

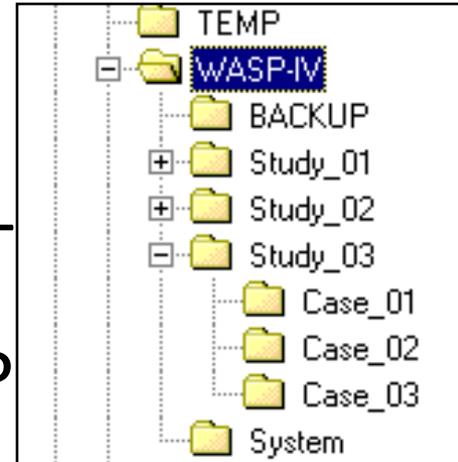
WASP-IV Installation and User Interface

WASP Software Installation

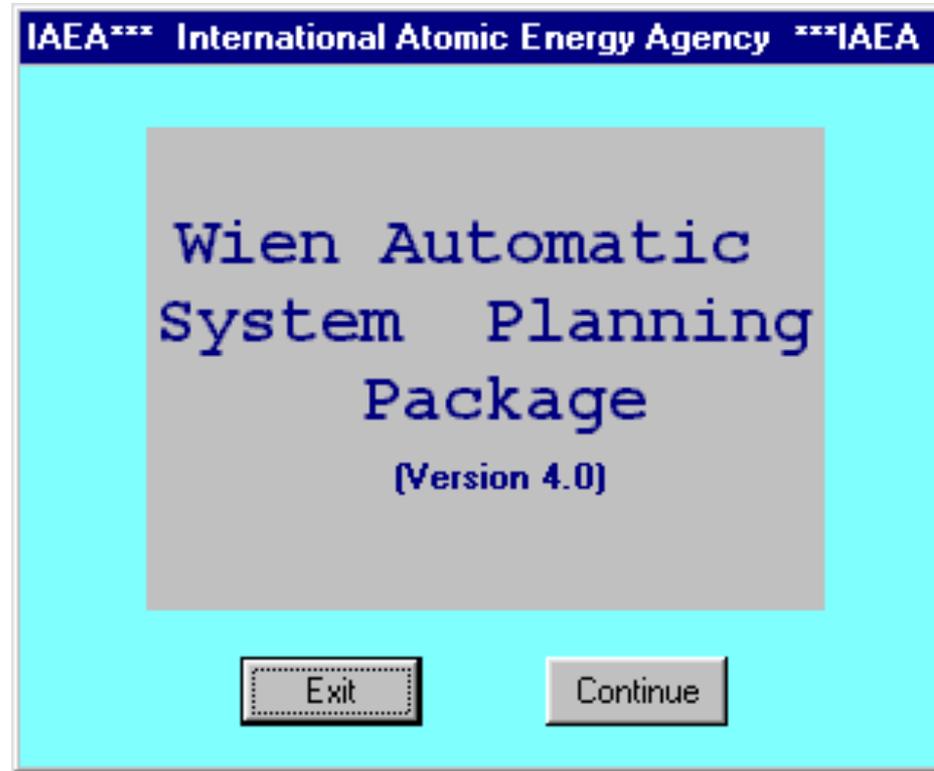
- Sign on to your computer with Administrator rights
- Open “WASP-IV Software” folder
- Click “WASP-IV_Setup” icon
- Follow settings to install software in folder C:\WASP-IV
- Copy Varsys.exe file from the \WASP-IV Software folder to replace the file “C:\WASP-IV\System\ Varsys.exe”
- If have trouble running under Windows 7 or 8, see additional tips in \WASP-IV\Fixes folder

