

Presentation Layout

- Introduction to ETAP
- Important features of ETAP
 - Load flow study
 - Short circuit analysis
- How to start ETAP
- How to use the libraries and toolbars
- Practical load flow study example

Introduction to ETAP

- ETAP stands for Electrical Transient Analyzer Program.
- It is one of the advanced software used for power system.
- It is very user friendly and requires very less simulation time.
- It provides data exchange interfaces including MSWord, MS Excel and PDF etc.

Important Features of ETAP

- Single line diagram can be created very easily.
- Infinite number of buses can be added in single line diagram of the Grid structure.
- It has the capability to perform various types of analysis given below.
 - Load flow studies
 - Short circuit analysis
 - Harmonic analysis
 - Optimal power flow analysis
 - Reliability assessment
 - Star analysis of protection devices
 - Transformer sizing and MVA capacity

Load Flow Analysis

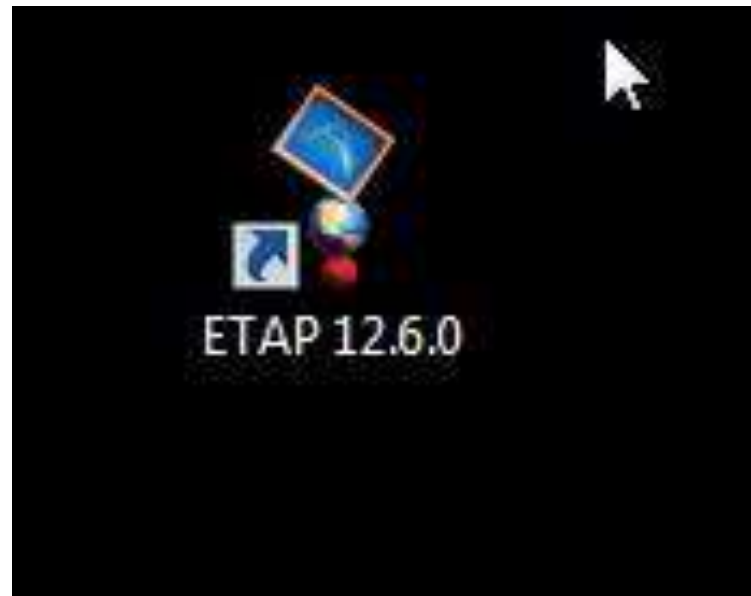
- Load flow study is a numerical analysis of the flow of electric power in an interconnected system.
- For notation of load flow, single line diagrams are usually used with per unit system.
- It focuses on the various aspects of the AC parameters of the such as voltages, voltage angles, real power and reactive power.
- It analyzes the power system in normal steady-state operation.
- Power flow study is very important for future expansions of power system.
- Gauss-Seidel, Newton-Raphson and Fast Decoupled are the various techniques used for load flow studies.

Short Circuit Analysis

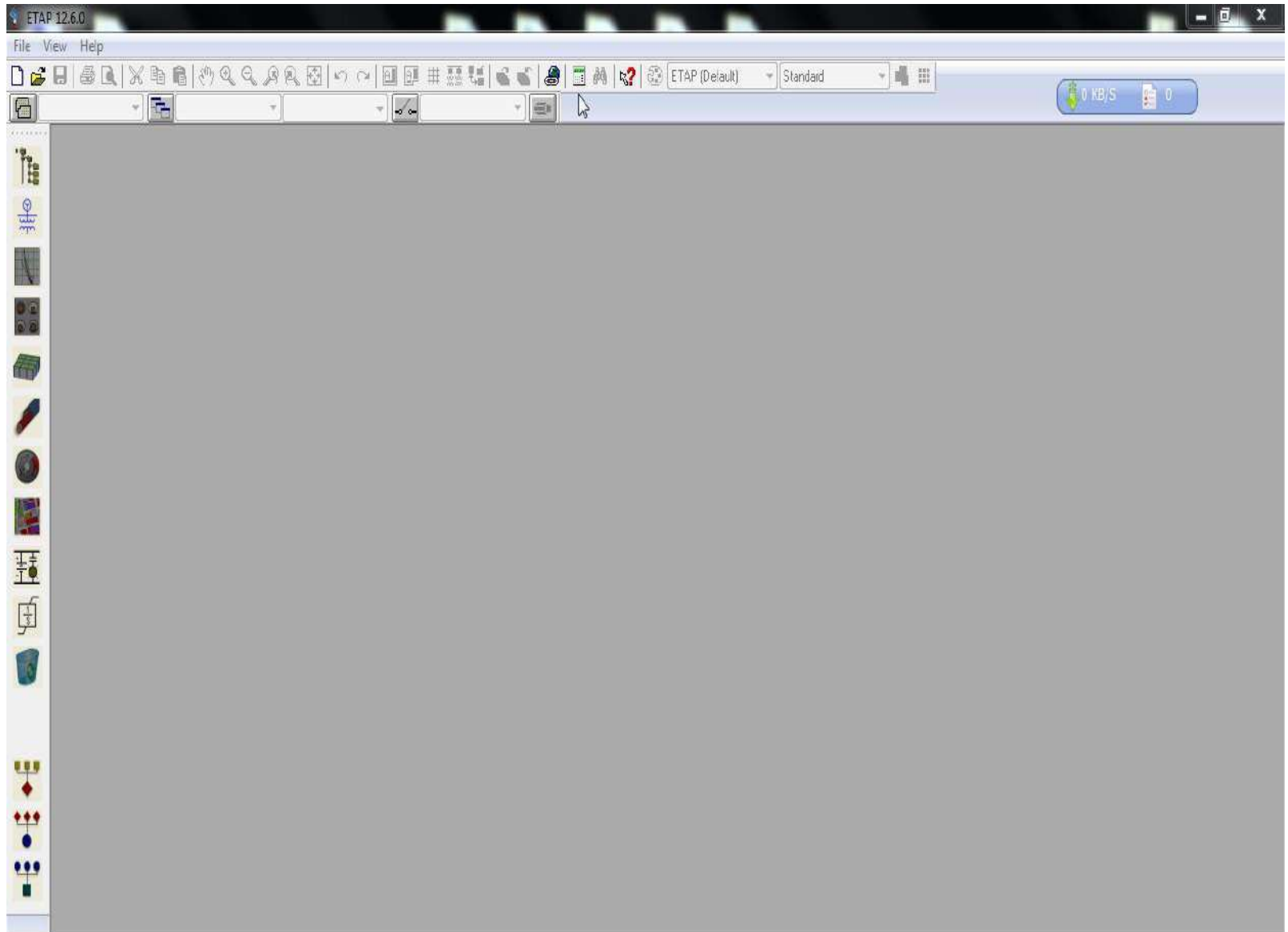
- A short circuit is an electrical circuit that allows a current to travel along an unintended path, often where essentially no (or very small) electrical impedance is encountered.
- This high amount of current introduce a large amount of destructive energy in the forms of heat in to the power system.
- The reliability and safety of electric power distribution systems depend on accurate and thorough knowledge of short-circuit fault currents that can be present, and on the ability of protective devices to satisfactorily interrupt these currents.
- A Short Circuit Analysis will help to ensure that personnel and equipment are protected by establishing proper interrupting ratings of protective devices (circuit breaker and fuses).

How to Start ETAP

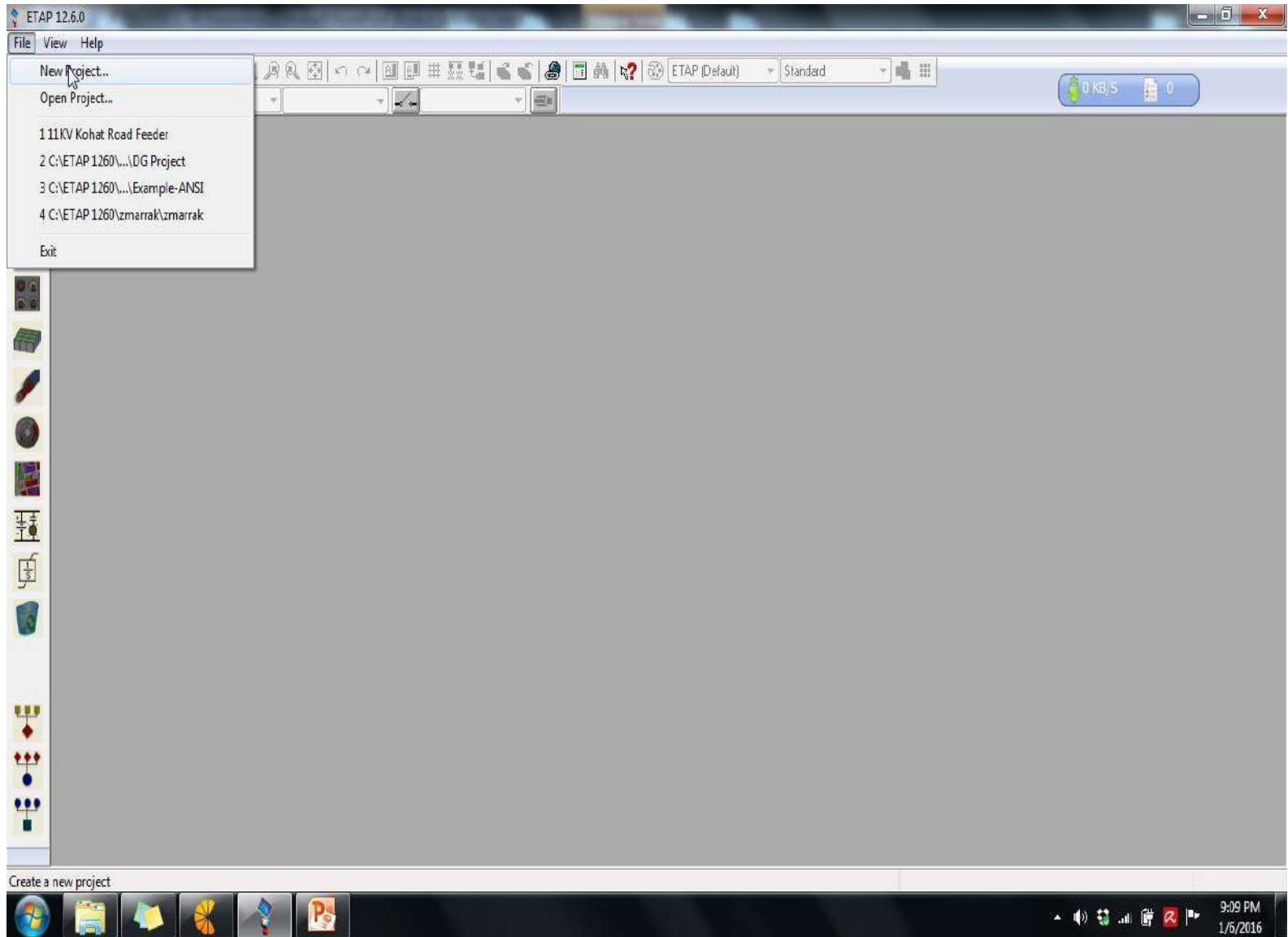
- First install ETAP in your system.
- Click on ETAP shortcut icon available on desktop after installation.



