A high-speed photograph of water splashing, creating a dynamic, blue-toned background. The water is captured in mid-air, with various droplets and streams visible against a light blue background.

ProdRisk experiences

Tor Halvor Bolkesjø
Production Planner
E-CO Energi AS

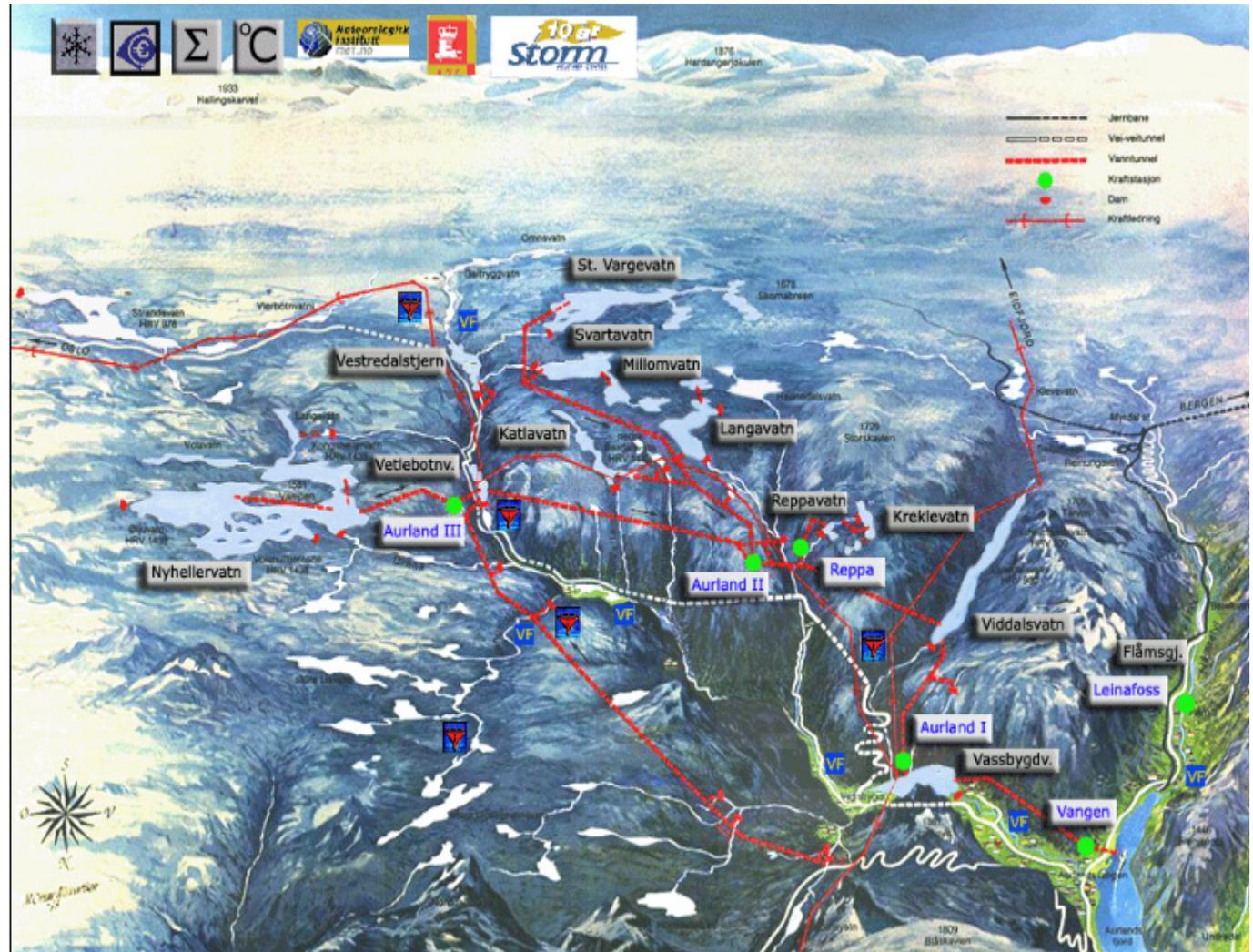
Agenda

- Model comparison
- Pumping case
- Issues
- User interface

Model comparison

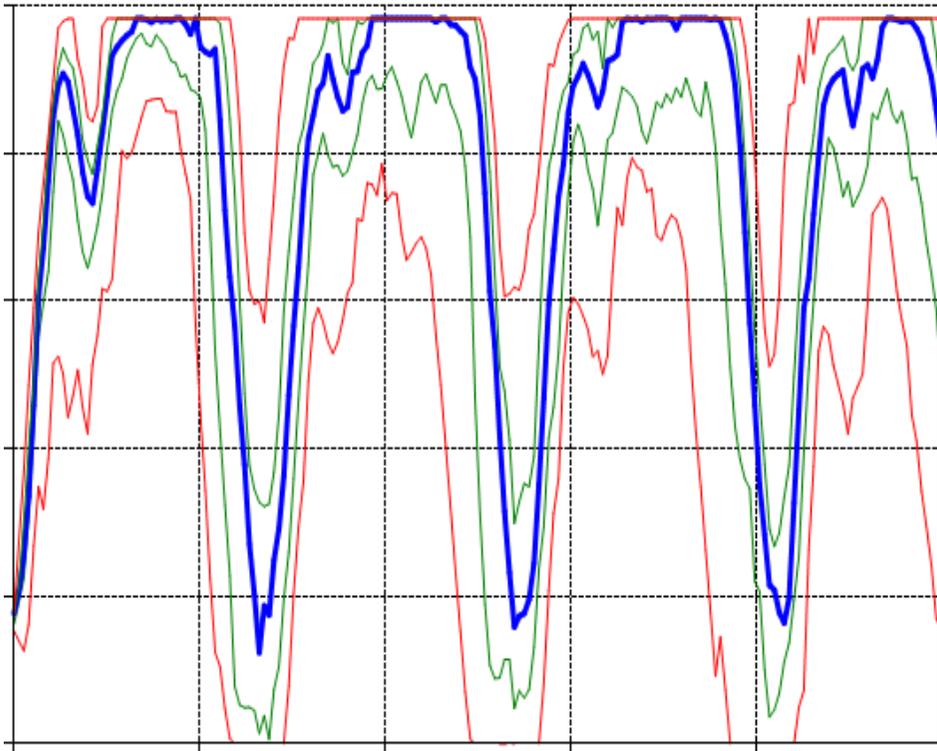
- ProdRisk normal mode
- ProdRisk NOHEAD option
- EOPS (VANSIMTAP)

