

HFC Powering Calculator

User Guide

General information

HFC Powering Calculator is the Microsoft Excel 2007 Macro-Enabled Workbook.
The program is based on VBA and uses ActiveX controls.

Before you start using the tool please verify that macro and ActiveX controls are enabled on your Excel (at least for the current session):

a) Change macro security settings

You can access the Trust Center in the Excel Options dialog box. Click the Microsoft Office Button , and then click Excel Options.  In the Trust Center category, click **Trust Center Settings**, and then click the **Macro Settings** category.

See Fig. 1

b) Enable ActiveX controls

You can access the Trust Center in the Excel Options dialog box. Click the Microsoft Office Button , and then click Excel Options.  In the Trust Center category, click **Trust Center Settings**, and then click the **ActiveX Settings** category.

See Fig. 2

In both cases you have to decide which security option you prefer.

To learn more in depth the security issues related to macro and ActiveX use Excel Help:
Press F1 and paste the following phrases in the Search Window:

- Enable macros in Office documents
- Change macro security settings in Excel
- Enable ActiveX controls in Office documents
- Enable or disable security alerts on the Message Bar

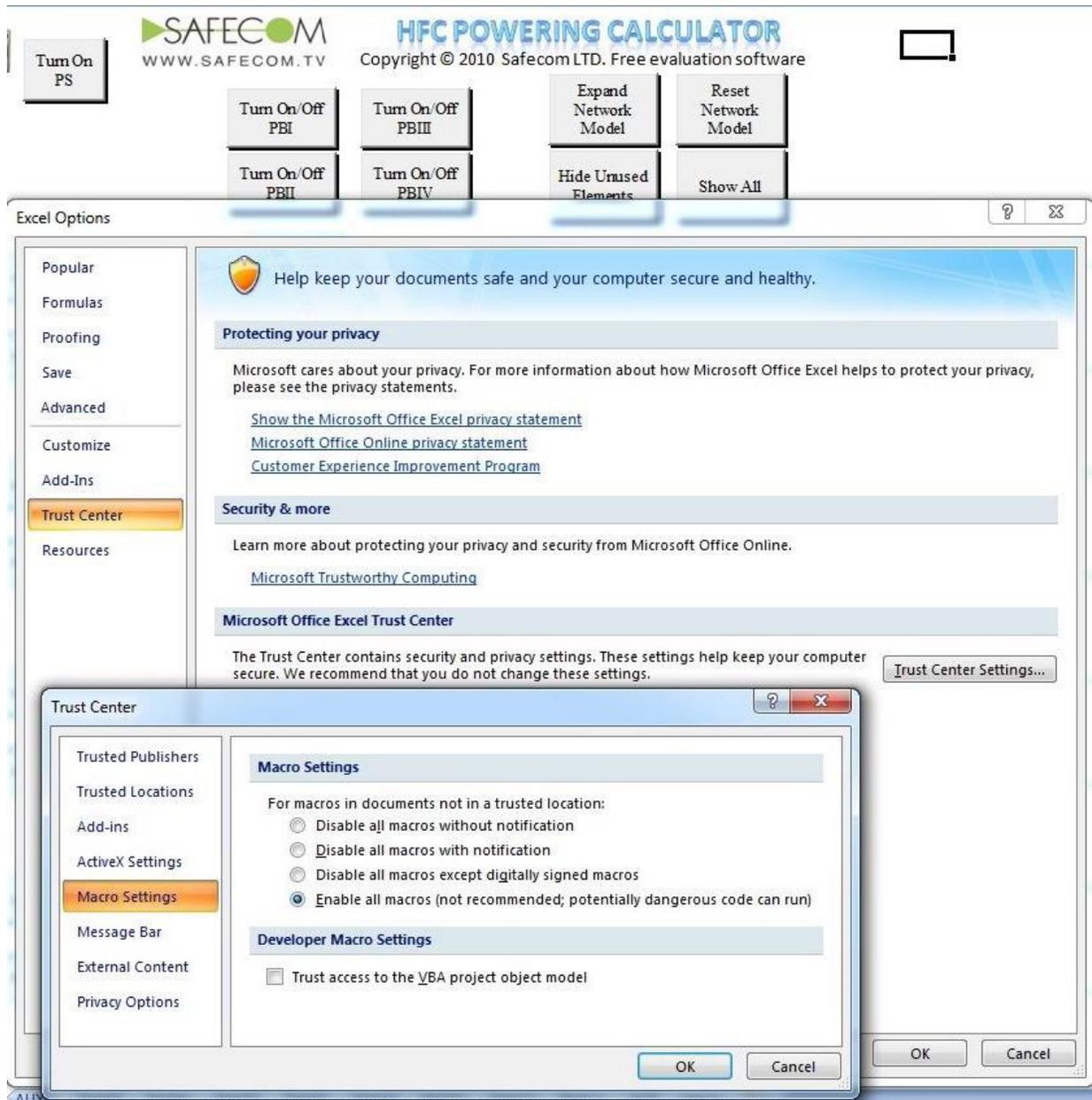


Fig.1 Enabling macro via Trust center

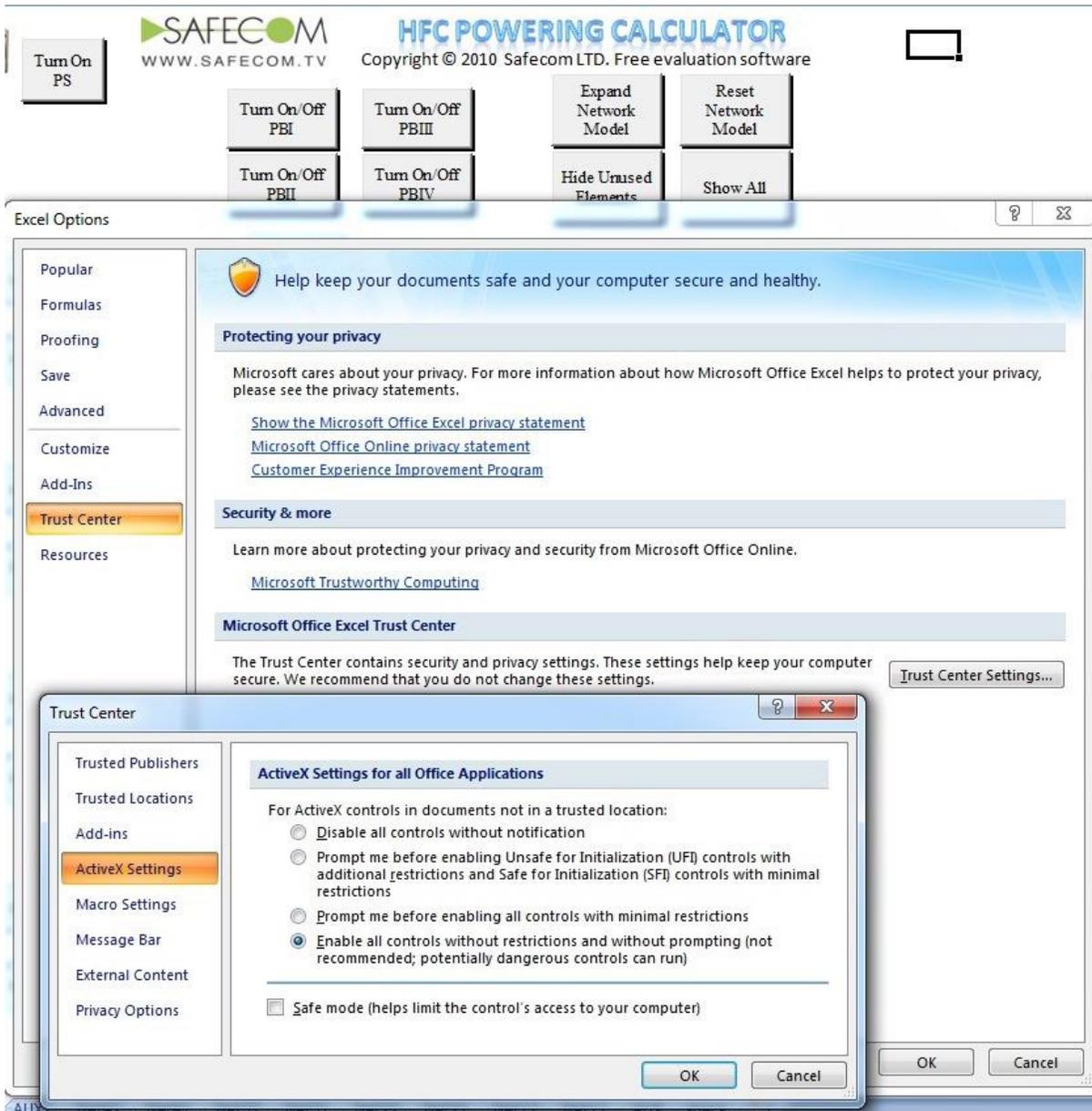


Fig.2 Enabling ActiveX via Trust center

Program function

HFC Powering Calculator is designed for power calculations in cable networks.

The Network Model includes:

- Power source (AC power supply);
- Power consuming active components (Optical Nodes, RF amplifiers etc.);
- “Tree” structured cable system (coaxial cables or power wires) connecting power source to the active components.

The following parameters serve as inputs for calculations:

- Power source output voltage (Volts AC, RMS);
- Power supply current capability (Amperes, RMS)
- Power consumption of the active component (W) at nominal input voltage level;
- Minimal allowed voltage at the input of the active component (Volts AC, RMS);
- Cable loop resistance (Ohm/km);
- Length of the cable span between two adjacent points (meters or feet);

The following parameters are calculated:

- Voltage levels at the inputs of each active component;
- Voltage levels at the splitting points;
- Current values consumed by every active component;
- Overall currents at the critical sections;
- Power source current load;
- Power source actual power load for different power supplies.

Special features:

The Calculator can now handle Safecom’ patent pending **Power Booster**, a device that compensates the voltage drop over coax cable, enables to utilize the DPS technology between remote locations and to solve “low voltage” problems for plant expansions of the existing networks avoiding addition of the new power sites. Designer can seamlessly locate Power Booster at different points in the cable system and choose the optimal location using this special feature.

