

***Use of modeFRONTIER
nested projects for
optimization of fuel cell
operation***

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fuel cell vehicles

- Emits only heat and water
- Provide driving range and fueling time of gas powered vehicles
- Powered by hydrogen and air



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operating conditions

Current	40	90	150	240	300	400
Power						
H2 pressure						
H2 humidity						
H2 stoic						
Air pressure						
Air humidity						
Air stoic						



nested projects

- Top level provides the batch function
- Lower level provides the optimization



procedure for nested projects

- Use modeFrontier node to call another mF project
- Scalar buffer to return all values of each variable
- Add scalar buffer for optimum ID to choose best value of objective
- In output values for mF node, click on binoculars and select ID for the maximum under parameter definitions and not unfeasible under filter (! Is not).
- In calculator node, add expressions for each output variable as shown
- In lower level project, in DOE node, select required number of runs. Then delete and save.
- After any changes to nested project, must click on binoculars in one variable (in top level project) and select refresh.



tips for nested projects

- If error occurs that says cannot find file, open nested project and go to scheduler, pick another algorithm, then back to original algorithm. Save, close, go back to top level project and refresh as described above
- Can view lower level results in mFBATCH directory inside the directory where the project resides



tips for nested projects

- Always do introspection at top level after making changes in lower level.
- Delete mfBatch folders whenever possible to save space on computer
- If top level cannot find lower level .des file, try opening lower level and reselecting DOE then delete then save. If the error persists, select a different type of optimizer, then go back to original choice.



outcome

- Optimum pressures, flow rates and humidities for all loads determined
- Process can be quickly and easily repeated when design is updated
 - Approx 1000 iterations
 - All results real (not virtual)
 - Runs overnight