- River system: Aurland

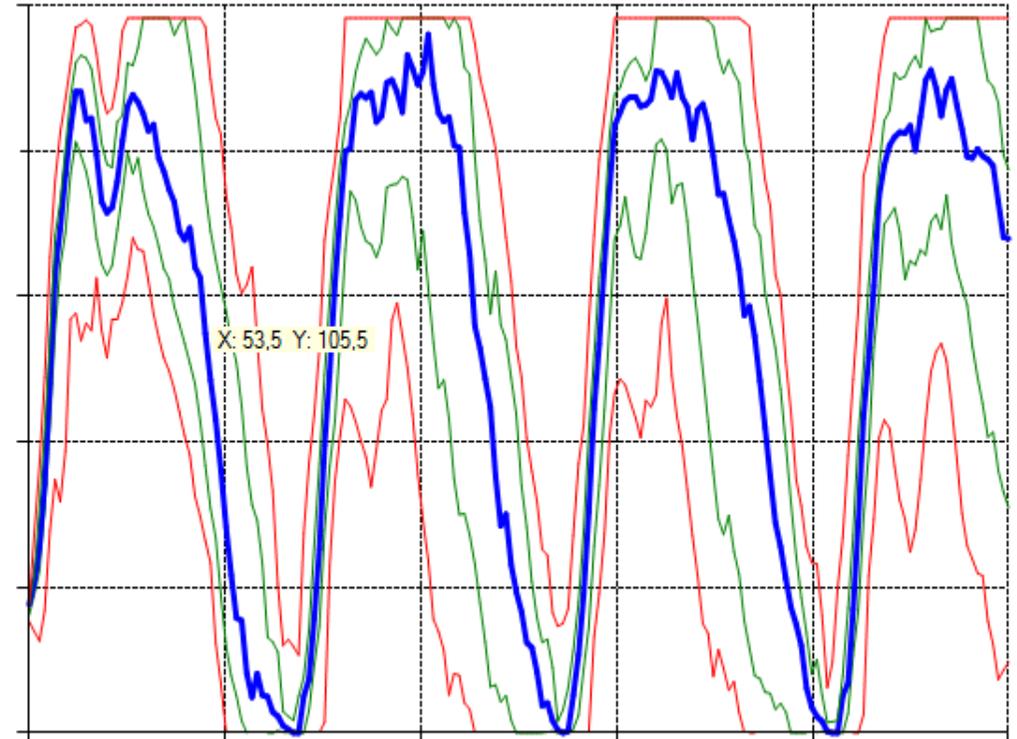


Model comparison

Head



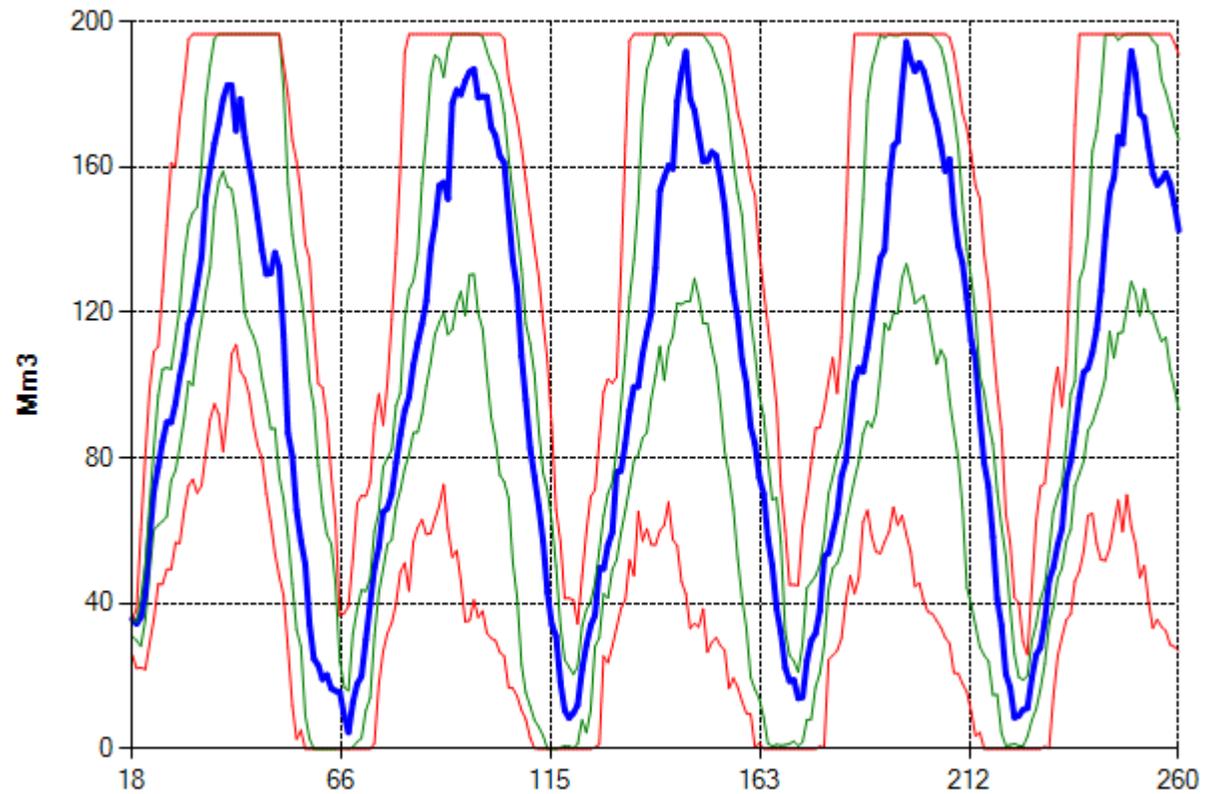
No Head



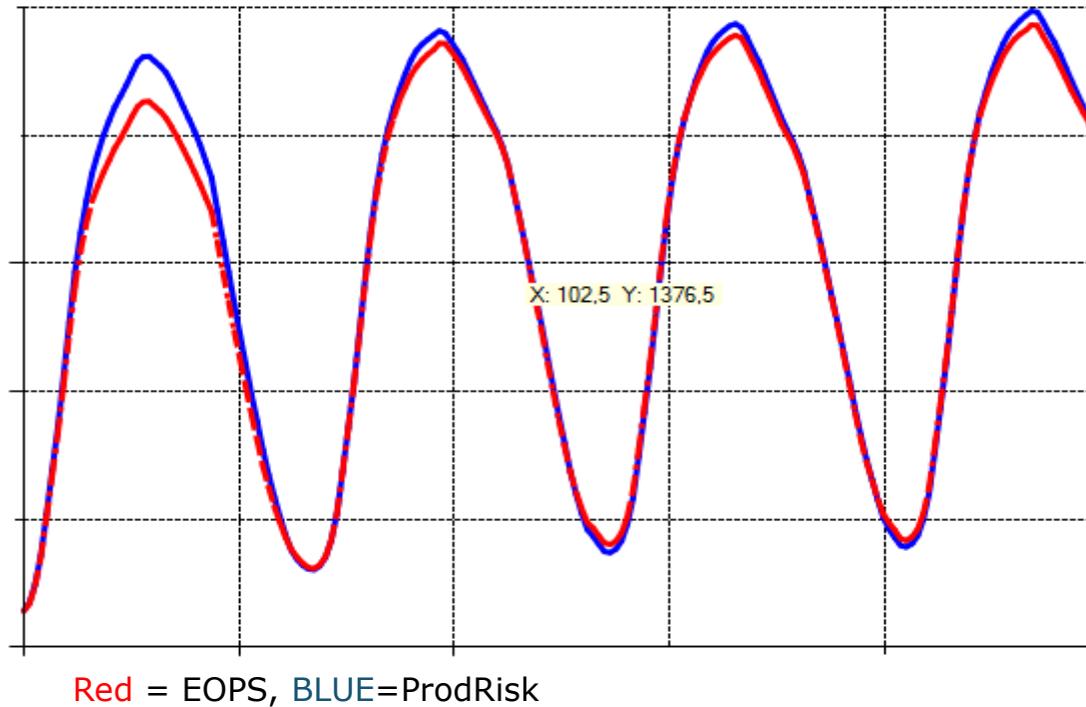
Reservoir with high energy conversion factor

EOPS reference simulation

EOPS model

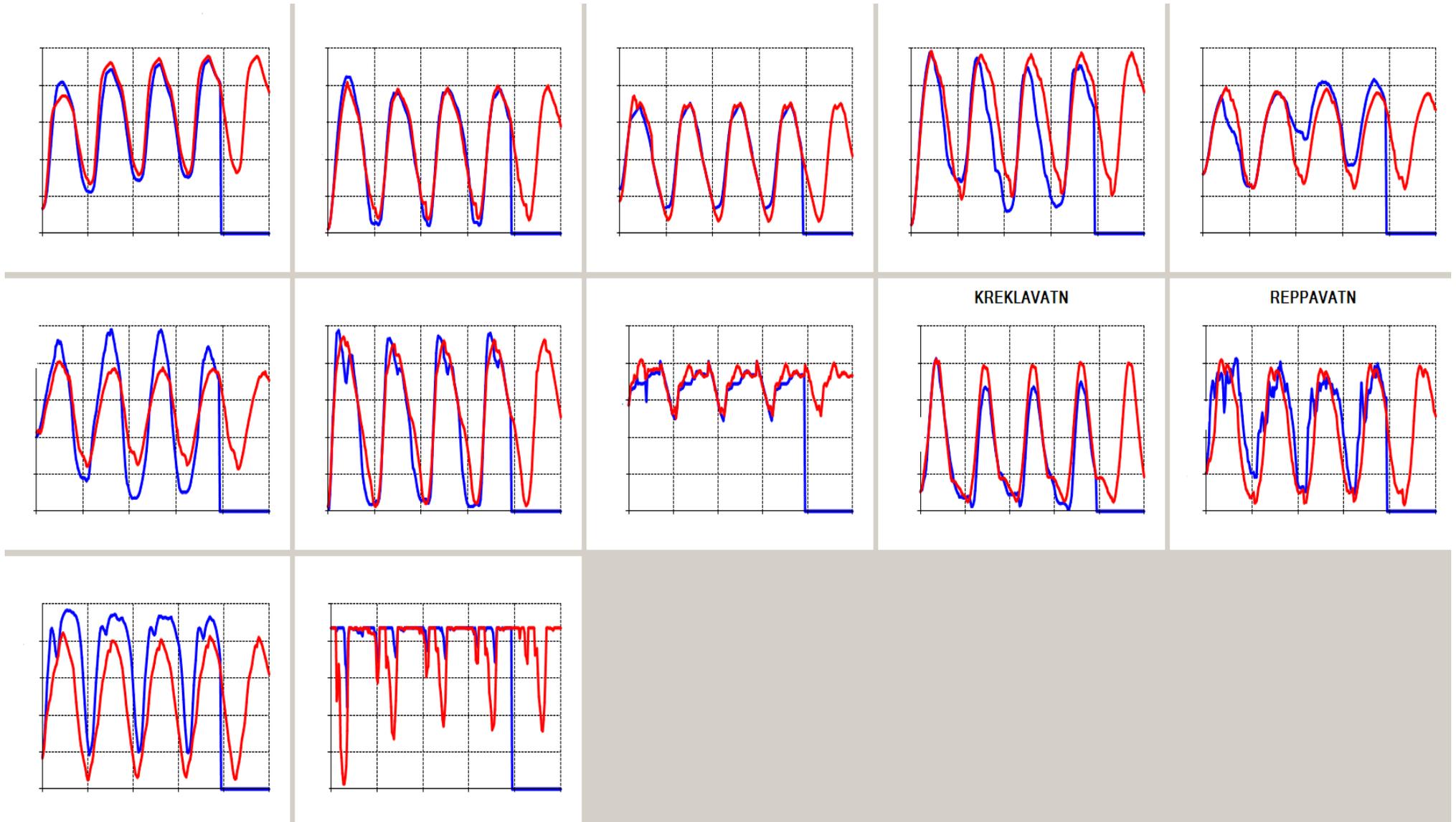


Average reservoir for the total system.



