Welcome!

Webinar #10. Supplementary Firing &
Control Loops in GT PRO/GT MASTER

August 31, 2017

The webinar will be starting on time (10:00 EDT)

Host: Meritt Elmasri (US office)
Presenter: Evgeny Zakharenkov

Thermoflow Training and Support

- Standard Training
- On-site Training course
- Advanced Workshop
- Webinars when new version is released
- Help, Tutorials, PPT, Videos
- Technical Support

→ **Feature Awareness Webinars**

Agenda

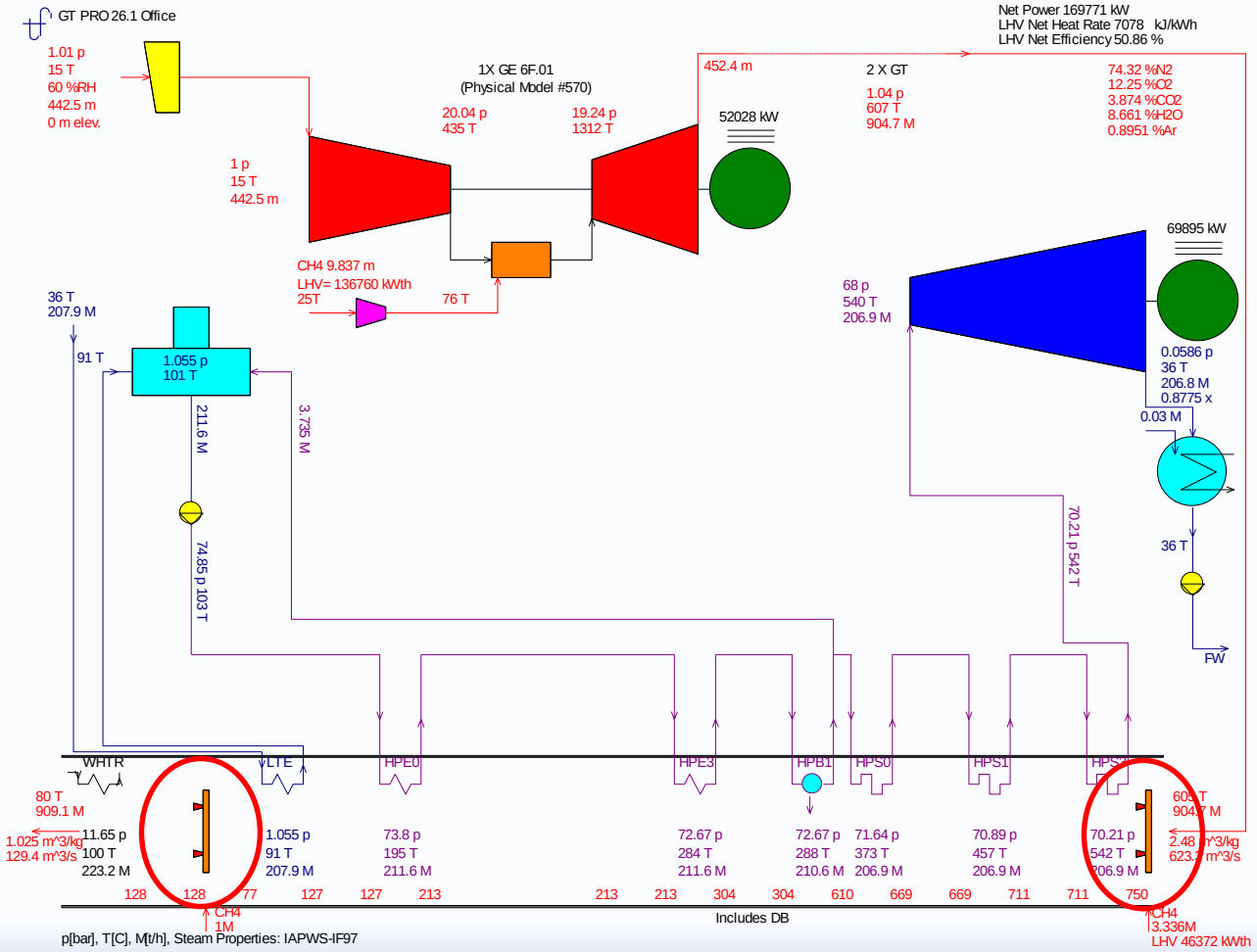
- Designing plants with supplementary firing
- HRSG with radiant surfaces
- Control Loops in GT MASTER

Designing plants with supplementary firing

When supplementary firing is used

- Flexible steam production and power output of the steam turbine.
- Flexible cogeneration plants for steam and hot water production.
- Compensation for changing ambient conditions (stabilizing steam temperature and mass flow rate).

