



the  
**abdus salam**  
international centre for theoretical physics

SMR.1524 - 4

**College on Evaluation of Energy Technologies  
and Policies for Implementation of Agenda-21**

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**Advanced Features of MESSAGE: Multi Region**

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These are preliminary lecture notes, intended only for distribution to participants



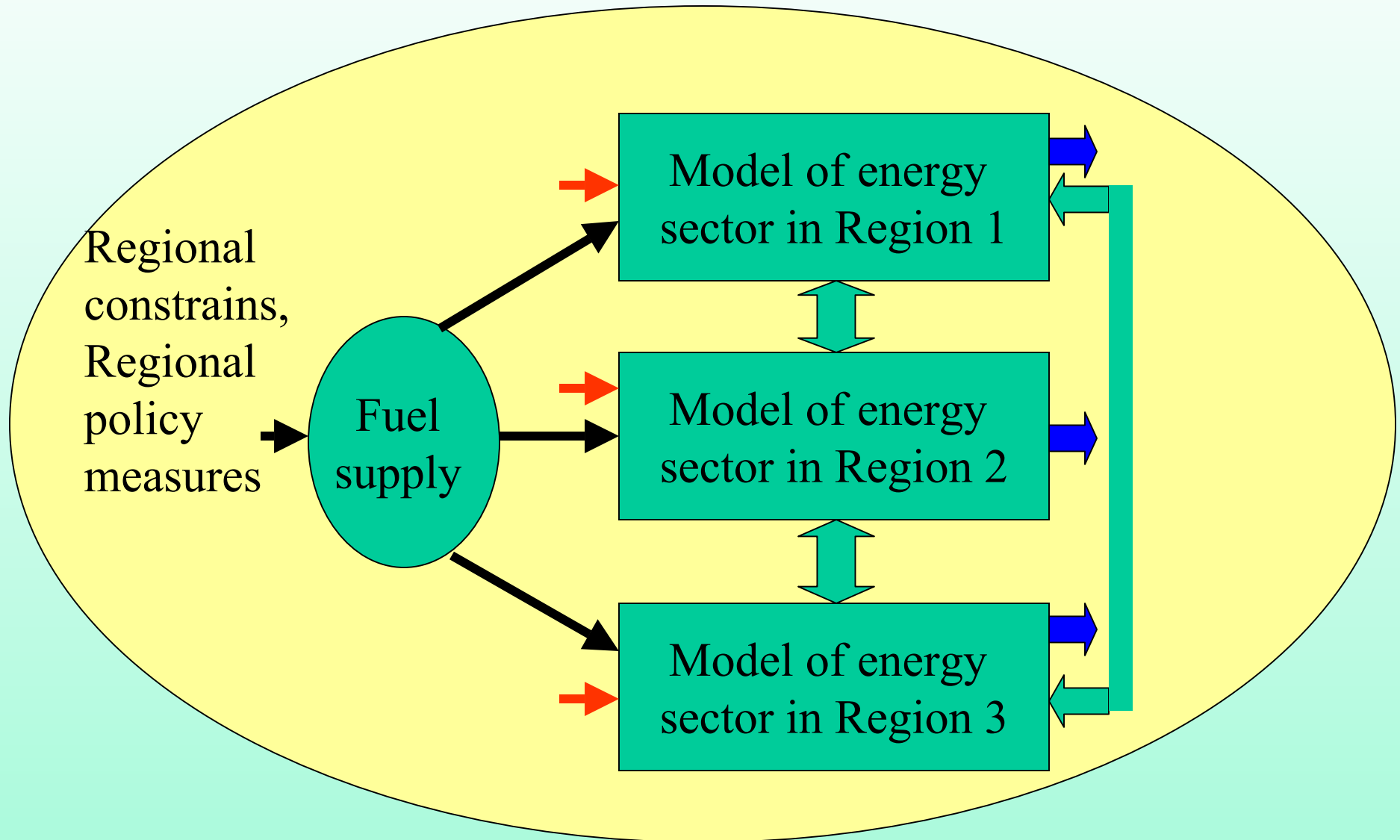
**Advanced Features of**

**MESSAGE:**

**Multi region**

*A. Galinis*

## Structure of the multi-regional model



# Application of the Multi-Regional model

For representation of different continents or country groups in the World energy model;

For representation of different countries in multi-country energy model;

For representation of different regions in the country energy model;

For representation of different energy systems (Oil supply, gas supply, electricity supply and others) in country energy model;

For other purposes.

## **Advantages of Multi Regional model**

Structure of Multi Regional model better corresponds to reality;

Model of each region may be prepared and calibrated separately;

Particular expert can work with model of particular region (preparation calibration);

Easier calibration because model of single region is less complicated;