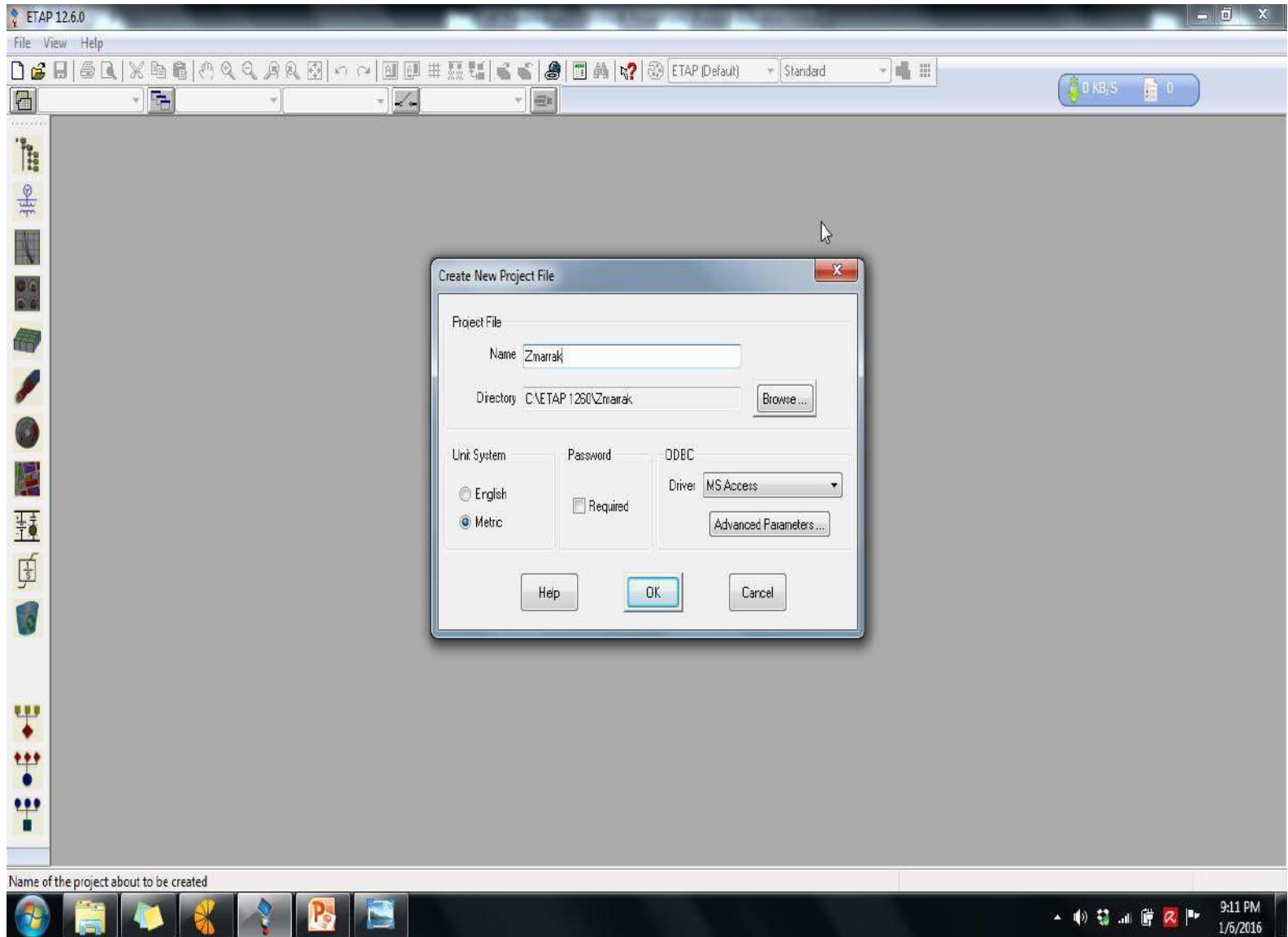
Main Window of ETAP



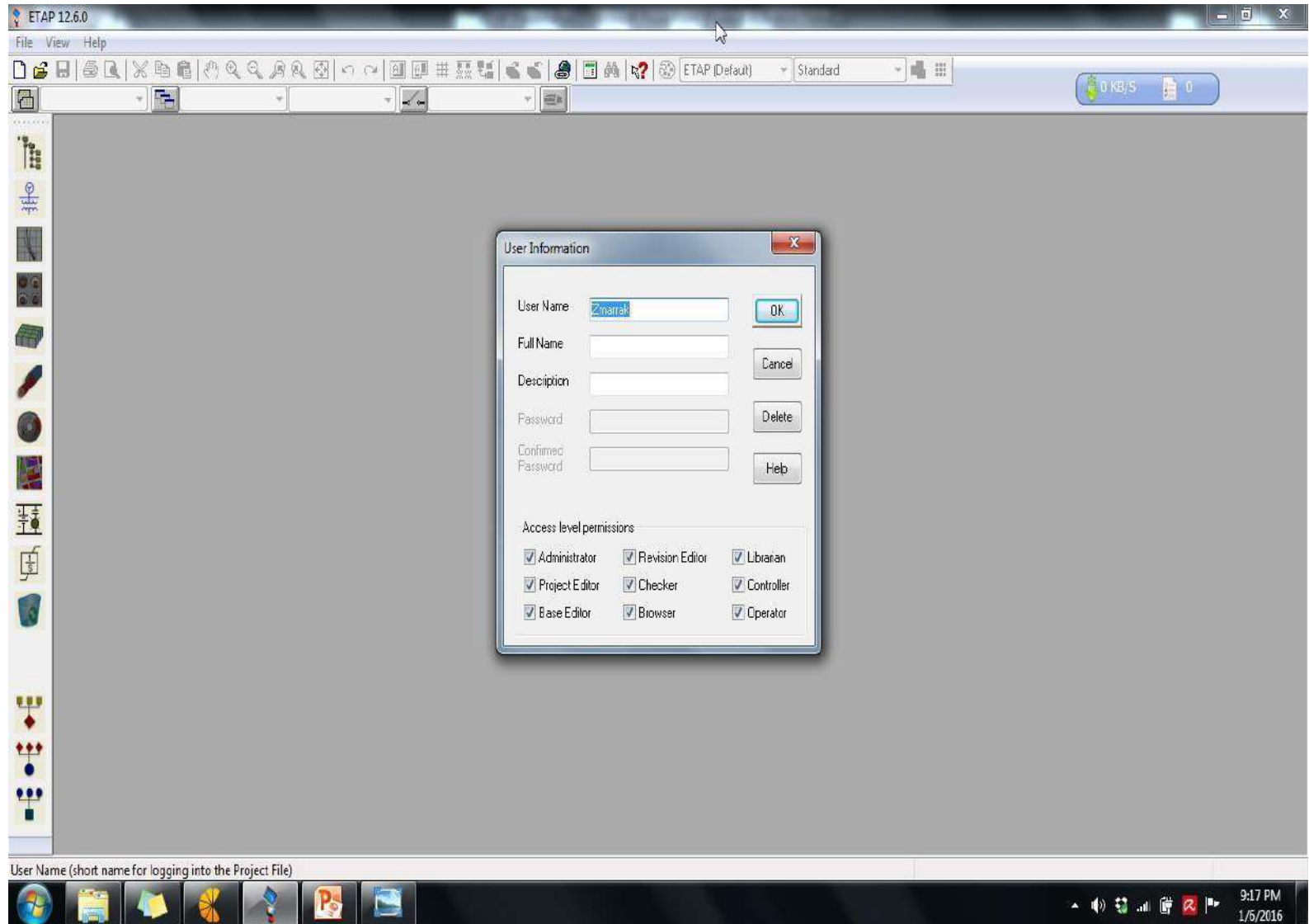
How to Open New Project



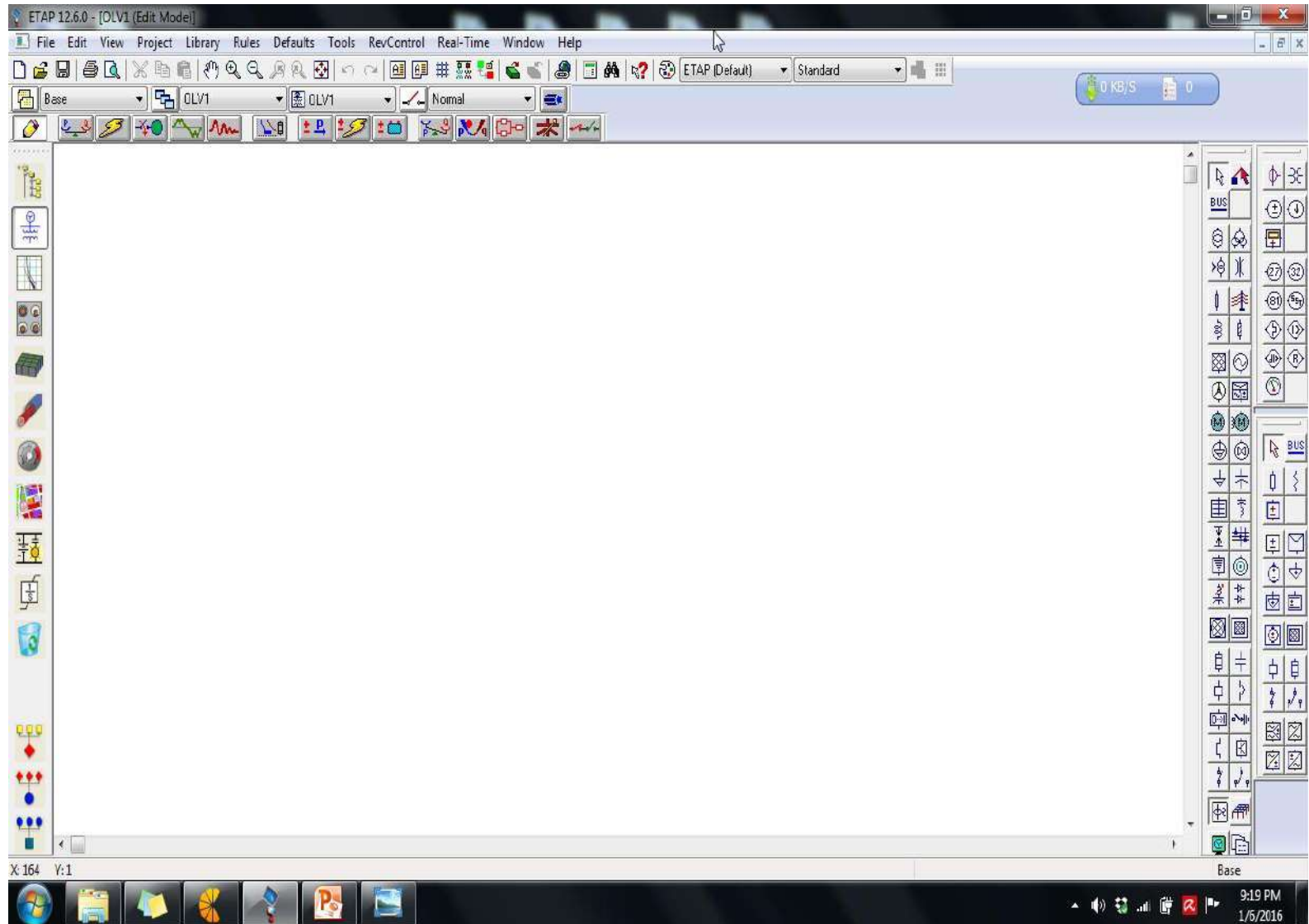
Enter Project File Name and Unit System



Enter Full Name and Description



