

Optimization without/with CO₂ cap *in LEAP*

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Basics

Optimization: calculation of least cost capacity
expansion & dispatch of Transformation modules
(typically electricity generation)

Relevant integrated tools: Open Source Energy Modeling
System (**OSeMOSYS**)* & GNU Linear Programming Kit
(**GLPK**)

*developed by Royal Technical University of Sweden (KTH), SEI, International Atomic Energy Agency (IAEA), and UK Energy Research Center



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Minimum data requirements

- Process efficiencies
- Availability rates
- Costs
 - Capital
 - Fixed and variable O&M
 - Fuel (where appropriate)

Taking into account GHG emissions & pollution damage costs

- Emission factors
- Pollutant externality values
- Emission constraints



Key steps for set-up

1. Go to [Basic Parameters](#)
 - Optimization tab: check that OSeMOSYS is properly installed
 - Optimization tab: specify emissions constraints (optional)
 - Optimization tab: enable **Addition Size** variable (optional)
 - Costing tab: check Discount Rate and cost annualization method: **Capital Recovery Factor**
2. Select the Transformation module (typically electricity generation)
3. Check minimum level of data required
4. Create new scenario or select an existing scenario that will be calculated using the optimization methodology
5. Go to **Optimize tab** at the [respective Transformation module branch](#) and set value: **Yes** (*Optimize tab is not visible in Current Accounts!*)
6. Specify additional constraints for the Minimum and Maximum Capacity variables for each process within the module



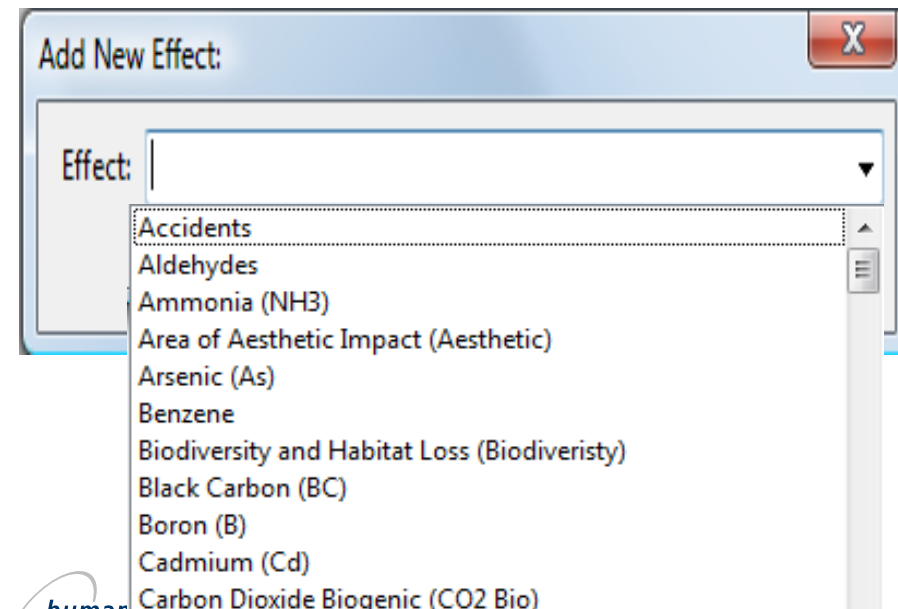
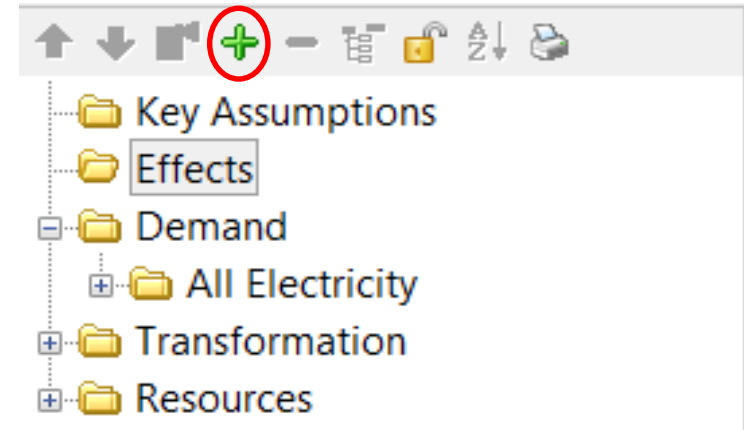
Environmental Externality costs