- Quite similar pattern for the far end.

ProdRisk vs. EOPS



•The distribution among single reservoirs, on the other hand, is quite different.

Delta Production – 4 years period

Values in GWh

	NO HEAD-HEAD	EOPS-HEAD
Summer	-38	260
Winter	-100	-414
Pumping	74	50
Reservoir change	11	-38
Total	-53	-141

ProdRisk vs. EOPS income – 4 years period

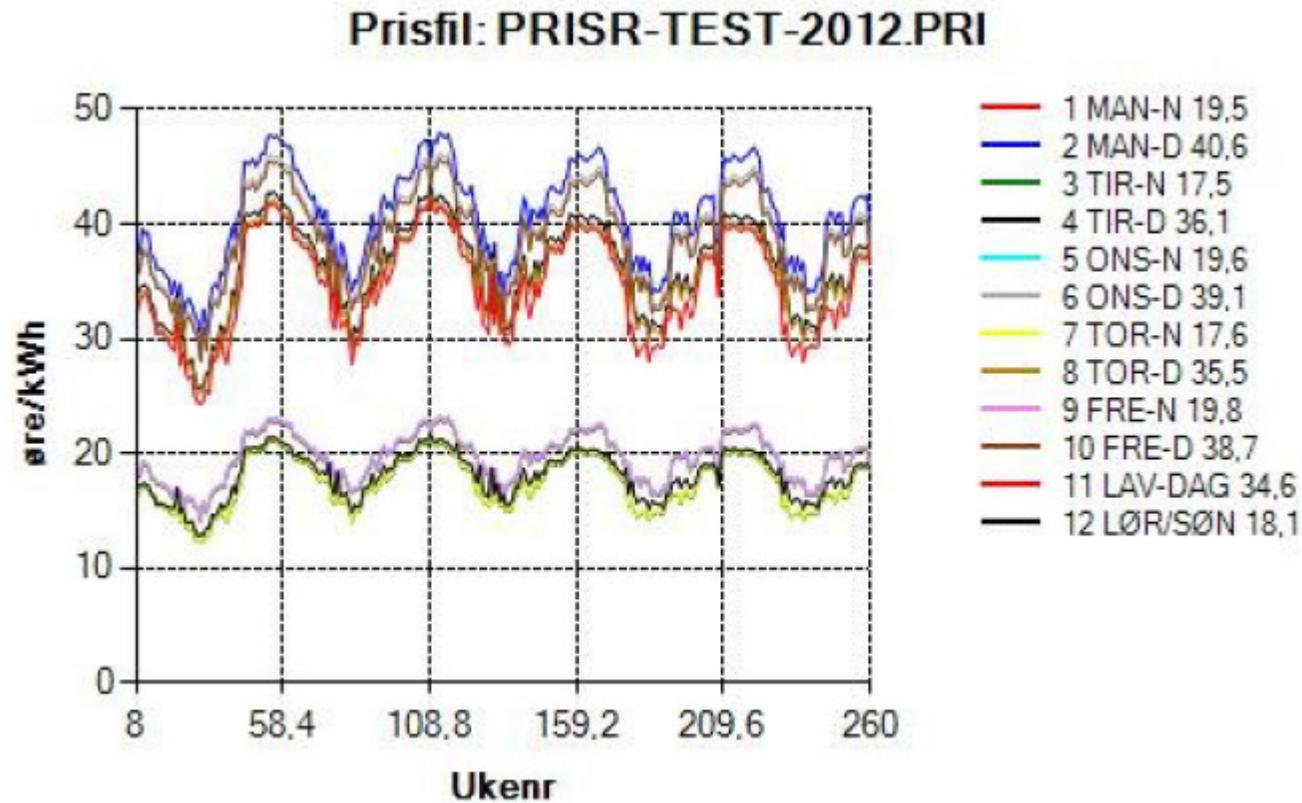
Values in Mill.NOK

	NO HEAD-HEAD	EOPS-HEAD
Summer	8	-64
Winter	31	132
Pumping	-16	-15
Reservoir change	-4	12
Total	19	65

Water Values

	PR HEAD - PR NOHEAD	PR HEAD - EOPS
NYHELLERVATN	-2,5	4,1
KATLAVATN	1,1	2,4
MILLOMVATN	-5,8	46,0
VARGEVATN	5,2	6,3
LANGAVATN	4,8	4,6
SVARTAVATN	3,6	5,3
AURLAND II H	-	-
VESTREDALSTJ	-0,9	9,1
VESLEBOTN	-0,8	3,9
KREKLEVATN	50,0	134,2
REPPVATN	3,3	34,9
VIDDALSVATN	-0,4	-1,0
VASSBYGDVATN	0,0	0,0

Pumping Case: Behavior with large price spreads



Difference between ProdRisk and EOPS

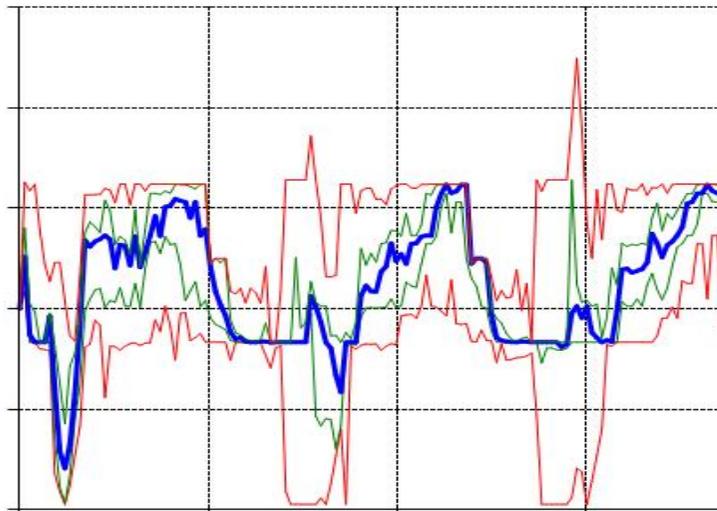
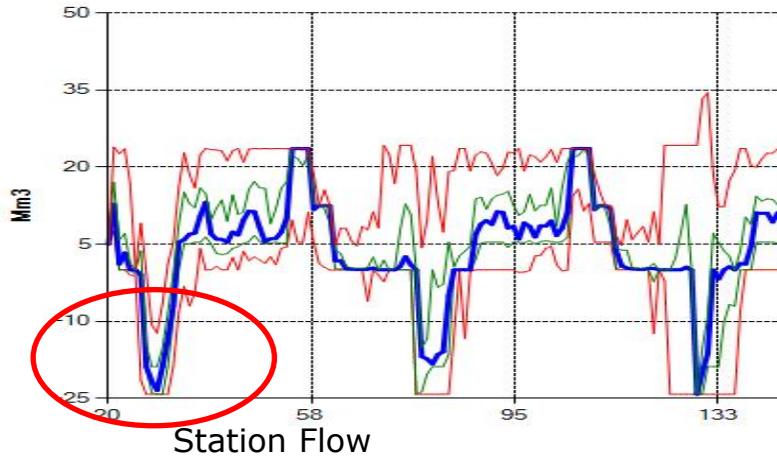
	Summer [MKR]	Winter [MKR]	Total [MKR]	Production [GWh]	Average price [Øre/kWh]
Station A	3,5	27,3	30,8	72,1	0,7
Station B	8,8	2,9	11,7	31,8	0,2
Station C	1,3	0,2	1,5	0,8	0,7
Station D	0,8	-0,7	0,1	-0,6	0,9
Station E	8,6	5,8	14,4	-5,0	0,7
Station F	0,3	2,6	2,8	12,8	-1,8
Total	23,3	38,0	61,3	111,9	0,7
Pumping	1,3	0,0	1,3	9,5	-1,4
Reservoir correction			-1,0		
Sum			61,7		

Issues

- Pumping
- Shop coupling
 ➡ New Sintef Project
- Hydraulic coupling

Hydraulic coupling – Weakness?