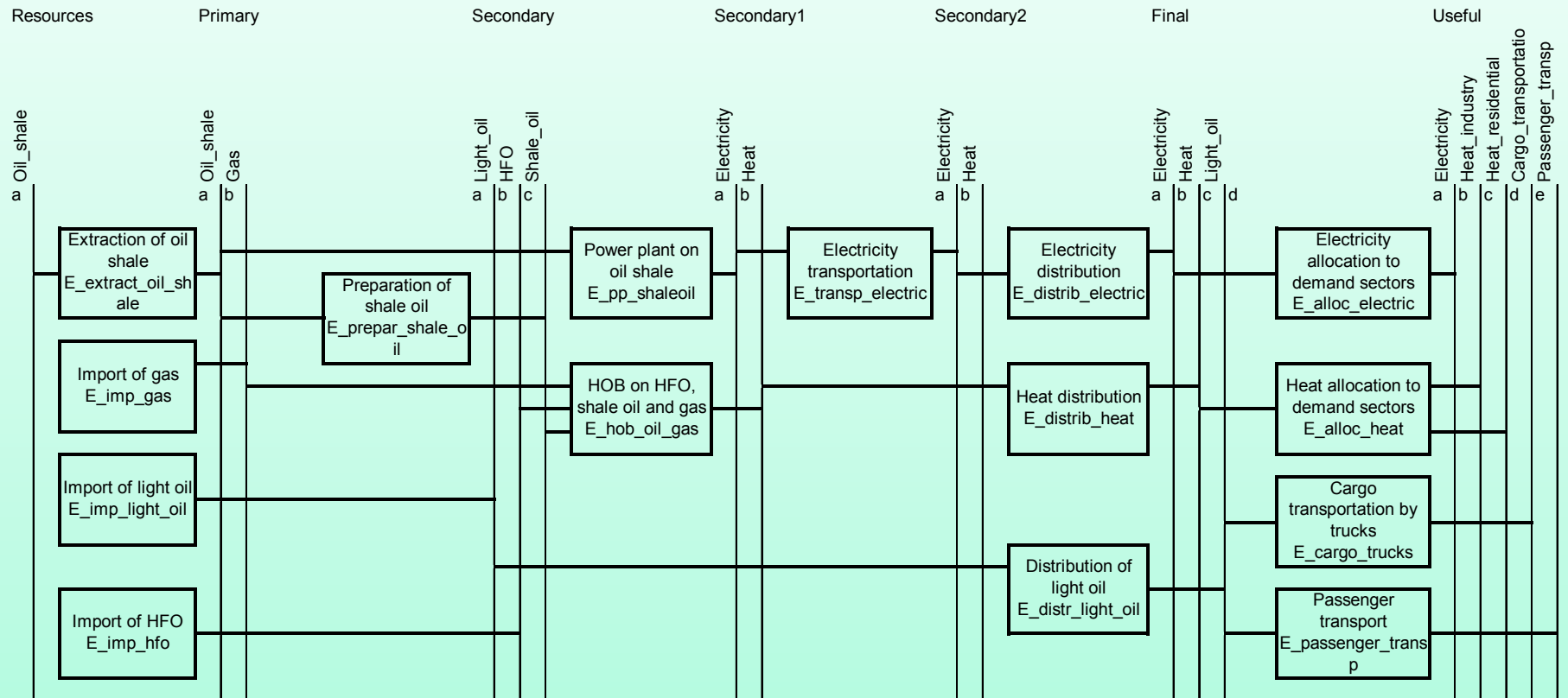
Shorter computation time during calibration of model of particular region;

## Assumed energy system. (Main components)

- Region 1: Mining of oil shale; Production of shale oil; Power plant on oil shale; Heat only boiler on liquid fuel and gas; Import of various fuels; Electricity and heat transport and distribution; Cargo and passenger transportation; Demand of electricity, heat in industry, heat in household, cargo transportation, passenger transportation.
- Region 2: Hydro power plant; CHP on HFO and gas; Heat only boiler on liquid fuel and gas; Import of various fuels; Electricity and heat transport and distribution; Cargo and passenger transportation; Electricity import. Demand of electricity, heat in industry, heat in household, cargo transportation, passenger transportation.
- Region 3: Refinery; Thermal power plant on HFO and gas with possibility to install FGD; Nuclear power plant; Heat only boiler on liquid fuel and gas; Import of various fuels; Electricity and heat transport and distribution; Demand of electricity, heat and light oil products.