GT PRO / GT MASTER allows to have up to two duct burners



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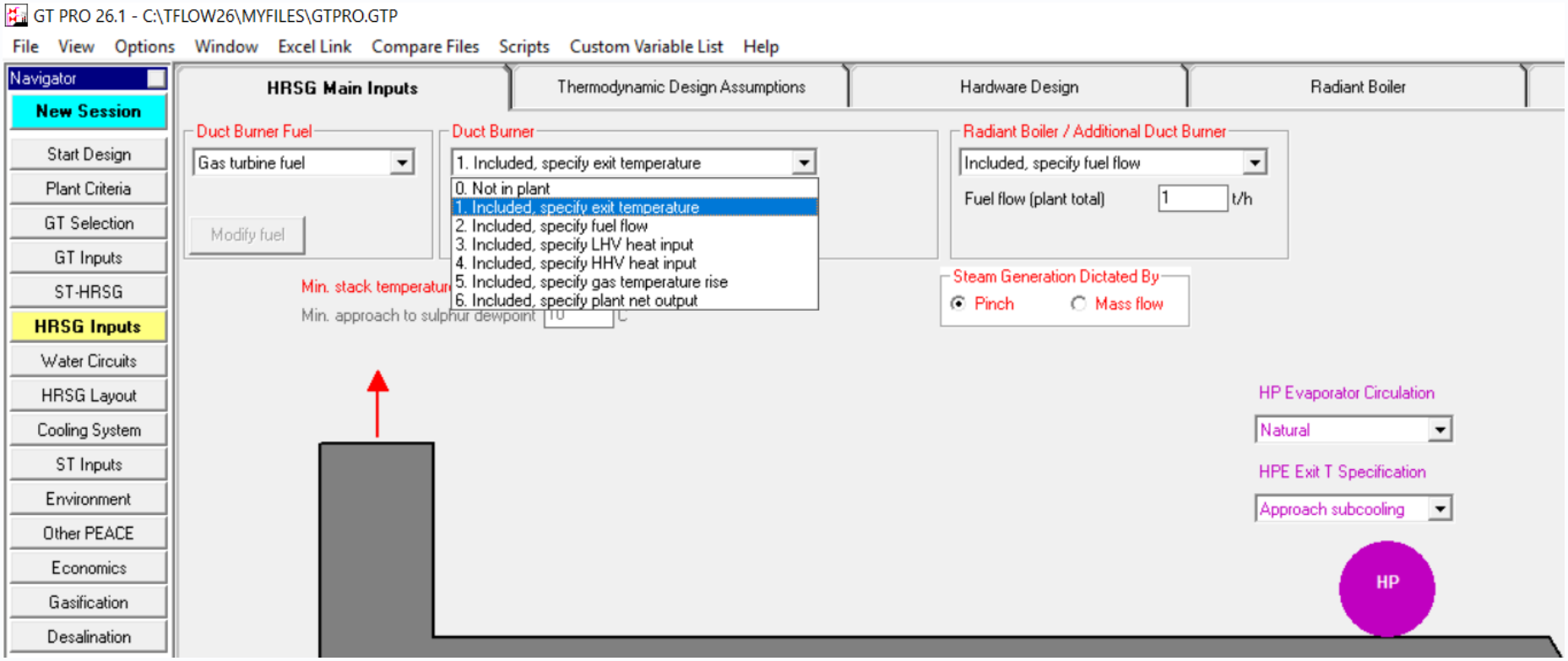
How to set duct burners



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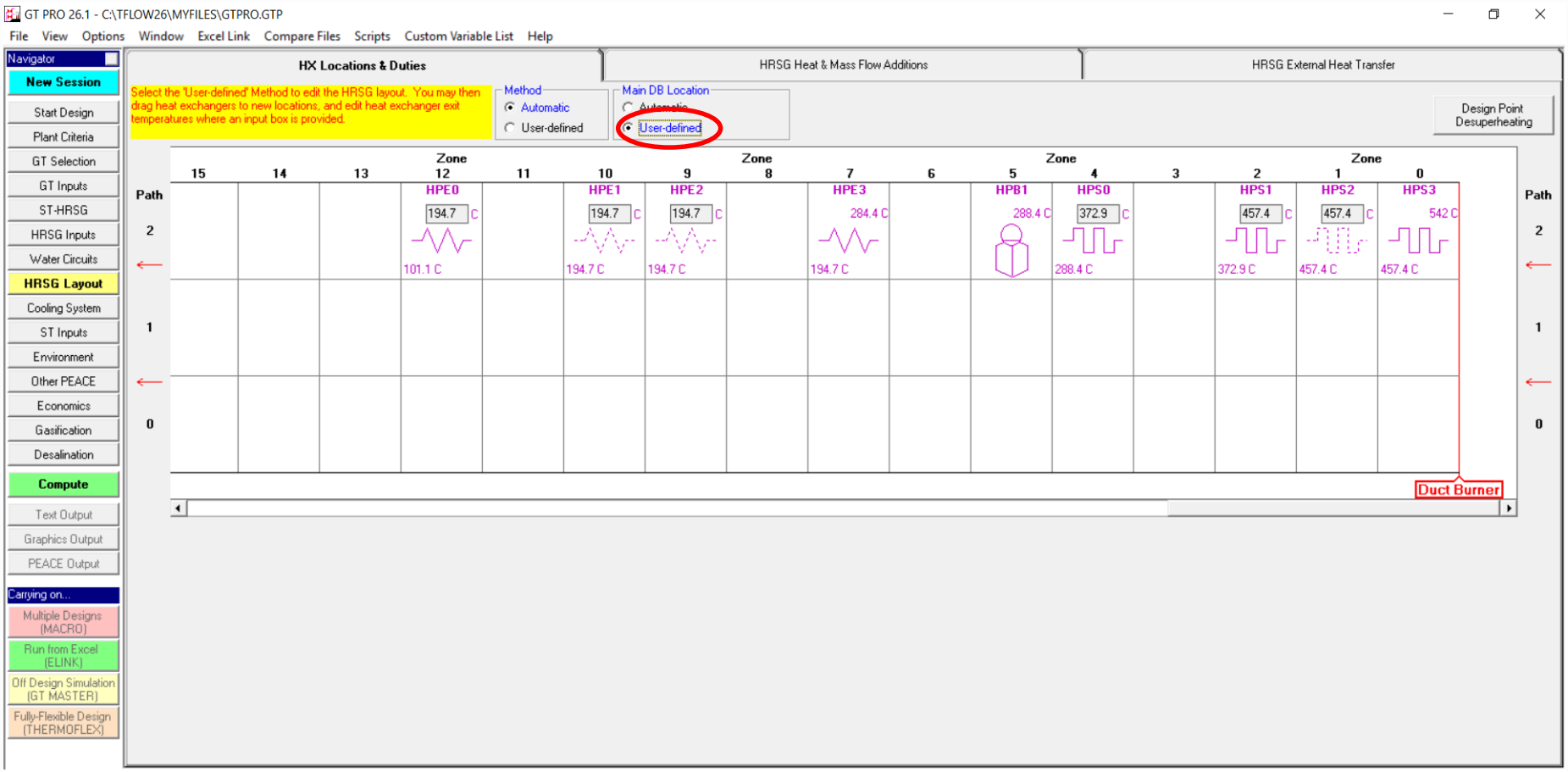
Changing location of the duct burner



*Switch to user-defined and drag duct burners to new locations

Plant model sample with supplementary firing

- Combined cycle based on 2xGE 6F.01.
- Supplementary firing (up to 750 C) to produce more power when electricity price is high.

