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Abstract. The power system of Kosovo is a compact and integrated structure at the hierarchical level. It plays an important role in the process of transmission and distribution of energy to consumers. Based on this importance analysis is necessary in order to estimate the medium and long-term plans of the production of electricity and development of the power generation plants. With the implementation of Distributed Generation (DG) in the distribution power system, there are many issues that need to be addressed and analyzed, as the impacts can be significant on the operation and stability of the distribution system. When DG is connected to the distribution system, it affects the performance of level voltage, short-circuit level, and power flow in the power system. This paper is presented a feasibility study of the Mareci (village) project of wind production 32.8 MW, which new substation Mareci this renewable source will be connected to the line 110kV connecting SS Pristina 4 - SS Gjilani 1. The maximal power output of 32.8MW will be collected in the main substation in new SS Mareci which contain two power transformers with capacity 20 MVA MVA. The methodology is based on the Newton Raphson model that deals with the load flow analysis of wind energy production and structuring relay protection system.

Keywords: Wind and PV solar park, Relay protection system, Short circuit current, Voltage profile, Power system performance and stability.

Introduction

The task of the electric power system is to supply the customers with qualitative electric power, with a highdegree of reliability, but economically accepted.

The generation, transmission and distribution are three main components of the electric power system. Kosovo power system consists of power plants, the main grid, regional networks, distribution networks, and consumers of electricity. Electrical power system of Kosovo mainly operates power plants using coal resources for electricity production thus has lack of renewable energy resources.

In the traditional power systems, electricity production is based on the conventional power plants that mainly use the fossil fuels. Conventional power plants have high power from150 to 1000 MW (Willis, H.LScott, W.G, 2000). Such power plants require high investments and operating costs and are located far fromthe consumption. This requires the need for along-distance electricity transmission, and in connection with this, the existence of adequate high and very high voltage switchgear and transmission infrastructure (Ultra High Voltage (UHV) and Extra High Voltage (EHV) (Mithulananthan, N.Than, Oo. Phu, L.V, 2004).

So is increased interest of investment in the field of the alternative resources, such as wind park and solar panel plants. The impact of the connection of wind turbine to the distribution system, respectively in the Gjilani 1 substation will be analyzed in some aspects.
The connection of the new renewable energy can affect to the stability of the system, voltage profile, lossesin distribution system, quality of the energy and the reliability of supplying. Also connection of a renewableenergy to an electricity network has impact on the operation and performance of network. New and existing generators wind turbine connected to the network have to fulfill the requirements: frequency stability, voltage deviation, voltage waveform, voltage symmetry, power factor, operational, earthing and insulationlevel of detail defined in Kosovo network (www. kostt.com).
Instead of conventional power plants that are based on the use of coal, modern power systems are increasingly represented by the distributed generators (DG), which predominantly use the renewable energysources (wind energy) to generate electricity. Generators of this type are most often located in the consumption center, and their output power and energy are uncontrolled. Their production capacities can be from several kW to several MW and are connected directly to the distribution network. With the connection of the DG, the passive distribution network becomes active and power flow changes significantly (Vukobratovic, M. Hederic, Ž.Hadžiselimovic, M, 2014).
DG (wind turbine) has the potential to reduce emissions and increase dependence on alternative energy sources and hence, participate at energy diversification. It also helps to deliver backup power during the times of increased electricity demand, having also as a result the reduction of the distribution power losses(Vita, V. Alimardan, T. Economou, L, 2015).
The impact of wind power plant integration on the distribution network is multiple: technical, economical, techno-- economical, techno-ecological and economic-ecological (Naik, G.Khatod, D. K. Sharma, M.P, 2012).
The technical impact of the wind power plant integration on the distribution network is reflected through (Lopes, J. A. P. Hatziargyriou, N. Mutale, J. Djapic, P. Jenkins, N, 2007):

- Reduction of power losses;
- Improving the voltage stability;
- Impact on quality of electricity;
- Increase on the reliability and security of the system;
- Impact on the protection coordination, etc.
- Impact of the wind generators will depend on the number, type, location, and size of the windturbine

1. Power losses in the electrical energy system

In the electrical energy system are several sources of losses which will be described below. Classification of power losses There are two types of transmission and distribution losses:

- Technical losses;
- Non-technical losses.