# Network of energy system in Region 1

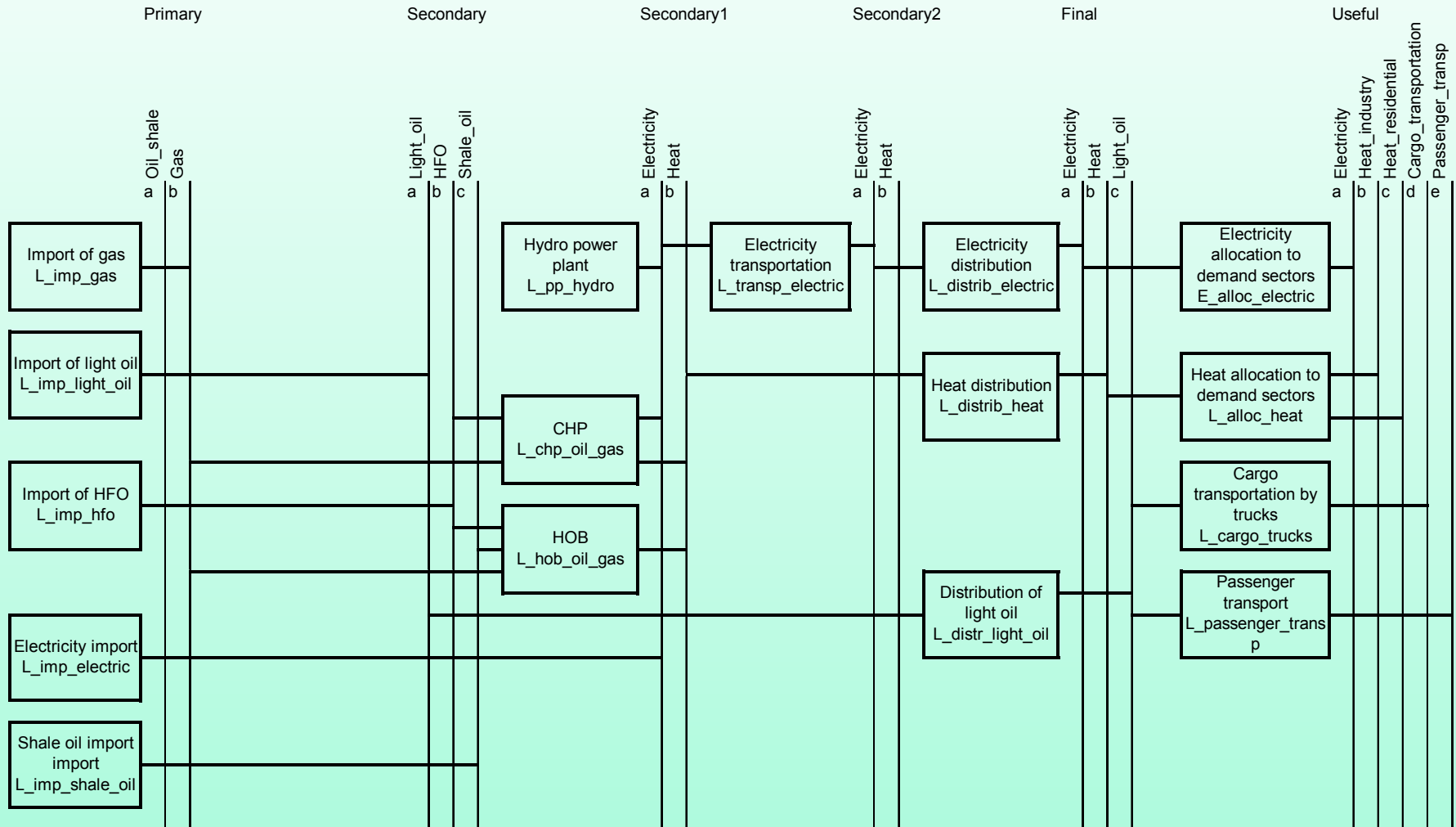
## Estonia





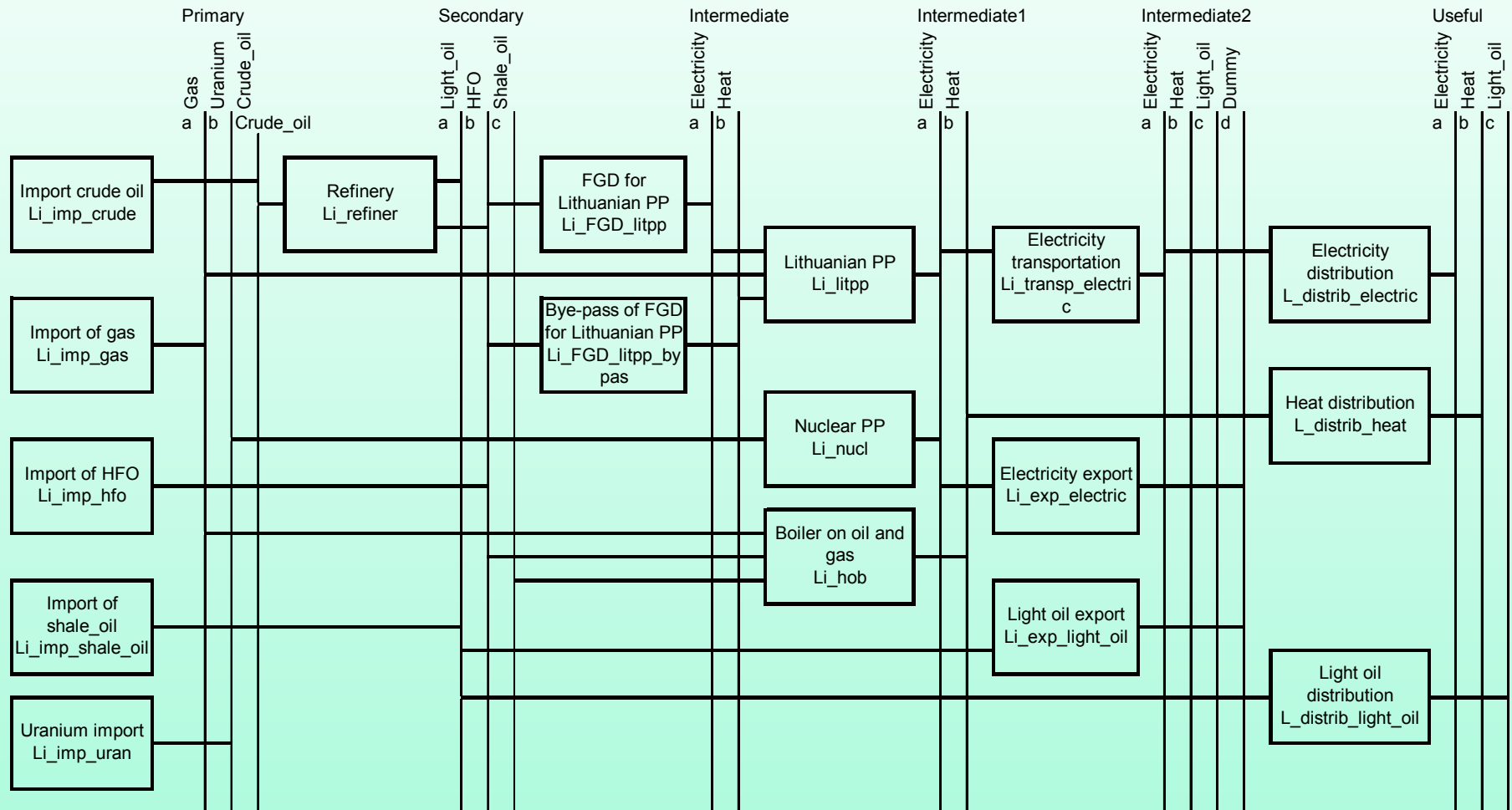