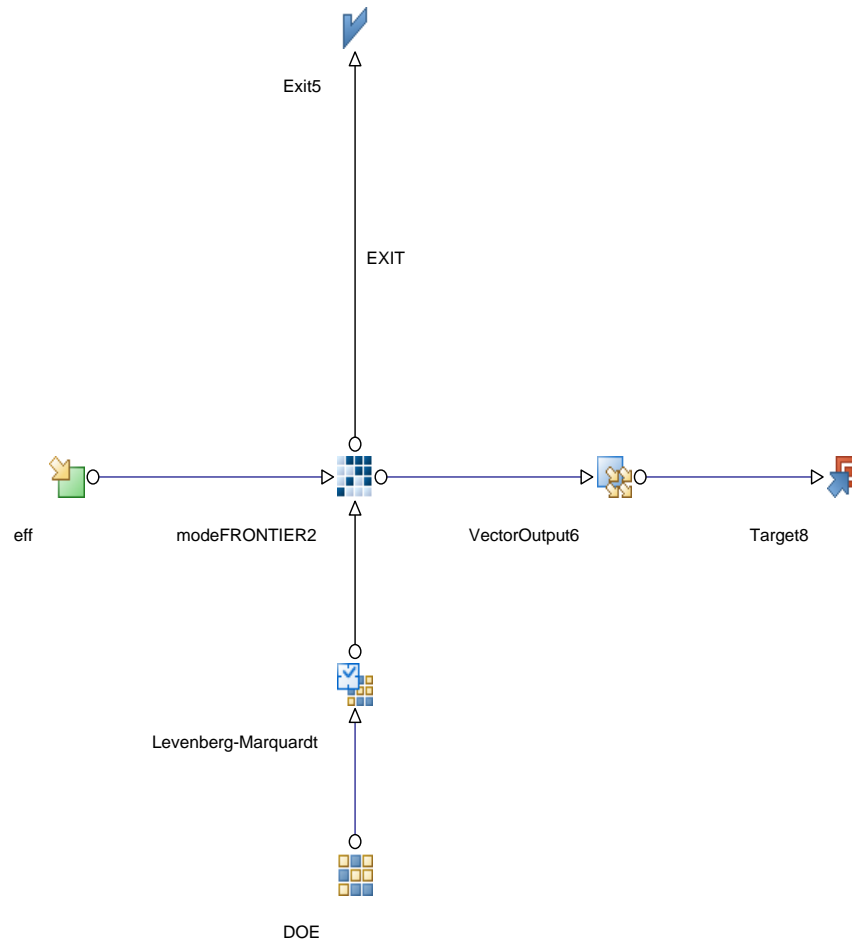


nested project for model calibration

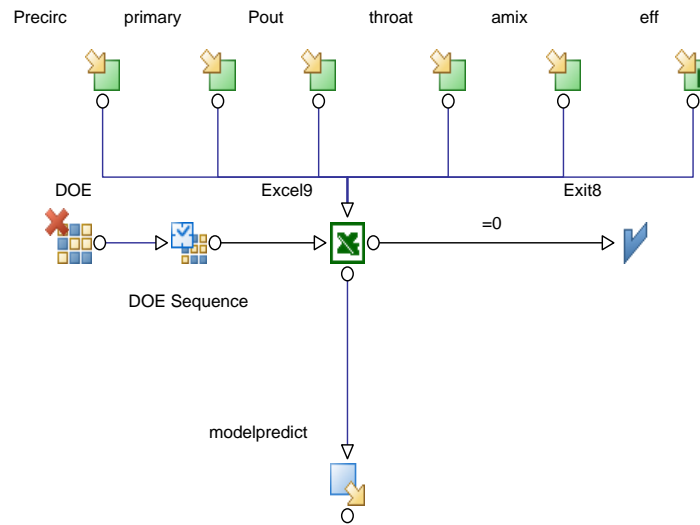
- Use nested project to determine unknown parameter (efficiency) given test data
- High level project determines parameter values
- Lower level project runs through DOE that duplicates the experimental data



