united nations
educational, scientific
and cultural
organization

international atomic
energy agency

the
abdus salam
international centre for theoretical physics
40th anniversary 1964 2004

SMR 1585 - 11

WORKSHOP ON DESIGNING SUSTAINABLE ENERGY SYSTEMS
18 October - 5 November 2004

Representation of Depletable and Non Depletable Resources in MESSAGE

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***These are preli*minary lecture notes, intended only for distribution to participants.**

Representation of Depletable and Non Depletable Resources in MESSAGE

Chae Young Lim
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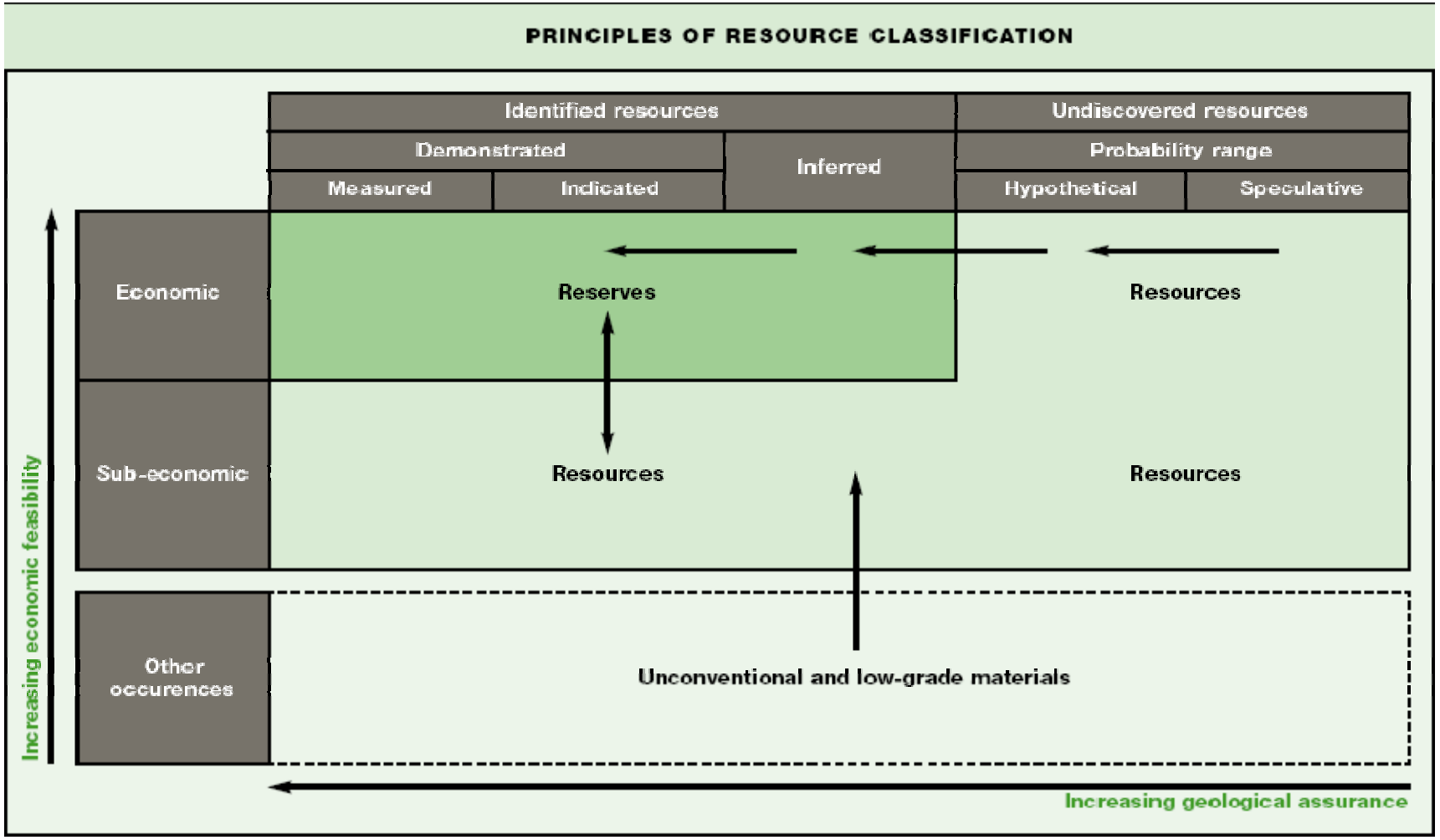
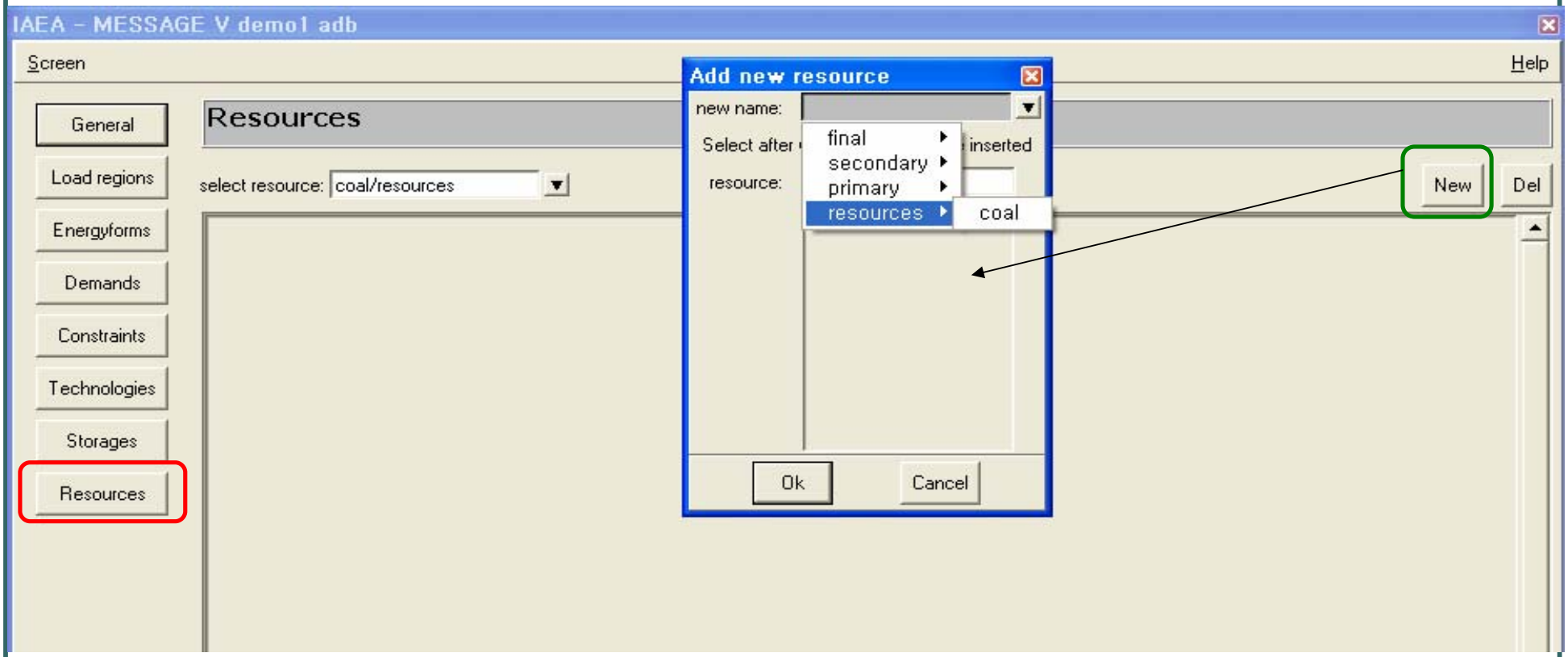
Classification of resources