Program Main Window description (Worksheet “Control”)

The central element of the main Window is a **Network Model** consisting of power source (PS), main cable run having four splitting points and eight branches, each one of them includes six power consuming locations separated by the cable spans. Each branch has its label like Net11, Net12, Net21 and so forth up to Net42. Note that there are worksheets of the same names in the workbook. The Network Model may be expanded by adding new branches (described later in the User Guide).

Buttons

In the upper part of the window nine buttons are located. See Fig. 3



Five buttons run the calculation process:

- **“Turn On PS”** button to calculate the Network without Power Booster;
- Four buttons **Turn On/Off PBx** to run Power Boosters located before each of the splitting points.

The following combinations of the Power Boosters are allowed:

- Power Booster I
- Power Booster II
- Power Booster III
- Power Booster IV
- Cascaded Power Booster I + Power Booster IV
- Cascaded Power Booster I + Power Booster III
- Cascaded Power Booster II + Power Booster IV

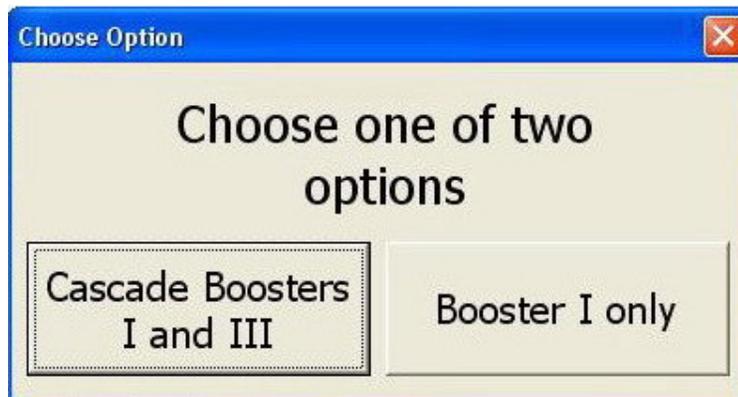
The present state of each booster is indicated by the appropriate LED: Grey LED for the state "OFF" and Green LED for the state "ON".

The program provides friendly interface for choosing desired combination of boosters relying on the present state. See Fig.4



fig.4 Power Booster states

For example, if all boosters are "OFF" pressing each button will switch "ON" the appropriate booster. If only booster IV is "ON" and you press the button of the booster II the dialog will pop-up prompting for desired action, and so forth. See Fig.5



Power Booster related information appears when it is relevant to the right of the buttons panel. See Fig.6

Fig. ifo

PB Location I	
V in	V out
47.5V	62.7V
I in	I out
13A	9.6A
Gain	1.32

Four buttons panel to the right of the run buttons includes:

- **“Hide Unused Elements”**
- **“Show All”**

When preparing specific network layout all elements must be visible to insert data (“Show All”) When the network layout is set you can hide unused controls for comfortable viewing.

- **“Reset Network Model”**

Use this option when you want to clear out all elements and start new network layout from scratch.

- **“Expand Network Model”**

The base Network Model covers only limited scope of network topologies. The “Expand Network Model” feature presents remarkable capability to overcome this limitation substantially. How it works. When you press the button the dialog box opens prompting to choose a network branch you want to expand. See Fig. 7



Fig.7 “Add branch” dialog

Press “Click here to create new branch”.

If for example you added a new branch to the base branch Net31 the new empty branch is virtually added to this one starting from the big black point appearing to the left of the first branch element.