# Network of energy system in Region 2

## Latvia

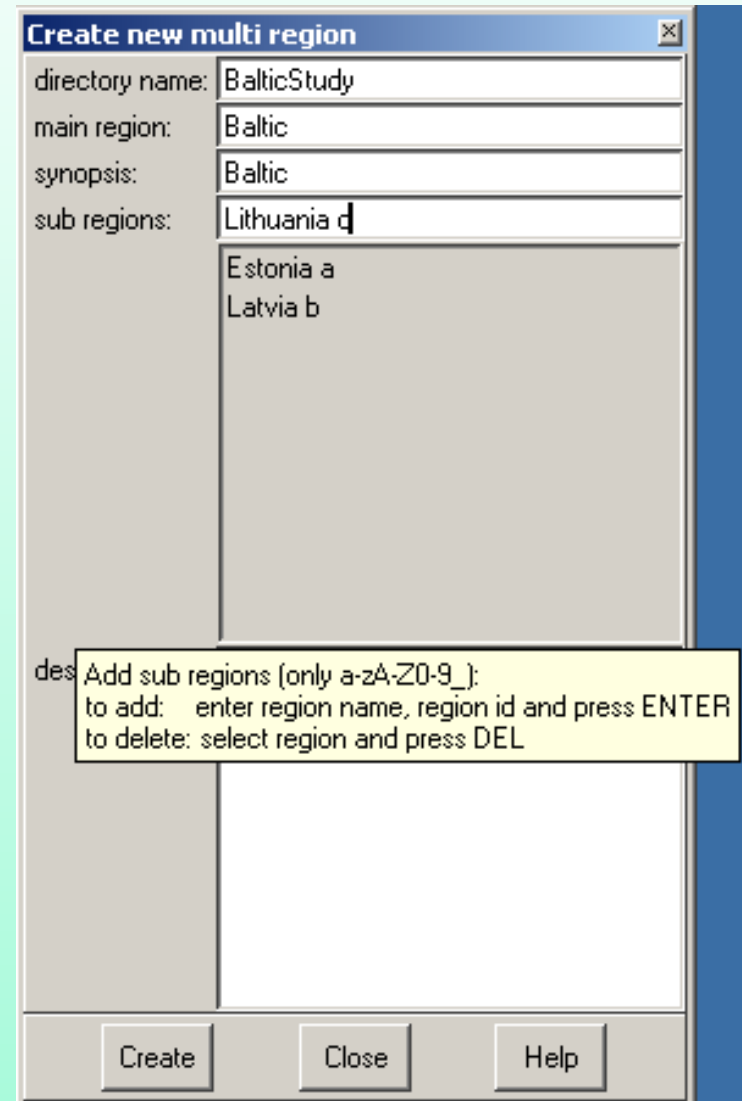
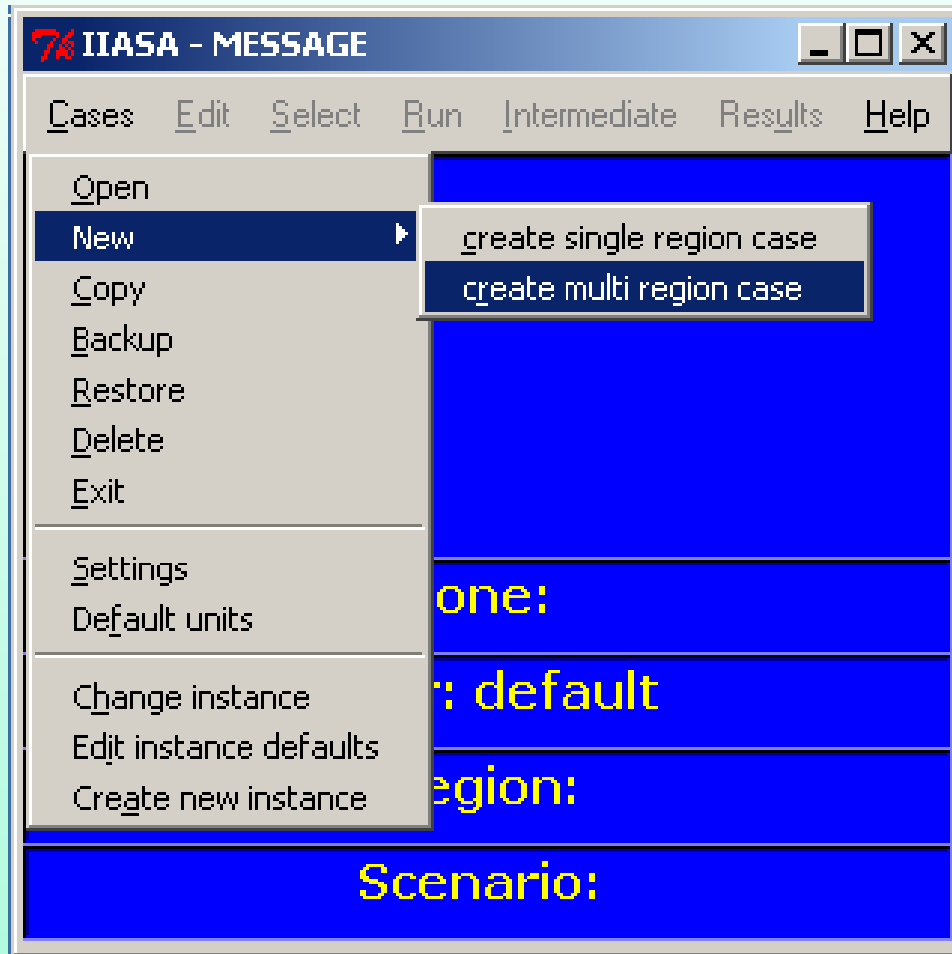