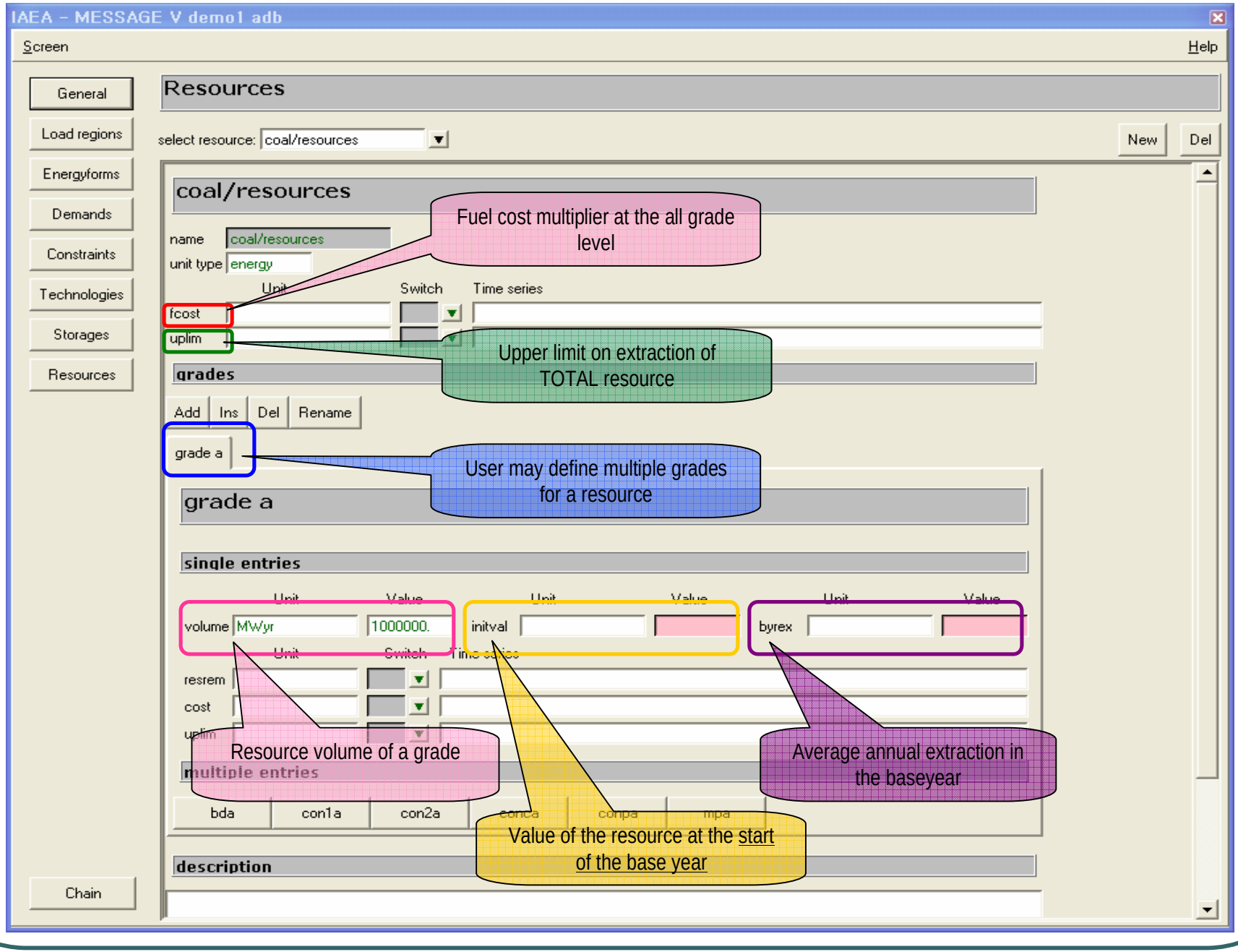
Source: UNDP, 2000



Representation of Depletable Resources

- MESSAGE allows considering multiple grades for a resource
- User can introduce various limitations on the resource production
  - Annual extraction limit
    - Absolute value
    - Relative to the remaining resource
  - Amount of remaining resources


