

Analysis of electrical power and energy systems

Programming Assignment 2

21 October 2021

The objective of this assignment is to study the impact of phase shifting transformers and generators' reactive power limits on the solution of a power flow. For programming assignment 1, you were given an electrical network composed of 1 *PV* bus, 2 *PQ* buses and a slack bus. You are asked to incorporate, in your previous algorithm and based on the template given in the following link [template pf2](#), a limit on the reactive power of the *PV* bus generator. You are also asked to replace one of the existing line by a phase shifting transformer based on the information highlighted in **red**. Your finally code will take as inputs the reactive power limit q_{lim} as well as the phase shift in degree $phase_shift$. In the tables below, you will find the type of buses and the topology of your electrical network (**those are the same as for programming assignment 1**).

This exercise has been already solved and gives you hints on how you should compute your own power flow based on your own statement (sent to you by mail). The link to the solved python notebook: [Solution Statement0](#)

BUS1		BUS2		BUS3	
V	θ	P	V	P	Q
1	0	2	1.05	5	1

Table 1: Bus information. Values are given in pu and in radians. PV buses are generator buses : P is the active power produced. PQ buses are considered as load : P and Q are the active and reactive powers consumed.

	BUS1	BUS2	BUS3
Coordinates (xy) in km	(0, 0)	(100, 111.8034)	(200, 0)
Connections	BUS2	BUS3	BUS1

Table 2: Bus information. Position given in km along the x and y-axis. The Connections row gives the buses to which the current bus is connected. If it appears that two buses are connected twice (e.g. BUS 1 to BUS 2 and BUS 2 to BUS 1), consider only one link.

New Data Replace the line connecting **BUS1** and **BUS2** by a phase shifting transformer. The impedance associated with the phase shifting transformer is equal to $Z_{pst} = 0.3 \cdot 10^{-3} + 1j \cdot 9.9954 \cdot 10^{-3} \Omega$.