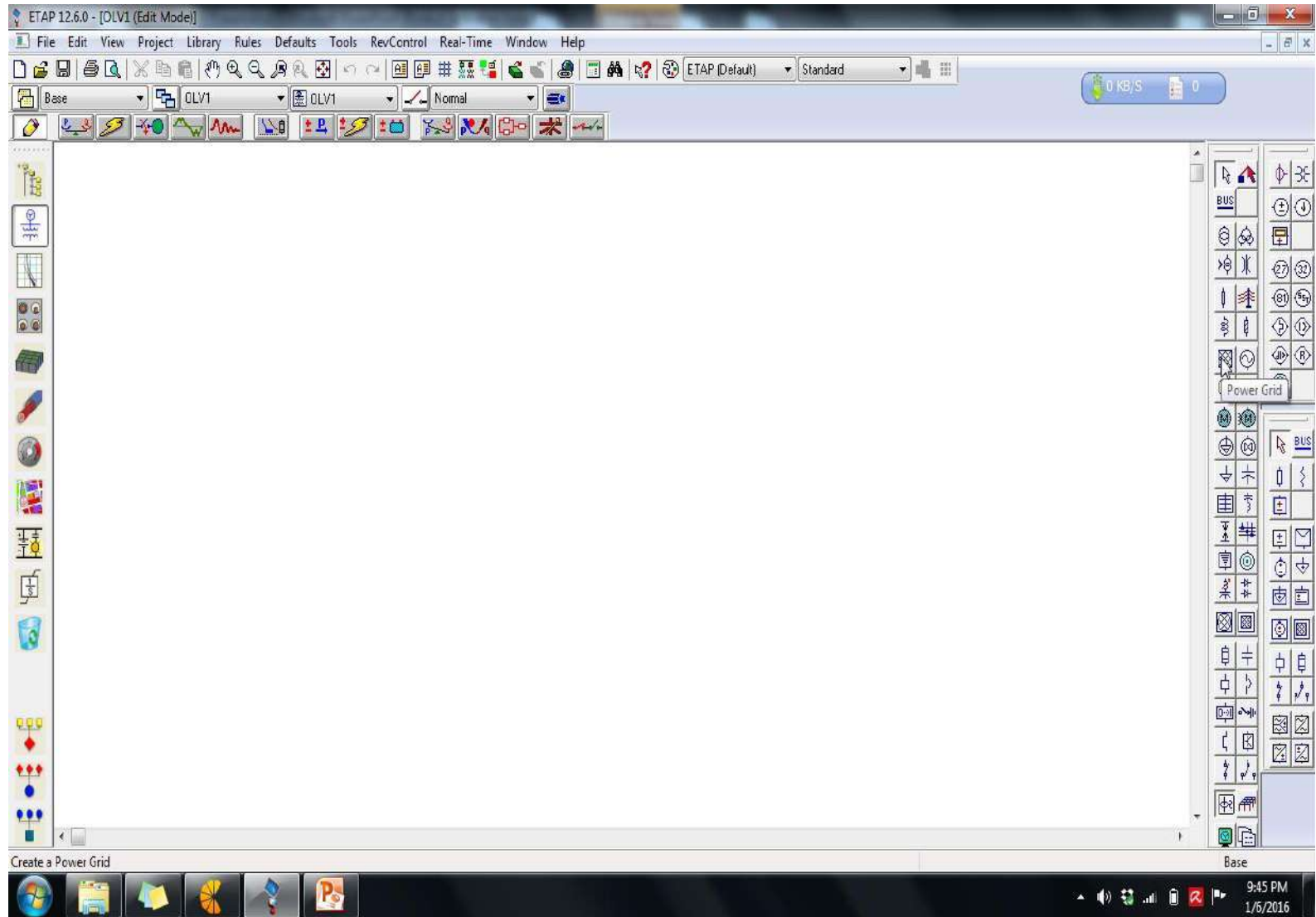
Main Window for Project



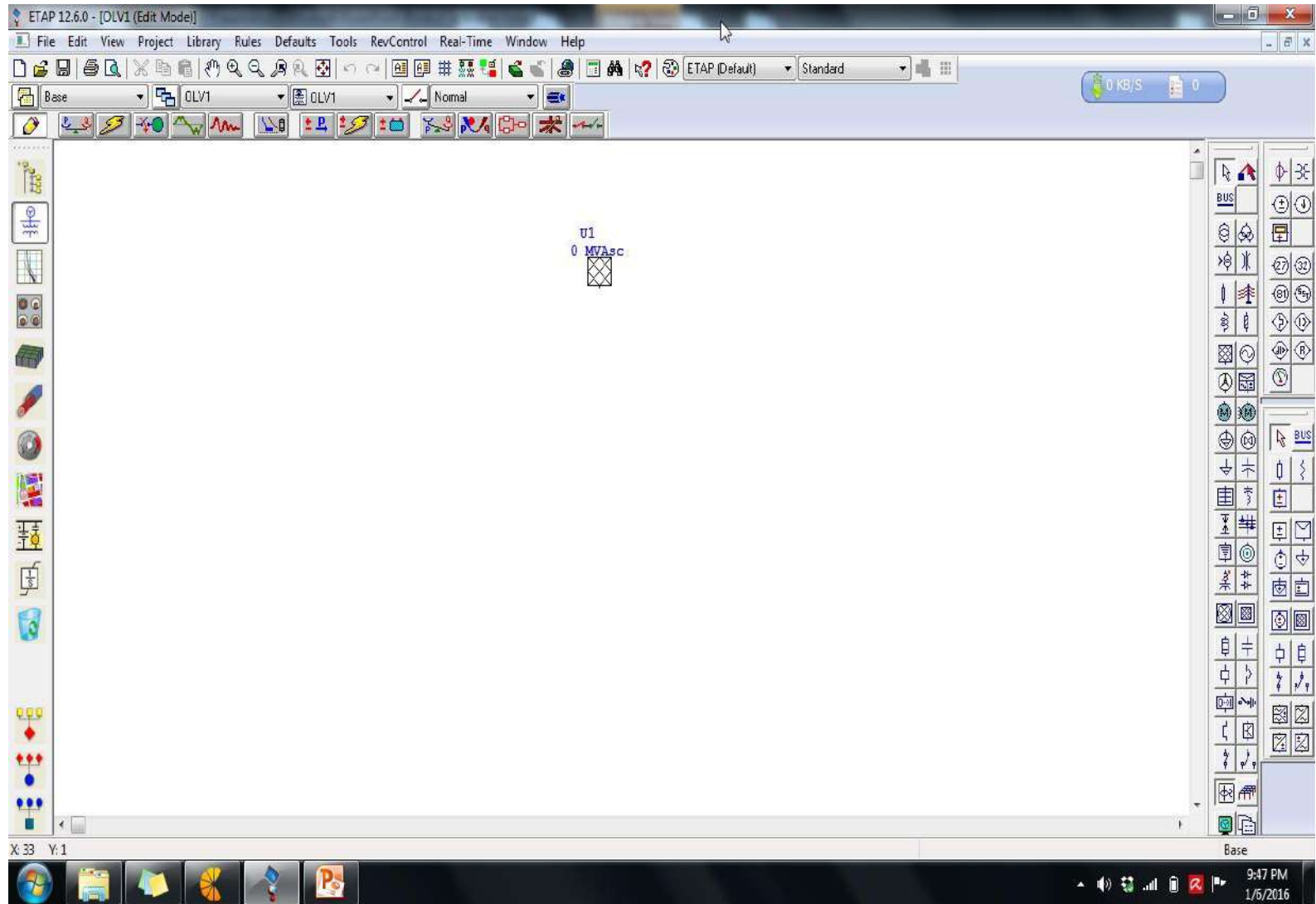
Different Toolbars

- On the main page we have different toolbars such as
 - Project toolbar
 - System toolbar
 - Mode toolbar
 - Presentation toolbar
 - Real toolbar