IAEA - MESSAGE V demo1 adb
Screen
Help
General
Load regions
Energyforms
Demands
Constraints
Technologies
Storages
Resources
Resources
select resource: coal/resources
New
Del
Add new resource
new name:
Select after
inserted
resource:
final
secondary
primary
resources
coal
Ok
Cancel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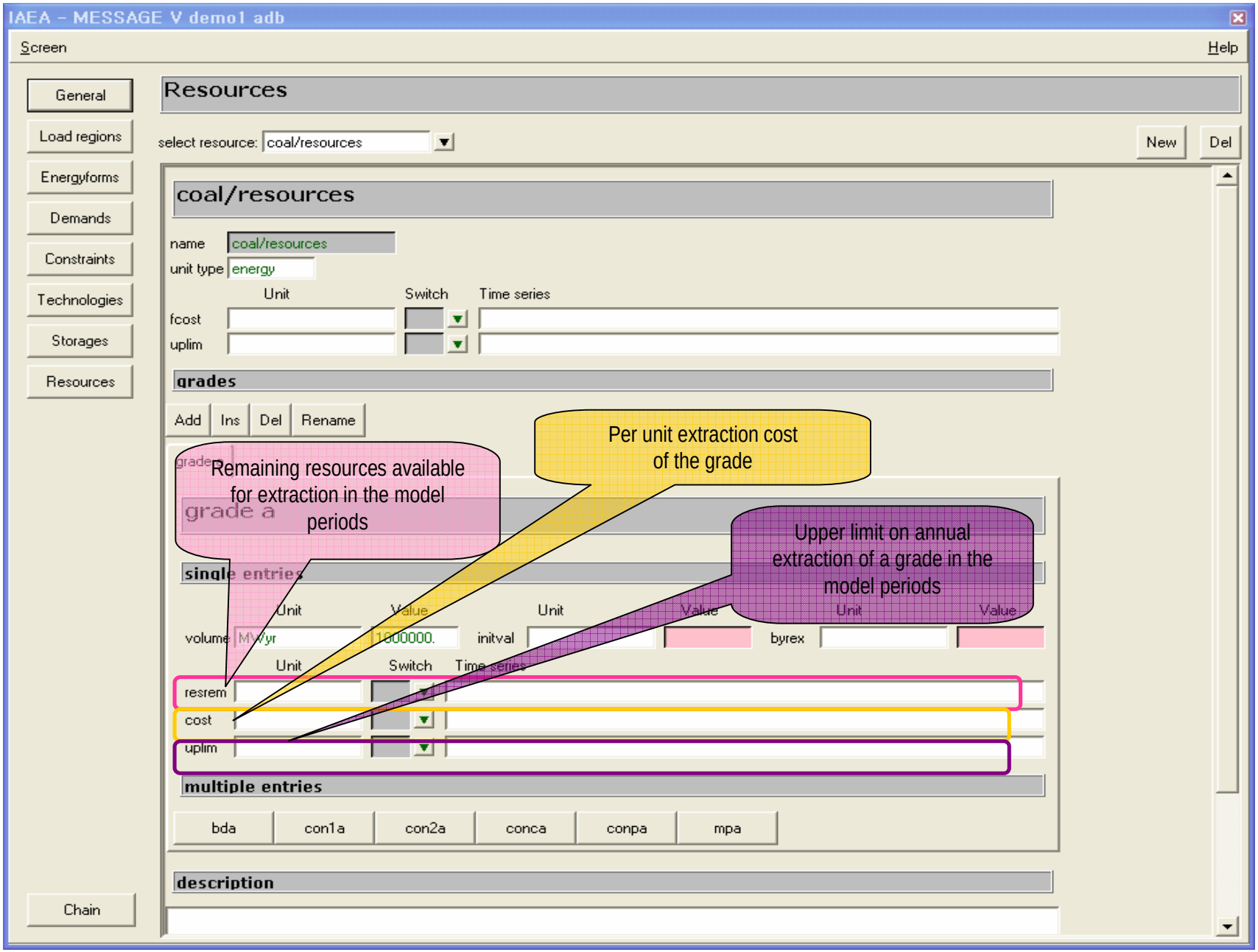
Chain
Resources
select resource: coal/resources
New
Del
coal/resources
name coal/resources
unit type energy
Unit
Switch
Time series
fcost
uplim
grades
Add
Ins
Del
Rename
grade a
grade a
single entries
Unit
Value
volume MWyr 1000000.
initval
byrex
resrem
cost
uplim
multiple entries
bda
con1a
con2a
conca
conpa
mpa
description
Fuel cost multiplier at the all grade level
Upper limit on extraction of TOTAL resource
User may define multiple grades for a resource
Resource volume of a grade
Value of the resource at the start of the base year
Average annual extraction in the baseyear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name coal/resources
unit type energy
Unit
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Time series
fcost
uplim
grades
Add
Ins
Del
Rename
grade
grade a
Remaining resources available for extraction in the model periods
Per unit extraction cost of the grade
Upper limit on annual extraction of a grade in the model periods
single entries
Unit
Value
volume MWyr
1000000.
initval
byrex
resrem
cost
uplim
multiple entries
bda
con1a
con2a
conca
conpa
mpa
description

Balance in the single grade resource

Volume

>

initval + byrex x (No. years between baseyear & 1st period)

> $\sum_{t=1}^{n} X^{t}_{extraction}$

$\underline{\text{uplim}^{t}}$ > $X^{t}_{extraction}$

where, *t: model period*

Representation of Non-Depletable Resources

- Non-depletable energy resources such as wind, solar, etc. should be considered differently
- Renewable potentials can be modeled using constraints