Technical losses are due to energy dissipated in the conductors, the equipment used for power lines andtransformers and magnetic losses in the transformers. They are directly dependent on the grid characteristics and the mode of operation [2].
There are two type of technical losses:

- Fixed technical losses;
- Variable technical losses.

2. An analysis of the renewable energy sources– case study

The substation consists of 8(3.9 MW for an turbine) sources of wind turbines with an installed power of
32.1 MW while the 110-kV side is equivalent to the power system as a strong balancing bus of the activeand reactive power balance and the 20 kV side is designed for lines, cable and transformers.
Through the analysis and simulation results achieved through the ETAP 19.1 program, the performanceaspects of wind panels and their impacts on the electrical substation are addressed.
In this study, the substation performance is analyzed when the wind turbines are integrated into operationin aspects of voltages, short circuit currents and losses.
First case is presented when are not installed wind turbine in power system of Kosovo

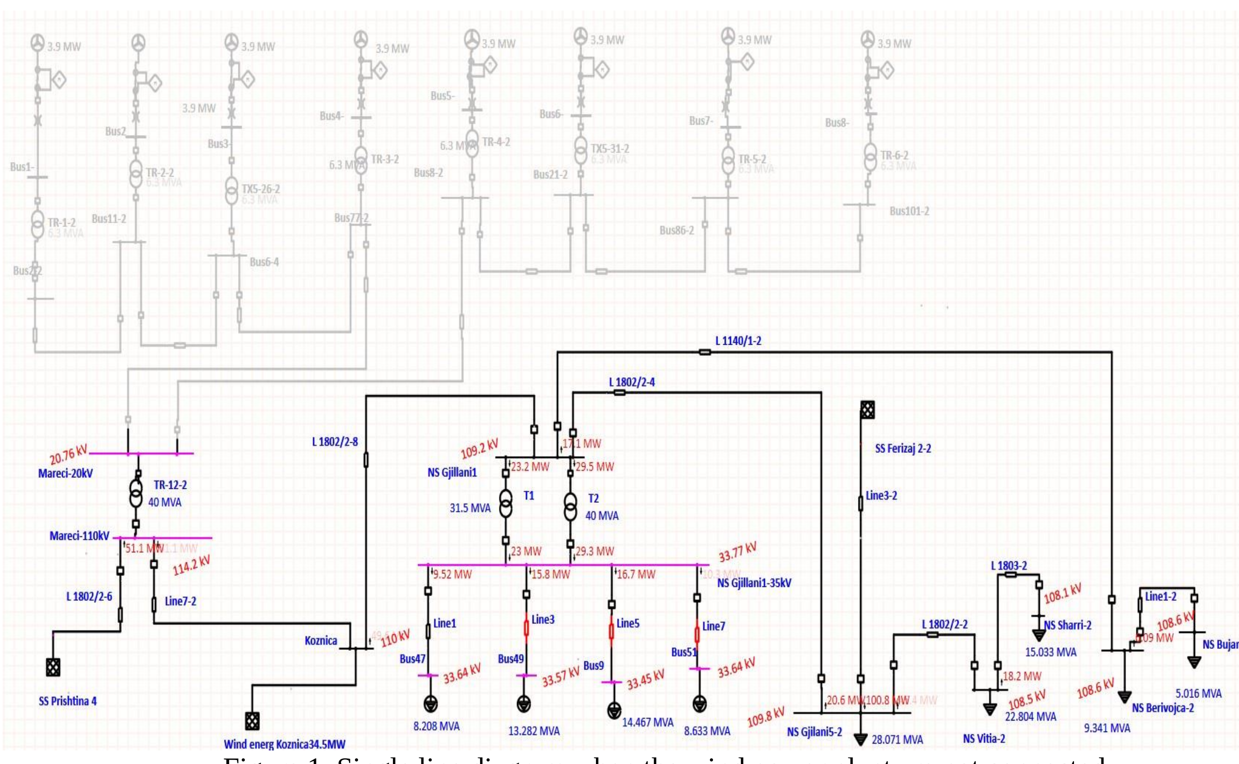

Figure 1. Single line diagram when the wind power plant are not connected
In this case the profile voltage in some susbtation when are not installed wind turbine is presented in fig.2.

