Introduction to Smart Grid

Description: Smart grid is an important concept that is still undergoing rapid development. This course will help students to better understand the motivations, concept, key technologies, and applications of smart grid in a collaborative and interactive way. This course will cover underlying features of smart grid, including the source (renewable and distributed generations), network (active distribution networks & microgrid), demand (demand response, electric vehicles), and corresponding communication technologies. Students are expected to have an initial understanding of the idea of smart grid and establish solid basis for their future research.

Prerequisites: Multivariate calculus, linear algebra, Prior exposure to power systems is not required.

Staff:

Instructors: Ye GUO (guo-ye@sz.tsinghua.edu.cn), Nanshan Park C2-1514
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Office hours: Friday 14:00-17:30 or contact the instructor/TA to make an appointment

Textbook and references: Class notes posted after lectures.

Tentative Topics and Schedule

Lecture 1: Introductions to Smart Grid (Feb. 19)
Lecture 2-3: Integrating Renewable Energies (Feb. 26, Mar. 4)
Lecture 4: Smart Transmission System and Energy Management Systems (Mar. 11)
Lecture 5: Active distribution network and microgrid (March 18)
Lecture 6: Electric Vehicles and Demand Response (March 25)
Lecture 7: Electricity Market (April 1)
Lecture 8: Energy Internet (April 8)
Lecture 9: Power electronics in microgrid (Apr. 24)
Lecture 10: Microgrid (May 8)
Lecture 11: Invited talk: Integrated Energy System and Power Distribution System Planning considering Operation Conditions and ESS (May 15)
Lecture 12: Invited talk: Hierarchical control of Microgrid (May 22)
Lecture 13: Distributed control and optimization in smart grid. (May 29)
Lecture 14: Optimal EV charging in an integrated energy system. (June 5)
Lecture 15: Massive flexible recourses' participation in energy and ancillary service markets
Lecture 16: Student presentations, Discussions

Grading: Classroom performance 20%, homework (4 sets) 40%, final project 40%.