The new Worksheet Nett11(2) is automatically created and activated so that you may set data for the new branch. If no data is set the Network Model will be handled as if no branch has been added. After setting data return to the Main Window (Worksheet “Control”). See Fig.8

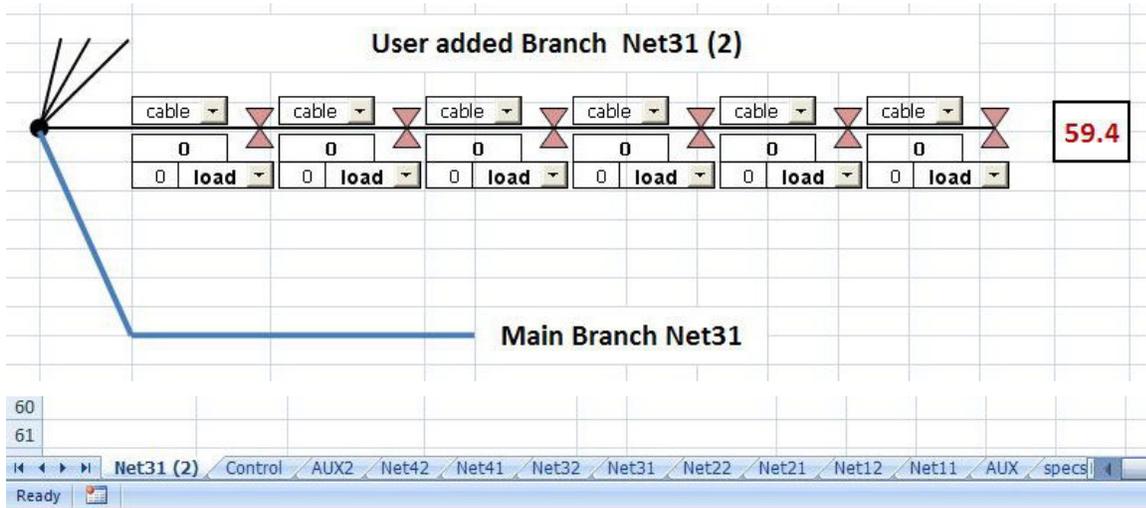


Fig.8 Added Worksheet

You may add any number of branches to any base branch in this manner.

Additional branches are not displayed on the main program window (Worksheet “Control”) though they are being handled by the program as the integral part of the Network Model. When any calculation is completed successfully you may look over appropriate added Worksheets to view the level of AC Voltage at the inputs of the last active element in the branch cascade (appears to the right of the last drawn element – 59.4V as shown on the above picture).

Important Note! It is strictly prohibited to delete worksheets using standard Excel procedure. Deleting any worksheet causes the program to stop functioning. If in any case it happened you are advised to exit Excel immediately **without saving the changes in the Workbook**, and then run the application again.

However all added branches may be seamlessly erased from the Network Model programmatically by pressing the button “Erase all added branches”. In case you want to erase only selected branch/es without affecting other added ones you may just cancel all its/their elements, i.e. put “cable” for all cable types and “load” for all active devices (see section Controls below)

- “Reset Network Model” button

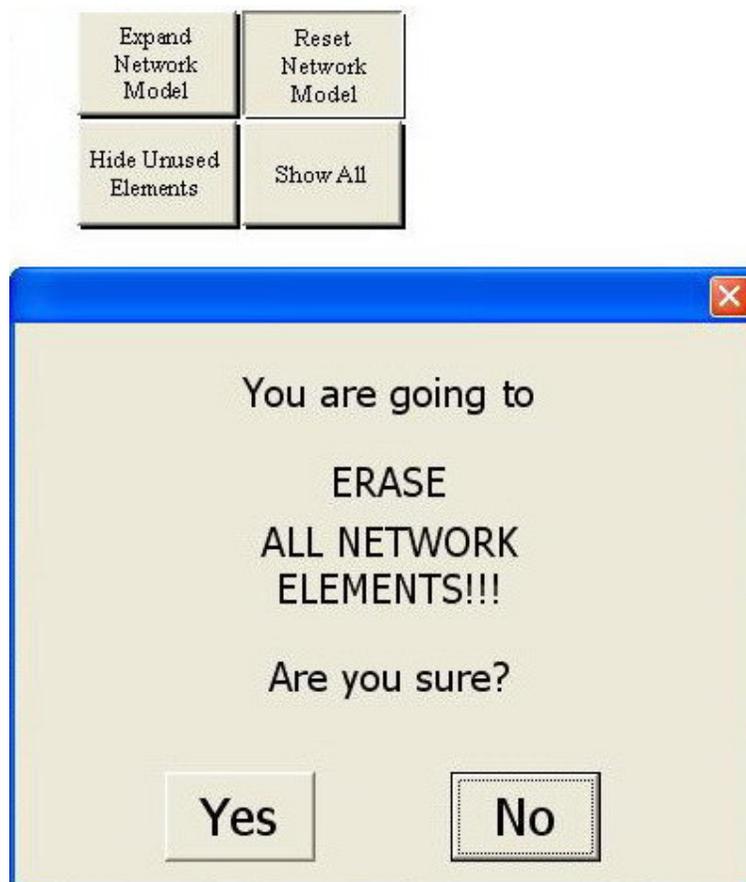
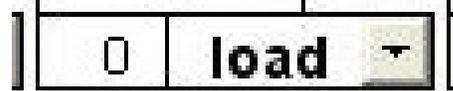


Fig.9 “Reset Network Model” dialog

Use it only if you are intending to start a new Network Model from scratch. See Fig.9

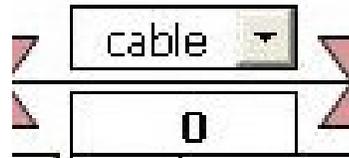
Controls

- Choose from the pop-down list of the “load” control the type of the active component to place in the specific location;



- “Number” control : aside to each “load” control there is a small rectangle where a number of loads of the chosen type must be set (this number may be set to any value including zero and fractions);

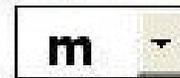
- Choose from the pop-down list of the “cable” control the type of the cable for the specific cable span;



- “Length” control : below each “cable” control there is a small rectangle where the length of the cable span of the chosen type must be set;

- “Length Unit” control allows to choose meters (“m”) or feet (“ft”) depending on measuring system used;

Choose
Length Unit



PS

66 V

- Power source “Output Voltage” control allows to set the appropriate parameter for the power supply.

Basic operation

It is recommended to prepare a schematic diagram of the Network that you want to calculate before you start using the program. We'll take the diagram shown in Fig.10 as an example. The work starts with analyzing the map diagram in order to designate devices of the real network to the certain elements of the certain branch of the Network Model. Encircled numbers 11, 12 etc. correspond to the appropriate branches Net11, Net12 and so on.