Definition

- damage costs associated with pollution

Procedure

- Go to **Effects** branch
- Add branches for pollutants
- Insert data in externality cost tabs



Annual Emission Constraints (1/2)

Definition: maximum annual level of emissions for a pollutant

- only used when optimizing Transformation module using OSeMOSYS so as to identify a least cost configuration that keep total emissions below the specified constraint
- refers to the maximum desired value for emissions across all emission sectors



Annual Emission Constraints (2/2)

- Go to Basic Parameters
 - Select the box ***Enable Emission Constraints***
- Go to Effects branch
- Select the pollutants (sub-branches)
- Insert data in ***Annual Emission Constraint*** tab

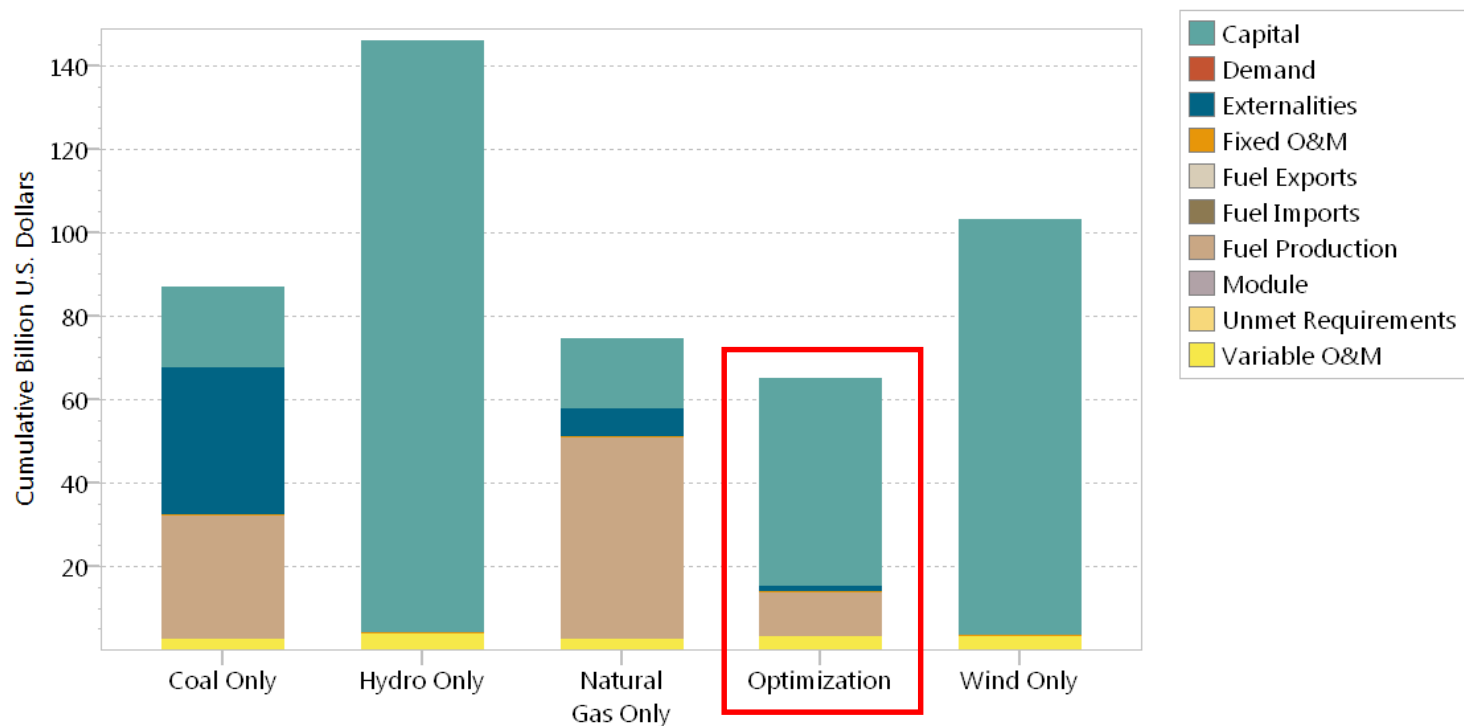
Note: Use the expression **Unlimited** if you do not wish to specify a constraint for a certain pollutant



Results

Social Costs: 2020

Year: 2020



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Let's practice!

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