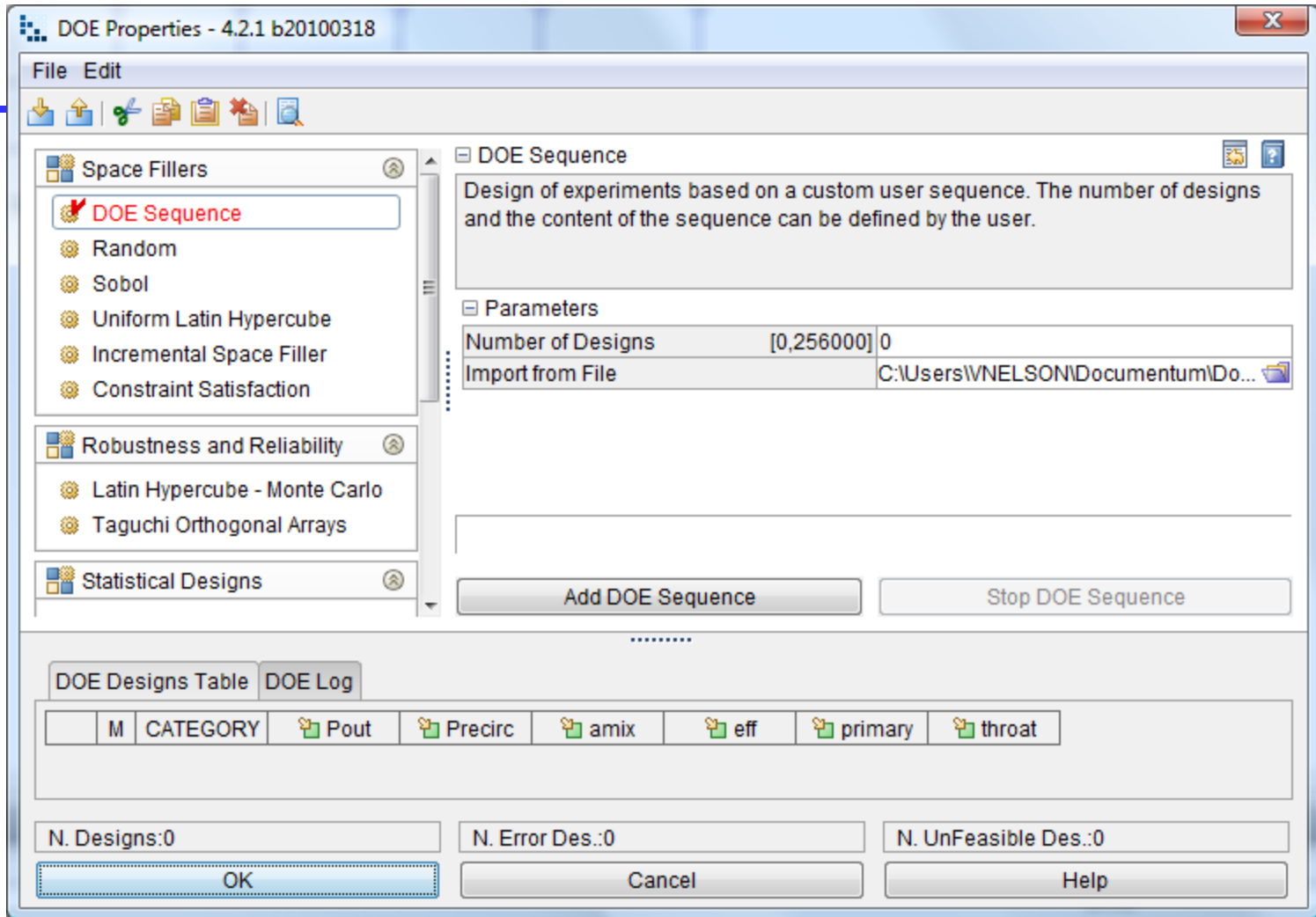
high level project



lower level project



DOE node









vector output variable

Vector Output Variable Properties - 4.2.1 b20100318

Vector Output Variable Properties

Name	VectorOutput6
Description	
Size	18

Outputs Variables Connectors

  |    

	Description	Format
0		0.0000E0
1		0.0000E0
2		0.0000E0
3		0.0000E0
4		0.0000E0
5		0.0000E0
6		0.0000E0
7		0.0000E0
8		0.0000E0
9		0.0000E0
10		0.0000E0
11		0.0000E0
12		0.0000E0
13		0.0000E0
14		0.0000E0
15		0.0000E0
16		0.0000E0
17		0.0000E0

OK Cancel Help



target node

The screenshot shows a dialog box titled "Target Objective Properties - 4.2.1 b20100318". It contains two main sections: "Target Objective Properties" and "Data Input Connector".

Target Objective Properties	
Name	Target8
Description	
Enabled	<input checked="" type="checkbox"/>
Format	0.0000E0

Data Input Connector	
VectorOutput6	[0.001754472, 0.001798253, 0.001688006, 0.002523896, 0.00244446, 0.0...

At the bottom of the dialog are three buttons: "OK", "Cancel", and "Help".