WASP-IV File System

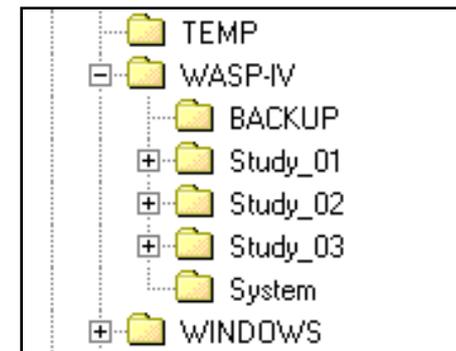
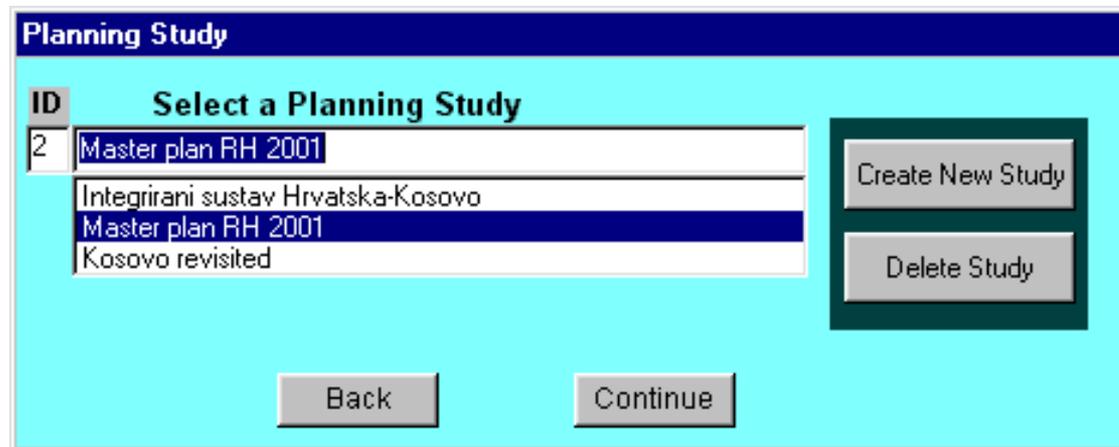
- All files used to run WASP-IV are stored in a Case Folder
- Input data files have the extension .DAT
- Results/output files have extension .REP
- Intermediate information/results are stored in files with extension .BIN and .WRK
- Some of modules produce files with extension .DBG for debugging purposes.



WASP-IV Opening Screen

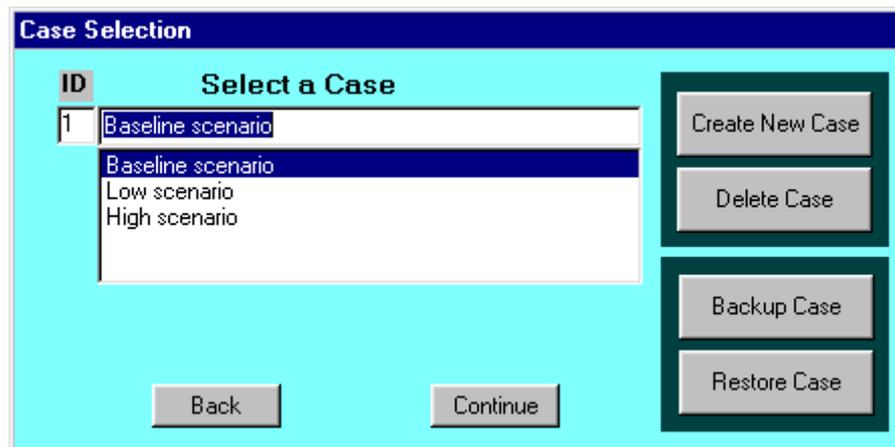
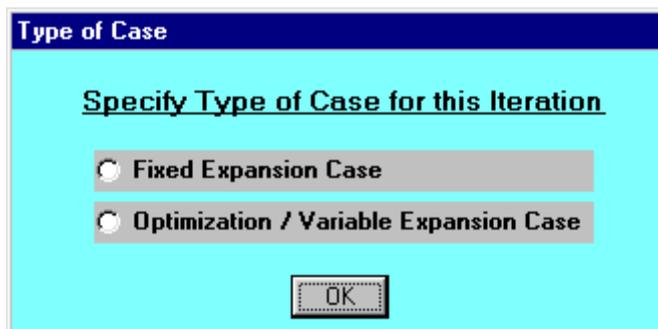