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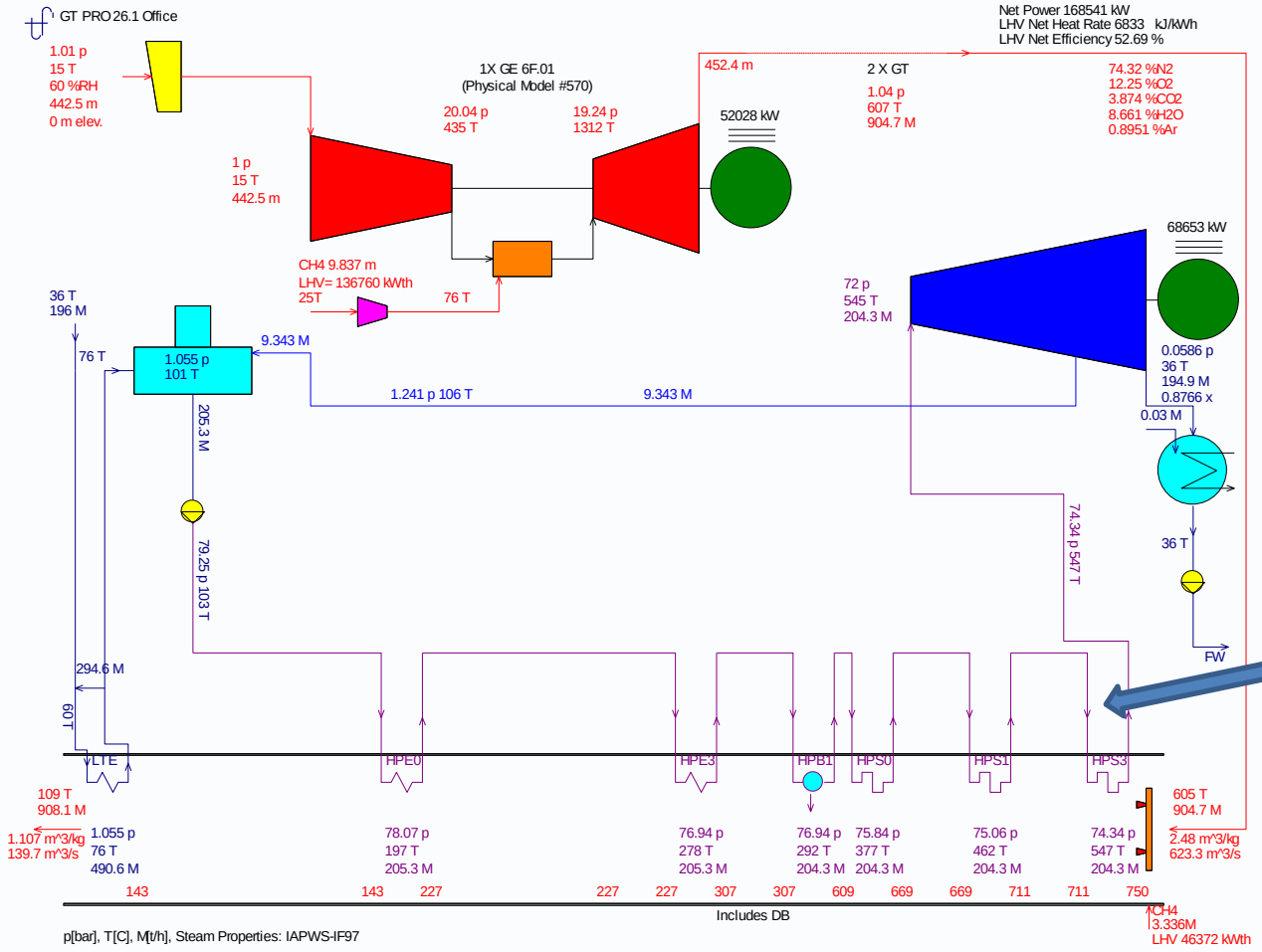
Plant model sample with supplementary firing



Super Heaters undersized

Plant model sample with supplementary firing

Thermoflow Multi-Point Design 26.1 - C:\TFLOW26\MYFILES\GTPRO.MGP

File Edit Options Help

< Review / Edit Designs | SUMMARY | HRSG | STEAM TURBINE | COOLING SYSTEM | GT INLET | PUMPS | PIPES | OTHER | Build and Run GT MASTER Model | Build and Save GT MASTER Model

Use HRSG from specific design: Nominal Design

Use sizing options below

Model Determining HX & DB Location and Sequence: Nominal Design

Duct Burner Capacity: Average / From range: Min plus 1 * (Max - Min)

Duct Width & Tube Length: Average / From range: Min plus 1 * (Max - Min)

Drum Dimensions: Average / From range: Min plus 0.75 * (Max - Min)

Superheater Areas: Average / From range: Min plus 0.7 * (Max - Min)

Stack Dimensions: Average / From range: Min plus 0.75 * (Max - Min)

Evaporator Areas: Average / From range: Min plus 1 * (Max - Min)

SCR & CO Catalyst Effectiveness: Average / From range: Min plus 1 * (Max - Min)

Economizer Areas: Average / From range: Min plus 1 * (Max - Min)

Radiant Boiler Projected Areas: Average / From range: Min plus 1 * (Max - Min)

		Nominal Design	Design 1
User excluded this design entirely		no	no
HRSG compatible with HRSG in nominal design		yes	yes
Gas temperature reaching HRSG	C	604.6	604.6
Gas temperature after duct burner (if present)	C	750	604.6
Duct burner nameplate LHV capacity	kW	23,186	20,723
Overall heat transfer surface	m^2	23,919	12,994
Economisers	m^2	15,933	5,415
Evaporators	m^2	6,719	5,728
Superheater/Reheaters	m^2	1266.7	1,850
Duct width	m	3.547	3.254
Tube length	m	10.33	9.463
Main stack height	m	22.73	20.82
Main stack diameter	m	2.981	2.976
HP drum length	m	5.172	4.744
HP drum diameter	m	1.222	1.036
HP drum thickness	mm	51.37	43.56