# Network of energy system in Region 3

## Lithuania



# Creation of Multi Regional model (1)



# Creation of Multi Regional model (2)

**Create new multi region**

directory name: BalticStudy

main region: Baltic

synopsis: Baltic

sub regions: Lithuania c  
Estonia a  
Latvia b  
Lithuania c

description: Multi Regional model of Baltic states

Create Close Help

**Create region Baltic**

main region: Baltic

synopsis: Baltic

tdb name: Baltic

description: Common module of Multi regional model

Ok

**Create region Estonia**

sub region: Estonia

synopsis: Estonia

tdb name: Baltic

description: Model of Estonian energy system

Case description

**Create region Latvia**

sub region: Latvia

synopsis: Latvia

tdb name: Baltic

description: Model of Latvian energy system

Ok

**Create region Lithuania**

sub region: Lithuania

synopsis: Lithuania

tdb name: Baltic

description: Lithuanian energy model

Ok Cancel

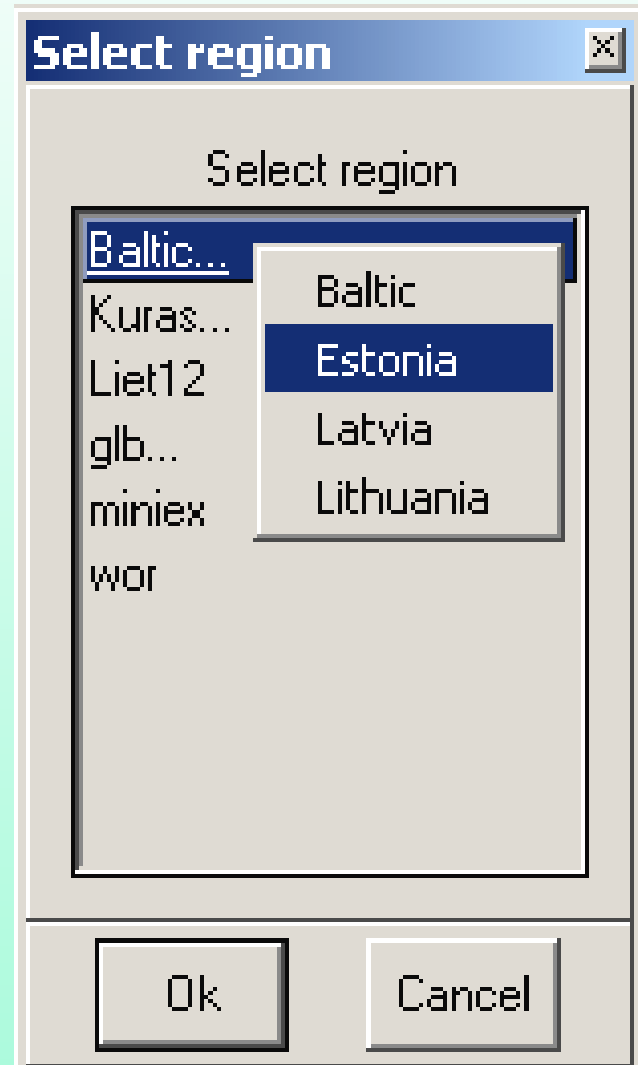
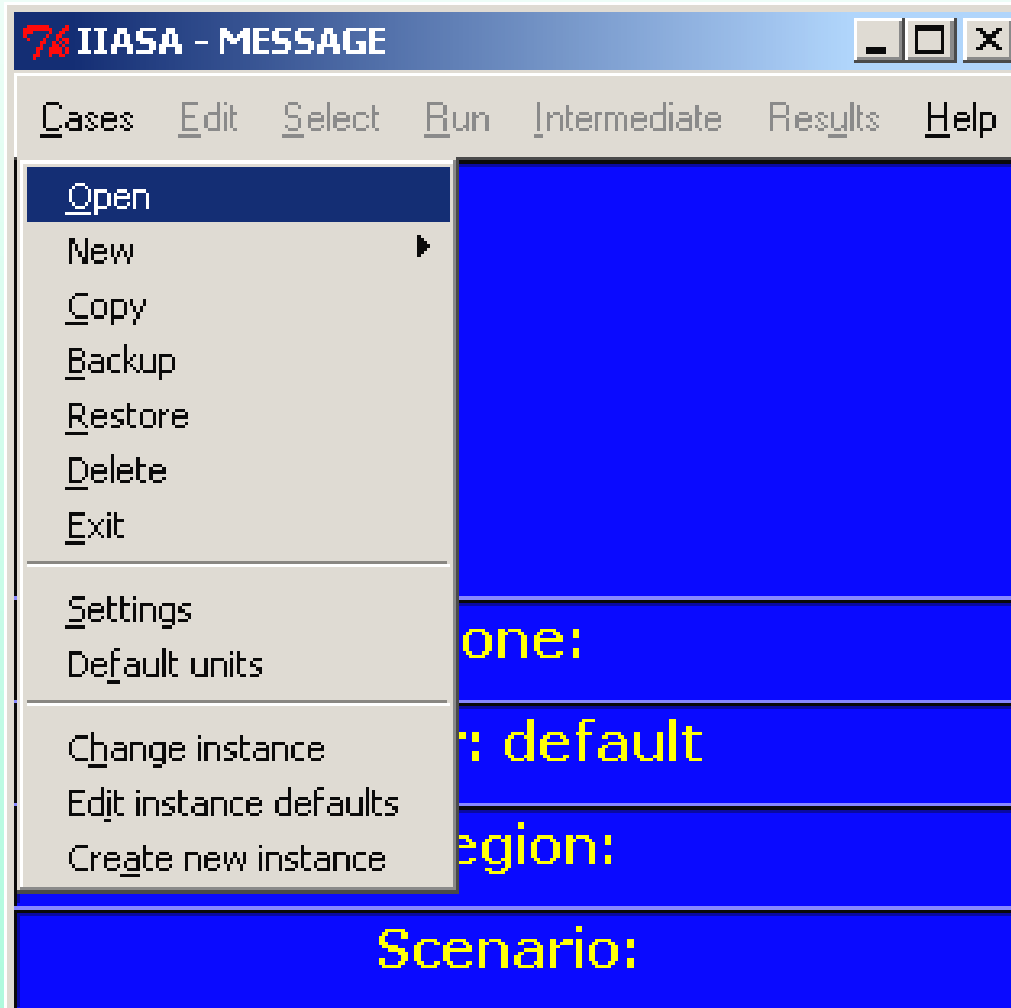
# Files of Multi Regional model