Head simulation



Styrefil Straff.CPAR

Felles straffverdier

	Verdi	Benevning	Inkluder
CFlomFram			<input type="checkbox"/>
CFlomBak			<input type="checkbox"/>
CForbFram			<input type="checkbox"/>
CForbBak			<input type="checkbox"/>
CMaMax			<input type="checkbox"/>
CMaMin			<input type="checkbox"/>
CStyrbuf			<input type="checkbox"/>
CQmin			<input type="checkbox"/>
CGfomin			<input type="checkbox"/>

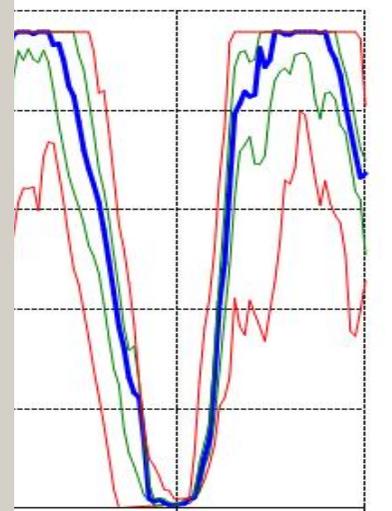
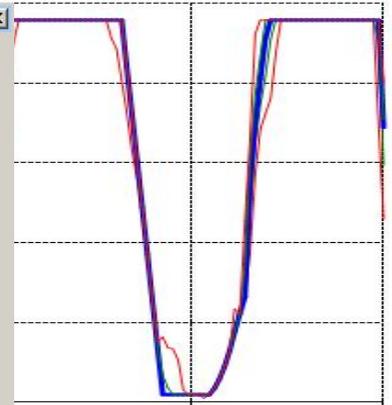
4385 USTEVANN Antall straffverdityper: 9

Type 1	CFlomFram	Start: 1	Type 5	CMaMax	Start: 1
Benevning 1	E	Slutt: 52	Benevning 5	E	Slutt: 52
Perioder 1	1	Verdi: 0,0	Perioder 5	1	Verdi: 0,0
Type 2	CFlomBak	Start: 1	Type 6	CMaMin	Start: 1
Benevning 2	E	Slutt: 52	Benevning 6	E	Slutt: 52
Perioder 2	1	Verdi: 0,0	Perioder 6	1	Verdi: 1,0
Type 3	CForbFram	Start: 1	Type 7	CStyrbuf	Start: 1
Benevning 3	E	Slutt: 52	Benevning 7	E	Slutt: 52
Perioder 3	1	Verdi: 0,02	Perioder 7	1	Verdi: 0,0
Type 4	CForbBak	Start: 1	Type 8	CQmin	Start: 1
Benevning 4	E	Slutt: 52	Benevning 8	E	Slutt: 52
Perioder 4	1	Verdi: 0,02	Perioder 8	1	Verdi: 0,0

linjer skrevet på fil: Straff.CPAR 53

OK Lukk

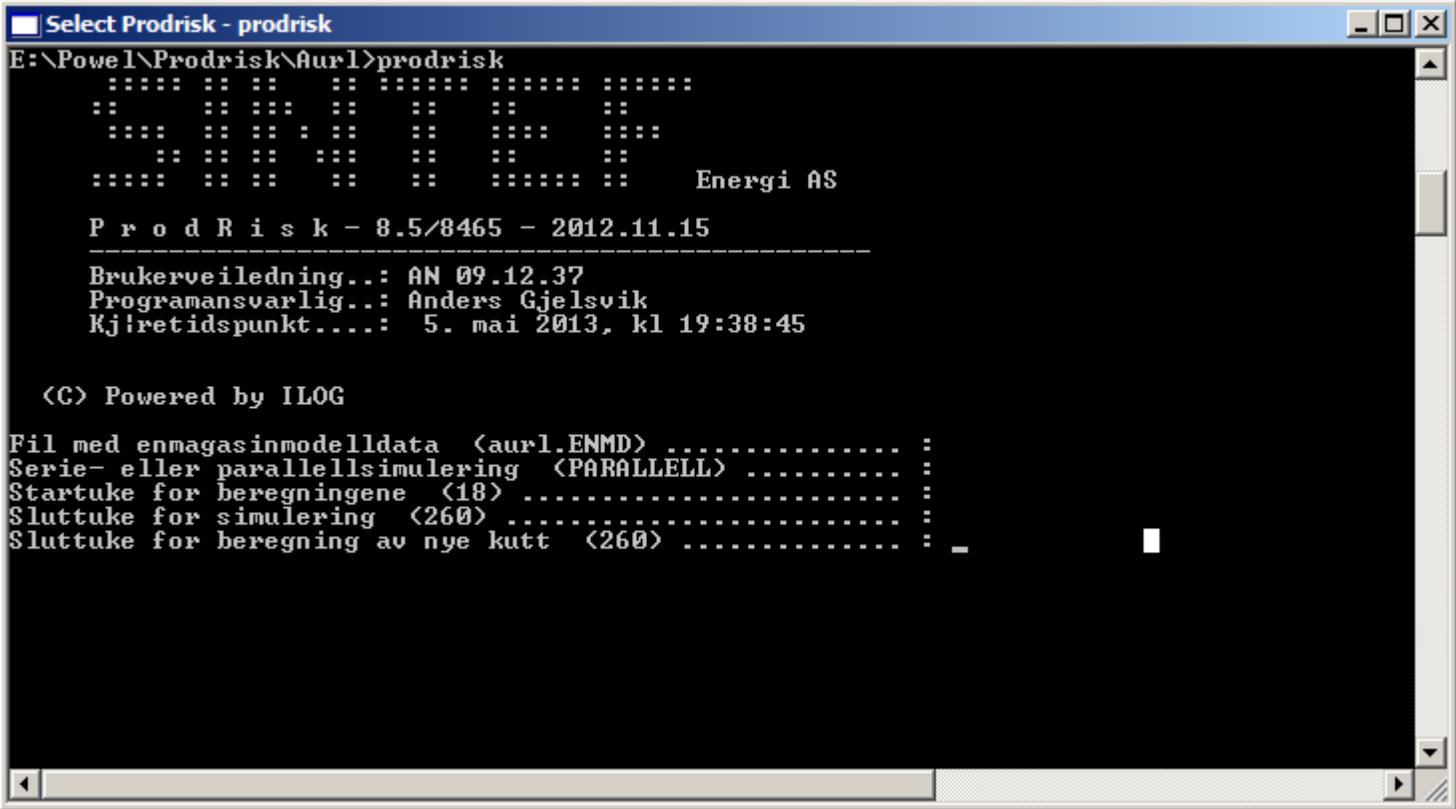
Reservoir

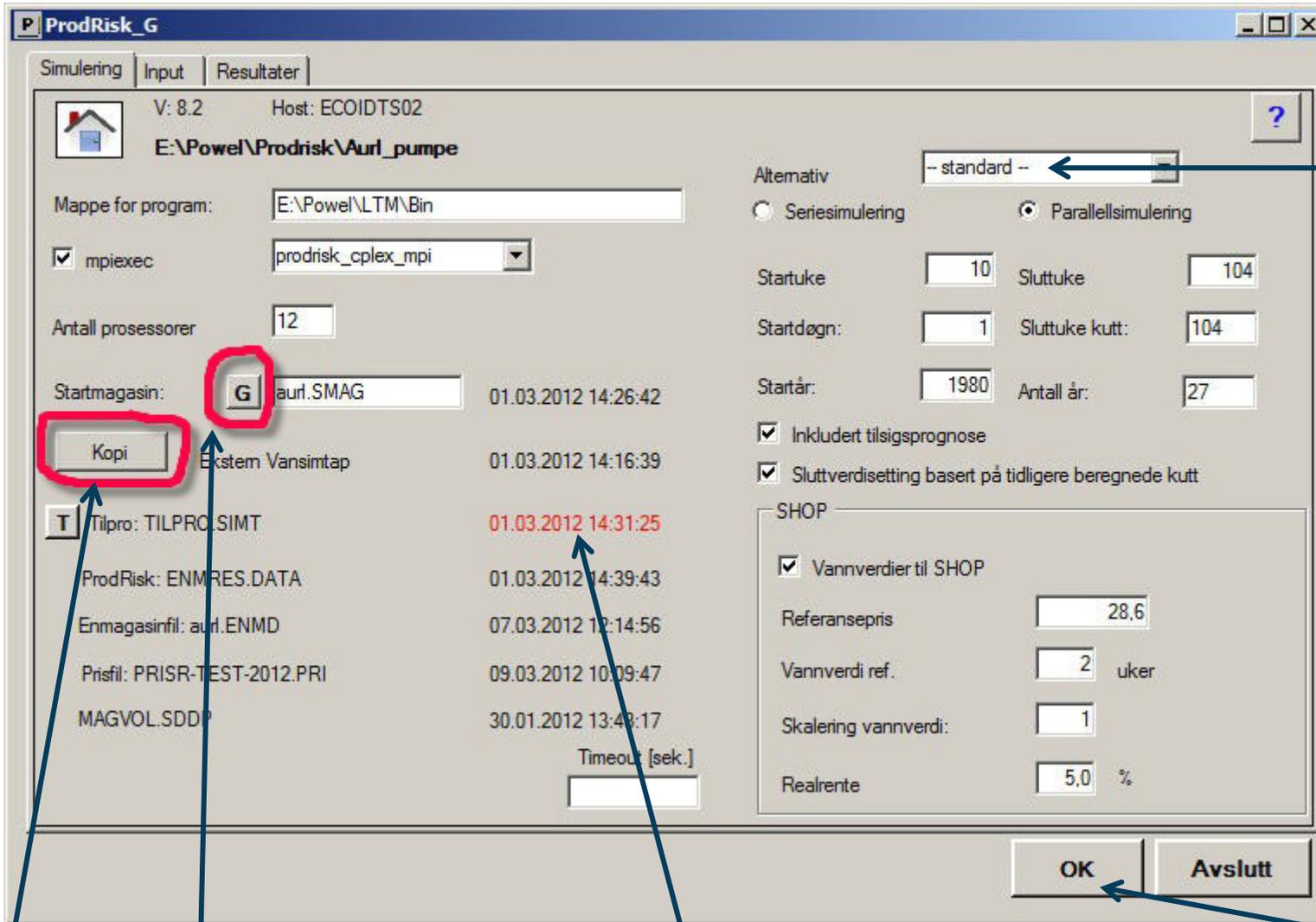


Conclusions so far

- Seems to give higher net value
- More risk averse?
- Some teething problems
- We are quite pleased