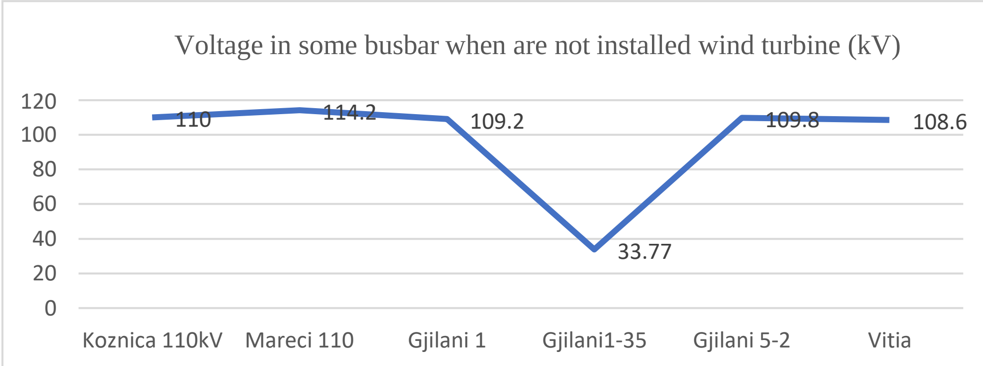

Fig.2. The profile voltage in some susbtation when are not installed wind turbine.

Losses (active and reactive) in this current situation are below:

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Mareci-2

Study Case: LF

Revision: Base
Config.: Normal

Branch Losses Summary Report

Branch ID	From-To Bus Flow MW	From-To Bus Flow Mvar	To-From Bus Flow MW	To-From Bus Flow Mvar	Losses kW	Losses kvar	% Bus Voltage From	% Bus Voltage To	Vd % Drop in Vmag
L 1140/1-2	-17.066	-3.216	17.129	2.983	63.3	-233.0	98.8	99.2	0.47
L 1802/2-2	45.351	8.685	-44.936	-8.294	414.8	390.9	99.8	98.7	1.17
L 1802/2-4	20.598	17.199	-20.513	-17.249	84.3	-50.1	99.8	99.2	0.59
L 1802/2-6	51.369	10.436	-51.076	-10.147	292.2	289.5	104.5	103.8	0.77
L 1802/2-8	49.608	8.640	-49.313	-8.328	294.8	312.3	100.0	99.2	0.75
L 1803-2	-18.103	-1.203	18.169	0.998	65.9	-205.2	98.3	98.7	0.39
Line1	-9.500	-3.875	9.525	3.916	24.9	41.4	96.1	96.5	0.38
Line1-2	6.091	0.167	-6.086	-0.488	4.6	-321.1	98.8	98.7	0.08
Line3	-15.750	-5.250	15.815	5.365	65.4	114.8	95.9	96.5	0.58
Line3-2	105.504	35.651	-100.824	-28.354	4680.5	7296.8	106.4	99.8	6.54
Line5	-16.583	-6.387	16.689	6.576	106.9	188.5	95.6	96.5	0.91
Line7	-10.250	-3.375	10.278	3.421	27.5	46.2	96.1	96.5	0.37
Line7-2	-49.608	-8.640	51.076	10.147	1468.5	1506.3	100.0	103.8	3.80
T1	23.216	9.954	-23.044	-8.493	171.8	1460.7	99.2	96.5	2.75
T2	29.481	12.640	-29.263	-10.785	218.2	1854.8	99.2	96.5	2.75
TR-12-2	0.000	0.000	0.000	0.000			103.8	103.8	0.00
					7983.7	12692.9			

* This Transmission Line includes Series Capacitor.