Study Selection Window

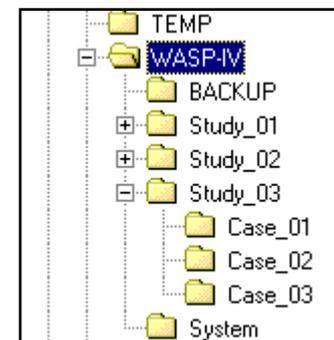


- Window for manipulating studies (opening, deleting, creating)
- Each study is assigned a separate folder in C:\WASP-IV, named *Study_n*

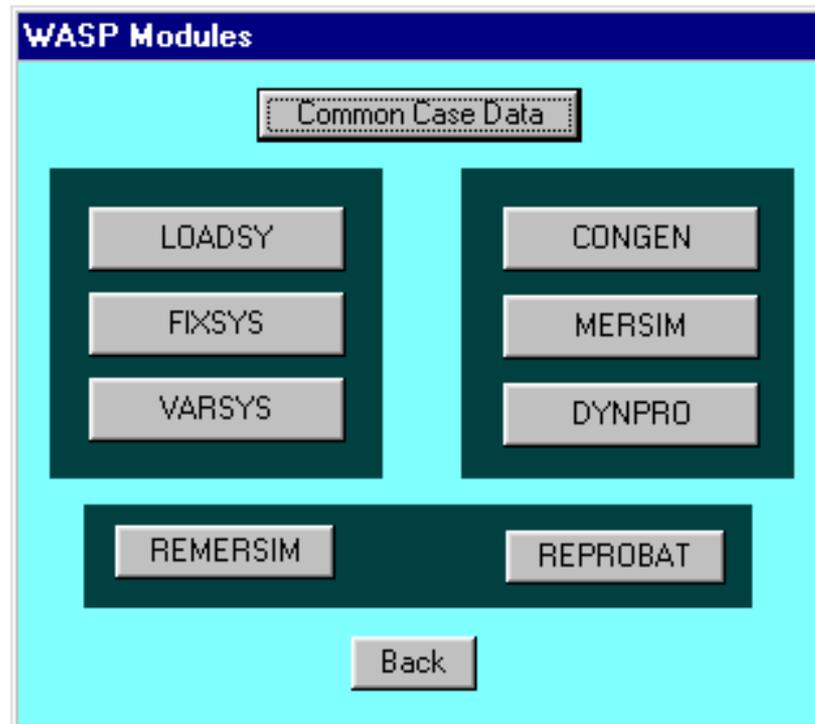
Case Selection Window



- Multiple cases can be defined within a single study
- Each case is assigned a separate subfolder within the corresponding study folder, named *Case_n*
- Cases can be opened, created (based on previous cases), deleted, backed up (in form of packed archive files) or restored