Interface (old fashion)





Simulation options

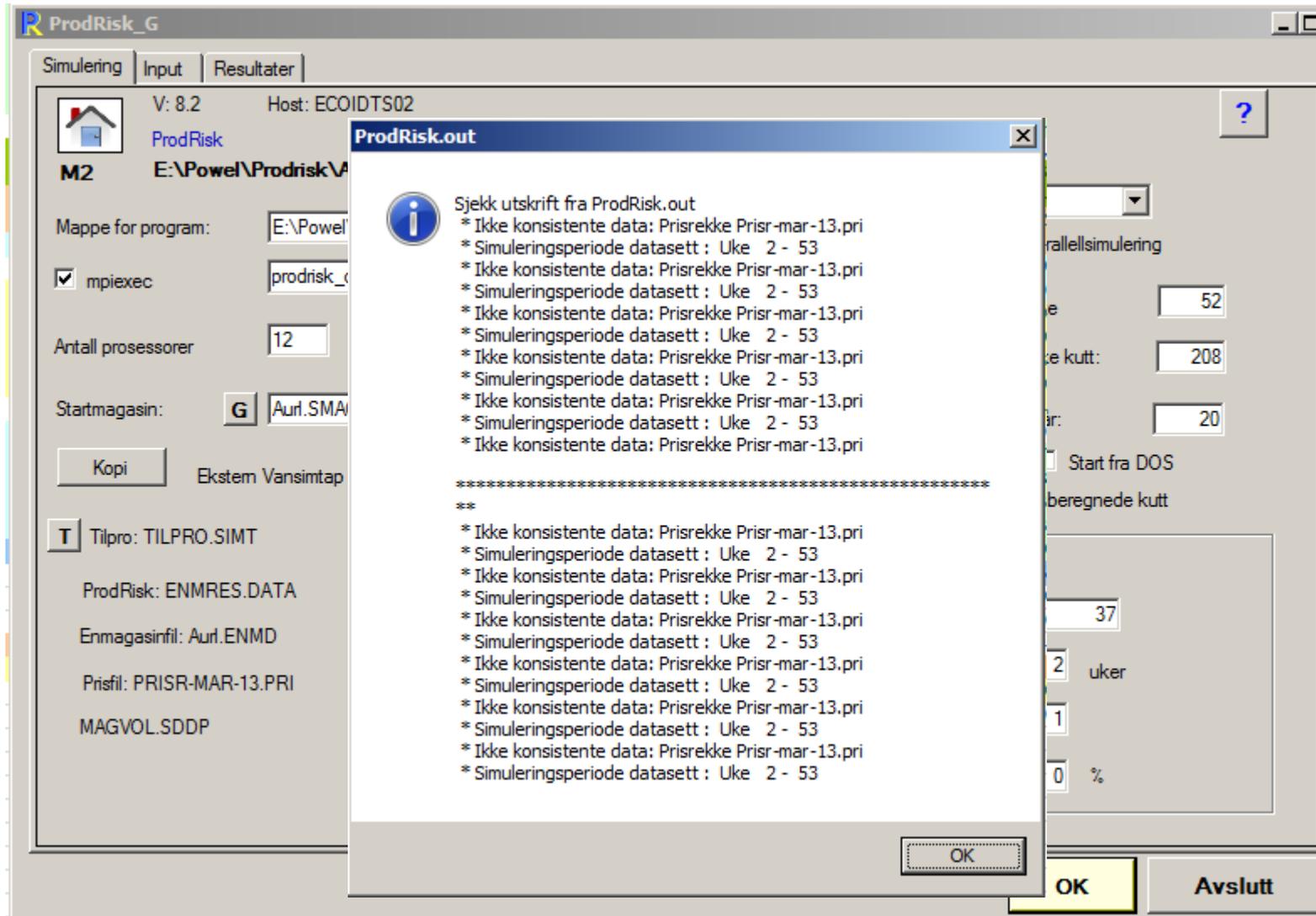
Run ProdRisk

• Show start reservoirs

Indication of "old" files

Copy of external Vansimtap-files

Direct feed back



The screenshot shows the ProdRisk_G software interface with a dialog box open. The main window has tabs for 'Simulering', 'Input', and 'Resultater'. The 'Input' tab is active, showing simulation parameters. The dialog box, titled 'ProdRisk.out', displays an information icon and a message about data consistency. The background window shows the following details:

- V: 8.2 Host: ECOIDTS02
- ProdRisk
- M2 E:\Powel\ProdRiskV
- Mappe for program: E:\Powel\
- mpiexec prodrisk_
- Antall prosessorer: 12
- Startmagasin: G Aurl.SMA
- Ekstem Vansimtap
- T Tilpro: TILPRO.SIMT
- ProdRisk: ENMRES.DATA
- Enmagasinfil: Aurl.ENMD
- Prisfil: PRISR-MAR-13.PRI
- MAGVOL.SDDP

The dialog box content is as follows:

Sjekk utskrift fra ProdRisk.out

- * Ikke konsistente data: Prisrekke PrISR-mar-13.pri
- * Simuleringsperiode datasett : Uke 2 - 53
- * Ikke konsistente data: Prisrekke PrISR-mar-13.pri
- * Simuleringsperiode datasett : Uke 2 - 53
- * Ikke konsistente data: Prisrekke PrISR-mar-13.pri
- * Simuleringsperiode datasett : Uke 2 - 53
- * Ikke konsistente data: Prisrekke PrISR-mar-13.pri
- * Simuleringsperiode datasett : Uke 2 - 53
- * Ikke konsistente data: Prisrekke PrISR-mar-13.pri
- * Simuleringsperiode datasett : Uke 2 - 53
- * Ikke konsistente data: Prisrekke PrISR-mar-13.pri
- * Simuleringsperiode datasett : Uke 2 - 53
- * Ikke konsistente data: Prisrekke PrISR-mar-13.pri
- * Simuleringsperiode datasett : Uke 2 - 53

**

- * Ikke konsistente data: Prisrekke PrISR-mar-13.pri
- * Simuleringsperiode datasett : Uke 2 - 53
- * Ikke konsistente data: Prisrekke PrISR-mar-13.pri
- * Simuleringsperiode datasett : Uke 2 - 53
- * Ikke konsistente data: Prisrekke PrISR-mar-13.pri
- * Simuleringsperiode datasett : Uke 2 - 53
- * Ikke konsistente data: Prisrekke PrISR-mar-13.pri
- * Simuleringsperiode datasett : Uke 2 - 53
- * Ikke konsistente data: Prisrekke PrISR-mar-13.pri
- * Simuleringsperiode datasett : Uke 2 - 53
- * Ikke konsistente data: Prisrekke PrISR-mar-13.pri
- * Simuleringsperiode datasett : Uke 2 - 53
- * Ikke konsistente data: Prisrekke PrISR-mar-13.pri
- * Simuleringsperiode datasett : Uke 2 - 53

Buttons: OK (in dialog), OK, Avslutt (in main window)

Copy EOPS data from other directory

The screenshot shows the 'ProdRisk_G' application window with the 'Input' tab selected. The 'ProdRisk styrefiler:' section lists several files, with 'straff.CPAR' highlighted by a red arrow and labeled 'Input data'. The 'Ekstem Vansimtap' button is circled in red. A dialog box titled 'Kopi av Vansimtapfiler fra ekstern mappe' is open, showing a list of files to be copied from the directory 'I:\Power\NccData\Vansimtap\Paral\Aurl\'. The dialog includes checkboxes for 'Kopier datafiler fra Vansimtap', 'Filer fra Vansimtap', 'Tilsigdata', '.NETD fil', '.ENMD fil', 'Prisfil', and 'Ekstra backup på lokal mappe'. The 'Sist kopiert' and 'Ny dato' columns show the dates of the last copy and the current copy, respectively.