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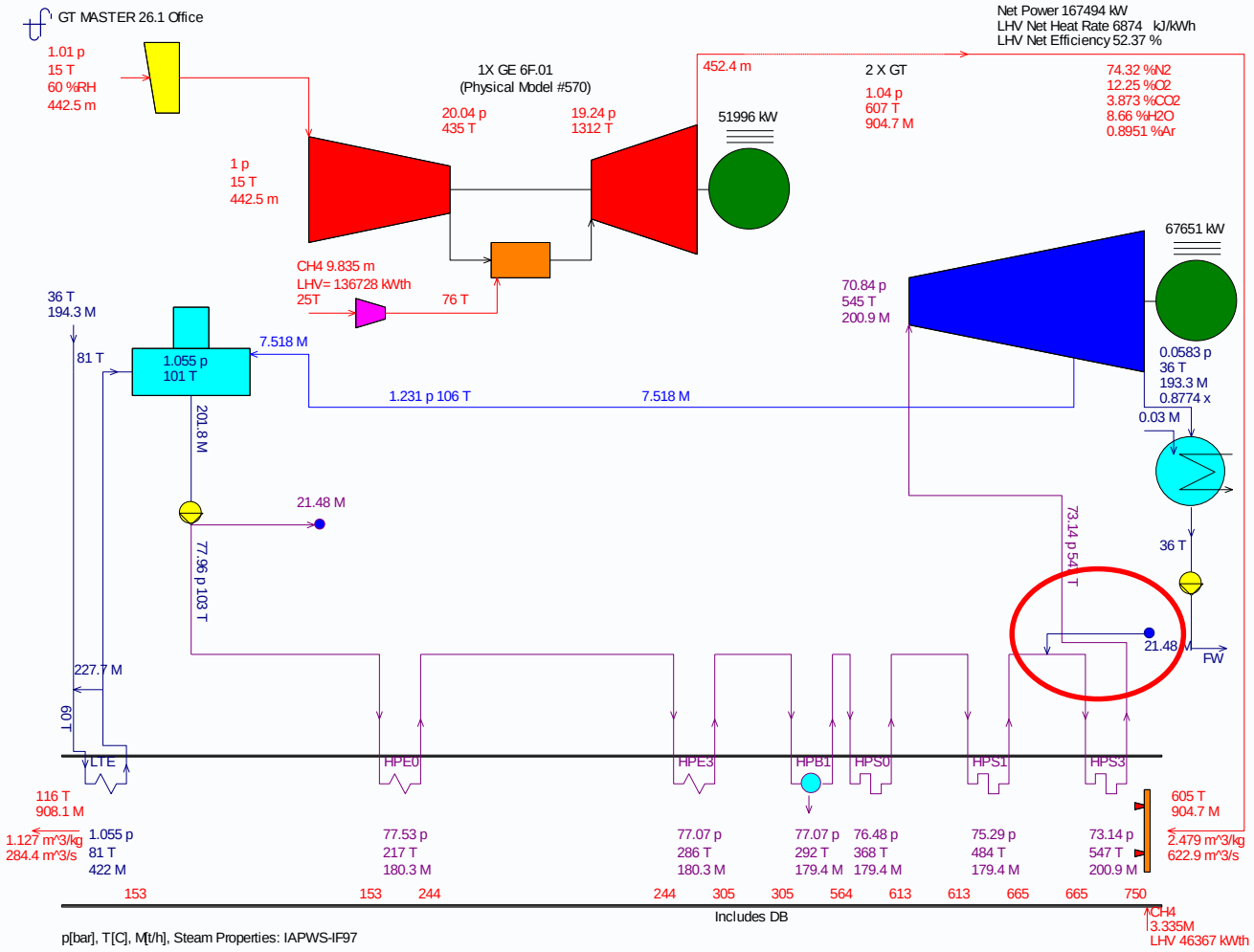
Supplementary firing 750 C



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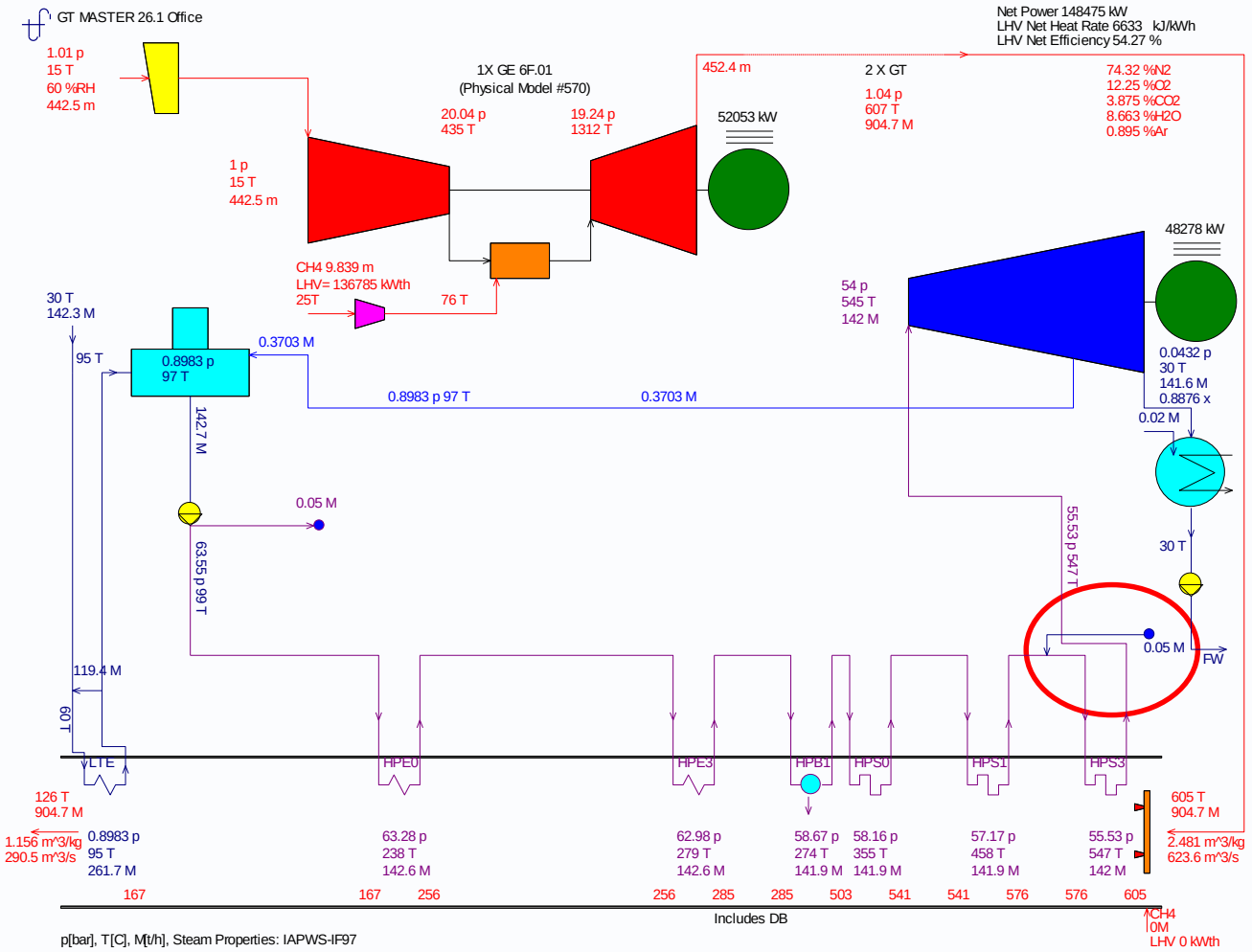
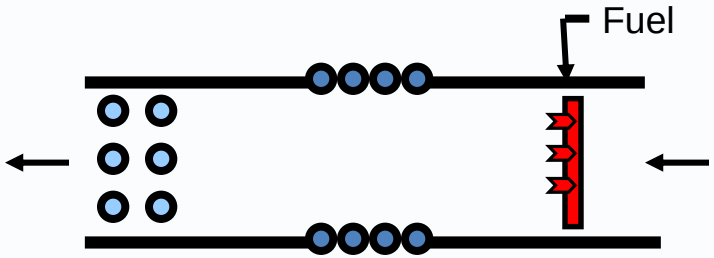
No supplementary firing

