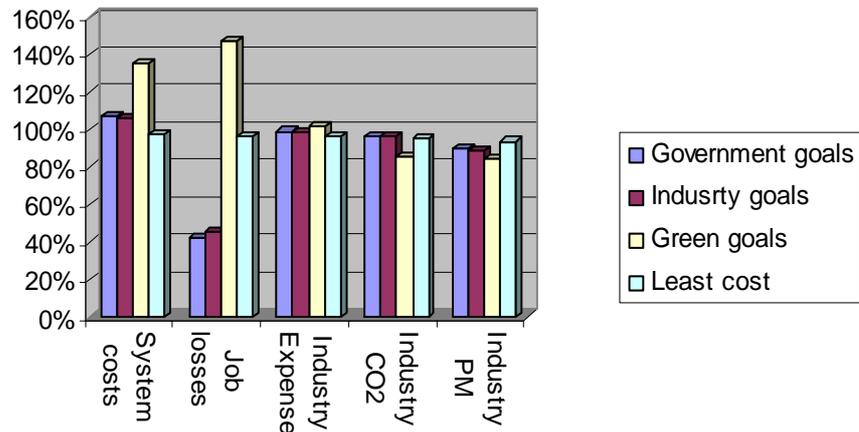
GP MARKAL: hurdle rate and development goals



GP MARKAL: hurdle rate and development goals



GP MARKAL: Development scenarios



Conclusions

- There are GHG mitigation measures that drive development
 - including increasing profitability
 - potential for market driven development
- New spin on the Climate Change debate:
 - development imperative
 - Identify win-win “profitable policy”
- Not all measures fit all development scenarios
 - Helps justify the notion of “burden sharing”
 - CDM, AIJ and post Kyoto
- Help place energy modeling within the broader development context
 - Engage industry, civic society and other government departments

Next steps

- Need to undertake a larger analysis
 - Fuel switching and multi sectors
 - What levels of mitigation can co-drive development?
- Need to look at energy consumer demand
 - Where are the market failures
 - Where to apply “smart measures”
- Need to look at better sector specific scaling in the context of sector specific scaling
- Define this work in the context of a sensible externality framework

Acknowledgements

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GP-IO-MARKAL RES