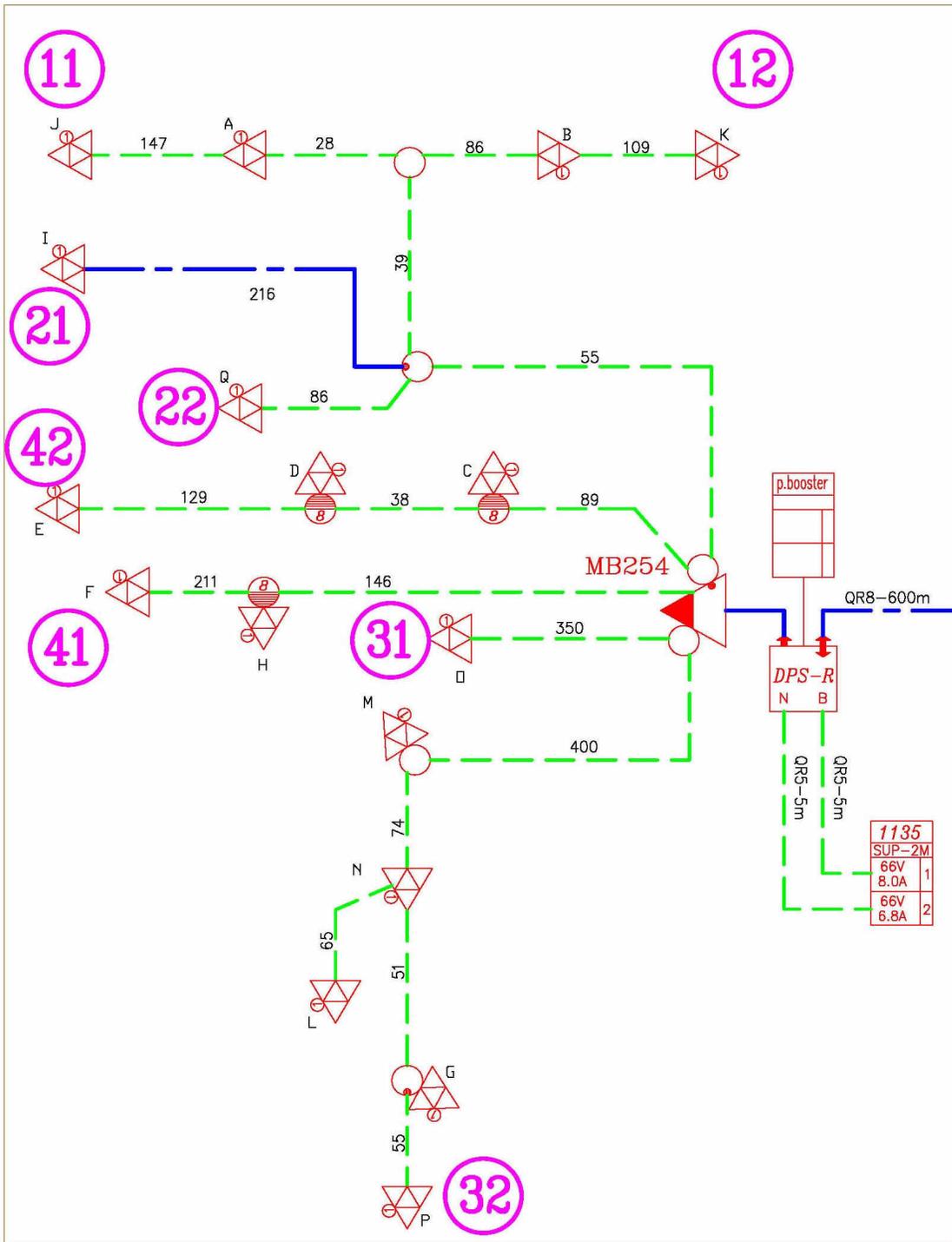


Fig.10 Real Network Schematic Diagram

1. The cable span between PS and the first splitting point we'll reserve for DPS backup calculation and set it meanwhile to "0". For backup calculation this span will be set to 600m of cable QR-860 (the blue line marked QR8-600m connected to the DPS on the map) See Fig.11

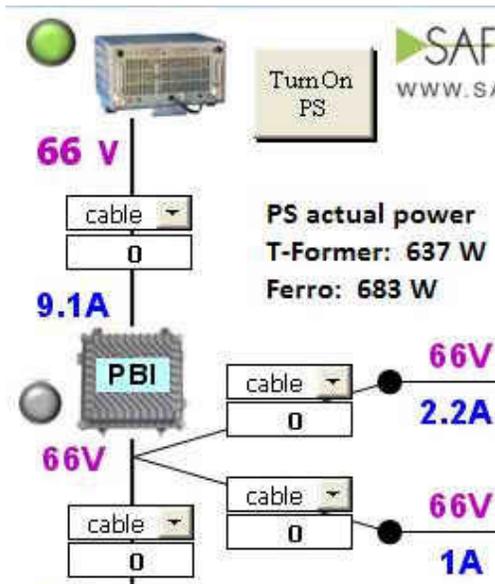


Fig.11 Backup span set to zero

2. Choose the trunk MB254 and line extenders C, D and E for the branch Net42. Set the active elements and cable spans as shown in the Fig.12

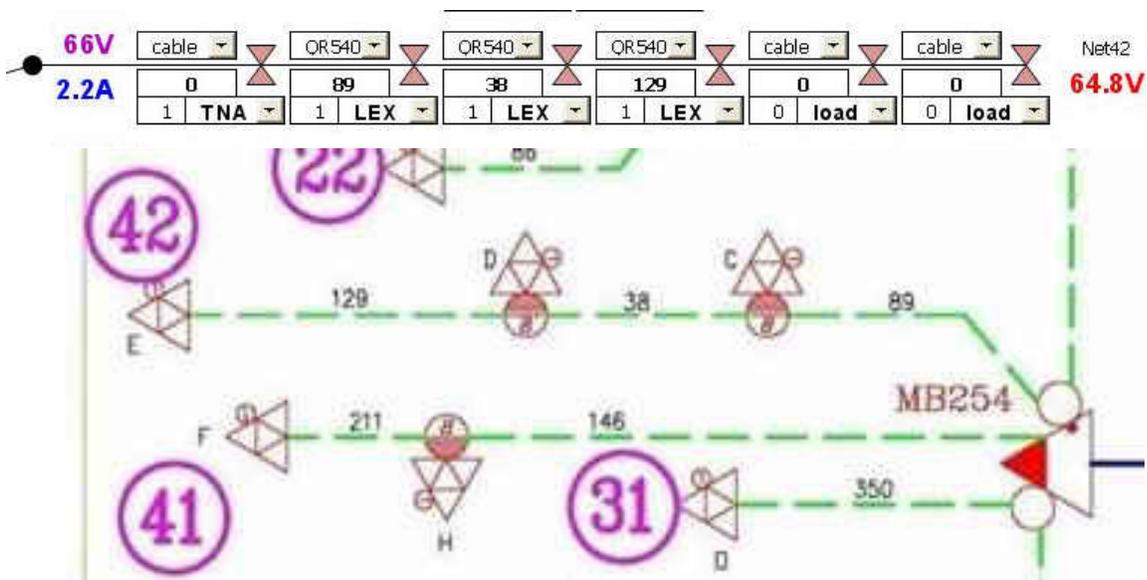


Fig.12 Branch Net42

- Designate the line extenders H and F for the branch Net41. Set the branch data as shown in the Fig.13