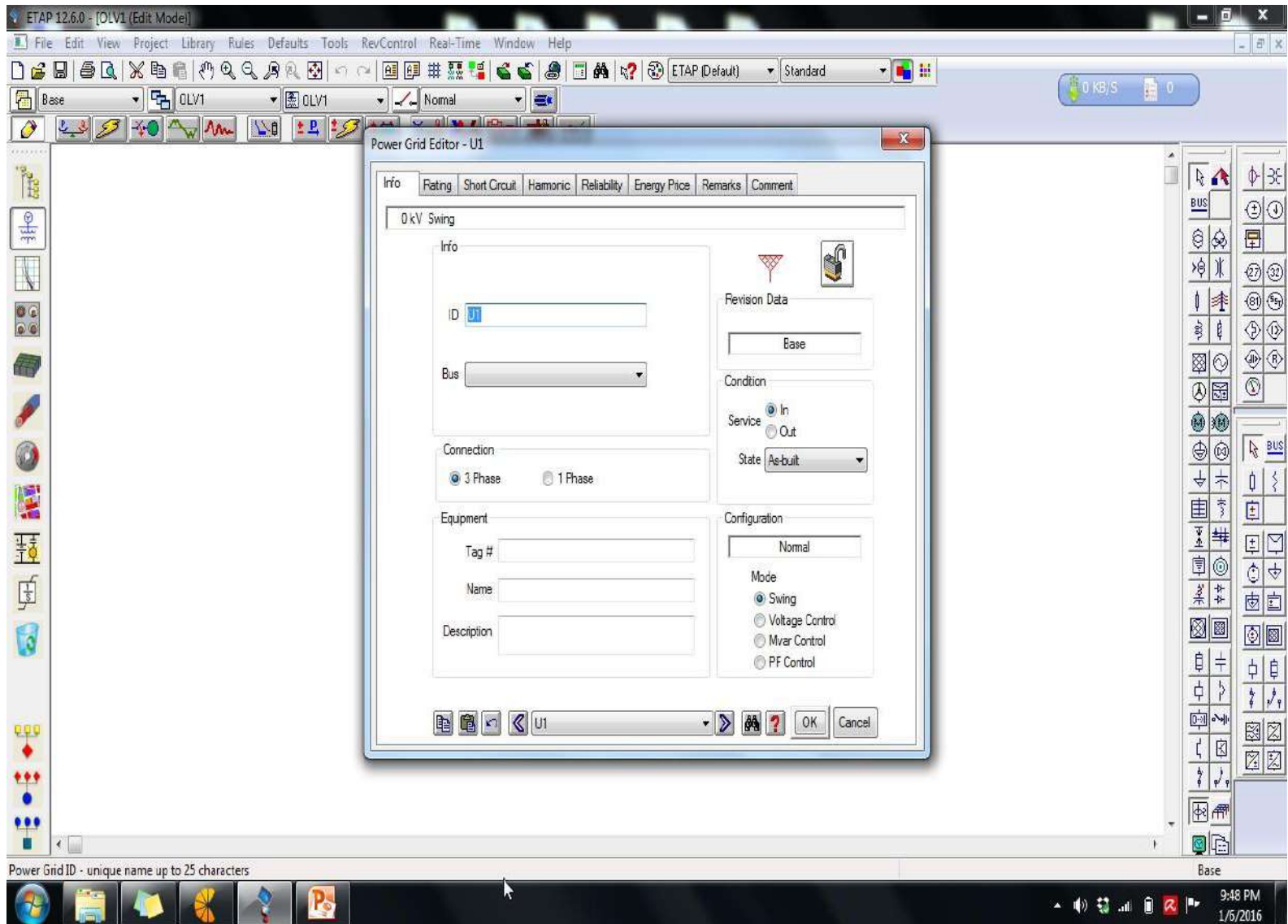
Start of Project from Power Grid



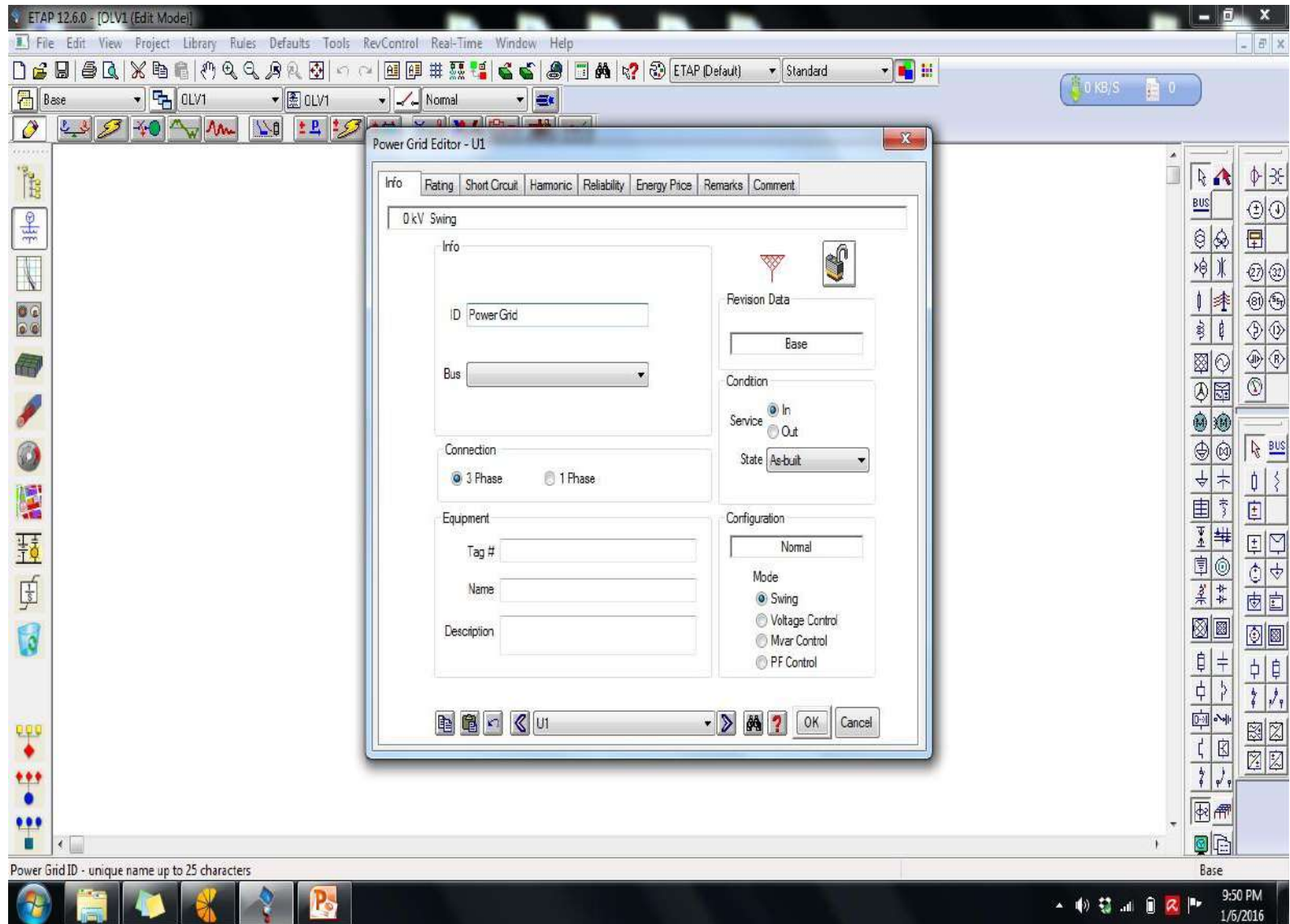
Select Power Grid and Bring it to Main Window



Open Power Grid



Provide Information about Power Grid



Provide Ratings (Voltage Level)

ETAP 12.6.0 - [DLV1 (Edit Mode)]

File Edit View Project Library Rules Defaults Tools RevControl Real-Time Window Help

Base DLV1 DLV1 Normal

0 KB/S 0

Power Grid Editor - U1

Info Rating Short Circuit Harmonic Reliability Energy Price Remarks Comment

0 kV Swing

Rated kV 132 Balanced Unbalanced

Gen. Cat.	%V	Vangle	MW	Mvar	%PF	Gmax	Qmin
1 Design	100	0					
2 Normal	100	0					
3 Shutdown	100	0					
4 Emergency	100	0					
5 Standby	100	0					
6 Startup	100	0					
7 Accident	100	0					
8 Summer Load	100	0					
9 Winter Load	100	0					
10 Gen Cat 10	100	0					

Operating

% V Vangle MW Mvar

0 0 0 0

U1 OK Cancel

Click to activate the help file

Base

9:54 PM
1/6/2016

Provide Short Circuit MVA and X/R (Imp)

The screenshot shows the ETAP 12.6.0 software interface with the 'Power Grid Editor - U1' dialog box open. The dialog box is titled '132kV Swing' and has tabs for 'Info', 'Rating', 'Short Circuit', 'Harmonic', 'Reliability', 'Energy Price', 'Remarks', and 'Comment'. The 'Short Circuit' tab is active, showing the following data:

Grounding:

SC Rating:

