EE 340 - PROJECTS

SPRING 2020

Y. BAGHZOUZ

1. ENERGY STORAGE

- NEED FOR ENERGY STORAGE
- ENERGY STORAGE TECHNOLOGIES
- UTILITY ENERGY STORAGE APPLICATIONS
- RESIDENTIAL ENERGY STORAGE (TESLA POWERWALL)
- STATE AND FEDERAL INCENTIVES
- ETC…
- REFERENCES

HTTPS://WWW.NREL.GOV/DOCS/FY19OSTI/71714.PDF

HTTPS://WWW.UCSUSA.ORG/CLEAN-ENERGY/HOW-ENERGY-STORAGE-WORKS

2. TRANSFORMER DESIGN

- MAGNETIZING REACTANCE & EXCITATION CURRENT
- TURN RATIO AND NUMBER FOR TURNS OF PRIMARY AND SECONDARY WINDINGS FOR GIVEN VOLTAGE RATIO (TURNS/VOLT)
- CORE DESIGN (CORE SIZE – AREA AND LENGTH)
- WIRE TYPE
- K RATING
- ETC…
- REFERENCES

HTTP://XITRONTECH.COM/ASSETS/002/5787.PDF

HTTP://WWW.YMCAUST.AC.IN/ELECTRICAL/IMAGES/TRANSFORMER_DESIGN.PDF

HTTP://ECEE.COLORADO.EDU/~ECEN5797/COURSE_MATERIAL/CH15SLIDES.PDF

3. HISTORY OF 60 HZ FREQUENCY

- FACTORS THAT INFLUENCED THE CHOICE OF POWER SYSTEM FREQUENCY
- 50 HZ VS. 60 HZ
- LIGHT FLICKER VS. FREQUENCY
- IMPACT OF FREQUENCY ON GENERATOR AND MOTOR MATERIAL
- TIME ERROR CORRECTION
- LOAD-FREQUENCY CONTROL
- WHY 400 HZ IS USED IN AIRCRAFTS?
- ETC …
- REFERENCES
- HTTPS://IEEEXPLORE.IEEE.ORG/DOCUMENT/628099/
- HTTP://IEEEXPLORE.IEEE.ORG/DOCUMENT/7203276

4. VOLTAGE IMBALANCE IN POWER SYSTEMS

- CAUSES OF VOLTAGE IMBALANCE
- EFFECTS OF VOLTAGE IMBALANCE PARTICULARLY ON INDUCTION MOTORS
- HOW MUCH IS TOO MUCH, ARE THERE STANDARD LIMITS?
- WHAT IS DONE ABOUT MINIMIZING IMBALANCE
- MEASUREMENT ON LOCAL VOLTAGE IMBALANCE (24 HR)
- ETC…
- REFERENCES
- HTTPS://IEEEXPLORE.IEEE.ORG/ABSTRACT/DOCUMENT/766984
- HTTP://WWW.ELONGO.COM/PDFS/VOLTAGES.PDF

5. ELECTRIC VEHICLES

- EV TREND,
- STATE AND FEDERAL INCENTIVES
- IMPACT OF EV CHARGING ON UTILITY GRID
- EV CHARGING TYPES
- UTILITY INCENTIVES FOR CHARGING AT NIGHT
- ENVIROMENTAL IMPACT
- ETC…
- REFERENCES
- HTTPS://WWW.ENERGY.GOV/EERE/ELECTRICVEHICLES/VEHICLE-CHARGING
- HTTPS://WWW.NVENERGY.COM/ACCOUNT-SERVICES/ENERGY-PRICING-PLANS/ELECTRIC-VEHICLE
- HTTPS://WWW.NVENERGY.COM/CLEANENERGY/ELECTRIC-VEHICLES

6. WIND POWER GENERATION

- WIND POWER TREND, COST
- TYPES OF WIND POWER GENERATORS (VERTICAL VS. HORIZONTAL AXIS)
- COMPONENTS OF WIND POWER GENERATOR
- NUMBER OF BLADES, BLADE ORIENTATION
- ROTOR SPEED FOR OPTIMAL PERFORMANCE
- ENVIRONMENTAL IMPACT
- ETC…
- REFERENCES
- HTTP://WWW.CAISO.COM/TODAYSOUTLOOK/PAGES/SUPPLY.ASPX
- HTTPS://WWW.ENERGY.GOV/EERE/WIND/WIND-ENERGY-BASICS
- HTTPS://WWW.ENERGY.GOV/EERE/WIND/WIND-ENERGY-TECHNOLOGIES-OFFICE