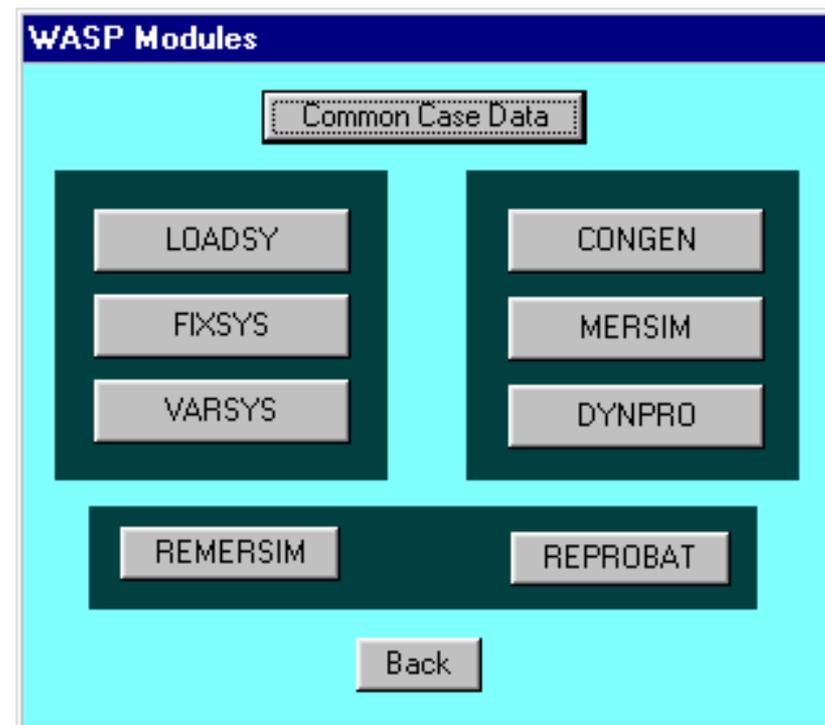
Module Selection Window



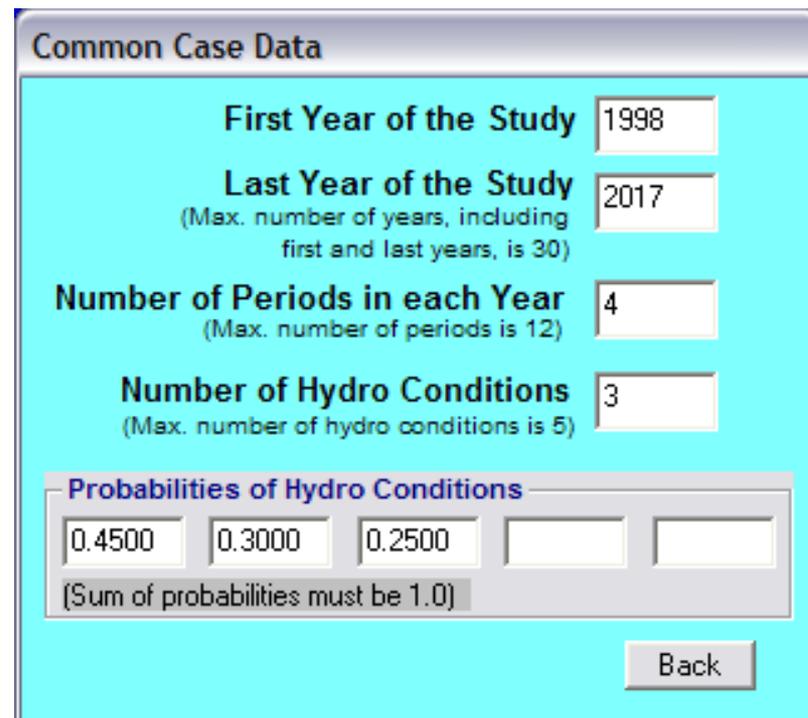
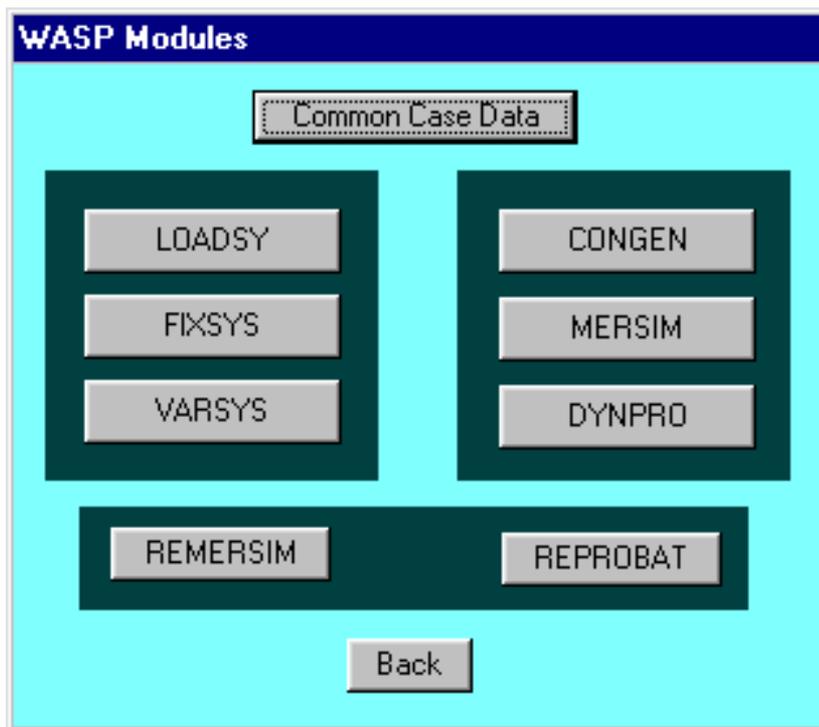
- Modules are entered simply by clicking the appropriate button