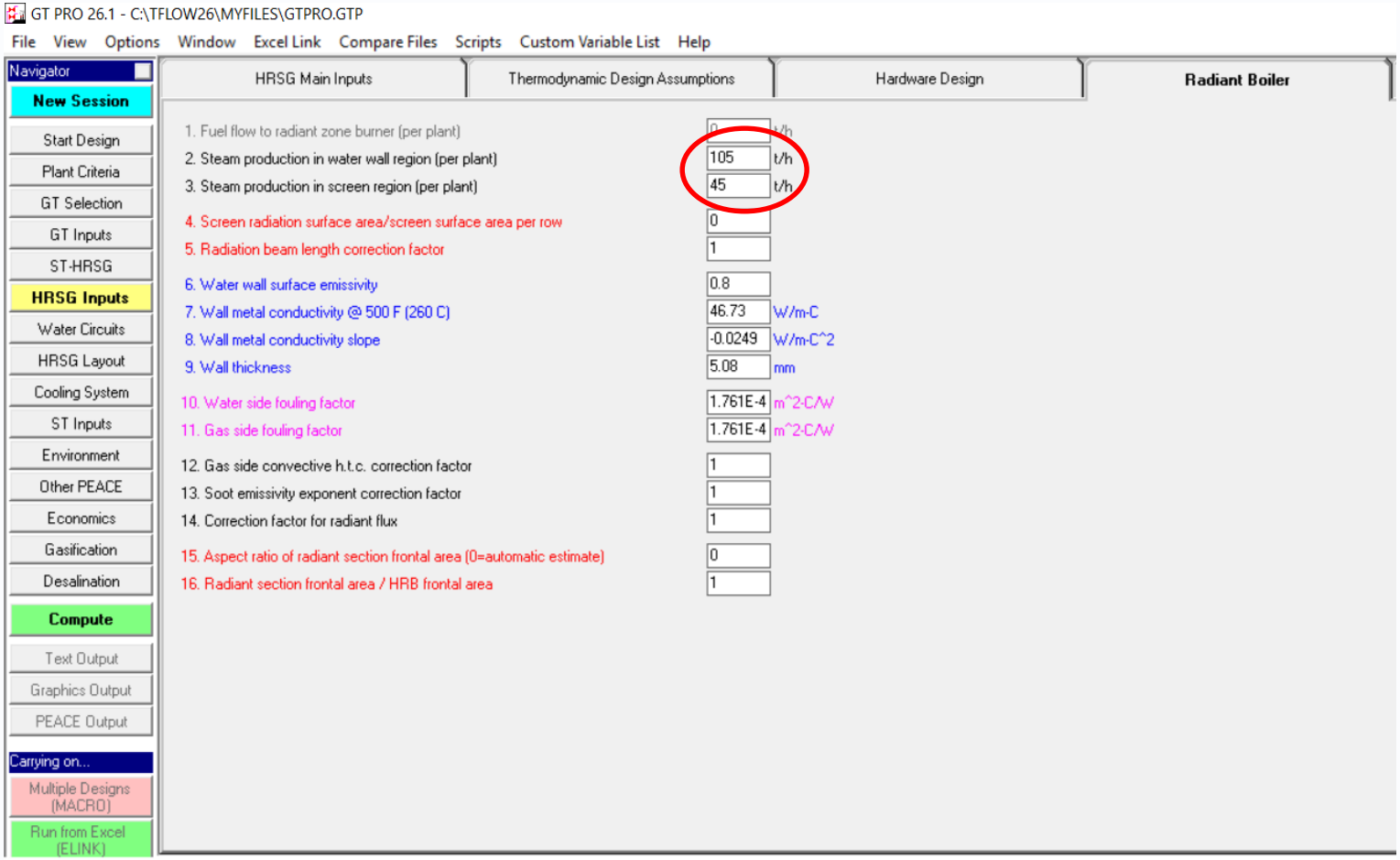


HRSG with radiant surfaces

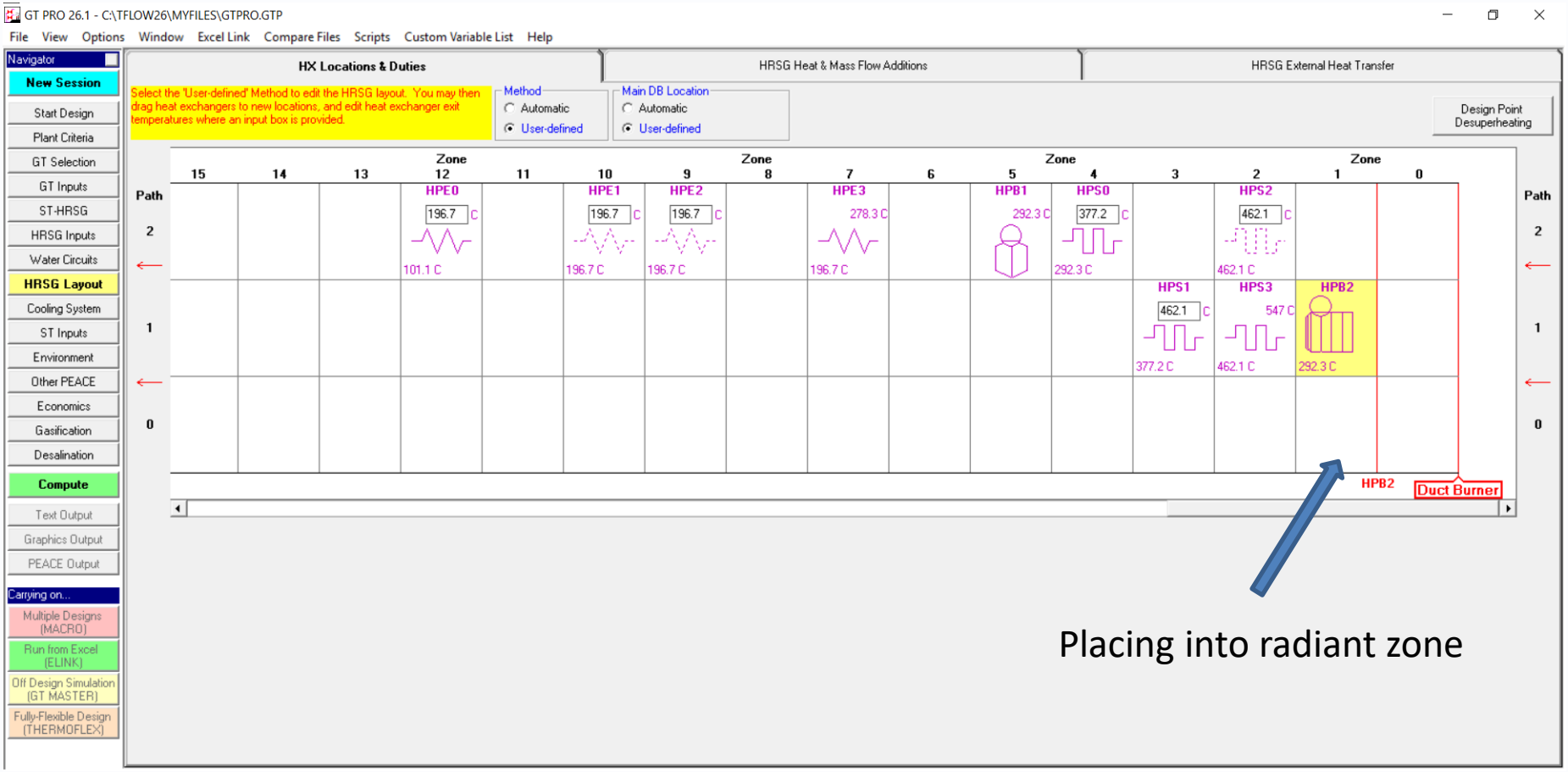
- When the gas temperature is higher than 800 C the radiant heat exchange takes place.
- Radiant heat exchanges have to be used in this case (screens).