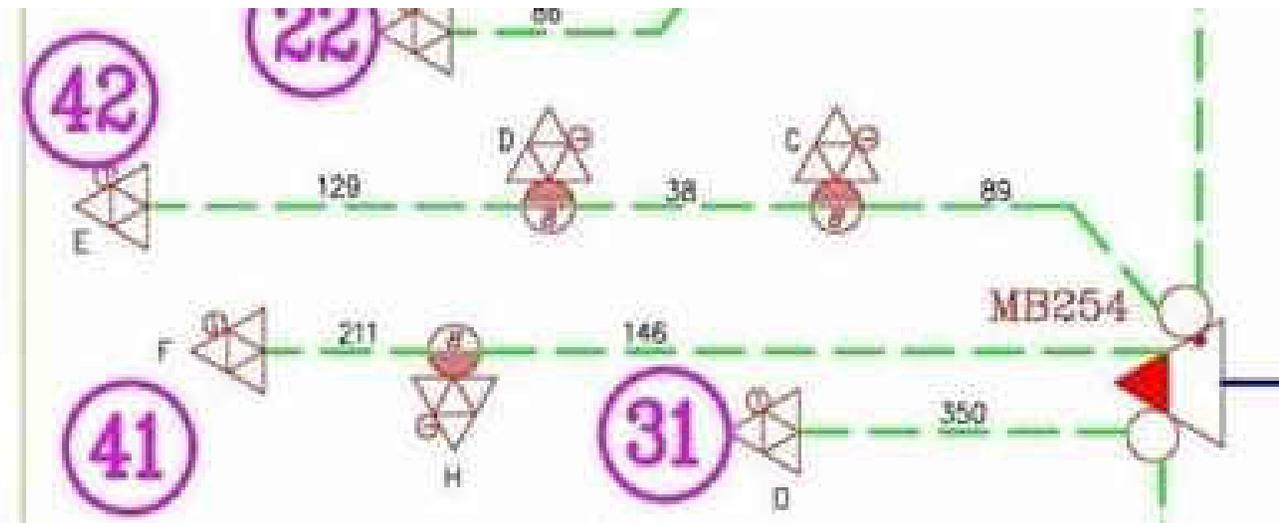
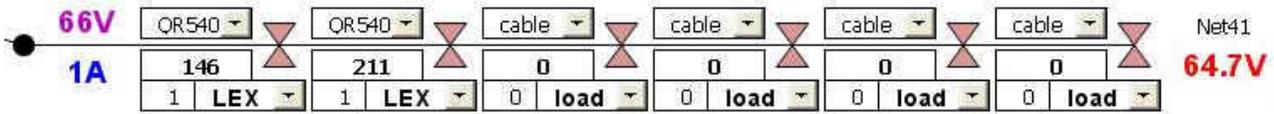


Fig.13 Branch Net41

4. Set branches Net31 and Net32 as shown in the Fig.14. Note that we “relocated” the line extender L 65m backward, close to the line extender N since we have no splitting point along the branch. However this amendment is acceptable because the difference in current consumption between two locations for one line extender is evaluated as 0.3% (or 15mA) only and has negligible impact on the overall result.