ProdRisk_G

Simulering Input Resultater

ProdRisk styrefiler:

File Name	Date
ProdRisk.cpar	10.06.2011 09:47:16
TilsigSddp.cpar	22.04.2010 10:12:09
dognkobling.dat	01.03.2012 14:25:55
straff.CPAR	
prodrisk_emps.link	

Aurland

Programversjon: E:\Power\LTM\Bin

Ekstem Vansimtap

Miljøvariable

File name: ProdRisk_G.exe
Comments: Graphical user interface for Sefas ProdRisk
File Description: ProdRisk_G0
Company name: E-CO Energi AS
File Version: 1.0.0.0
Product version: 1.0.0.0

Kopi av Vansimtapfiler fra ekstern mappe

Kopier datafiler fra Vansimtap

Filer som kopieres

Mappe: I:\Power\NccData\Vansimtap\Paral\Aurl\

File Name	Sist kopiert	Ny dato
<input checked="" type="checkbox"/> Filer fra Vansimtap		08.03.2012 15:18:21
<input checked="" type="checkbox"/> Tilsigdata		08.03.2012 15:17:57
<input type="checkbox"/> .NETD fil aurl.DETD		02.03.2012 15:24:32
<input checked="" type="checkbox"/> .ENMD fil aurl.ENMD		08.03.2012 15:18:42
<input checked="" type="checkbox"/> Prisfil: PRISR-FEB-12.PRI	01.03.2012 14:16:39	08.03.2012 11:35:38
<input type="checkbox"/> Ekstra backup på lokal mappe		

OK Lukk

Valuta: øre/kWh

User dom
Host nam
User nam
IP: 172.2
OS-versio
Processor

Interface for parameter files

ProdRisk styrefiler: prodrisk.CPAR

Maksimalt iterasjonstall i avsluttende strategiberegning	<input type="text" value="30"/>	STAITER
Minste iterasjonstall i avsluttende strategiberegning	<input type="text" value="5"/>	MINITER
Maks iterasjonstall 1. strategiberegning for å generere fallhøydekoefisienter	<input type="text" value="30"/>	STAITER1
Minste iterasjonstall 1. strategiberegning for å generere fallhøydekoefisienter	<input type="text" value="5"/>	MINITER1
Konvergenstkriterium [%]	<input type="text" value="5"/>	FKONV
Ubegrenset	<input type="text" value="1E+20"/>	STOR
Øvre grense for ALFA (kostfunksjonen)	<input type="text" value="1E+15"/>	ALFASTOR
Kostnad for brudd på minimumsrestriksjon	<input type="text" value="300"/>	CTANK
Maks iterasjoner i relaksasjonsprosessen	<input type="text" value="100"/>	TOMMAX
Maks antall kutt som lagres	<input type="text" value="500"/>	HALDKUT
Toleranser i LPSOL	<input type="text" value="0"/>	TOLINN
Kostnad for å bryte maksimalmagasin av type 1	<input type="text" value="5"/>	STR_MAGBR
Parameter relaksasjonsprosessen	<input type="text" value="1"/>	ANTBRU1
Parameter relaksasjonsprosessen	<input type="text" value="30"/>	SLETTE_FREKV
Toleranse i relaksasjonsprosessen	<input type="text" value="0.2"/>	SLETTE_TOL
1 - Berytte residualmodell for tilsig, 0 - standardmodell fra prinsipalkomponenter	<input type="text" value="0"/>	RESSTOY
Første uke med aggregering av prisavsnitt	<input type="text" value="9999"/>	JUKE_AGGR_PRAVSN
Første uke med sekvensielle prisavsnitt	<input type="text" value="1"/>	JSEKV_STARTUKE
Siste uke med sekvensielle prisavsnitt	<input type="text" value="9999"/>	JSEKV_SLUTTUKE
1 - Bruk innlest PQ-kurve, 0 - Bruk konveks PQ-kurve	<input type="text" value="1"/>	PQValg
1 - Magasinbalanse prisavsnitt, 0 - Magasinbalanse uke	<input type="text" value="1"/>	MagBal
Kostnad for forbitapping ved simulering	<input type="text" value="0.001"/>	CFORB_STYR
Kostnad for flom ved simulering	<input type="text" value="0.002"/>	CFLOM_STYR
1 - Framoversimulering som sluttsimulering, 0 - Konveks framovermodell	<input type="text" value="1"/>	FramSomSluttsim

Toleranse for konvergens. Man anser algoritmen for å ha konverget i en iterasjon hvis vektet magasinendring i noen uke eller noe scenario mellom to iterasjoner ikke er større enn konvergenkrevet. Vektet magasinendring er summen av absolutte endringer for alle magasin regnet i energi dividert med sum maksimalt magasinivolum. Konvergenkrevet er angitt i prosent, som regnes av angitt maksimalt disponibelt volum i magasinene.

OK Avbryt

ProdRisk.CPAR

Mark parameter for more information

Internationalization

ProdRisk.CPAR (example with **6** different languages)

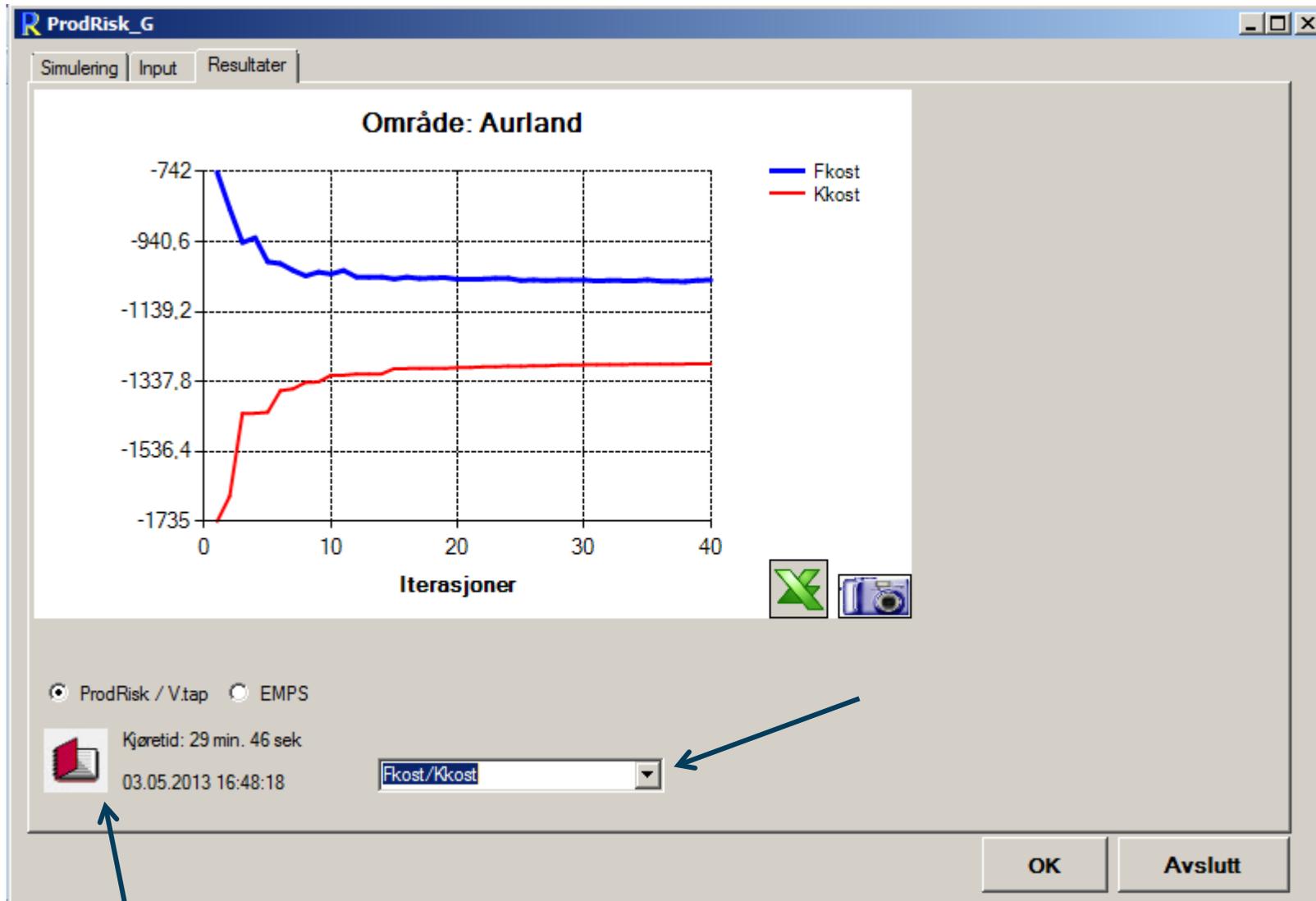
The image displays a complex interface for the ProdRisk.CPAR software, illustrating internationalization with multiple overlapping dialog boxes in different languages. The primary dialog box is in Norwegian, titled "ProdRisk styrefiler: tilsigsddp.CPAR". It contains several input fields and labels:

- Antall prinsipalkomponenter (1<= NPRBRUK <=antall tilsigsserier): 1 NPRBRUK
- Antall diskrete verdier pr prinsipalkomponent (1:NPRBRUK): 3 NRSTKOM
- Antall sesonger (1<=NSESONG<=antall uker): 1 NSESONG
- Første sesongstart og alle sesongslutter (0:NSESONG): 0 SESONG
- 0 - ingen simulering, >0 generere simulerte tilsig: 0 NAARSIM
- 0 lik tilsigssekvens, 1 vilkårlig, >1 generert (repetierbar) tilsigssekvens: 0 ITILFSTART
- Påvirker oppsetting av diskrete tilsigsalternativ (klipping av støyalternativ): 1 IKLIPPNEG