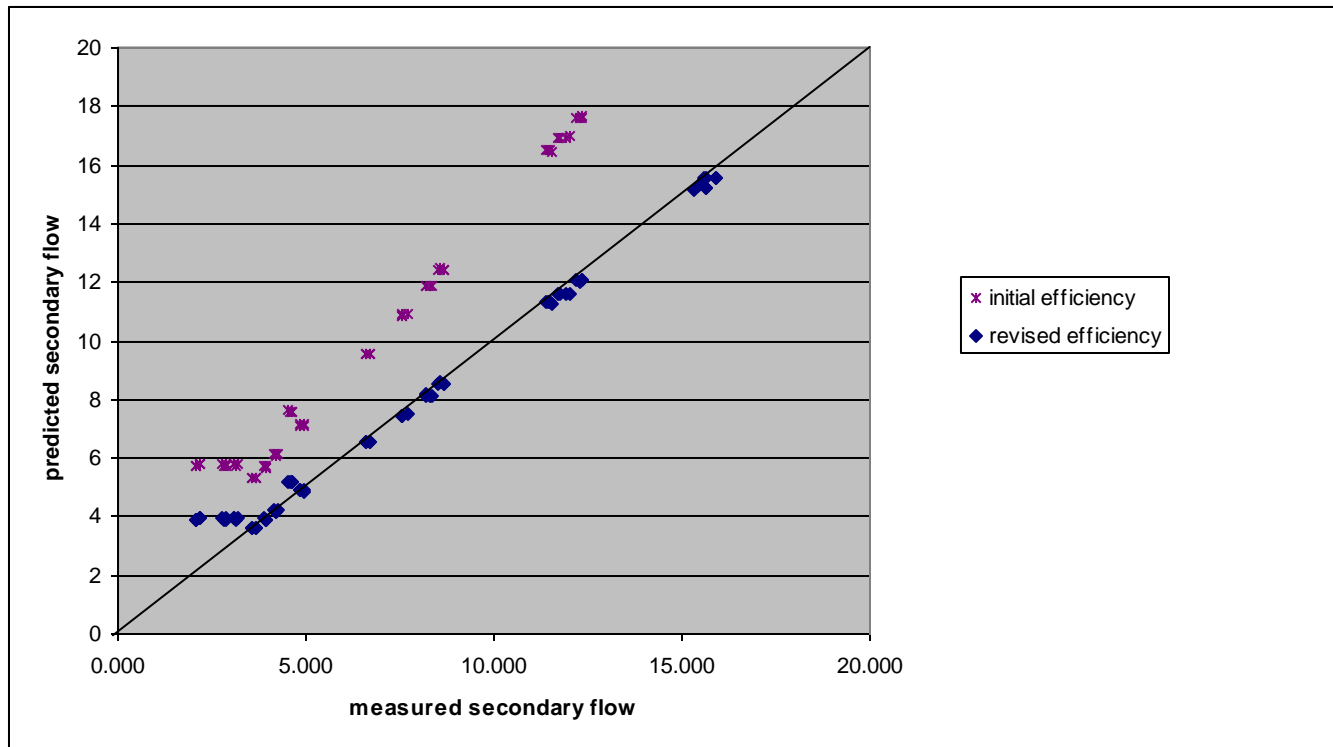


outcome

- Best value for efficiency determined
- Optimization is quick
 - Approx 50 iterations
 - All results real and not virtual
 - Takes approx 2 hours to run