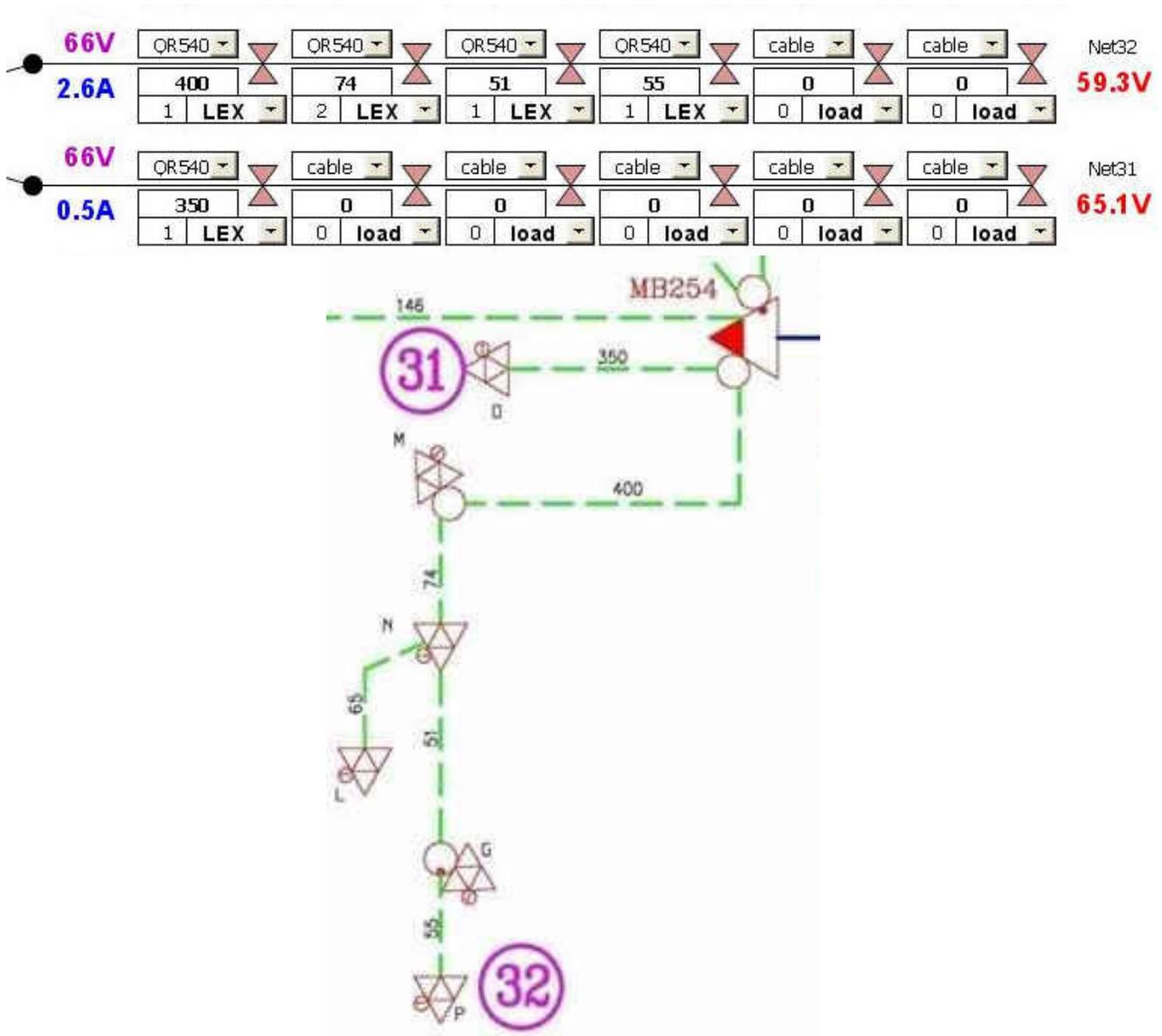


Fig.14 Branches Net32 and Net31

5. Branches Net11 through Net22 are arranged in the same manner (see Fig.15)

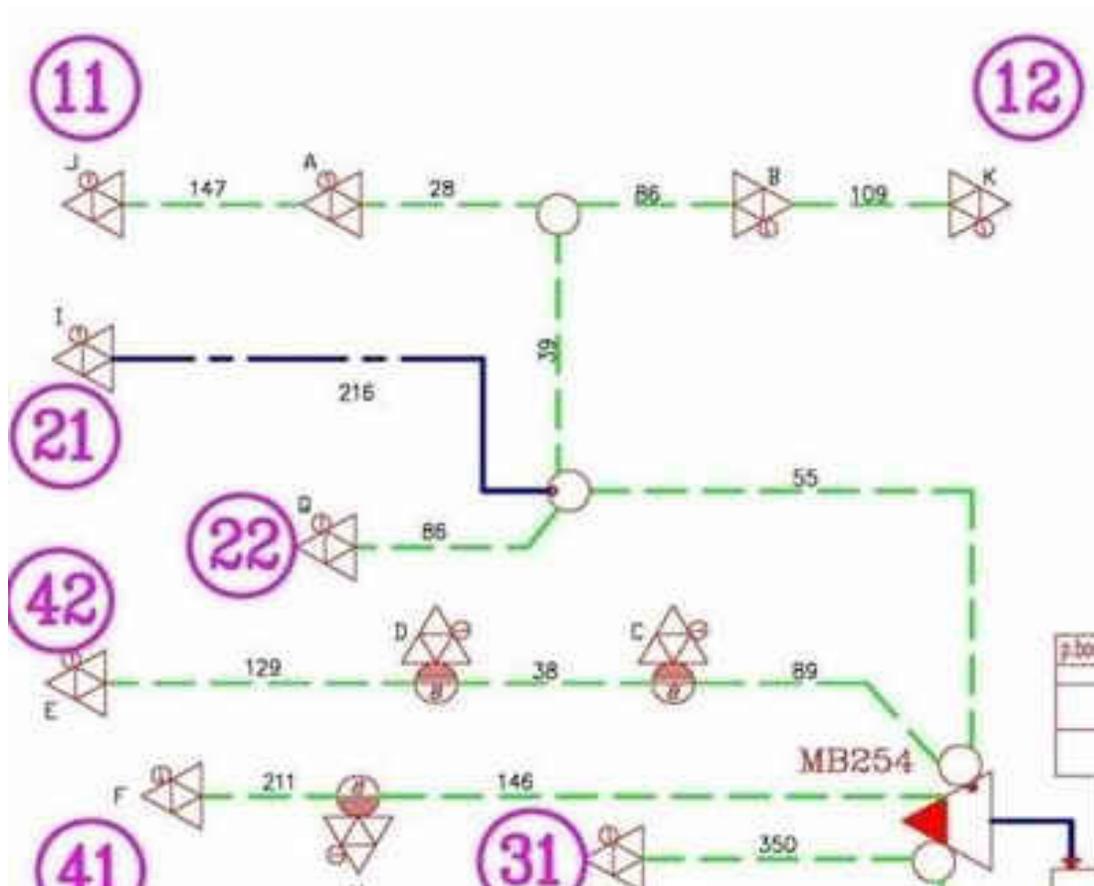
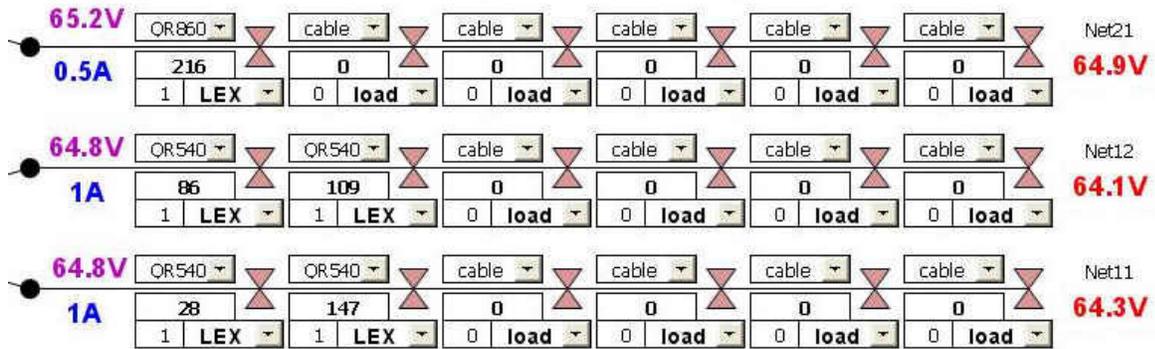