Buttons for "OK" and "Avbryt" are visible at the bottom of this dialog. Other overlapping dialog boxes show the same information in Spanish, German, and Chinese. The Chinese dialog box includes the text: "基于标准和残余模型可以产生模拟的流入。模拟和流入是从NAARSIM和ITILFS控制的。如果NAARSIM>=0,他们从NAARSIM年的串行模拟模型调整,从每周流入的情况下的平均值开始。当NAARSIM=0不会有模拟。"

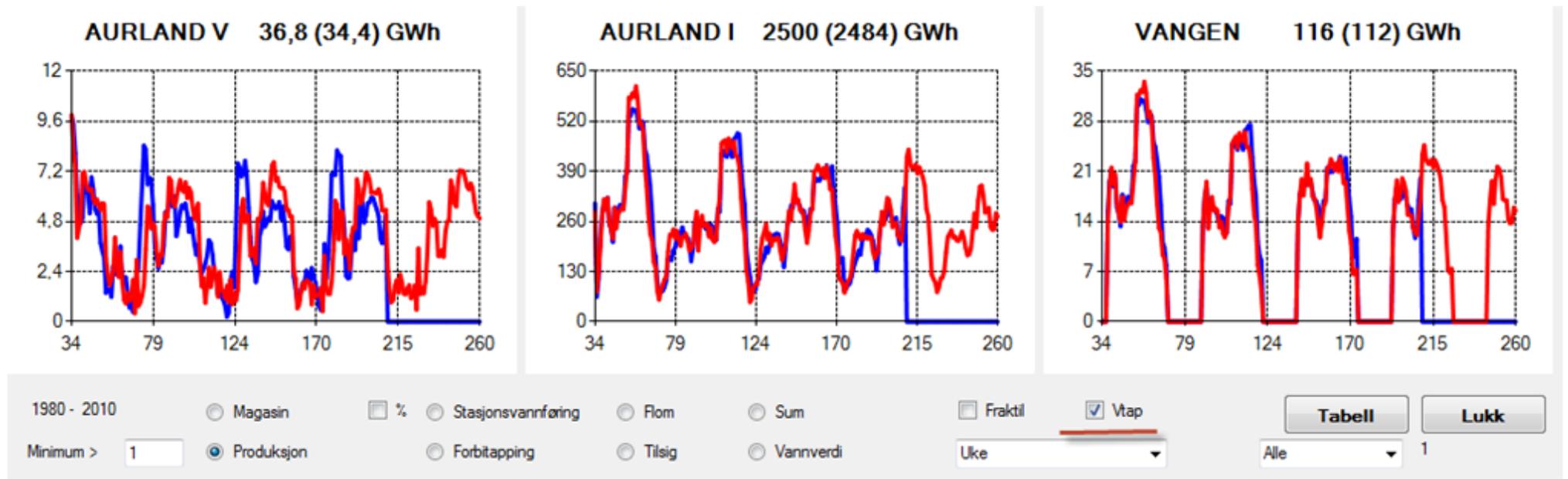
Present results

Results are read from ProdRisk output file, or standard result file (EMPS, EOPS)

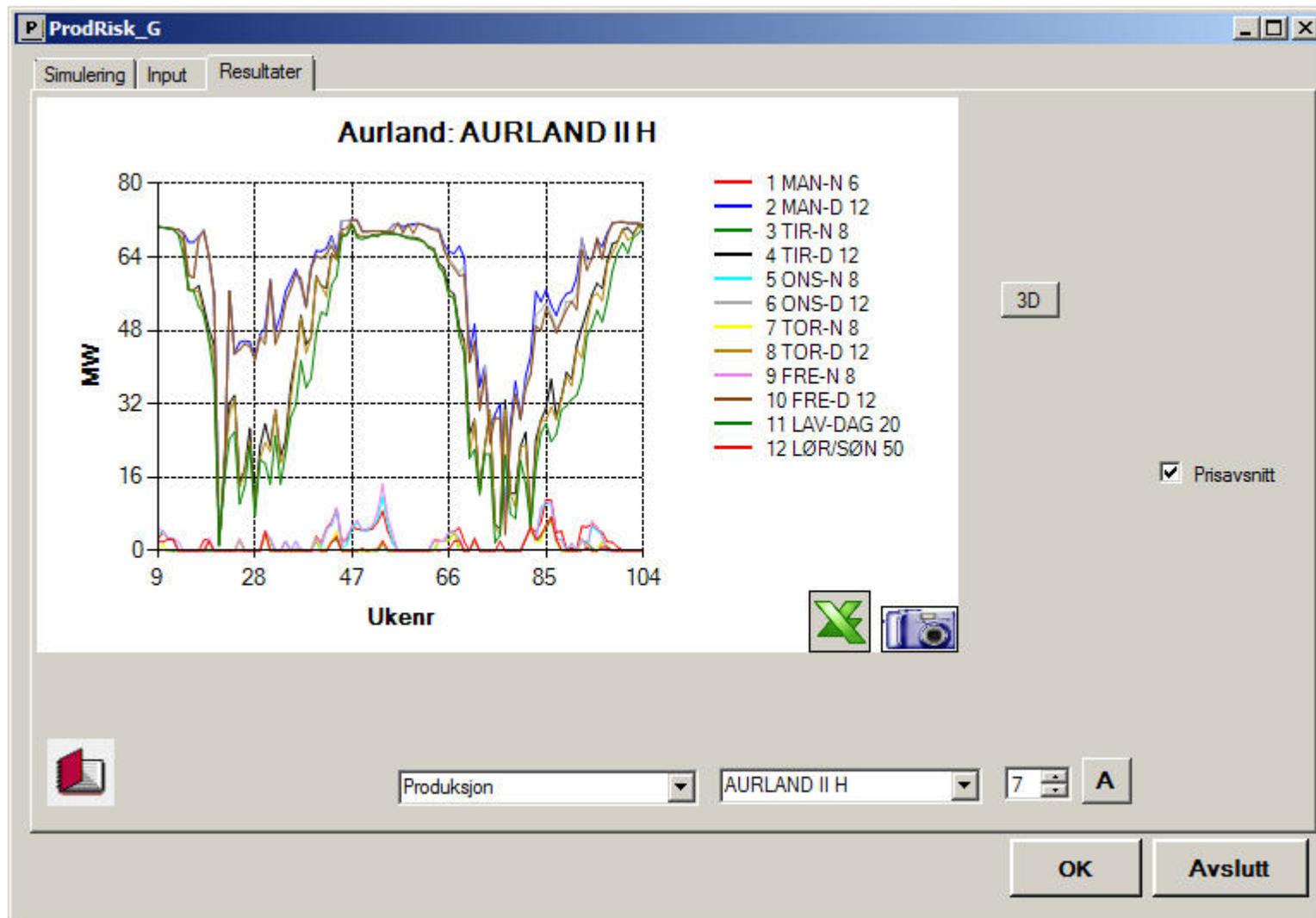


Open output file

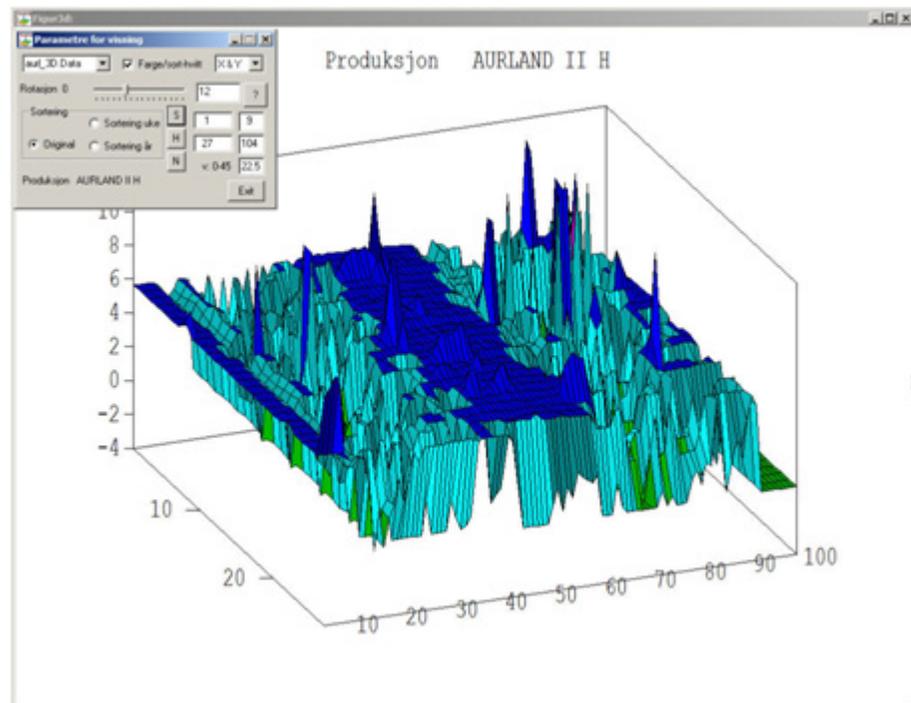
Comparing the models (ProdRisk vs EOPS)