Fig.3. Source: Autor' calculations losses based in software ETAP

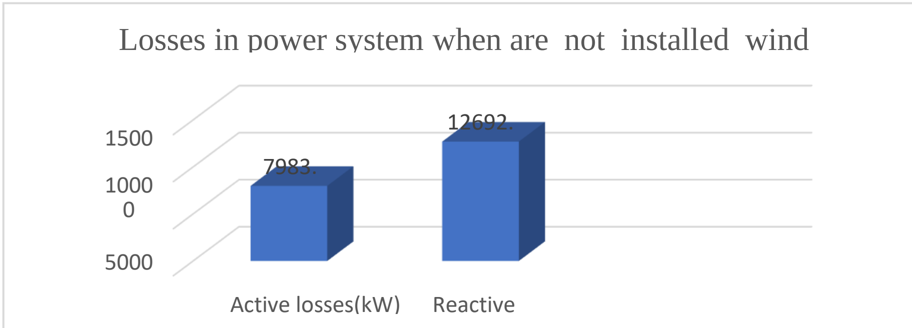

Fig.4. Active and reactive power losses of cases when wind turbine are not installed
Short circuit current in SS Mareci is 8.108 kA

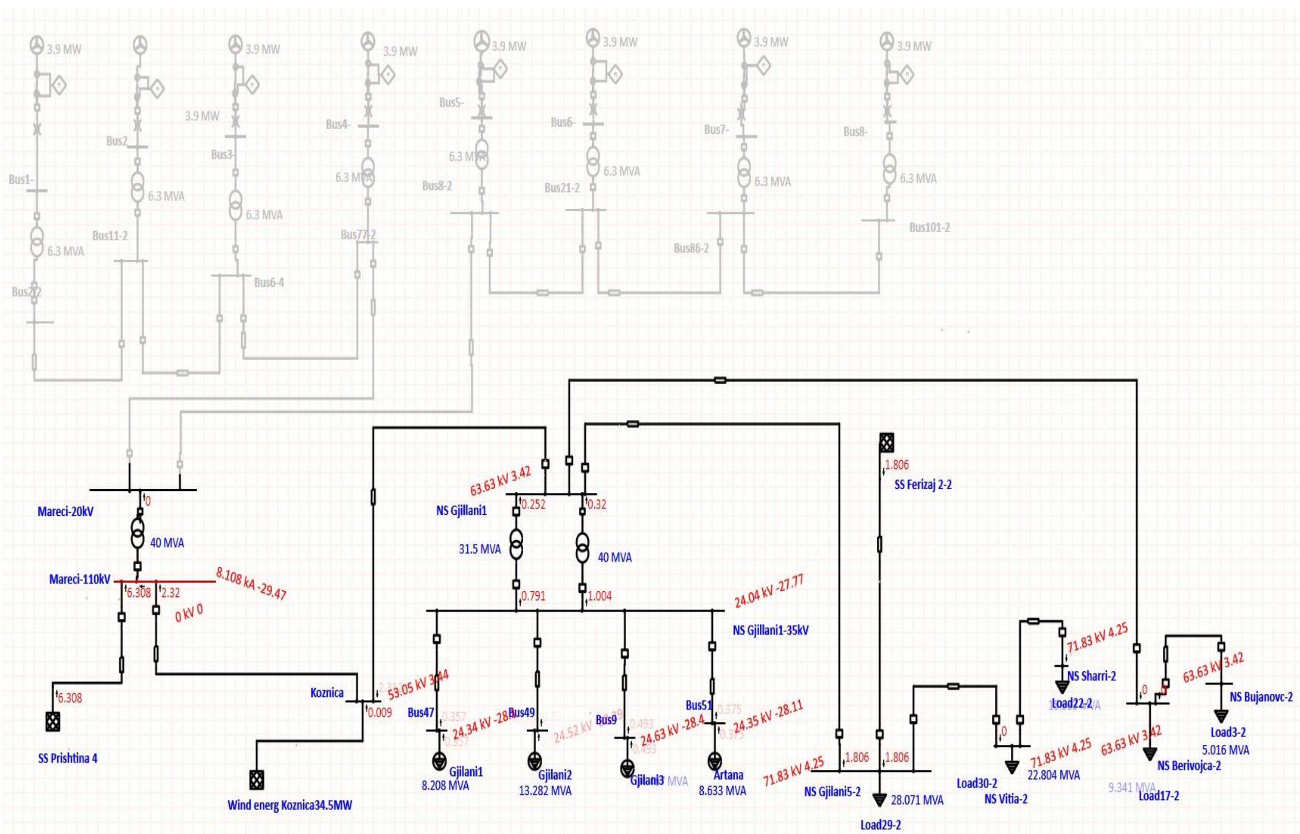

Fig.5. Short circuit current at SS Mareci 20/110kV substation when are not installed wind turbine