	MVA _{sc}	MVA _{sc}	X/R	kAsc
3-Phase	1500		20	6.561
1-Phase	1500	500	20	6.561

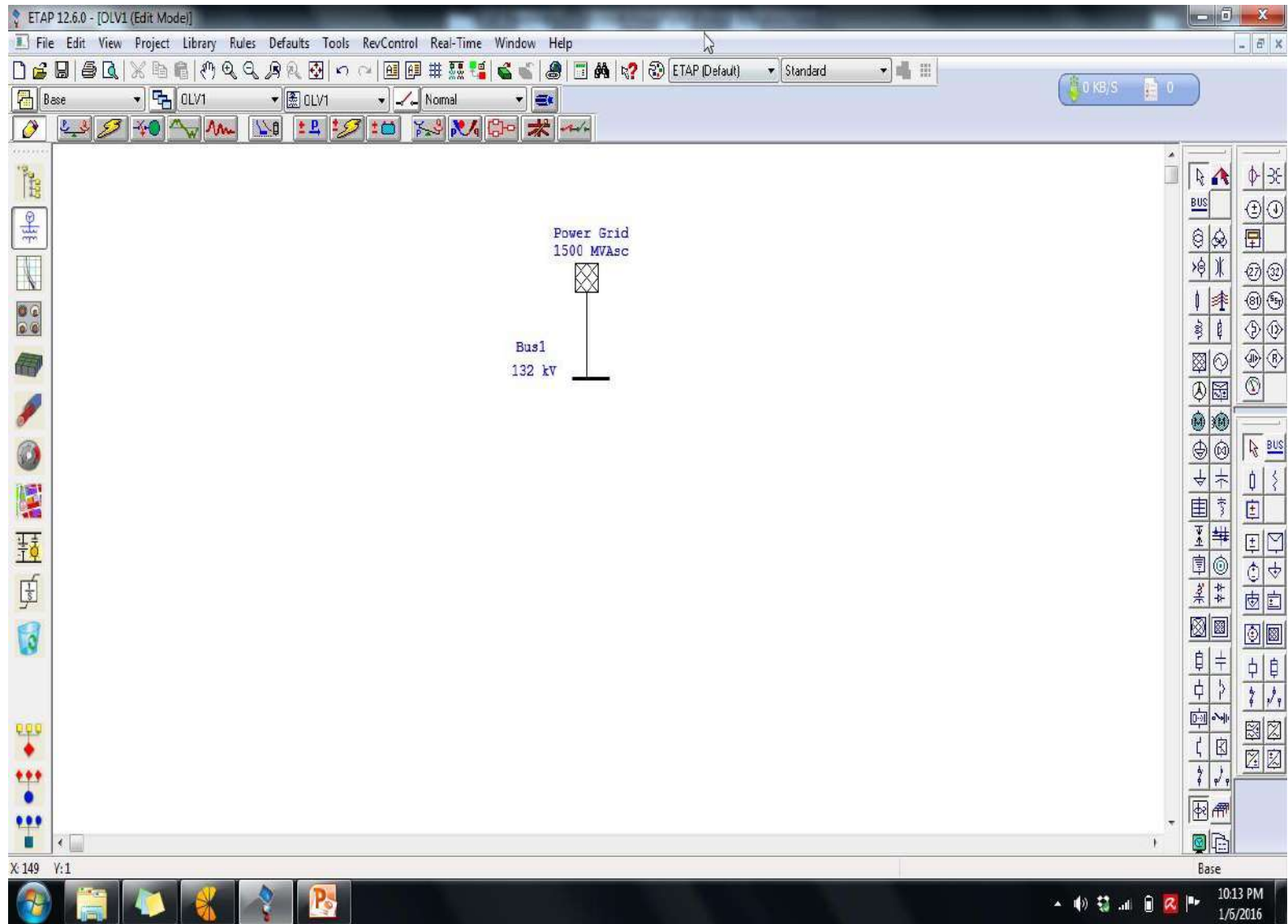
sqrt(3)Vll If Vln If

SC Impedance (100 MVA):

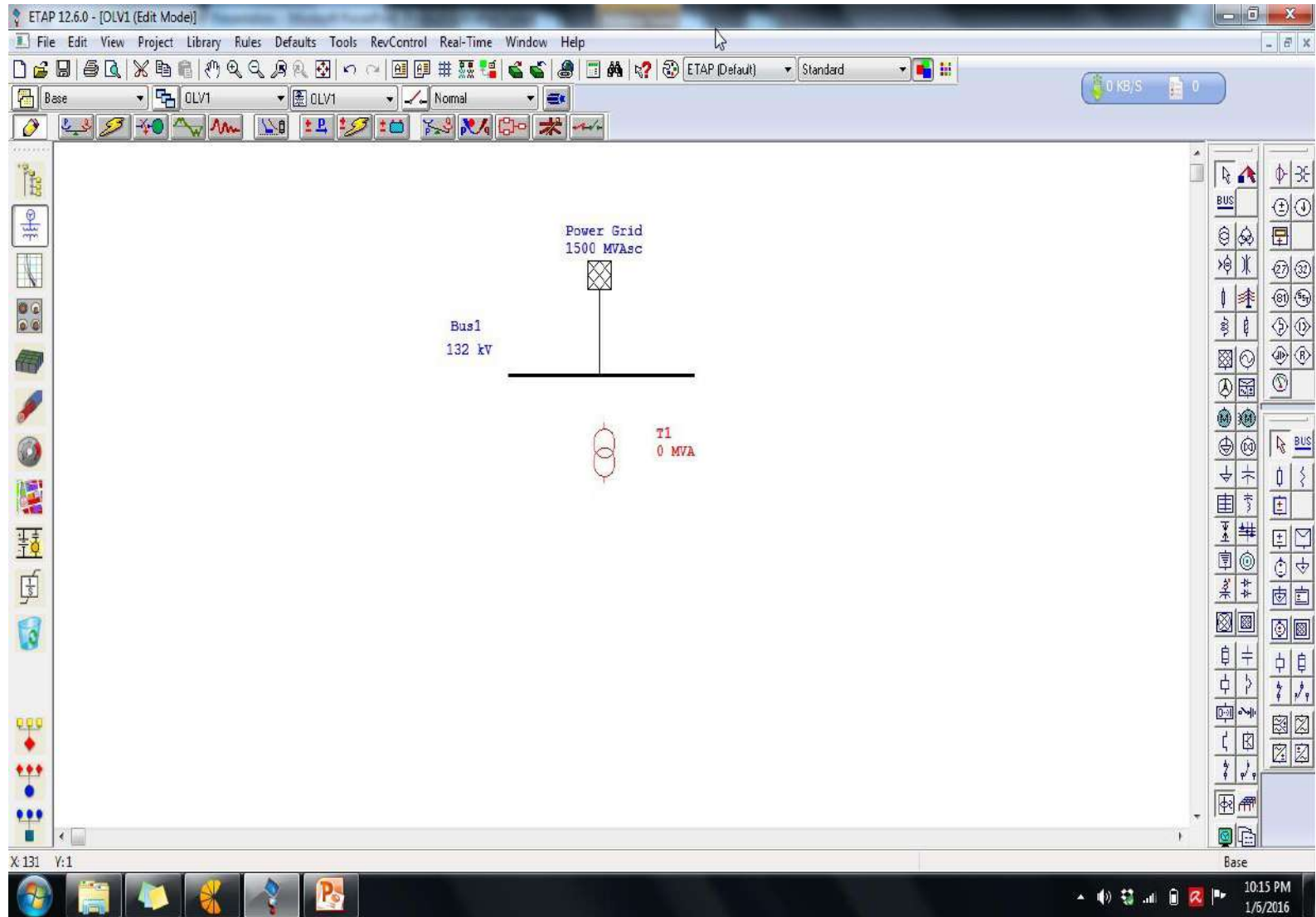
	% R	% X
Pos.	0.33292	6.65835
Neg.	0.33292	6.65835
Zero	0.33292	6.65835

The dialog box also includes a 'U1' dropdown menu and 'OK' and 'Cancel' buttons. The background shows the ETAP software interface with a menu bar, toolbars, and a toolbar on the right side.