HRSG with radiant surfaces



HRSG with radiant surfaces



Placing into radiant zone

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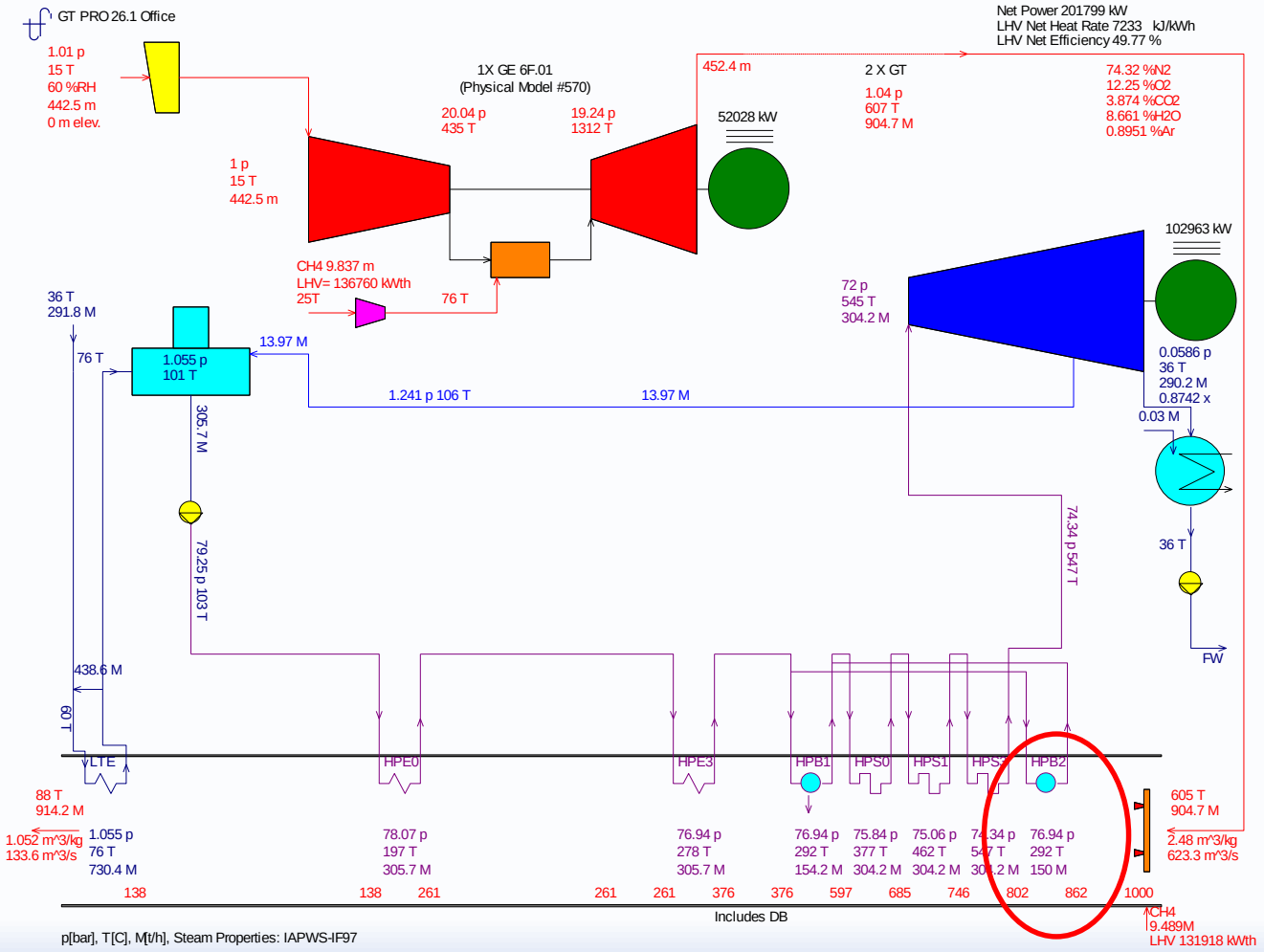
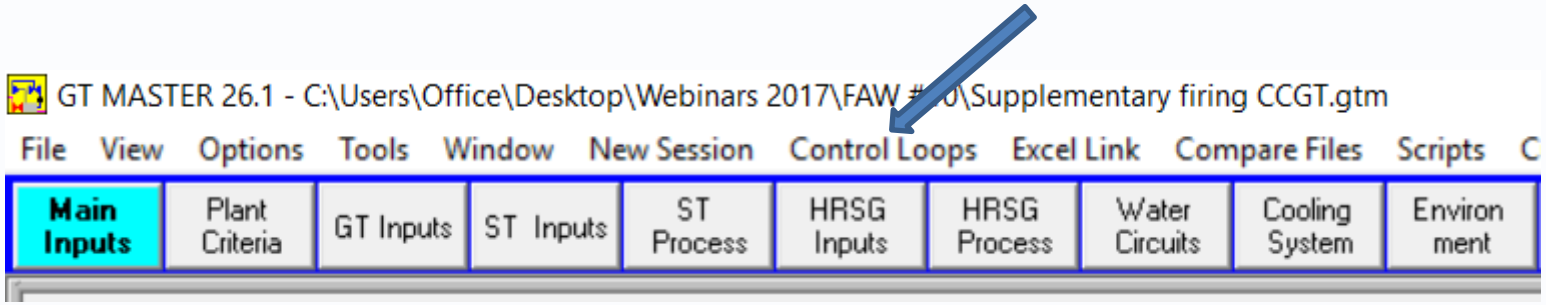
HRSG with radiant surfaces