From the simulation in the ETAP software, we can see the wind generator , when the wind power plant(32.1MW) are connected at line 110kV in SS Prishtina 4- SS Gjilani 1 is presented in fg.6.

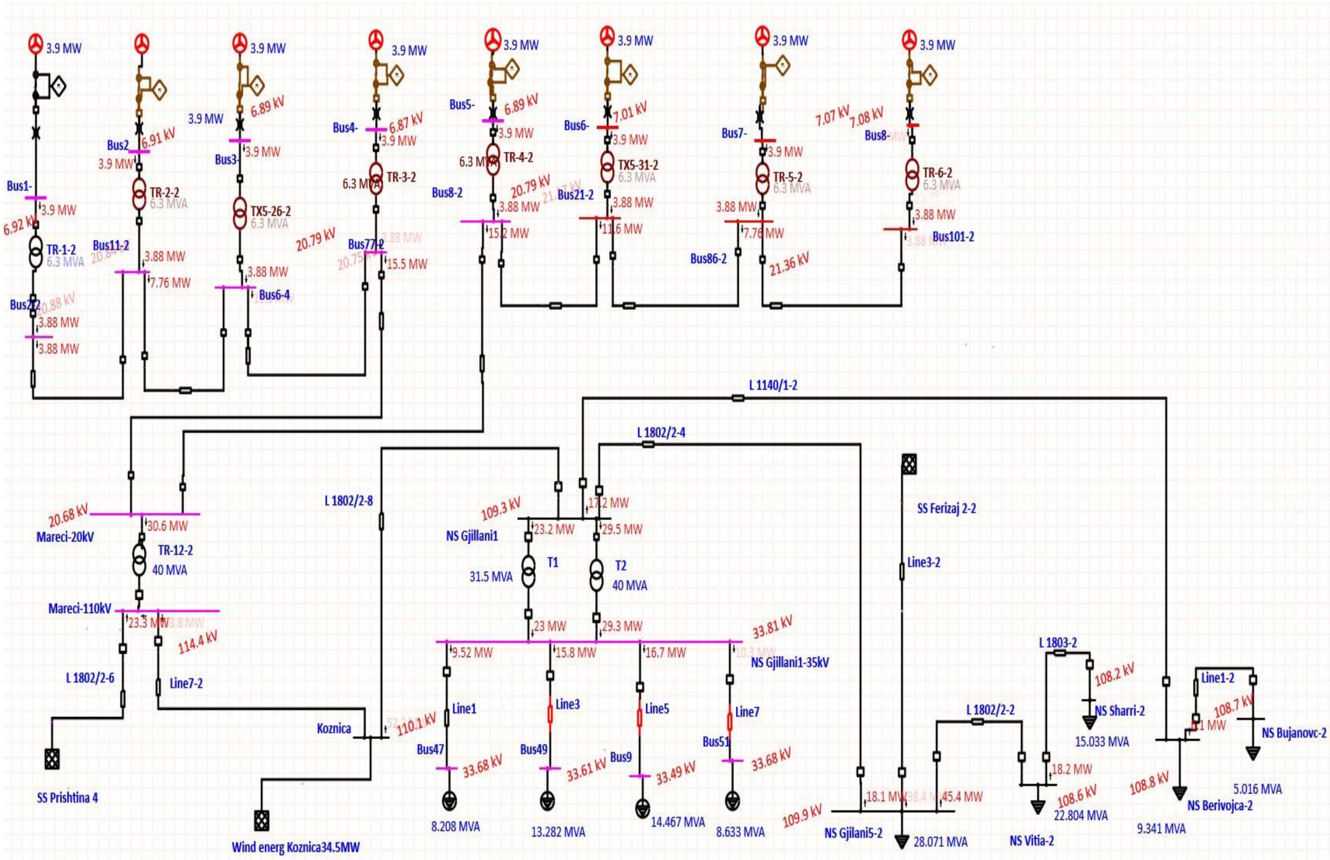

Fig.6. Single line diagram with the wind power plant are connected.