The image displays two overlapping Windows Explorer windows. The top window shows the directory 'C:\programs\message\models' with a list of folders including 'mms\_files', 'mod1', 'tdb', 'Course', 'test', 'data', 'run1', 'siluma1', 'dumprest', 'cvs\_save', 'co2\_allok', 'Vilniussil', 'Liet1', 'Liet1siluma1', 'LietRen0', 'Liet12\_1', 'Liet12EmTax', 'Liet12Inv80', 'Ren7', 'wor', 'miniex', 'Liet12', 'Liet1siluma', 'BalticStudy', and 'message.bat'. The bottom window shows the sub-directory 'C:\programs\message\models\BalticStudy' with a list of folders and files: 'Baltic', 'Estonia', 'Latvia', 'Lithuania', and 'description'. Red circles highlight the 'BalticStudy' folder in the main window and the 'Baltic' folder in the sub-window.

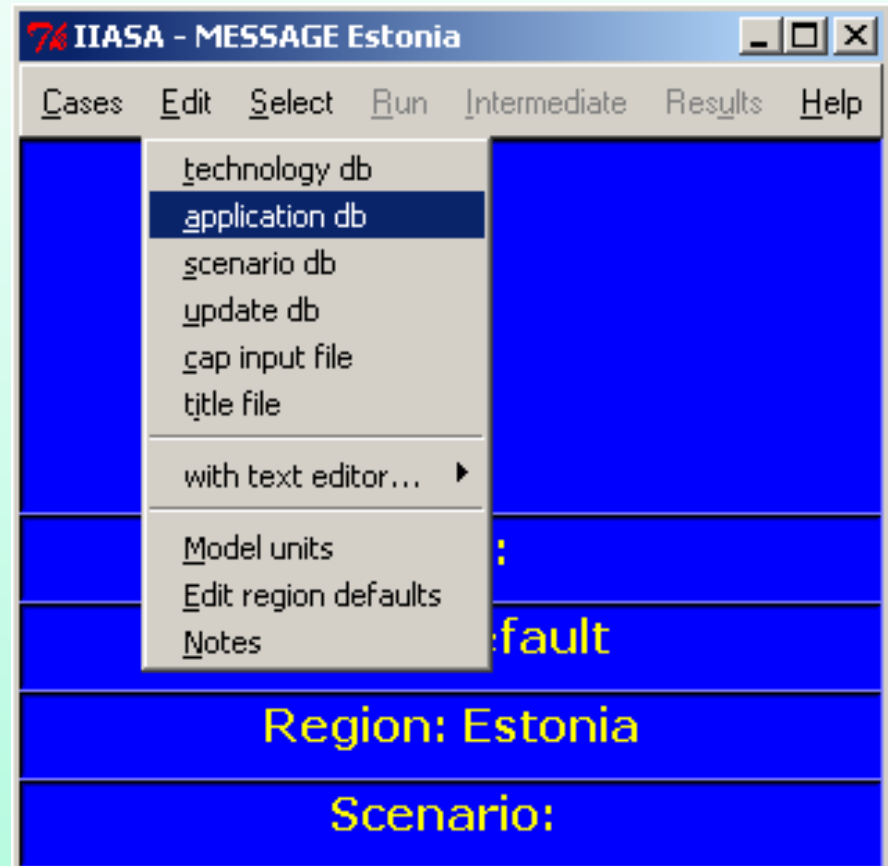
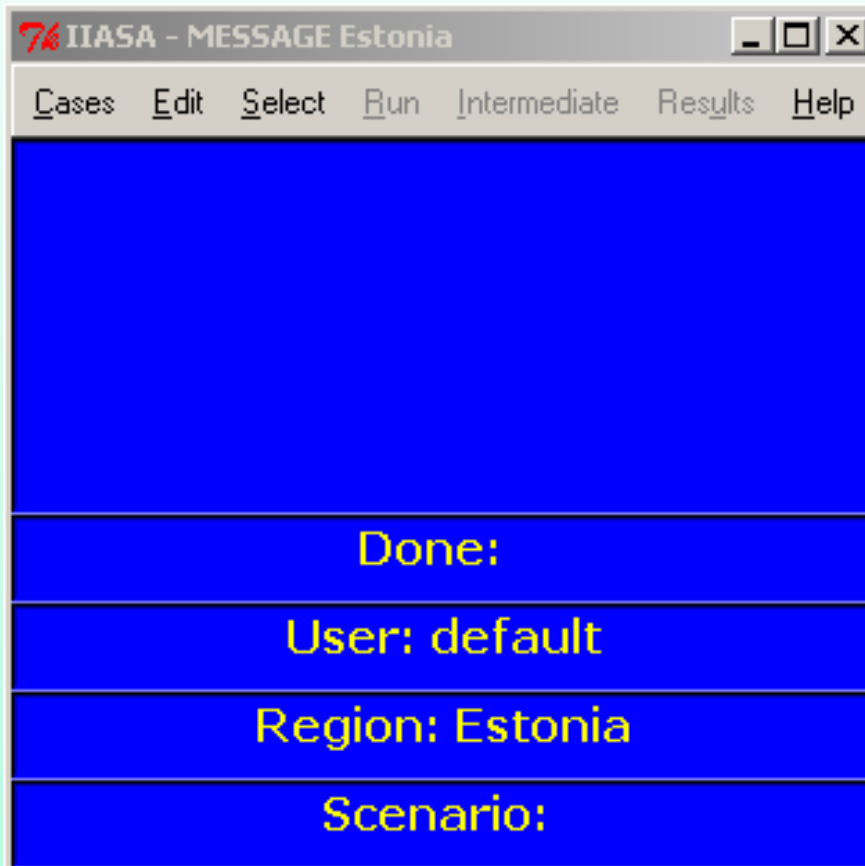
Name	Size	Type	Modified
mms_files		File Folder	2002.11.12 8:38 PM
mod1		File Folder	2002.11.12 8:38 PM
tdb		File Folder	2002.11.12 8:38 PM
Course		File Folder	2002.11.12 8:38 PM
test		File Folder	2002.11.12 8:38 PM
data		File Folder	2002.11.12 8:38 PM
run1		File Folder	2002.11.12 8:38 PM
siluma1		File Folder	2002.11.12 8:38 PM
dumprest		File Folder	2002.11.12 8:38 PM
cvs_save		File Folder	2002.11.12 8:38 PM
co2_allok		File Folder	2002.11.12 8:38 PM
Vilniussil		File Folder	2002.11.12 8:38 PM
Liet1		File Folder	2002.11.12 8:38 PM
Liet1siluma1		File Folder	2002.11.12 8:38 PM
LietRen0		File Folder	2002.11.12 8:38 PM
Liet12_1		File Folder	2002.11.12 8:38 PM
Liet12EmTax		File Folder	2002.11.12 8:38 PM
Liet12Inv80		File Folder	2002.11.12 8:38 PM
Ren7		File Folder	2002.11.12 8:38 PM
wor		File Folder	2002.11.12 8:38 PM
miniex		File Folder	2002.11.12 8:38 PM
Liet12		File Folder	2002.11.12 8:38 PM
Liet1siluma		File Folder	2003.10.21 10:46 PM
BalticStudy		File Folder	2003.10.27 10:57 PM
message.bat	1 KB	MS-DOS Batch File	2003.01.27 10:24 PM