Execution of WASP-IV

- WASP–IV consists of several modules.
- The first three modules (LOADSY, FIXSYS and VARSYS) can be executed in any order.
- Fourth module (CONGEN) only after succesful execution of first three modules.
- After CONGEN run, follows MERSIM and than DYNPRO module.
- Cycle CONGEN-MERSIM-DYNPRO usually needs a number of iteration for identifying an optimal solution

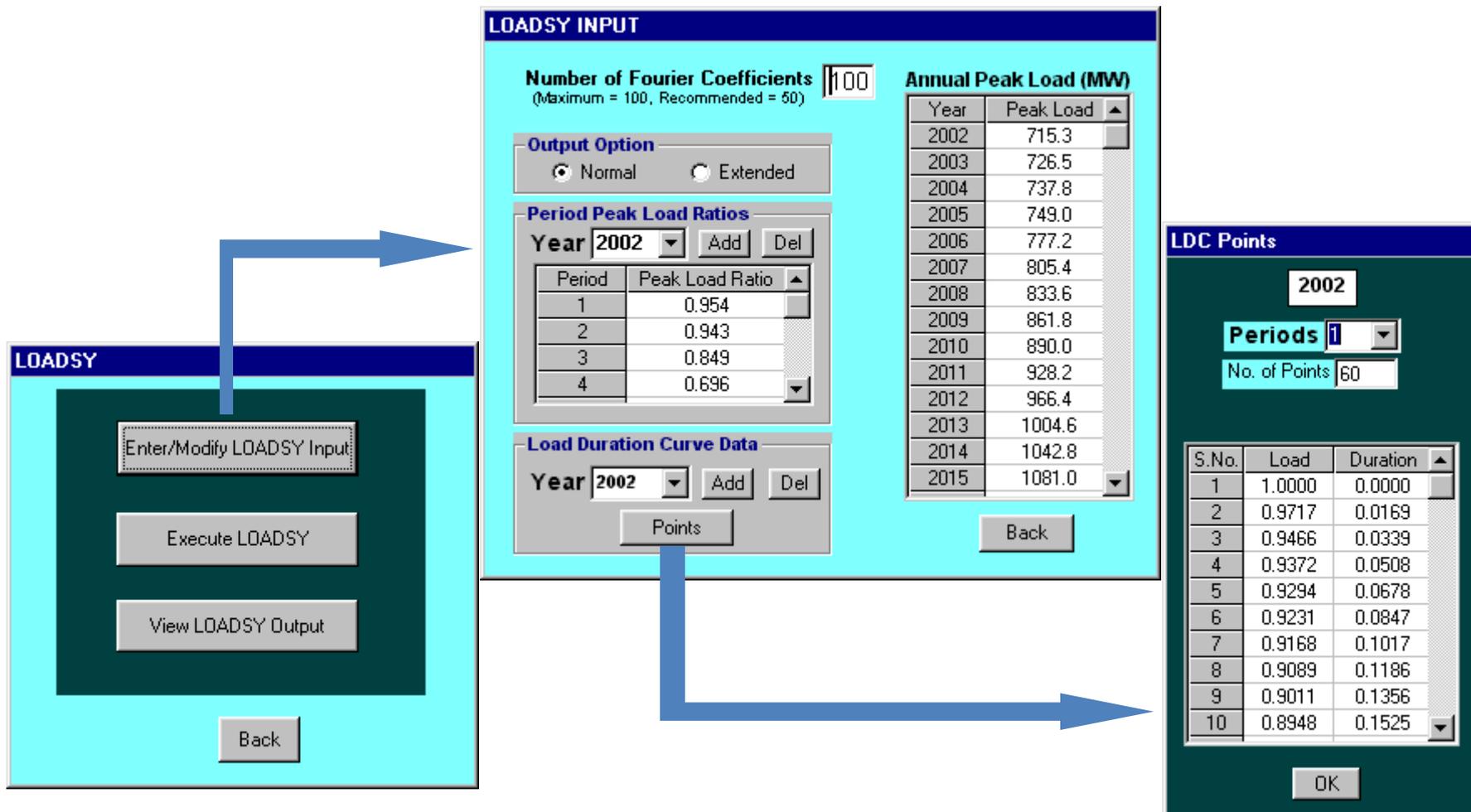


Common Case Data Window



- Used for the input of case- level parameters

LOADSY Windows



FIXSYS Windows

FIXSYS

Enter/Modify FIXSYS Input

Execute FIXSYS

View FIXSYS Output

Back

FIXSYS_Additions and Retirements

Additions and Retirements of Thermal Power Plants

| Thermal Plants | 2010 | 2011 | 2012 |
|----------------|------|------|------|
| TT05 | | | |
| TES1 | | -1 | |
| TES2 | | | |
| PT05 | | | -2 |
| TZ3K | | -1 | |

For Additions type "+" and no. of units
For Retirements type "-" and no. of units

Back

FIXSYS_Input

Thermal Plants

KRS1
KRS1
PL01
PL02

Add Plant
Remove Plant

Fuel Types