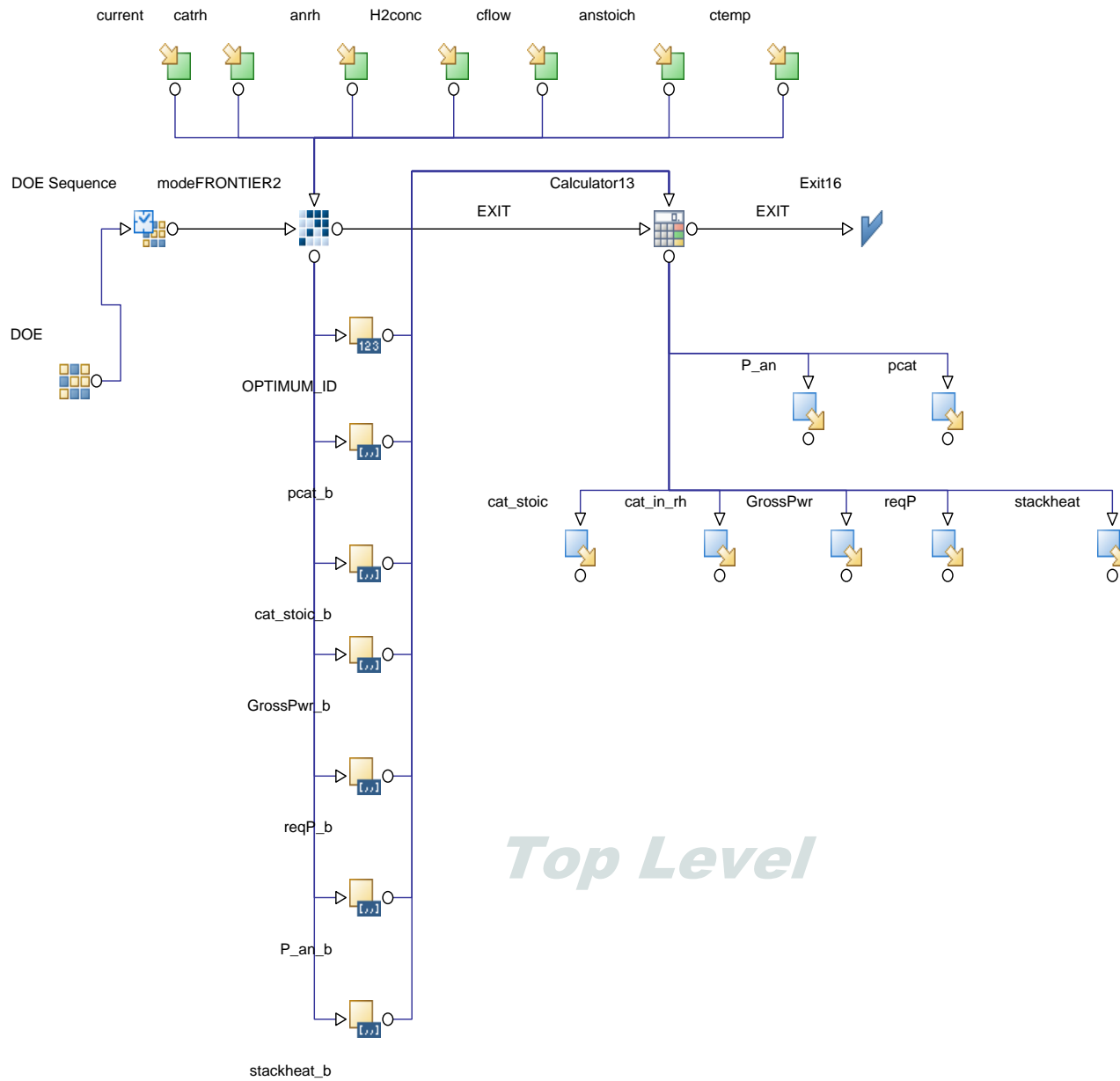


test and actual data



Questions?





ModeFrontier Node

modeFRONTIER Batch Properties - 1.0 b20100318

Introspection of : C:\Users\VN...

Table: Design Table

Variables

- Current
- H2con
- P_an
- an_stoic
- cat_stoic
- cath
- cflow
- ctemp
- pcat

Selected parameter: Design Table/maxnet

Parameter Definitions

Selection by: ID for the maxim...

Filter settings

Filter: !\$IS_UNFEASIB...

Batch Properties

modeFRONTIER2

change number of iterations stack model to 50

Project: C:\Users\WNELSON\Documentum\Documents\fuelcell\models\CET\topcond_RS1.prj

Batch Advanced Properties

Batch Run Option

Connector

Process Output Connector

Calculator13: EXIT

Data Output Connector

GrossPwr_b	GrossPwr[vector]
OPTIMUM_ID	maxnet[jdAtMax]
P_an_b	Pan[vector]
cat_stoic_b	cat_stoic[vector]
pcat_b	pcat[vector]
reqP_b	reqP[vector]
stackheat_b	stackheat[vector]

OK Cancel Help



