Lightning Detection Situation in Turkey

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Lightning is a sudden electrostatic discharge that can be in several types. There are several lightning types such as Cloud to ground (CG), ground to cloud (GC), cloud to cloud (CC), intra cloud (IC) depending on starting and ending terminal, discharge direction etc. [1]. Frequency of lightning increases about 12 percent for every degree of rise in the average global temperature according to the latest searches [2]. In order to prevent obscurity of lightning and estimate frequency, national detection systems are installed. The first Lightning Imaging Sensor (LIS) equipped satellite was considered in 1997 by NASA and National Space Development Agency (NASDA) of Japan. In America, lightning strike density/km²/yr averaged from 1997-2010 is available from the National Lightning Detection Network. In recent years, there have been several investments which cover installation of detection sensors in order to increase lightning data accuracy and measure more parameters by governments and/or private companies.

In Europe, 140 sensors have been installed by EUCLID (European Cooperation Lightning Data). Siemens is part of the cooperation by BLIDS (lightning information service) which provides real time data and archive data [3]. Figure 1 shows installed sensor locations in Europe.

A private company had installed 16 sensors in some regions in Turkey two years ago and wants to increase the number. Recently, General Directorate of Meteorology (GDM) has also started to invest in lightning detection and has installed 34 sensors all over the country. These improvements could be counted as one of the turning points for Turkey with regard to the lightning density. Figure 2 shows sample lightning data of a hydroelectric power plant installed northeast of Turkey for 13.05.2015 and 17.05.2015. The data is provided by the private company [4] and processed on the map. The highest lightning peak current is 148 kA and type is CG.
Wind power plants might have a special condition with regard to lightning due to high altitude above sea level, earth type, and containment electronic equipment. Even if the design of a modern turbine is based on IEC 61400-1 Part 1, LPS1 (lightning protection system 1), there is no standardized assessment of site performance because lightning performance will differ from site to site. It is also known that “In 2012, a major U.S. wind insurer reported 23.4% of claims were due to lightning [GCube 2012].”

Turkey has a big on-shore wind energy market; installed wind energy capacity is 3.97429 GW and planned to reach 20 GW by 2020. The Energy Ministry has also taken into consideration second high voltage dc back-to-back installation to Gürcistan, and the increase of solar energy promotion which is thought to bring the knowledge of lightning to the forefront in the future [5].

Observation of the lightning data including peak current, location and in high accuracy helps with:

- Determination of lightning density of relevant area under accuracy depending on statistical data
- Foreseen lightning frequency by a methodology
- Feasibility and planning study of a power system (power plant, industrial thesis)
- Risk management of area both in human safety and equipment damage

How Siemens Turkey will be a part of this is under consideration by cross-organized groups. The first step is to increase intellectual property and take a role for lightning density assessment and lightning protection improvements.

References