| Fuel # | Name | Short Description |
|--------|------|-------------------|
| 0 | URAN | NUKLEARNA ELEKTR |
| 1 | UGDO | UGLJEN DOMACI |
| 2 | UGUV | UGLJEN UVOZNI |
| 3 | NAFU | NAFTA UVOZNA |

(Valid fuel ID's are 0,1,2.....9 to be given in sequence)

Characteristics of Thermal Plant KRS1

| | Value |
|--|-------|
| No. of Units | 1 |
| Min. operating level in each year (MW) | 250. |
| Max. generating capacity in each year (MW) | 337. |
| Fuel Type | 0 |
| Heat rate at min. operating level (kcal/kWh) | 2701. |

Additions/Retirements of Thermal Plants

No. of Group Limits (max. 5): 0

Name of Pollutant I (default SO2): SO2

Name of Pollutant II (default NOx): NOx

LOLP penalty for group limits: 0

ENS penalty for group limits: 0

Emissions
Group Limits

Hydro/Pump Storage Plants
Back

FIXSYS_Hydro Plants

| Type | Code Name | Description of Hydro Plant Type | O and M Cost (\$/kW-month) |
|------|-----------|---------------------------------|----------------------------|
| A | HYD1 | HYDRO PLANTS GROUP 1 | .7 |
| B | HYD2 | HYDRO PLANTS GROUP 2 | .55 |