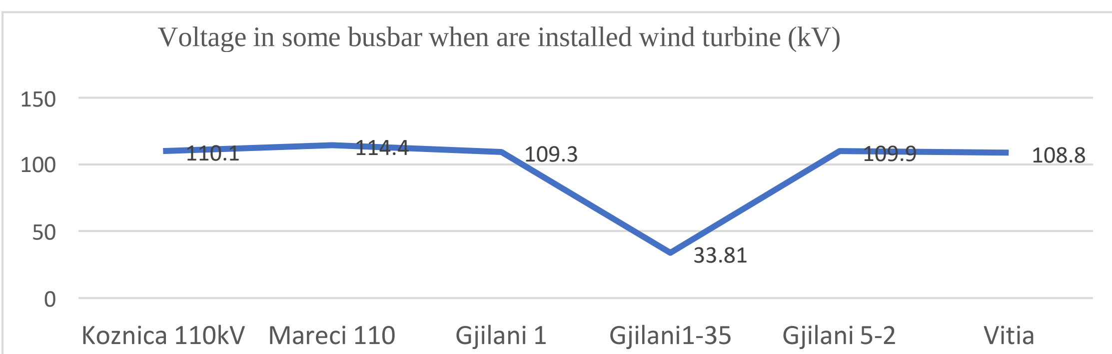

Fig.7. Voltage profile based in software ETAP when are installed wind turbine

In fig.8. is presented active and reactive power losses of cases when wind generators are connected

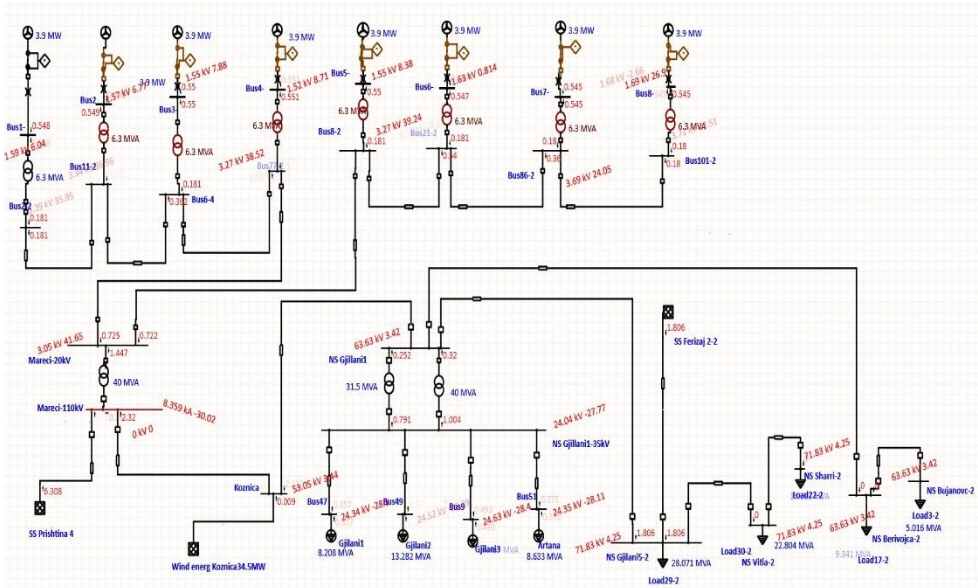

Fig.8. Source: Autor’ calculations losses based in software ETAPIn this case short circuit current in SS Mareci is 8.398kA