Fig.15 Branches Net11, Net12, Net21 and Net22

6. We are done with entering data. Press Hide Unused Elements button. See Fig.16

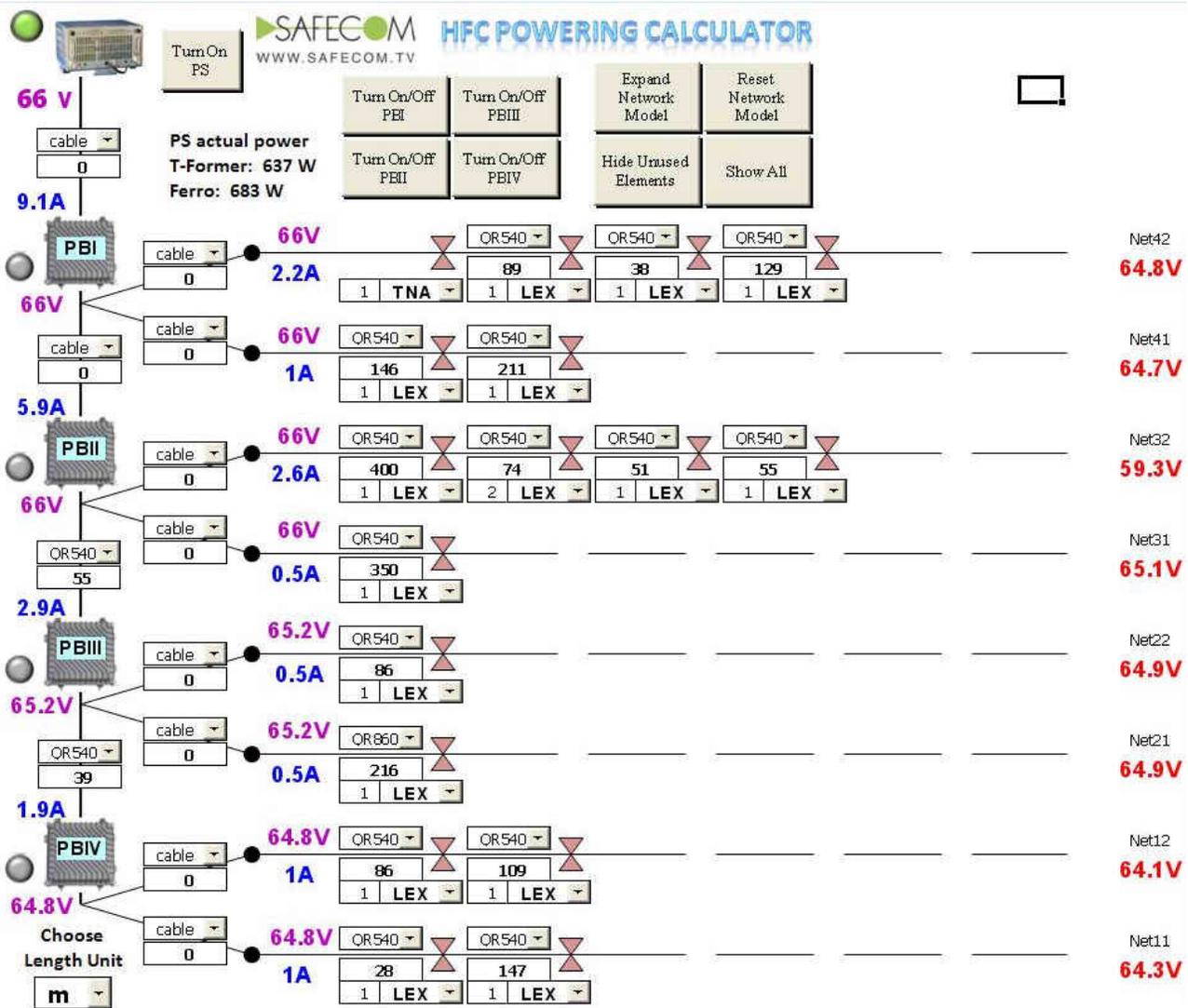


Fig.16 Network view after pressing "Hide unused elements" button

7. Press **Turn On PS** button to calculate network powered by the local PS. The results are shown in Fig.17. Note the pop-up window message.

The red colored numbers denote the levels of the input voltages at the last active for each branch. Voltage and current levels at various points of the network appear on the left. The overall current drawn from the power supply is 9.1A. The calculated values of the PS actual power appear beside the power source.

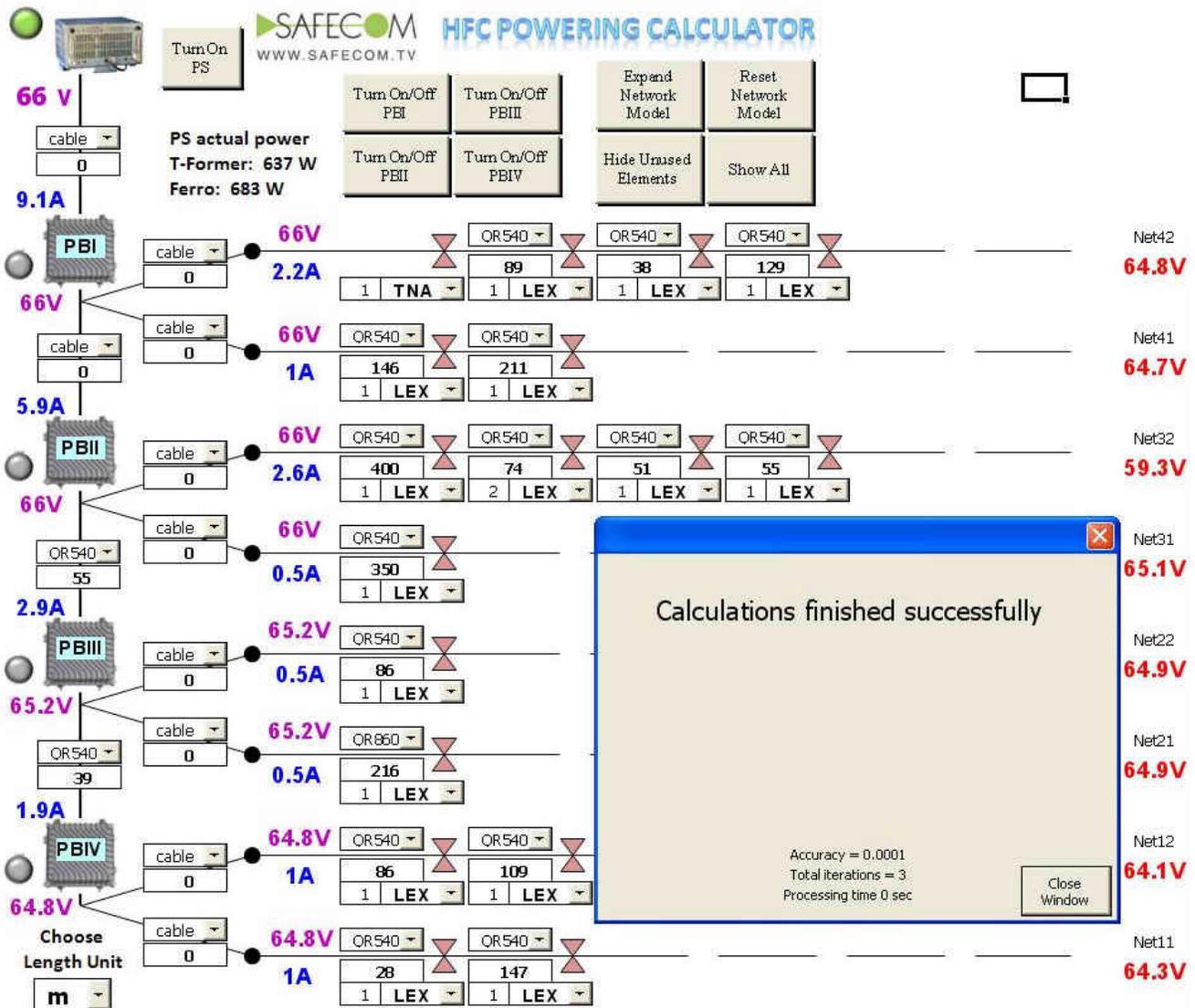


Fig.17 Results for Local PS calculation

8. DPS backup calculation. Enter 600m span of cable QR-860 between backup PS and trunk amplifier. Press **Turn On PS** button. See Fig.18.

Note the “low voltage” warning appearing on the pop-up window. Several amplifiers get the input voltages below the minimum required by the manufacturer. A designer may look for a closer power source to provide backup or try to solve the problem using Power Booster.