Name	Size	Type	Modified
Baltic		File Folder	2003.10.27 10:57 PM
Estonia		File Folder	2003.10.27 10:57 PM
Latvia		File Folder	2003.10.27 10:57 PM
Lithuania		File Folder	2003.10.27 10:57 PM
description	1 KB	File	2003.09.19 1:25 PM

## Access to the created Multi Regional model



## Access of data base of Multi Regional model (1)



# Access of data base of Multi Regional model (2)

IIASA - MESSAGE Estonia adb

Screen

General

Load regions

Energyforms

Demands

Constraints

Technologies

Resources

Chain

### General data

country: Estonia

case name: Baltic

subregions: Estonia

drate: 4.0

years: 2000 2005 2010 2015 2020 2025

ntrun: 5    mixsw    n    actint    5    invint    5

### description

Estonia  
Model of Estonian energy system



# **Links between regions**

See Microsoft Excel schema.xls file sheet 2

# Preparation of multi regional scenario

The image shows two windows from the IIASA MESSAGE software. The left window displays the 'Scenario' menu with 'Copy Scenario' selected. The right window shows the 'copy from' field set to 'adb - Default scenario', 'new scen' set to 'b', and 'synopsis' set to 'multiregional'. The 'description' field contains the text: 'Multiregional model of energy systems of Baltic states'. A dialog box in the foreground asks 'Make copy for all subregions?' with 'Yes' and 'No' buttons. The 'Ok' and 'Cancel' buttons are visible at the bottom right of the right window.

**IIASA - MESSAGE Baltic [Estonia Latvia Li...]**

Cases Edit Select Run Intermediate Results Help

Open  
Scenario ▶ Copy Scenario  
Save New Scenario  
Close Delete Scenario  
Exit Update defscen

Settings  
Default units

Change instance  
Edit instance defaults  
Create new instance

Region: Baltic  
Scenario:

**IIASA - MESSAGE Baltic [Estonia La...]**

copy from: adb - Default scenario  
new scen: b  
synopsis: multiregional  
description: Multiregional model of energy systems of Baltic states

Ok Cancel

**IIASA - MESSAGE Baltic [Esto...]**

Make copy for all subregions?

Yes No

# Introduction of interregional technologies (1)

The image displays the IIASA MESSAGE software interface with three overlapping dialog boxes. The main window, titled "IIASA - MESSAGE", has a menu bar with "Cases", "Edit", "Select", "Run", "Intermediate", "Results", and "Help". The background is a blue grid. A "Select region" dialog box is open, showing a list of regions: Baltic, Kura, Liet1, glb..., minie, and wor. A sub-menu is open over "Latvia", listing "Baltic", "Estonia", "Latvia", and "Lithuania". A "Select scenarios" dialog box is also open, showing a list with "b multiregional" selected. A third dialog box, titled "IIASA - MESSAGE Latvia", is open over the main window, showing a menu with options: "technology db", "application db", "scenario db" (highlighted), "update db", "cap input file", "title file", "with text editor...", "Model units", "Edit region defaults", and "Notes". Below the menu, the text "Region: Latvia" and "Scenario:" is visible.