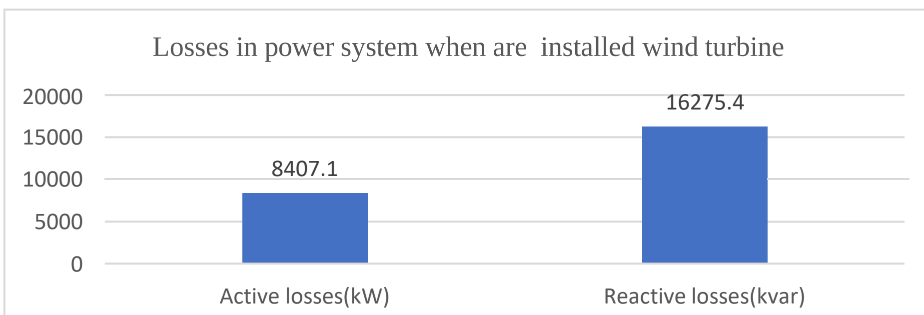

Fig.9. Losses in power system when are wind turbine connected

Fig.9. Single line diagram when the short circuit current is occurred on the bus of the substation inthe case when the wind power plant are connected in SS Mareci 110/20kV

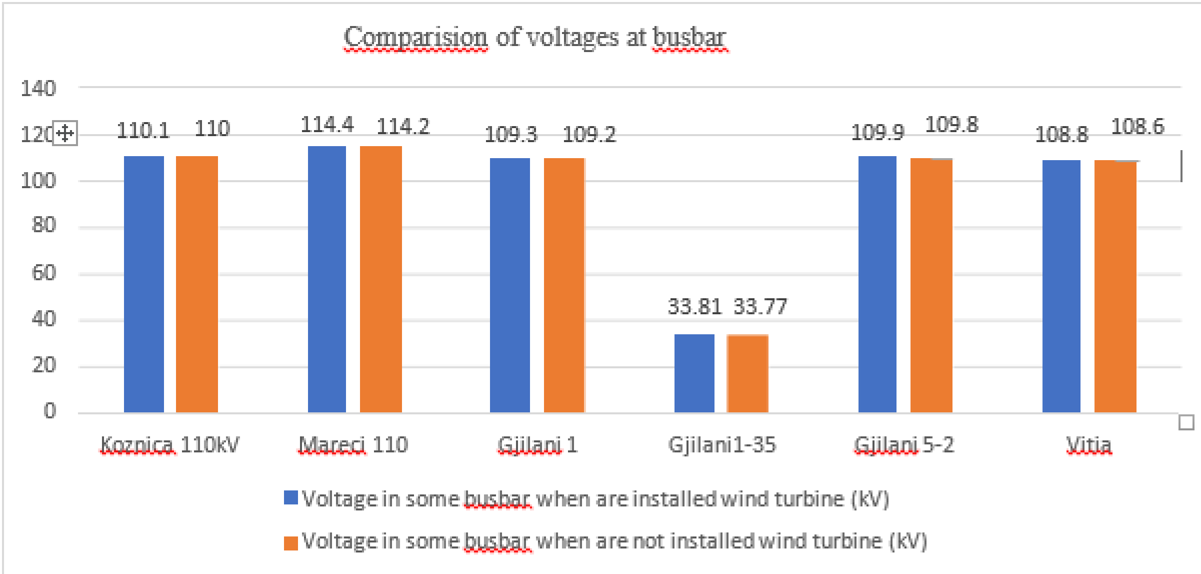

Fig.10. Comparison of cases when wind generators are connected and when they are not connected

