Portugal – PyPSA Group Assignment Full Checklist

Phase 0 – Project Setup

- Create shared Git repository and folder structure

- Decide Python environment (conda / venv)

- Install core packages: pypsa, atlite, geopandas, shapely, rasterio, xarray

- Test Gurobi license if available

- Download base dataset bundle from TU cloud

Phase 1 – Country & Regions Definition

- Extract Portugal shape from country_shapes.geojson

- Remove overseas territories if present

- Load GADM regions and aggregate to 5–8 regions

- Compute centroid for each region

- Extract Portugal EEZ from marineregions

Phase 2 – Land Eligibility Analysis

- Load land cover, protected areas, roads, airports, elevation

- Define eligibility rules for onshore wind

- Define eligibility rules for solar

- Define eligibility rules for offshore wind

- Build raster eligibility masks per technology

- Aggregate eligible area per region

Phase 3 – Atlite Weather & Capacity Factors

- Create atlite cutout with Portugal bounding box + buffer

- Choose weather year

- Define turbines and solar technology

- Compute capacity factor time series per region

- Compute p_nom_max using 3 MW/km² density

Phase 4 – Load Time Series

- Load GEGIS national load for Portugal

- Collect population per region

- Distribute national load to regions

- Validate regional load consistency

Phase 5 – Conventional Power Plants

- Load global power plant database

- Filter Portugal plants and exclude wind/solar

- Aggregate capacities per region and technology

- Simplify hydro using constant p_max_pu

Phase 6 – Build PyPSA Network

- Create one bus per region with centroid coordinates

- Attach regional load time series

- Add existing conventional generators

- Add extendable wind and solar generators

- Add bidirectional transmission links between regions

- Add battery and hydrogen storage options

Phase 7 – Technology Costs & Economics

- Choose cost projection year from technology-data

- Compute annuities with 7% discount rate

- Set capital and marginal costs for all technologies

- Document all assumptions

Phase 8 – Core Model Runs

- Run base case without CO2 limit

- Run 100% CO2 reduction case

- Compare capacities, mix, storage, system cost

Phase 9 – Sensitivity Analysis

- Choose one sensitivity category
- Run multiple scenarios
- Analyse changes in system design and cost

Phase 10 – Post-Processing & Plots

- Plot regions and transmission map
- Plot installed capacities by technology
- Plot electricity mix
- Plot storage filling levels
- Plot representative dispatch week

Phase 11 – Presentation & Slides

- Prepare intro slide on current Portuguese power system
- Explain methods and modelling setup
- Present base and 100% RE results
- Present sensitivity analysis results
- Summarise conclusions and limitations

Phase 12 – Code & Submission

- Clean and document code
- Prepare README
- Ensure reproducibility
- Prepare final slides and backup