Access of scenario DB of the region where interregional technology delivers energy from other region

# Introduction of interregional technologies (2)

IIASA - MESSAGE Latvia Idb b

Screen

**Technologies**

input: all    has inv:  all    yes    no

output: all    operator:  and    or

relations: all    technologies: L\_imp\_electr\_fr\_Est    Chain

Add from TDB    Add from ADB    New    Del

name (re):

alt a

**single entries**

Name	Unit	Value
main input: Electricity/Secondary2/E:	MWyr	1.
main output: Electricity/Secondary1		1
var costs	Unit	
hist. act.	Unit	

**multiple entries**

abda	alags	bdc		
consa	inp	mpa	outp	softlims

**Right click**

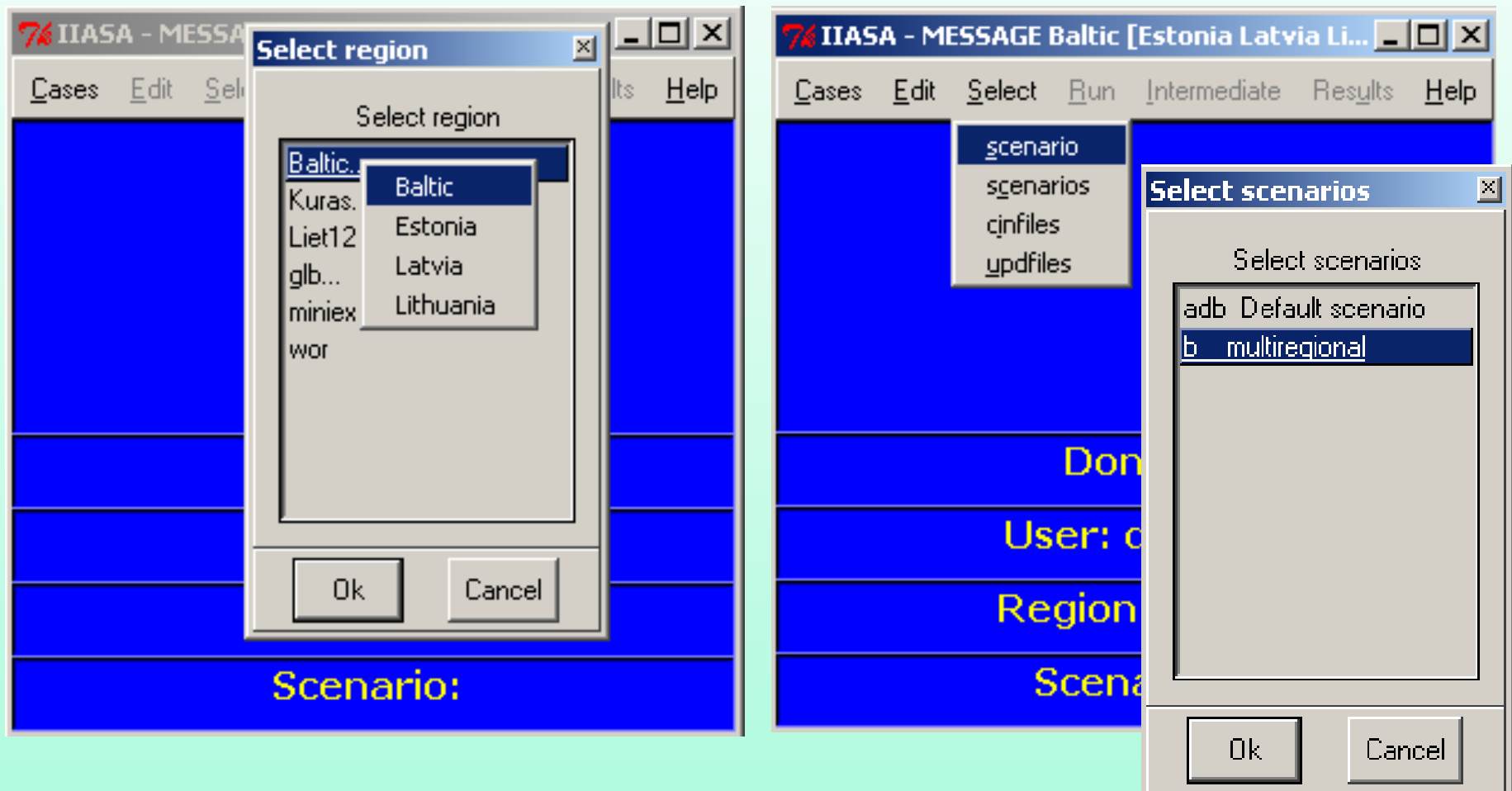
**Left click**

Latvia  
Estonia  
currreg  
Baltic  
Lithuania

Useful  
Final  
Secondary2  
Secondary1  
Secondary  
Primary  
Resources

Electricity  
Heat

## Run of the Multi Regional model (1)



## Run of the Multi Regional model (2)

```
MESSAGE
c:/programs/message/message_bin/mxg -f mxgerr -o osl -v -n no -s b Baltic
tcmd c:\programs\message\message_bin\sh -c "c:/programs/message/message_bin/mxg
-f mxgerr -o osl -v -n no -s b Baltic"
c:/programs/message/models/BalticStudy/Baltic
Generating region Baltic
Generating region Estonia
Generating region Latvia
Generating region Lithuania
Preparing matrix
Writing matrix
rows: 513
cols: 376
elms: 2674
rhs: 224
rngs: 0
bnds: 16
time for sorting rows: 0 sec
time for sorting columns: 0 sec
time for writing columns: 0 sec
time for writing rhs: 0 sec
time for writing ranges: 0 sec
time for writing bounds: 0 sec
Matrixgenerator done
mxg done
```

IIASA - MESSAGE Baltic [Estonia Latvia Li...]

Cases Edit Select Run Intermediate Results Help

Options... ▸

- all
- mxg**
- opt
- cap

Done:

User: default

Region: Baltic

Scenario: b

# Review of results of Multi Regional model

74 Interactive results

Load/wS Load/nS Save Quit Take balance Take curve Clear Graph Table

### Graph definitions

title:   
file:   
year:  graph:  fill:  type:

### Case/scenario selection

case:  scen:  sort:

### Curves selection

type:   
Bal:   
level:

(click 'Take curve' to select)  
item:  aspect:  fuel:   
(click 'Take balance' to select)  
fuel:  pr/con:  tec:

Selected curves