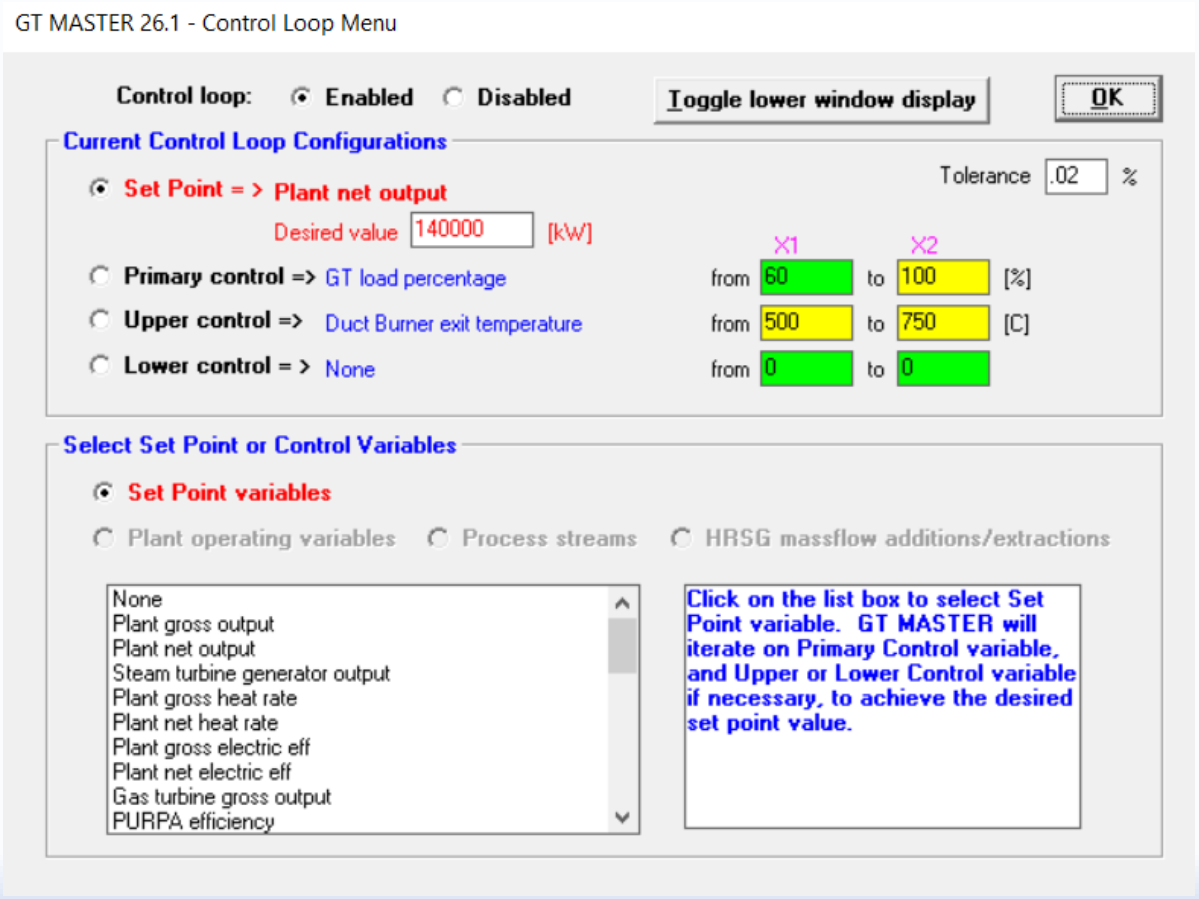
Control Loop in GT MASTER

- Control Loop is a tool for automatically searching for the values of inputs to the GT MASTER model that cause an output of the GT MASTER model to attain a certain, desired value.