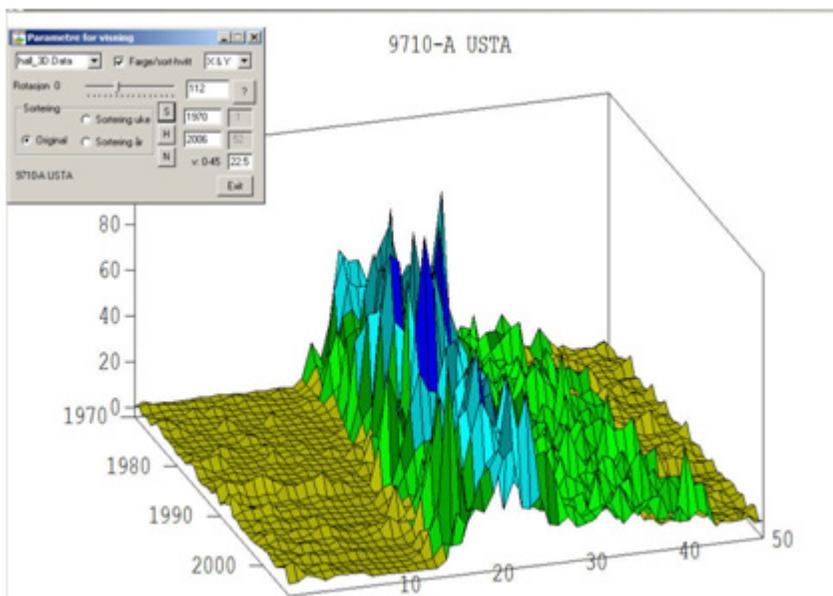
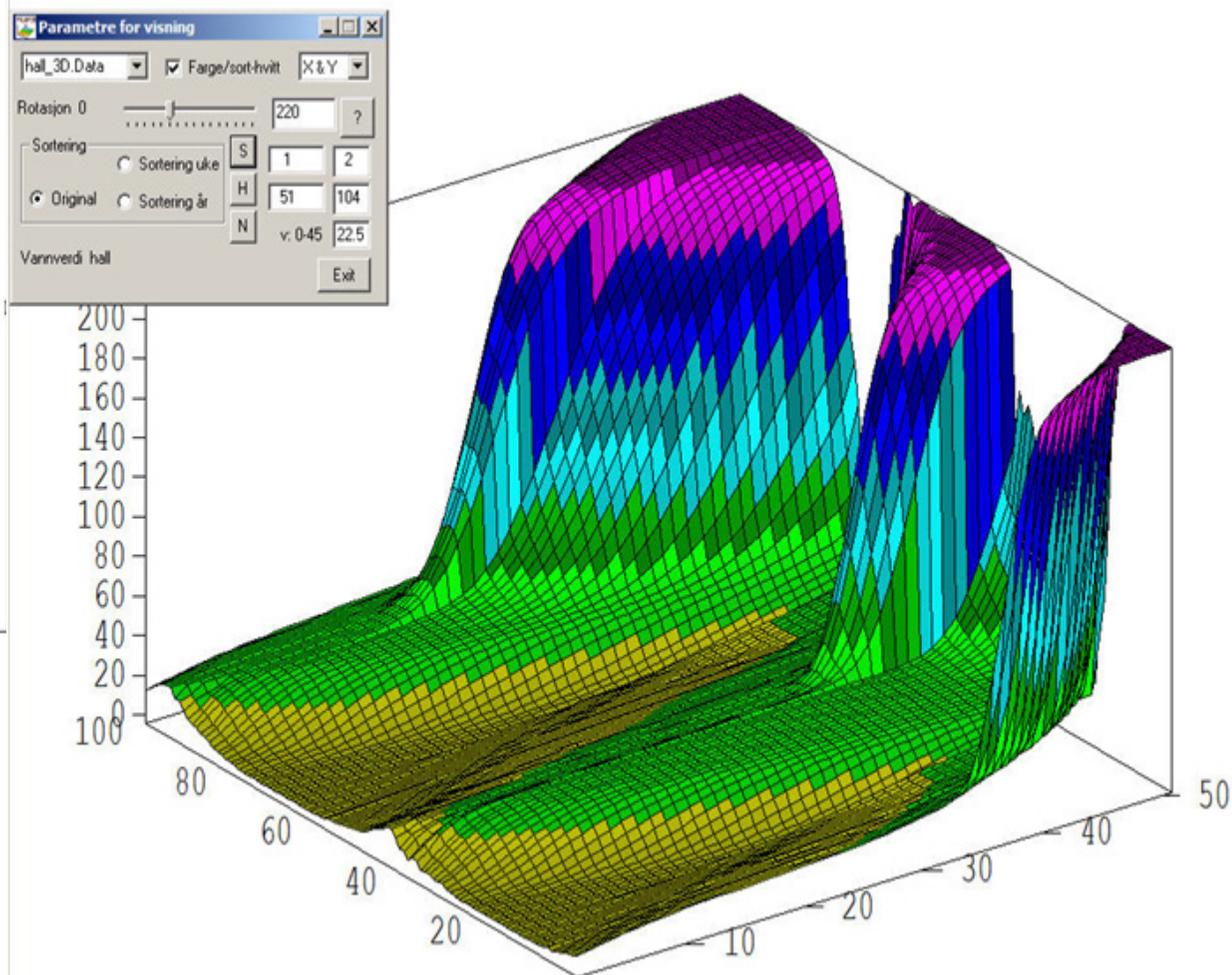
Production, reservoir, discharge, flow ...



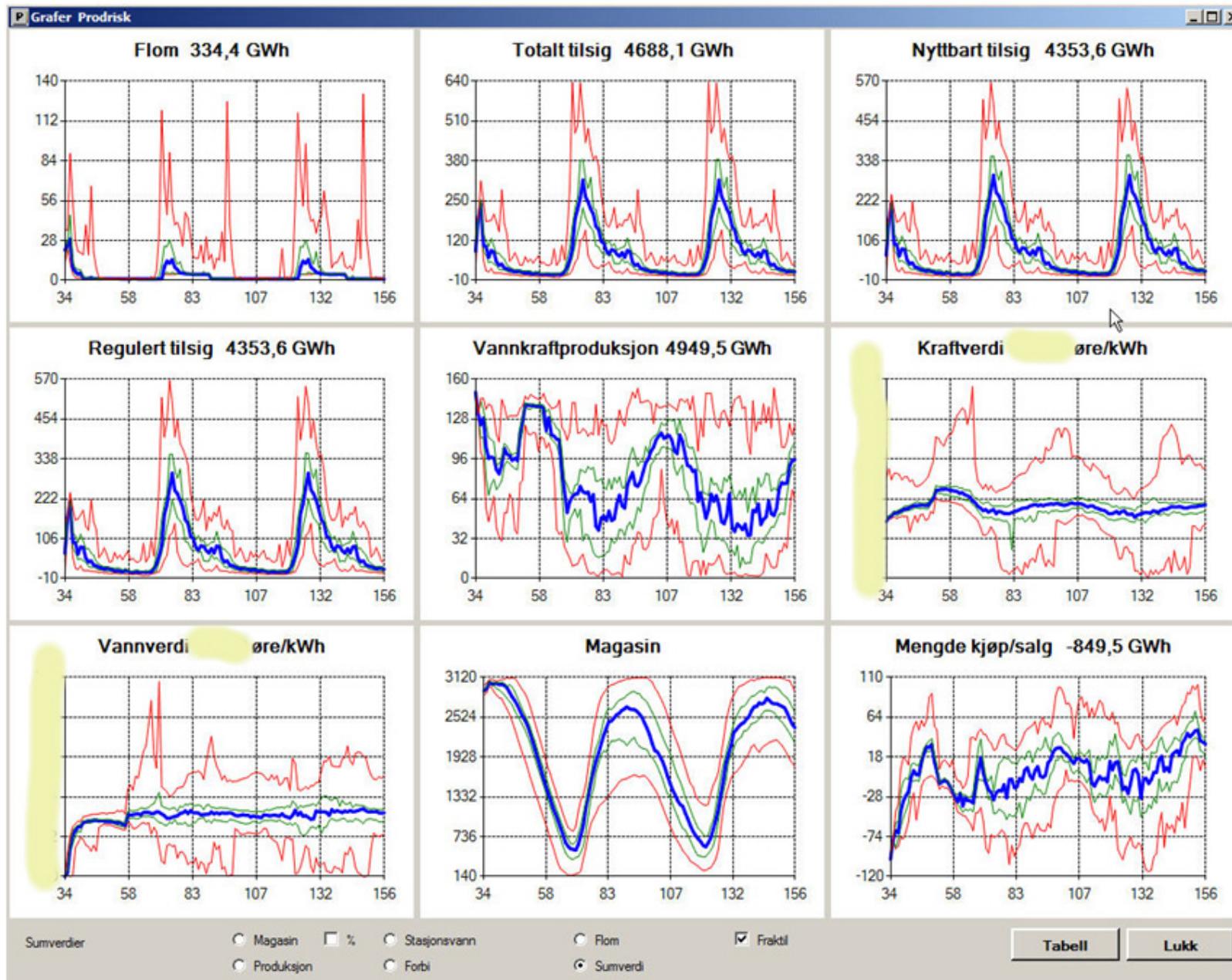
3D visualization



Roterende 3D-graf



Aggregated values



Thank you for the attention!

<http://e-co.no>