Pump Storage Plants
Back

Hydro Plants

Hydro Plant: VINO Type: HYD2 Year of Operation 2001

Installed Capacity (MW) 84.4 Storage Capacity (GWh) 62.5

| Period | Inflow Energy (GWh) | Min. Generation (GWh) | Avg. Capacity (MW) |
|--------|---------------------|-----------------------|--------------------|
| 1 | 18.9 | 0. | 84.4 |
| 2 | 20.2 | 0. | 84.4 |
| 3 | 12.5 | 0. | 84.4 |
| 4 | 8.2 | 0. | 84.4 |

Hydro Cond. 1, 2, 3, 4, 5

Add Plant
Remove Plant

VARSYS Windows

VARSYS

Enter/Modify VARSYS Input

Execute VARSYS

VARSYS Output

Back

VARSYS_Input

Candidate Thermal

Hydro/Pump
Storage Plants

Characteristics of Thermal Plant: P100

| | Value |
|--|-------|
| Min. operating level (MW) | 35. |
| Max. generating capacity (MW) | 100. |
| Fuel Type (index) | 7 |
| Heat rate at min. operating level (kcal/kWh) | 1615. |
| Avg. incremental heat rate (kcal/kWh) | 1615. |

No. of Group Limits (max. 5):
(must be same as used in FIXSYS)

Name of Pollutant I (default SO2):

Name of Pollutant II (default NOx):

CONGEN Windows

CONGEN

Enter/Modify CONGEN Input

Execute CONGEN

View CONGEN Output

Back

CONGEN_Optimization Expansion Analysis Data

Print Fixsys and Varsys Information?

Year **2013** Critical Hydro Condition **3** Reserve Margins Minimum Maximum

Candidate Plants

P100 P200 P300 U350 U500 N660 N715 N980 HYD1

Previous Year: **2012** No of units of each candidate plant

Minimum Number

Tunnel Width

Current Year: **2013** No of units of each candidate plant

Minimum Number

Tunnel Width

Previous Best Solution Year **2013**

No. of Units

Back

MERSIM Windows

MERSIM

Enter/Modify MERSIM Input

Execute MERSIM

View MERSIM Output

Back

MERSIM Input Data

Print Fixsys and Varsys Information?