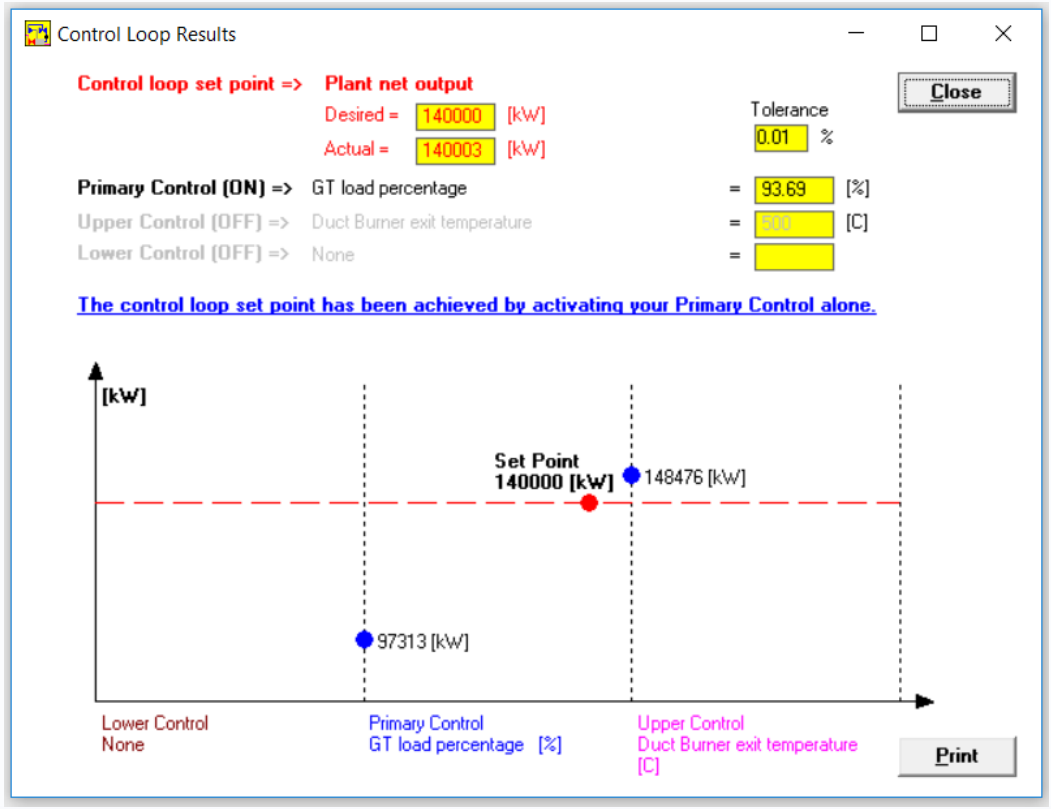
Control Loop in GT MASTER

Control Loop Menu



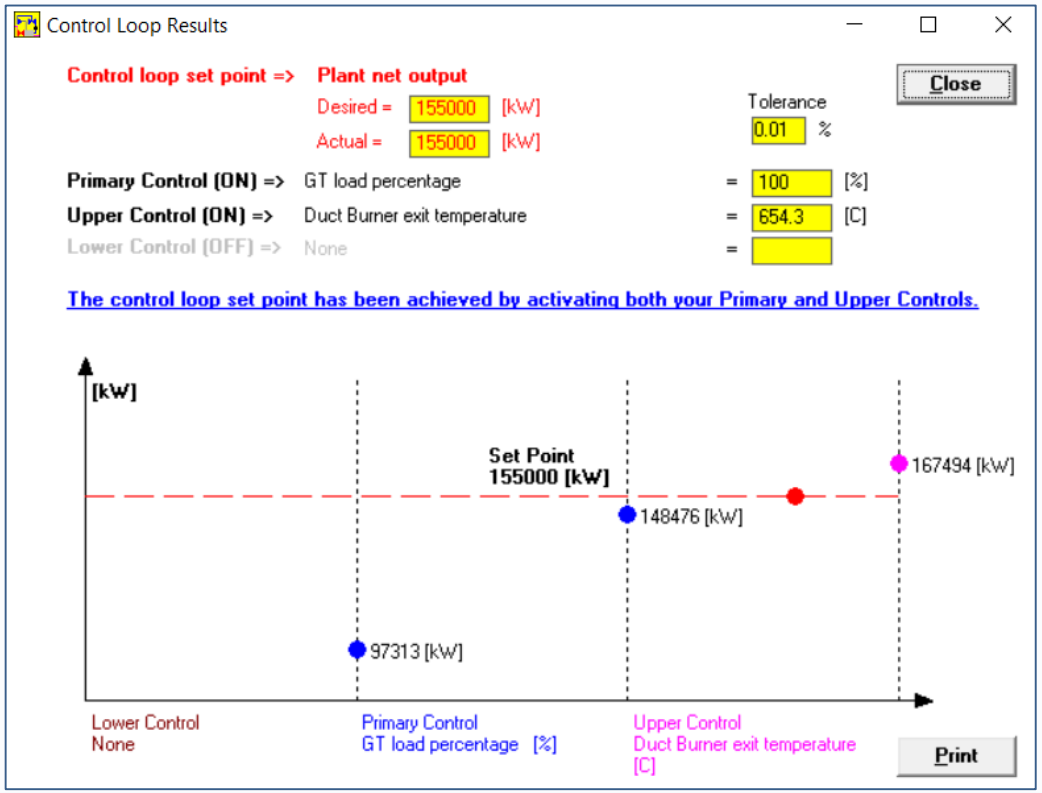
Control Loop in GT MASTER

Control Loop Results (140 MW)



Control Loop in GT MASTER

Control Loop Results (155 MW)



Control Loop in GT MASTER

Control Loop is available input for ELINK

ELINK 26.1 (Save-ALL) Copyright (c) 1999 - 2017 Base Case: C:\TFLOW26\MYFILES\GTPRO.gtm Loaded: 08-31-2017 : 10:53:39		Base Case	Case 1	Case 2	Case 3	Case 4	Case 5
Computation Message ->		Messages	OK	OK	OK	OK	Messages
INPUT VARIABLE DESCRIPTION	**Units**	Input	Input	Input	Input	Input	Input
Plant net output		170000	90000	110000	130000	150000	170000
OUTPUT VARIABLE DESCRIPTION	**Units**	Output	Output	Output	Output	Output	Output
Plant net output	kW	167,494	89,995	110,005	129,994	149,999	167,494
GT load	%	100.0	54.47	69.98	85.9	100.0	100.0
GT fuel flow	t/h	9.835	6.502	7.583	8.696	9.839	9.835
Total duct burner fuel flow	t/h	3.335	0	0	0	0.2547	3.335
Duct burner exit temperature	C	750.0	647.1	638.2	620.7	616.0	750.0

Q & A session

Please send your questions to the **presenter** in the webinar chat!

For further questions:
zakharenkov@thermoflow.com

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Thank you!