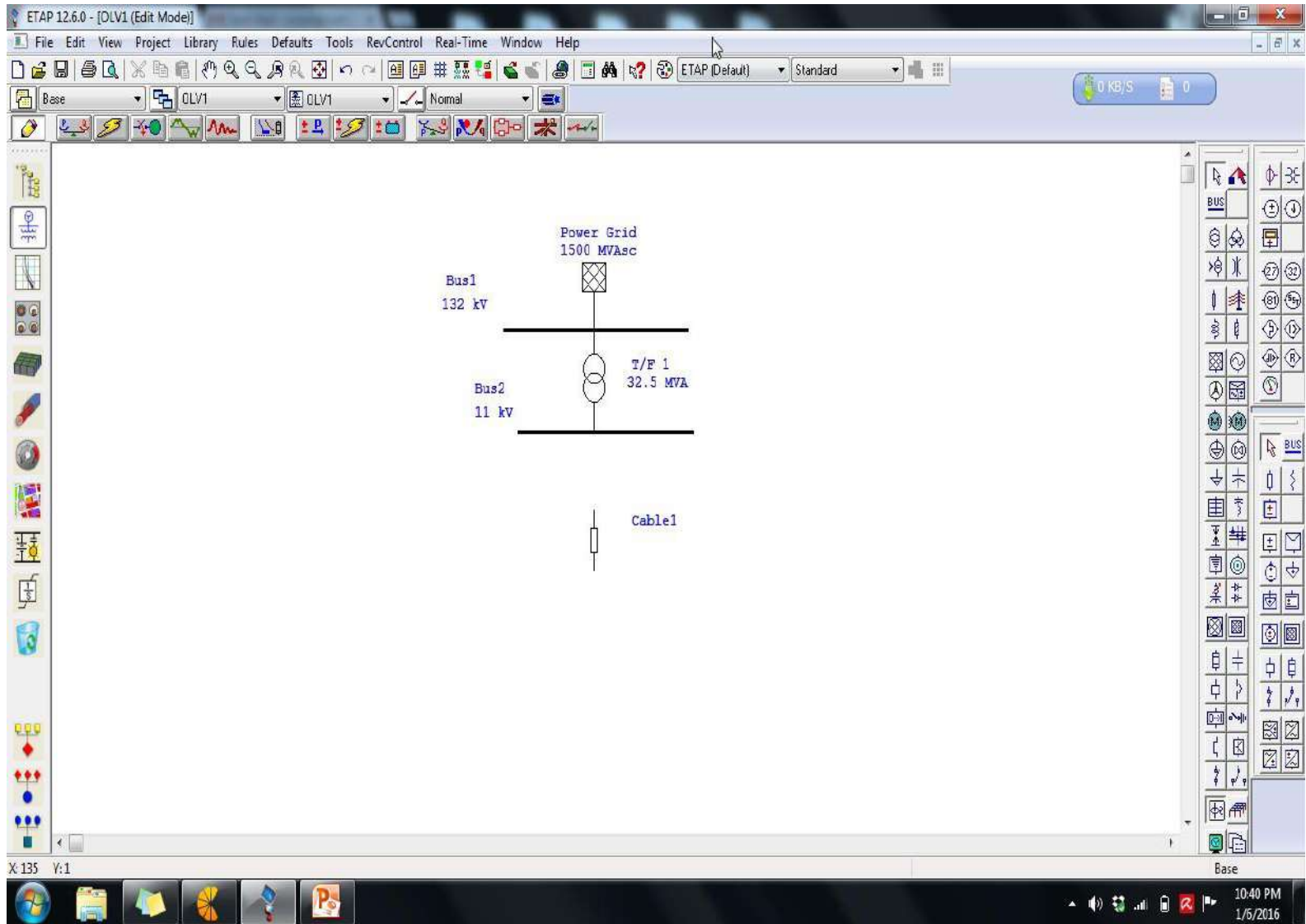
Power Grid Connected with Grid



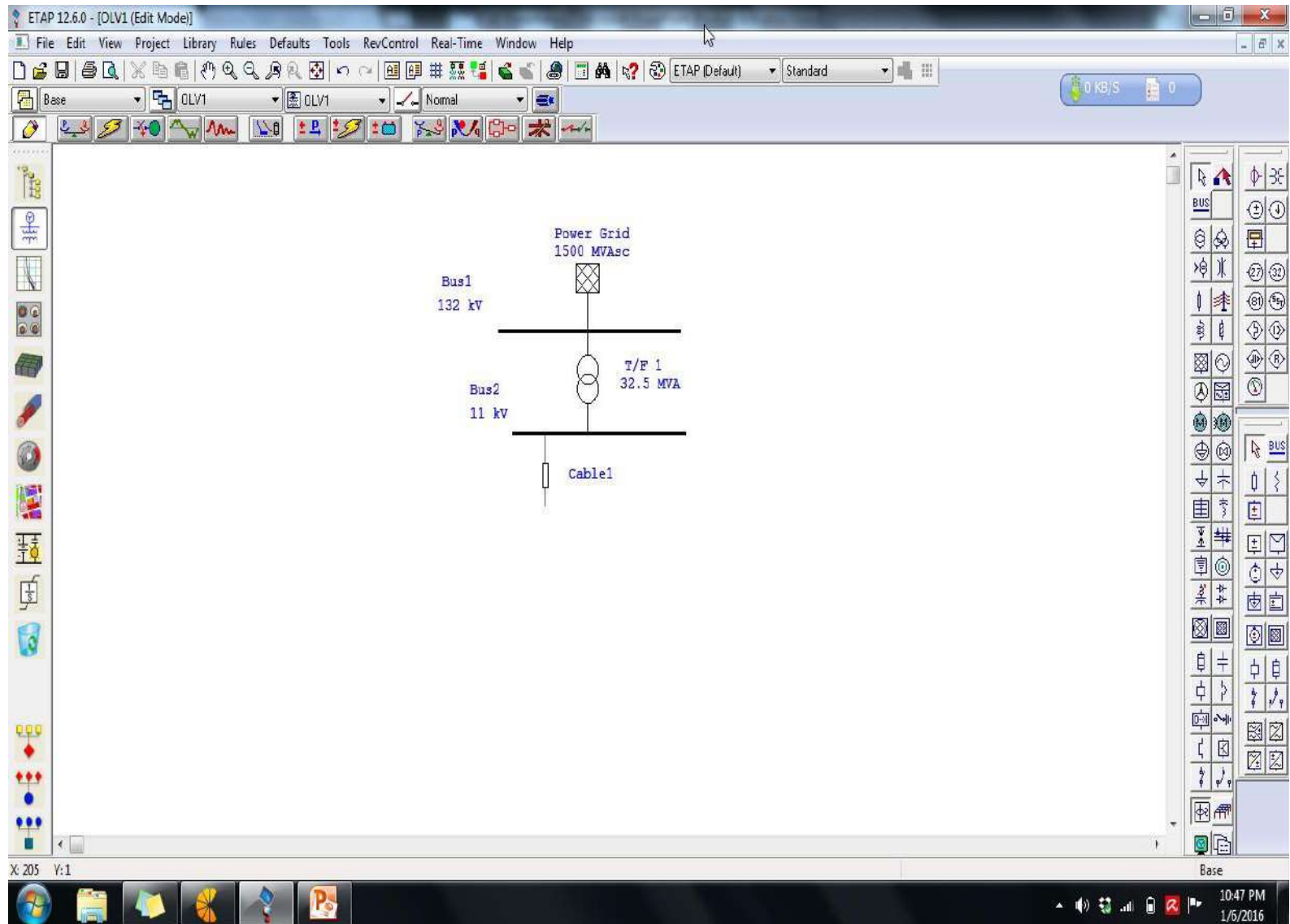
Select Two Winding Transformer and Drag it to Main Window



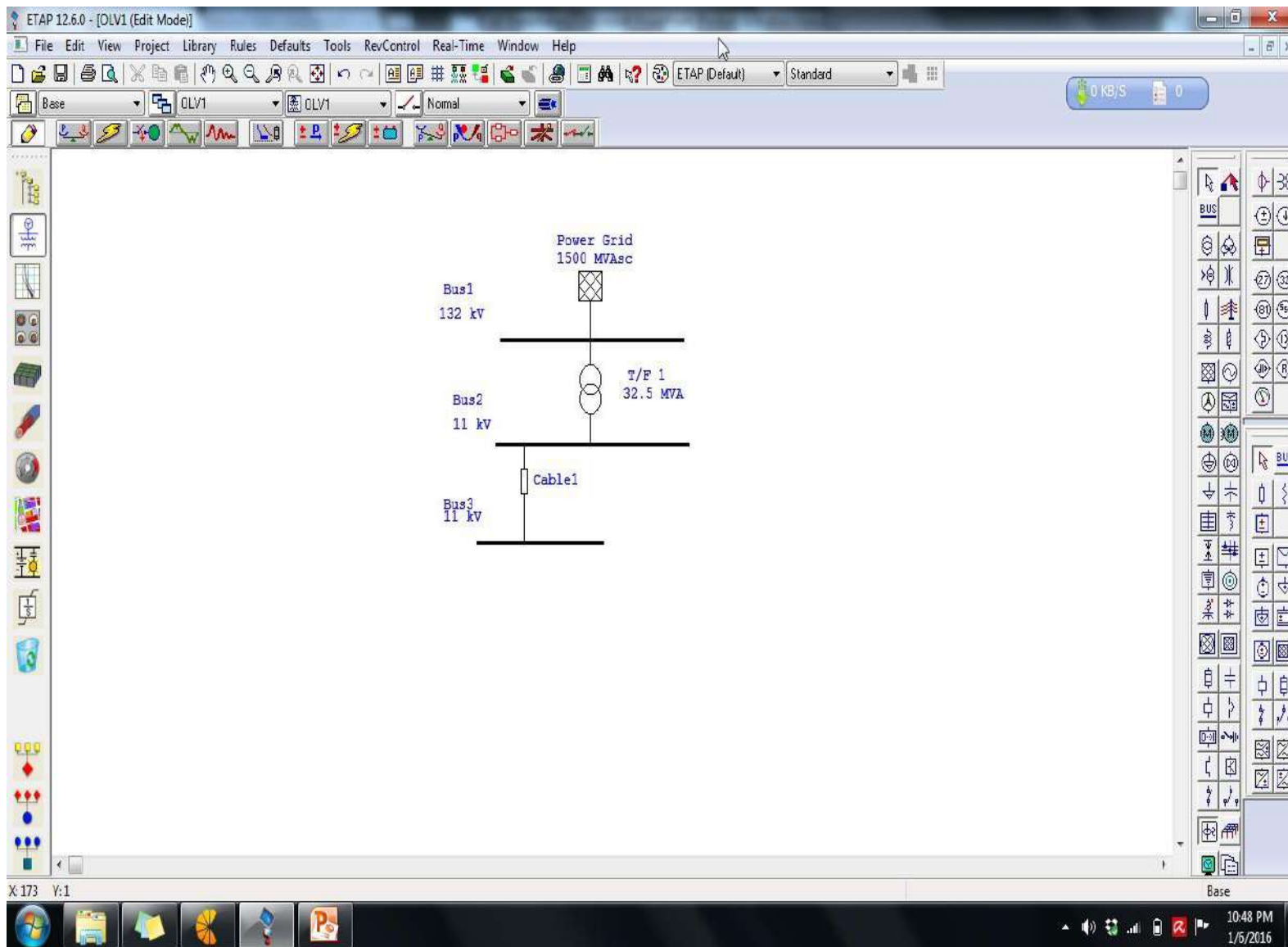
Drag Cable to Main Window



Cable Connected With Busbar



Cable is Extended to Load Point



Select T/F and Drag to Window

The screenshot displays the ETAP 12.6.0 software interface in 'Edit Mode' for a project named 'OLV1'. The main workspace shows a power system diagram with the following components:

- Power Grid**: 1500 MVA_{sc}, represented by a diamond symbol.
- Bus1**: 132 kV, connected to the Power Grid.
- T/F 1**: 32.5 MVA transformer, connected between Bus1 and Bus2.
- Bus2**: 11 kV, connected to the transformer.
- Cable1**: A cable connecting Bus2 to Bus3.
- Bus3**: 11 kV, connected to the cable.
- T1**: 0 MVA transformer, located below Bus3.

The transformer 'T/F 1' is currently selected, as indicated by a mouse cursor hovering over it. The software interface includes a menu bar (File, Edit, View, Project, Library, Rules, Defaults, Tools, RevControl, Real-Time, Window, Help), a toolbar with various drawing and editing tools, and a right-hand panel with a library of components. The status bar at the bottom shows 'X: 147 Y: 80' and 'Base'.