Pump Storage Operation
 Economic Forced

Group Limitation Calculations
 Optimal Solution Feasible Solution

Base Year

No. of Fourier Co-efficients

Spinning Reserves Requirements
 Variable Constant

Output of Simulation Details
 Minimum Intermediate Maximum

Loading Order Instructions
 Basic Economic LO User Specified LO

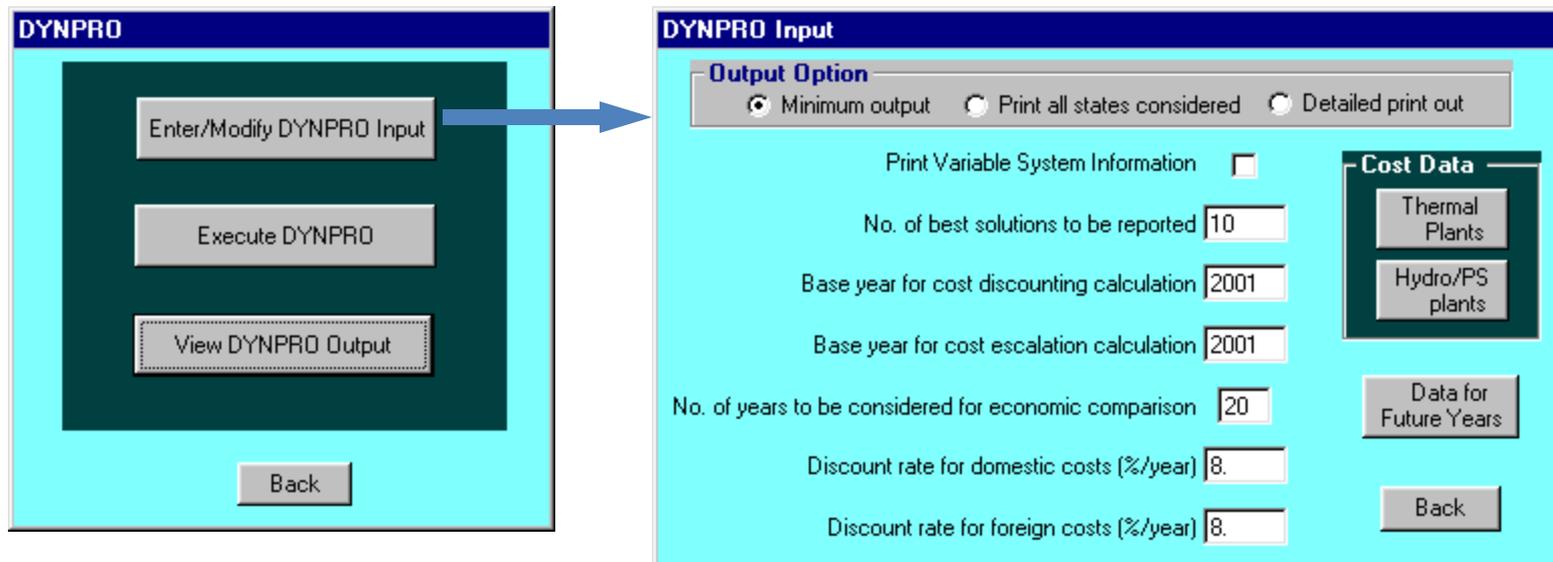
Spinning Reserve Contribution by HYDRO
 SPNVAL Type A Type B
 PEAKF

Loading Order Calculations
 Plant by Plant Unit by Unit

Change Data for Future Years

Back

DYNPRO Windows



Module Outputs

- Outputs are produced as text files with the extension *.REP*

```

fixsys.rep - WordPad
File Edit View Insert Format Help
3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

      WASP COMPUTER PROGRAM PACKAGE

      FIXSYS MODULE

      CASE STUDY

      Referentni scenarij 2001-2020

*****
*           THERMAL PLANTS           *
*   TYPE  NAME  DESCRIPTION           *
*   *     *     *                     *
*   0   URAN  NUKLEARNA ELEKTRANA     *
*   1   UGDO  UGLJEN DOMACI           *
*   2   UGUV  UGLJEN UVOZNI           *
*   3   NAFU  NAFTA UVOZNA            *
*   4   NAFD  NAFTA DOMACA            *
*   5   PLRS  PLIN IZ RUSIJE          *
*   6   NAPL  NAFTA I PLIN ZA TOPL    *
*   7   PLIT  PLIN IZ ITALIJE         *
*   8   URN1  NUC.GOR. ZA LWR I AP    *
*   9   URN2  NUCL. GOR. ZA CANDU     *
*   *     *     *                     *
*****
For Help, press F1
NUM
  
```

```

dynpro1.rep - WordPad
File Edit View Insert Format Help
4 5 6 7 8 9 10 11 12 13 14 15

      WASP COMPUTER PROGRAM PACKAGE

      DYNPRO MODULE

      CASE STUDY

      Referentni scenarij 2001-2020

*****
*           LIST OF VAR. EXPAN. CANDIDATES           *
*   *     *     *                     *
*           THERMAL PLANTS           *
*   SEQU. NUMBER  NAME                 *
*   *             *                     *
*   1             P100                  *
*   2             P200                  *
*   3             P300                  *
*   4             U350                  *
*   5             U500                  *
*   6             N660                  *
*   7             N715                  *
*   *             *                     *
*****
For Help, press F1
NUM
  
```

Thank you!

Any questions?