NUCE 2122 NOTES

May 8th 2025

Power plants are a factory → the product is power
Lots of factors to consider.

→ Unions
→ Insurance
→ Profit and Loss
→ Dispatch theories
→ Flexible labor sources

Management is NOT an exact science.
→ Competencies change with business situation and responsibilities.
(required)

Licensing has drastically changed in the past 50 years

BEFORE

1. Prelim Safety → Iterative process
2. Const. Permit
3. Final Safety } During Construction!
4. Public Hearings

- No defined end point.
- No clear rules
  ↳ Long Island plant mothballed over silly disagreements that changed during development.
- Capacity factor ~ 60%
- 4.5% of power consumed

TODAY

+ Capacity factor 92.7% (Best!)
+ 20.6% of power consumed

An effective manager understands the market they work in.
↳ You must be able to explain to subordinates.

NUCE 2122 – MODULE 1

May 8th

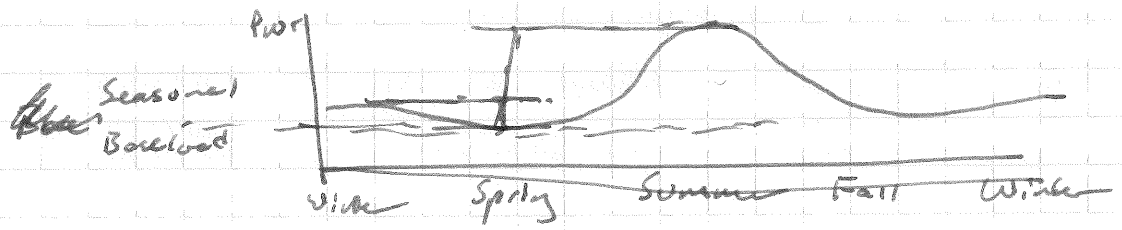
US Power base → 980,000 MWe

70,000 MWe UK, France ---

The most capital expensive industry in the world.

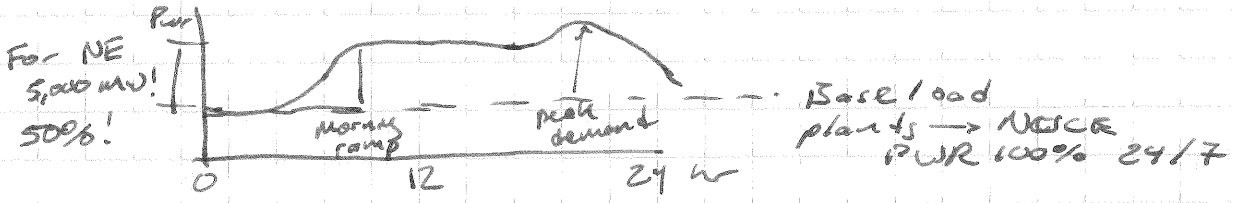
The US is NOT a single power market. It is a collection of power markets.

Power demand is seasonal:



These swings provide an opportunity in spring and fall for planned outages.

Each day also has a cyclical demand:



Even crafty in Pennsylvania Jersey Maryland

2008 → 60 GW → 110 GW!

~80%!!

That's the entire installed base of the UK.

Baseload plants : 6–8 k-hours/year Large Coal, Nuc
Intermediate : 2–6 k-hours/year Pump storage, coal, hydro
Peaking Units : <1000 hours/year Combustion turbines

Capacity Margin → How much capacity is in reserve?

30% → 70% of plants in use.

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Market Supply Curves
↳ Show price / mw demanded
↳ Plants are ranked by cost of running
↳ NUCE costs for running (variable cost is very low.

Reserve Margin is capacity factor over a longer time, like years
↳ Need 12+% for FOS against outages.

Power Plant Types.

1. Combustion Turbine Plant
↳ Basically a jet engine but much larger.
↳ About a 30 ft long skid sometimes.
↳ Often can be oil or gas.
Pushed VERY hard metallurgically
↳ 230 MW for one gas turbine
↳ Fail after 5000 hours → main shaft creep.
Replace after 2 ish years.

2. Gas Turbine Combined Cycle (CC)
↳ Same as combustion turbine, but scavenge energy from exhaust to create steam, run that through a turbine.

↳ 300 MW per.
↳ 90% of costs are fuel. → EXTREME dependence on Nat Gas cost.

↳ Nat gas prices are extremely volatile
↳ Makes CC plants hard to manage. Unpredictably profitable

↳ Very fast construction / build time
↳ 15 months for building sometime
↳ NUCE 10+ years???

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Coal Plants

- Not a lot of new technology
  But, can get up to 40% efficiency.
  Extremely dirty plants.

  EU imports a lot of coal from US.

Pump Storage

Reservoir systems pump water uphill when cheap
make power when demand is high by using a hydroturbine.

Renewables

- Extreme subsidies

Waste to Energy

- Wood from fire zones → burn it to make power
- Municipal trash incinerators

Nuclear

- Expensive (~$ 30 Billion)
- Long time to build (> 10 years!)