Edit Ratings of Lumped Load

The screenshot displays the ETAP 12.6.0 software interface with the 'Lumped Load Editor - Lump1' dialog box open. The dialog box is divided into several sections:

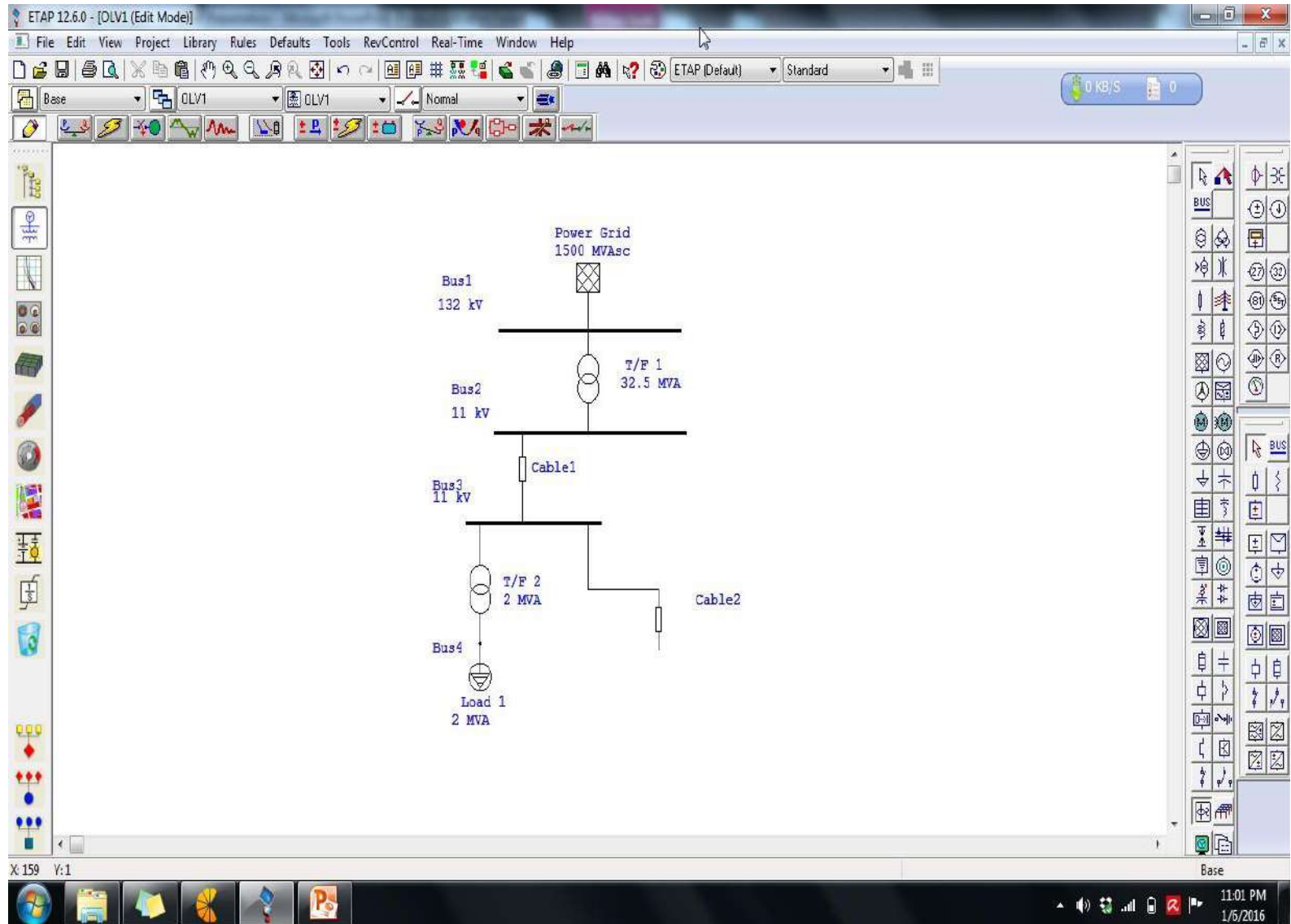
- Info:** 2 MVA 0.4 kV (80% Motor 20% Static)
- Nameplate:** Model Type: Conventional, Rated kV: 0.4
- Ratings:** MVA: 2, MW: 1.8, Mvar: 0.872, % PF: 90, Amp: 2687
- Load Type:** Constant kVA: 80%, Constant Z: 20%
- Motor Load and Static Load Table:**

Loading Category	% Loading	Motor Load		Static Load	
		MW	Mvar	MW	Mvar
1 Design	100	1.44	0.697	0.36	0.174
2 Normal	100	1.44	0.697	0.36	0.174
3 Brake	0	0	0	0	0
4 Winter Load	0	0	0	0	0
5 Summer Load	0	0	0	0	0
6 FL Reject	0	0	0	0	0
7 Emergency	0	0	0	0	0
8 Shutdown	0	0	0	0	0