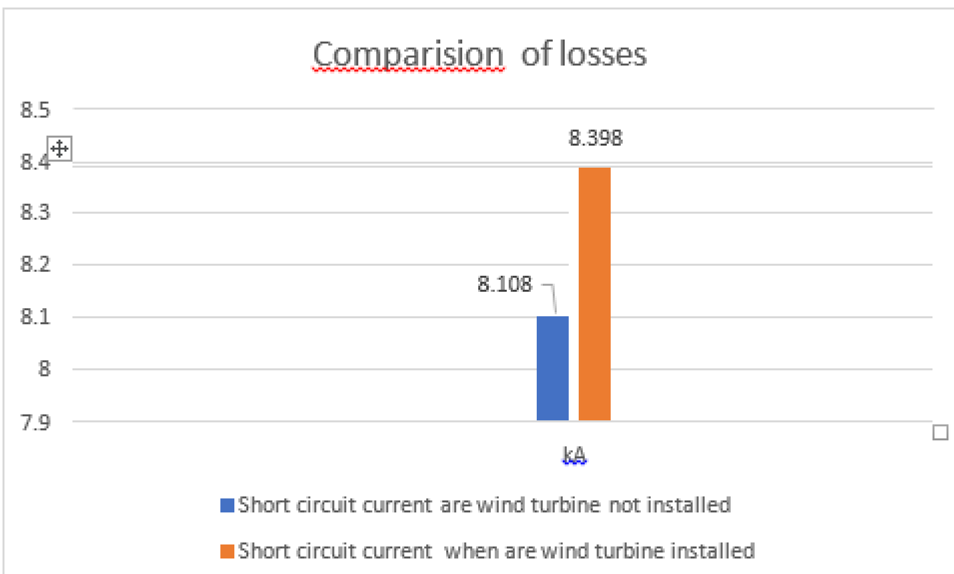

Fig.11. Comparison of losses for two case

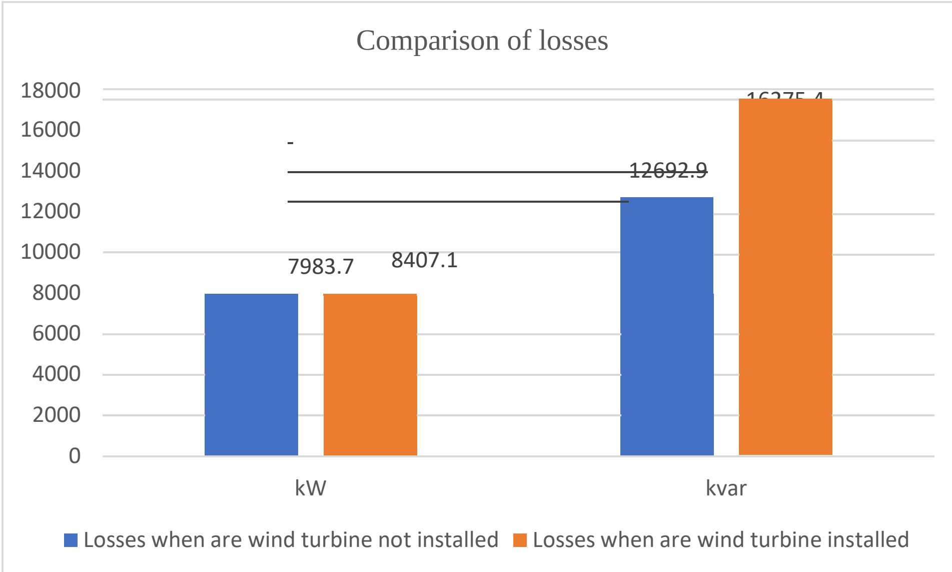

Fig.12. Comparison of losses for two case.

Conclusions

In this paper is presented the impact of the wind farm (32.1MW) when are connected to the distribution network of region Mareci. From the presented simulation results a conclusion can be made that the wind farm can influence the voltage profile, losses, short circuit current, radial network and stability. Voltage profile problem in the presence of distributed generation is much prominent than in the case without them. Wind generators are increasingly encountered in the transmission networks, so it is very important to havea strategy of the required level of their impact, as well as to connection points, all with the aim of achieving a maximum benefit from their integration into the power system.
The construction of the particular new plants with wind farm or solar panel plant will play a significant rolethe quality of voltage, increase generating capacity, as well as more secure in the supplying of customers. Wind generators are reliable power sources with low operating costs, increase of generating capacity, as wellas more secure in the supplying of the customers.
Voltage variations (instability) at the point of connection of the distributed generators can be pronouncedand as such represents a problem.
Thus, the construction of renewable sources in addition to electrical performance plays an important and increasing role in the efficiency and positive climate impacts, with particular emphasis on reducing greenhouse gases released mainly from fossil fuels.

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