7. HVDC TRANSMISSION

- TIE BETWEEN AC SYSTEMS OF DIFFERENT FREQUENCIES
- TIE LINES AMONG NORTH AMERICAN INTERCONNECTED SYSTEMS
- HVDC SYSTEM APPARATUS
- HVDC SYSTEMS IN NORTH AMERICA
- LIMITATIONS OF UNDERGROUND AC POWER TRANSMISSION
  - UNDER-SEA CABLES (INTERNATIONAL)
- ETC…
- REFERENCES
- HTTPS://WWW.RESEARCHGATE.NET/PROFILE/HUALEI_WANG/PUBLICATION/224199554_THE_ADVANTAGES_AND_DISADVANTAGES_OF_USING_HVDC_TO_INTERCONNECT_AC_NETWORKS/LINKS/00B7D5332B5EDD2870000000.PDF
- HTTPS://EN.WIKIPEDIA.ORG/WIKI/HVDC_CONVERTER_STATION
- HTTPS://WWW.ENERGY.GOV/SITES/PROD/FILES/2013/05/F0/HVDC2013-GALLI.PDF

8. POWER IN NON-SINUSOIDAL SITUATIONS

- TOTAL HARMONIC DISTORTION
- CONTROVERSY OVER REACTIVE POWER DEFINITION
  - BUDEANU & IEEE DEFINITIONS
- CASE STUDY: DESKTOP COMPUTER POWER SUPPLY
  - MEASUREMENTS
  - BASIS OF INSTRUMENT READING
  - ANALYSIS
- ETC …
- REFERENCES:
- HTTPS://IEEEXPLORE.IEEE.ORG/DOCUMENT/6140203
- HTTPS://WWW.DEGRUYTER.COM/VIEW/J/IJEEPS.2017.18.ISSUE-3/IJEEPS-2017-0002/IJEEPS-2017-0002.XML

9. DEMAND SIDE MANAGEMENT (DMS)

- TYPES OF DMS
- TYPES OF CONTROLLABLE LOADS
- AIR CONDITION CONTROL THROUGH SMART THERMOSTATS (NV ENERGY POWER SHIFT)
- ENERGY SAVINGS VS. COMFORT
- ETC…
- REFERENCES
- HTTPS://WWW.ENERGY.GOV/OE/ACTIVITIES/TECHNOLOGY-DEVELOPMENT/GRID-MODERNIZATION-AND-SMART-GRID/DEMAND-RESPONSE
- HTTPS://WWW.ENERGY.GOV/OE/DOWNLOADS/CHAPTER-3-DEMAND-SIDE-RESOURCES

10. PV POWER GENERATION

- PV POWER TREND, COST
- MAXIMUM POWER TRACKING
- CONVENTIONAL VS. SMART INVERTERS
- IMPACT ON GRID OPERATION
- STATE AND FEDERAL INCENTIVES
- ETC…
- REFERENCES
- HTTPS://WWW.ENERGY.GOV/EERE/SOLAR/ARTICLES/SOLAR-PHOTOVOLTAIC-TECHNOLOGY-BASICS
- HTTPS://WWW.NREL.GOV/DOCS/FY16OSTI/63042.PDF
- HTTPS://WWW.NREL.GOV/DOCS/FY17OSTI/68349.PDF

11. SMART METERS

- EVOLUTION OF METER READING
- SMART METERS AND AMI
- WHAT CAN SMART METERS READ?
- OTHER FUNCTIONS
- ETC…
- REFERENCES:
- HTTP://WWW.WHATISSMARTGRID.ORG/SMART-GRID-101/FACT-SHEETS/MYTHS-VS-FACTS-THE-TRUTH-ABOUT-SMART-METERS?GCLID=EAIAIQOBCHMIJT2RZN7Q4QIVCB6TBH0UDQGDEAAYASAAEGKNS_D_BWE
- HTTPS://WWW.SMUD.ORG/EN/RATE-INFORMATION/HOW-DO-WE-MEASURE-USAGE
- HTTPS://EN.WIKIPEDIA.ORG/WIKI/SMART_METER

12. ELECTRIC UTILITY RATES

- ELECTRIC ENERGY RATES IN VARIOUS STATES
- TYPES OF RATES (FIXED, TOU, TIER …)
- DEMAND CHARGE
- CHARGE FOR POOR POWER FACTOR (VARH)
- OTHER MISCELLANEOUS CHARGES
- CASE STUDY: NV ENERGY, APS, SDGE
- REFERENCES
- HTTPS://WWW.NVENERGY.COM/ABOUT-NVENERGY/RATES-REGULATORY
- HTTPS://WWW.SDGE.COM/TOTAL-ELECTRIC-RATES
- HTTPS://WWW.APS.COM/EN/OURCOMPANY/RATESREGULATIONSRESOURCES/SERVICEPLANINFORMATION/PAGES/RESIDENTIAL-SHEETS.ASPX