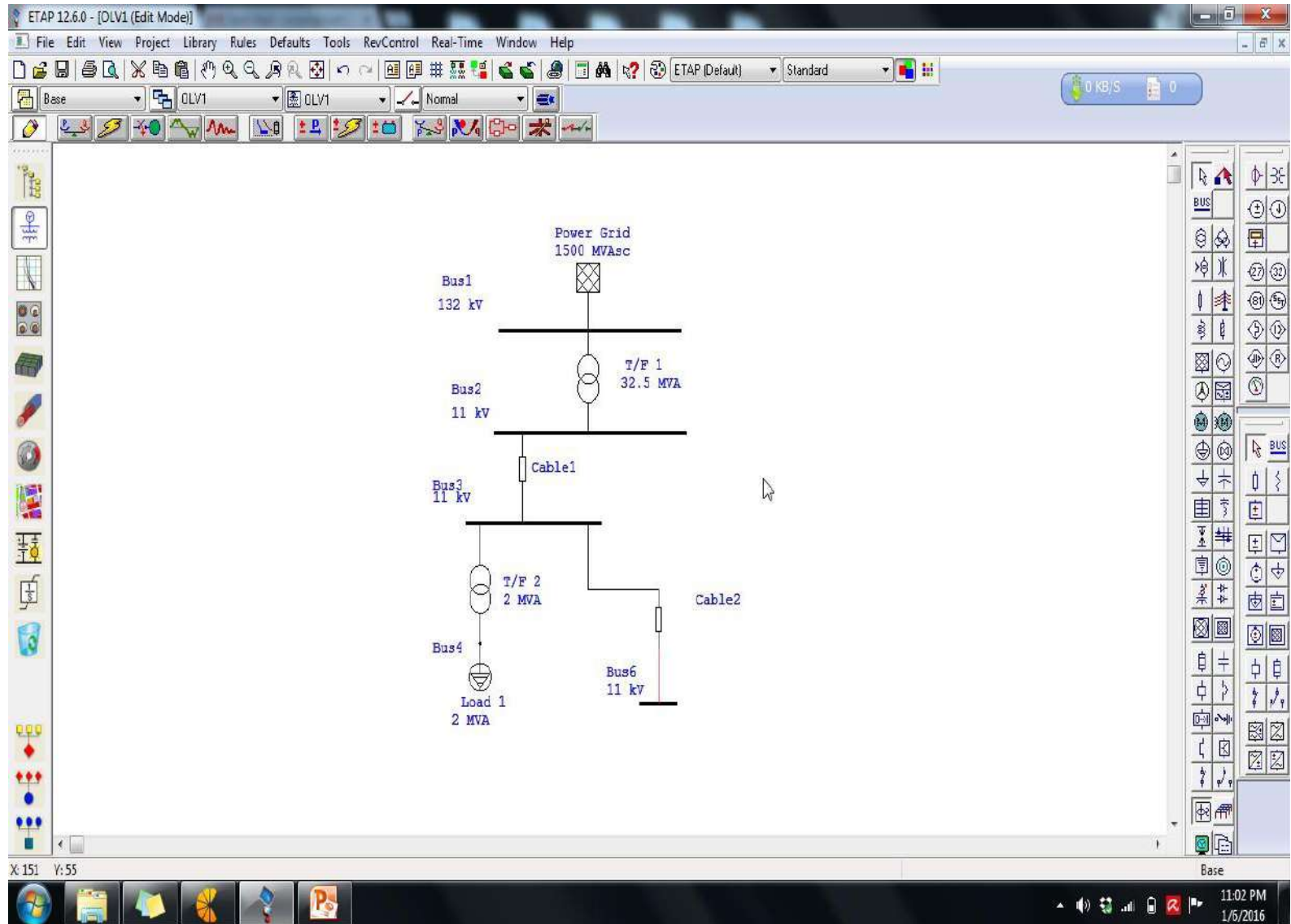
Operating: 0 MW + j 0 Mvar

Buttons: OK, Cancel

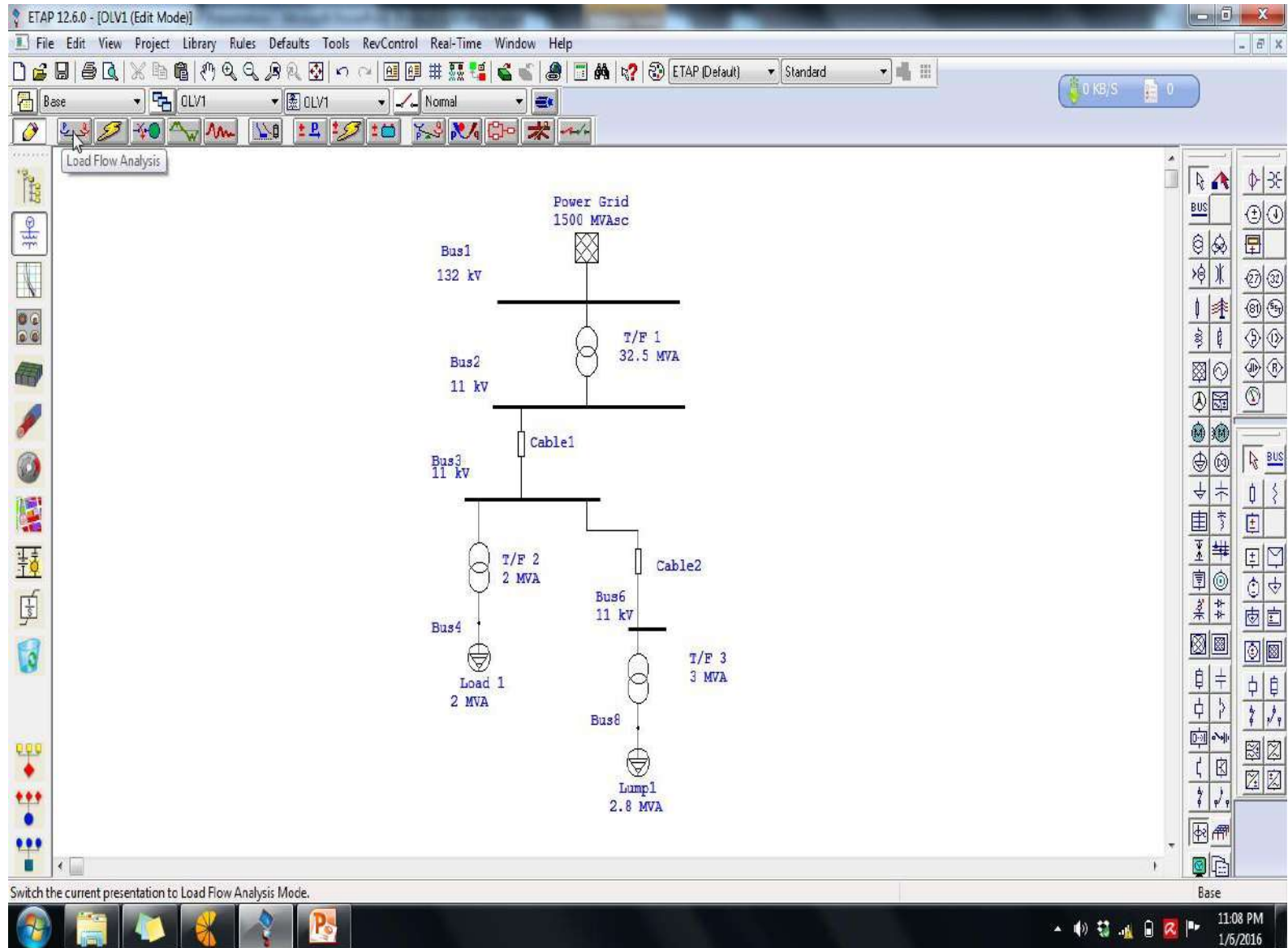
Connect Cable and Energize It



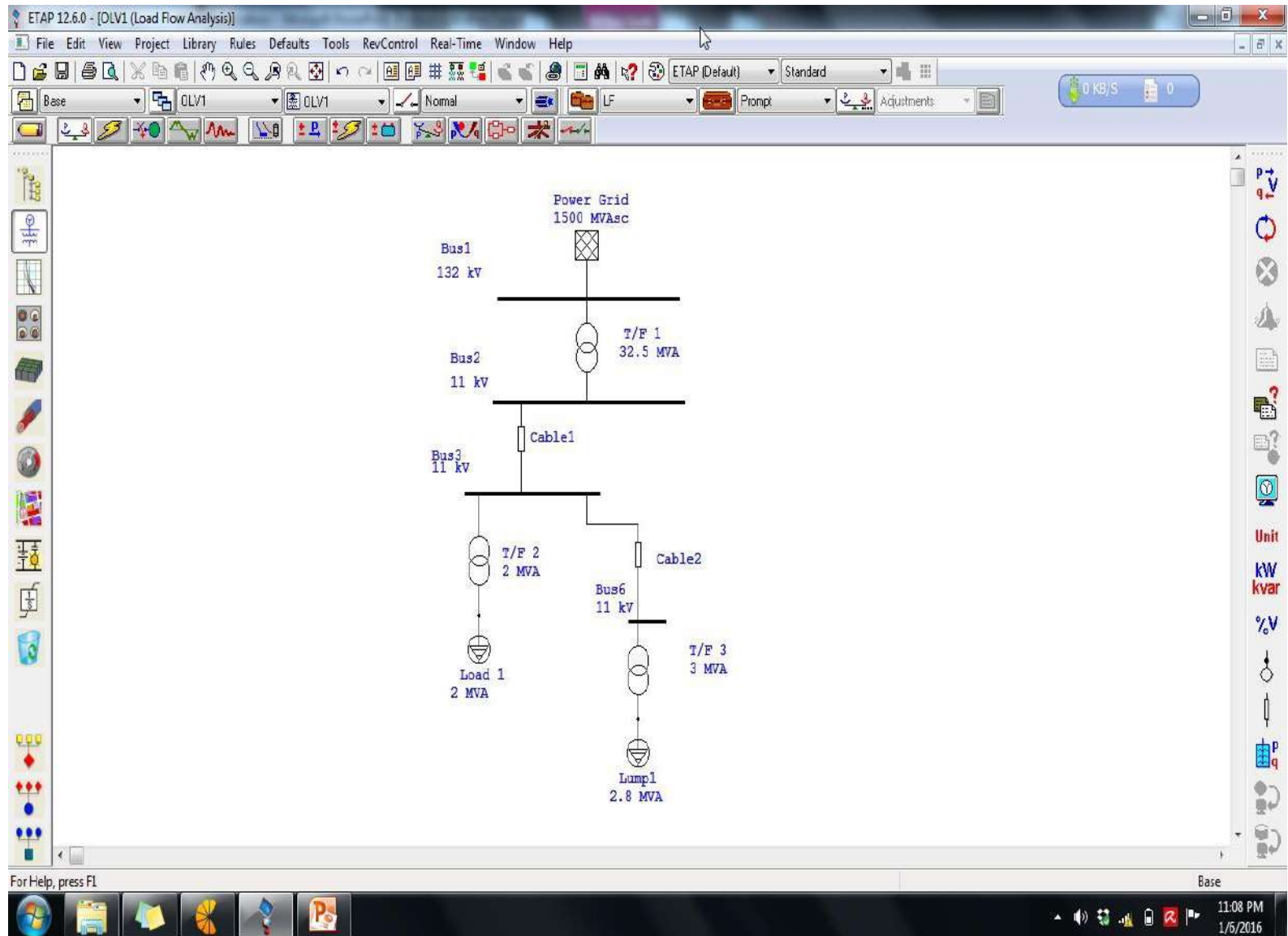
Insert Busbar and Connect Cable to Energize it



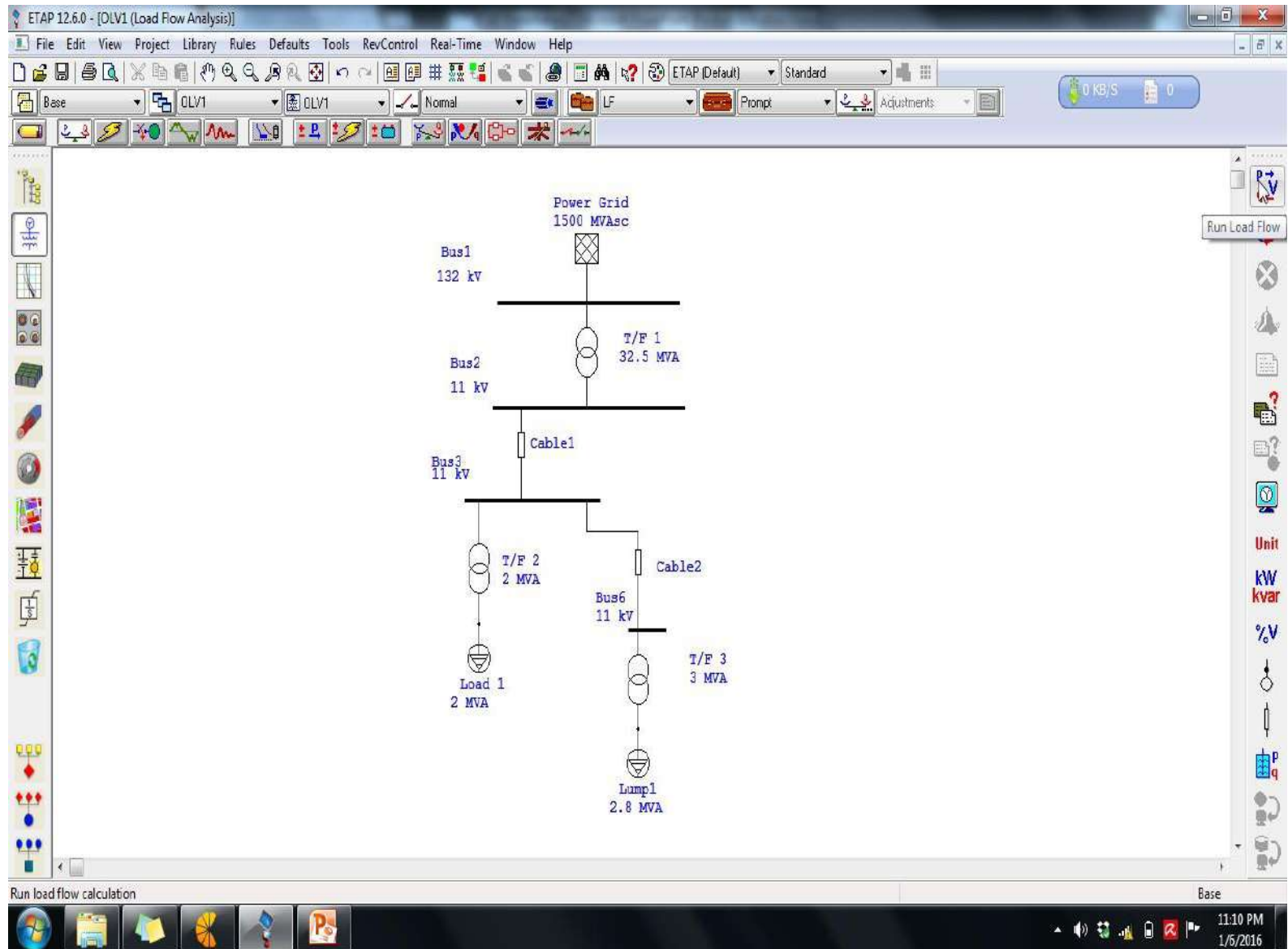
How to Perform Load Flow Study



Select Load Flow Analysis



Select Load Flow Analysis



Simulation of Load Flow