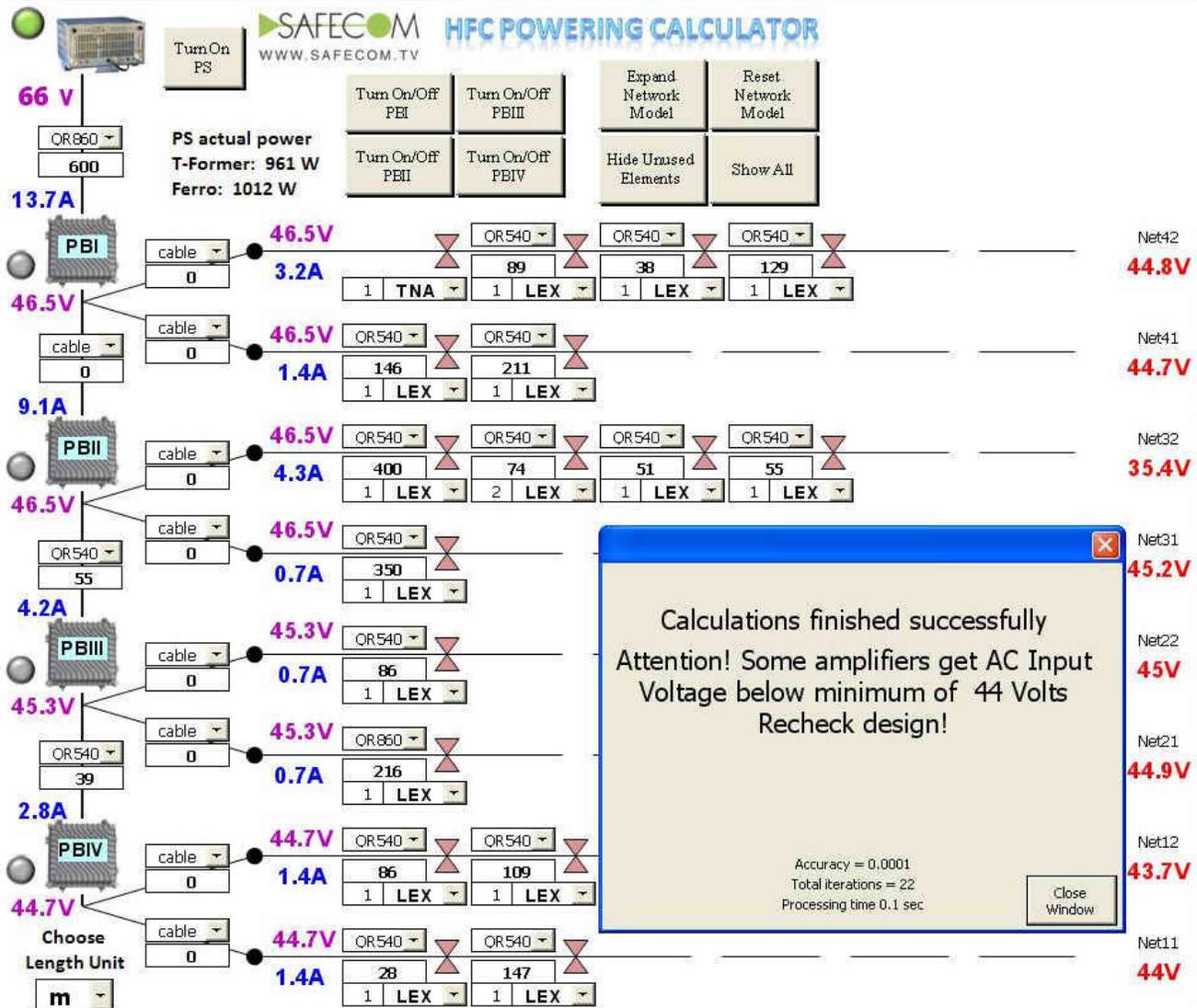


Fig.18 DPS backup results: low Voltage problem detected.

9. The low voltage problem occurs at the branches Net12 and Net32, hence we'll try to use Power Booster I before trunk amplifier. Press the button Turn On/Off PBI to calculate. Check the results (Fig.19). The Power Booster I LED "ON" indicator is Green; the calculated parameters appear in the Power Booster table. The low voltage problem is solved successfully.

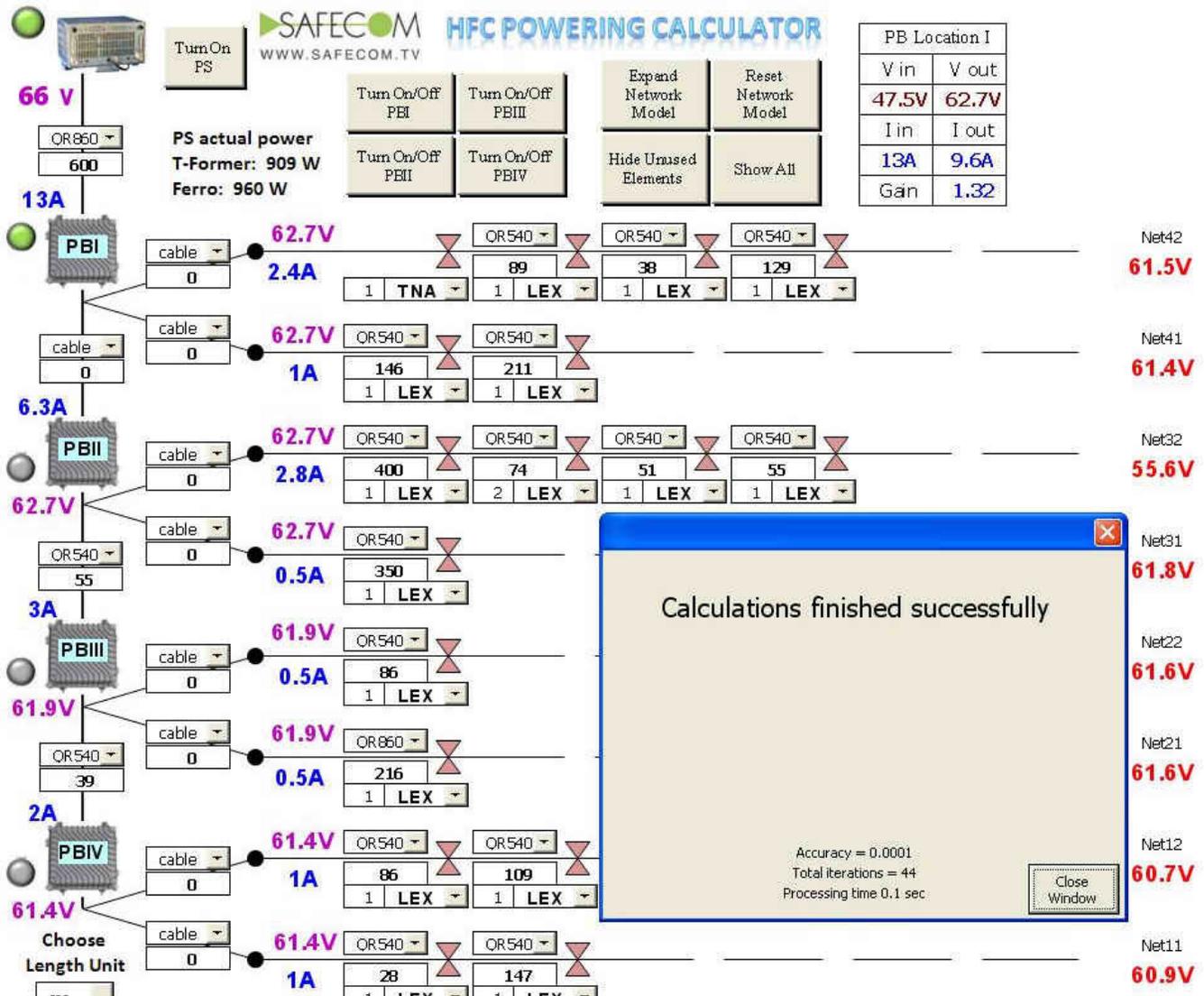


Fig.19 Power Booster solution. "Low Voltage" problem solved.