Artificial Neural Network (ANN) control strategy for Doubly Fed Induction Generator (DFIG)

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Abstract

In this paper, Artificial Neural Network (ANN) control strategy has been created for Doubly Fed Induction Generator (DFIG) based breeze vitality age structure and the presentation of the system is differentiated the fluffy and NN control systems. With the extending use of wind power age, it is required to prompt the dynamic execution assessment of Doubly Fed Induction Generator under various working conditions. In this work, ANN control systems have been proposed. To enhance various sorts of tainting free age wind vitality is an attainable other option. As of now wind turbines were worked at relentless speed.

Keywords: ANN, Wind Turbine

1. INTRODUCTION

As of late, the environmental tainting has transformed into an imperative stress in people's step by step life and a possible vitality crisis has driven people to develop new advancements for making great and sustainable power source. Wind power nearby sun based vitality, hydropower and tidal vitality are possible responses for an environmentally very much arranged vitality creation. Among these sustainable power sources, wind power has the speediest creating speed in the force business.

1.1 *ADVANTAGES OF THE DFIG-BASED WIND TURBINE-GENERATOR*

- It has the capacity of decoupling the control of the active and receptive power by controlling the rotor terminal voltages. Henceforth, the power factor control can be executed in this framework.
- The DFIG is typically an injury rotor induction generator, which is basic in development and less expensive than a PMSG.
- In a DFIG-based wind turbine-generator framework, the power rating of the power converters is typically evaluated ±30% around the appraised power, and this trademark prompts numerous benefits, for example, diminished converter cost, decreased channel volume and cost, less exchanging misfortunes, less consonant

infusions into the associated matrix, and enhanced generally productivity (approx. 2-3% more than full-scale frequency converter) if just the generator and power converters are considered.

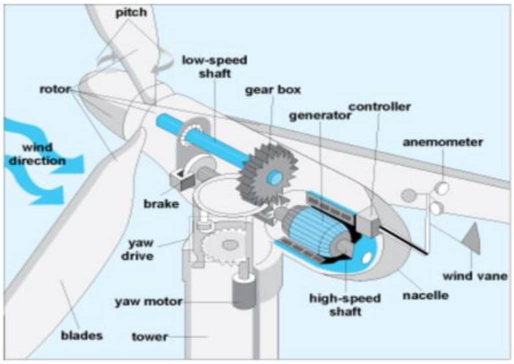

Figure. 1: Components of a Wind Turbine Generator System

1.2 WIND ENERGY CONVERSION SYSTEM TOPOLOGIES

Wind Energy Conversion Systems (WECS) have a couple of particular topologies depending upon the sort of machine used similarly as the application. WECS can in like manner be orchestrated by their speed of action, that is, fixed speed or variable-speed undertaking of the systems.

The clear structure and low help of settled speed WECS made them common previously. This kind of structure involves an induction machine related direct to the network. The term settled speed is a direct result of the path that there is no speed control in this system and the working rate is consistent and not expose to the changing wind speed. This infers they can simply achieve perfect streamlined proficiency at a solitary wind speed.

1.3 TYPES OF DOUBLY-FED MACHINES

The cascaded doubly-fed induction machine includes two doubly-fed induction machines with wound rotors that are related precisely through the rotor and electrically through the rotor circuits. See Fig. 2 for a standard framework. The stator circuit of one of the machines is direct connected with the grid while the other machine's stator is related by methods for a Converter to the cross section. Since the rotor voltages of the two machines are proportionate, it is possible to control the induction machine that is explicitly connected with the network with the other induction machine.

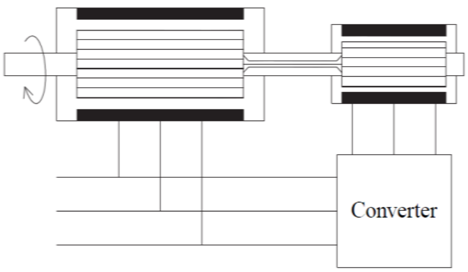

Figure 2: Principle of Cascaded doubly-fed Induction Machine.

2. SYSTEM MODEL

The DFIG-based WECS on a very basic level involves generator, wind turbine with drive train structure, RSC, GSC, DC-associate capacitor, pitch controller, coupling transformer, and security system as showed up in Figure 3. The DFIG is damage rotor induction generator with the stator terminals related explicitly to the cross section and the rotor terminals to the mains through a for the most part assessed variable recurrence air conditioning/dc/air conditioning converter, which simply needs to manage a division (25-30 %) of the total capacity to accomplish full control of the generator. The helpful rule of this variable speed generator is the mix of DFIG and four-quadrant air conditioning/dc/air conditioning VFC outfitted with IGBTs. The air conditioner/dc/air conditioning converter system includes a RSC and a GSC related back to back by a DC-interface capacitor.

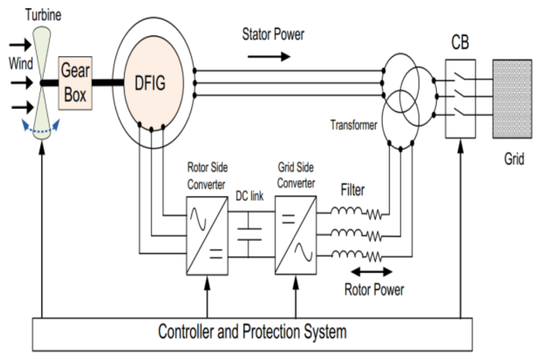

Figure 3: Components of DFIG-based WECS

2.1 DOUBLY-FED INDUCTION GENERATOR WIND TURBINE

DFIG Wind turbines, as portrayed in part (3) outfitted with an injury rotor induction generator, which its rotor is coupled by full controlled converter (consecutive voltage source converter) to the lattice while the stator windings are associated directly to the utility framework. Fig 4 depicts the arrangement of DFIG wind turbine.

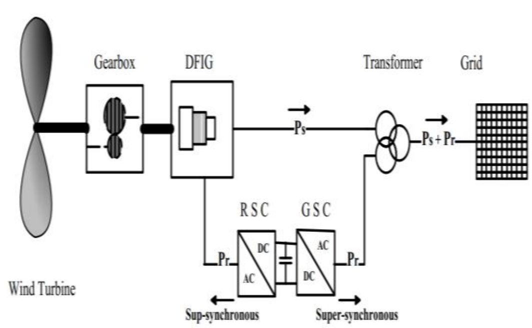

Figure 4: DFIG Wind Turbine System.

The rotor terminals are fed by extra voltage from the machine-side converter which has a slip recurrence. The variable speed task is utilized by dealing with the rotor voltage, which furthermore achieve a decoupling dynamic and open force controllability of DFIG. The DFIG has two mode undertakings, super-synchronous and sub-synchronous action, the errand mode depends upon the size and time of the rotor voltage. The force streams between the rotor terminal and the converter is depending upon task mode. In the midst of sub-synchronous speed (underneath evaluated speed), the converter supplies the ability to the rotor windings, regardless, in super-synchronous assignment the rotor urges capacity to the converter and a short time later to the framework.

3. SIMULATION RESULTS

The Performance of the proposed DFIG-based WECS arrangement at sub-synchronous speed, super-synchronous speed, and at synchronous speed, individually, during change. The waveforms for battery power are displayed for various wind speeds. The motor vitality plot is chosen as antagonistic if the PC discharges any vitality to the turbine and great if the example is held.

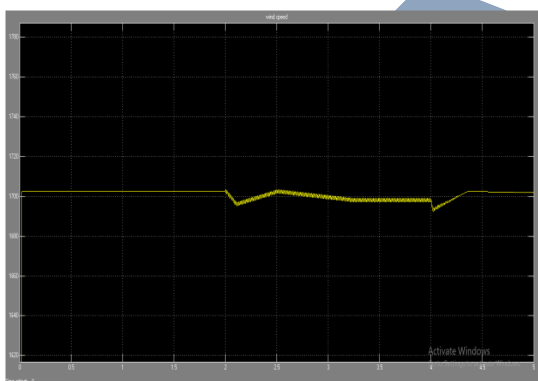

Figure 5: Constant Wind Speed

Solitary line diagram of a model structure with a consistent electromagnetic speed WT. the torque of mechanical trademark has been gotten, and is showed up in Fig. 6. In the normal working condition, the electrical and mechanical torques will be equal; from this time forward, the WT will work at slip s0 (point Q). Right when a genuine inadequacy occurs close to the WT, the terminal voltage of the WT falls certainly. This will lessen the electrical torque to directly around zero. Hence, the rotor will falter, and the mistake of the WT will increase.

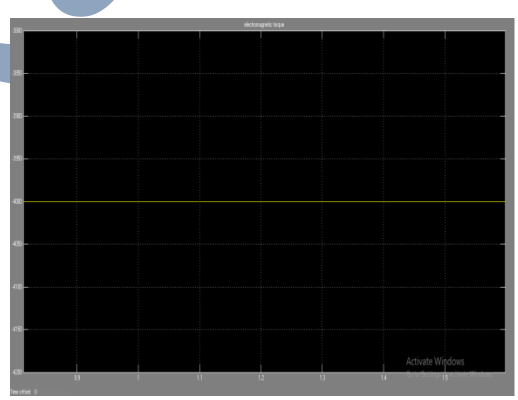

Figure 6: Constant Electromagnetic Torque

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