Background on IFE Economics Studies

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Many studies of IFE economics have been completed and work continues to improve models and estimates

Systems modeling and analyses have been carried out for laser, heavy ion and Z-IFE power plants

- **1980's (e.g., HYLIFE-II)**
  - Used fission reactor Energy Economic Data Base (EEDB) for non-fusion items (e.g., structures, heat transfer system equipment, turbine plant equipment, heat rejection systems)
  - Chamber costed based on mass of materials and material unit costs ($/kg)
  - Simple models for drivers (e.g., $/MJ estimates)
  - Applied different indirect costs to nuclear and conventional cost centers
- **1990's**
  - DOE reactor studies (Sombrero, Osiris, Prometheus) included input from AE firms (e.g., Bechtel) on BOP costs
  - Chamber costs based on mass of materials and unit costs
  - More detail on reactor plant equipment than other cost categories
  - Laser and HI driver cost models based on proposed architectures, first level CBS, and unit costs ($/kg of metglas, $/$m^2$ of mirror, etc.)
  - Common ground rules for indirect costs and COE calculations used (same as used by MFE ARIES work), e.g., J. Delene, "Nuclear Energy Cost Data Base" report, ORNL)
- **2000's**
  - HIF
  - Detailed model (>100 pages) of induction linac driver in support of HIF Robust Point Design
  - Chamber and BOP costs updated from HYLIFE-II study
  - Used as system optimization to select design point and identify cost trades

Many studies of IFE economics …(cont.)

- **2000's (cont.)**
  - **HAPL**
    - Very simple laser models ($/J)
    - Focused on trade and sensitivity studies for different driver efficiencies, gain curves, power conversion efficiencies, etc.
  - **Z-IFE**
    - Adapted TLW reactor and BOP models
    - Added SNL estimates for RTL factory
    - Driver cost based on SNL $/J estimates for delivered pulsed power
    - Mainly used to understand system design trades and overall plant optimization
  - **LIFE (2007-present)**
    - Recent work includes more detailed laser models benchmarked to NIF
    - New work on target production costs
    - BOP models informed by ALMR study (late 90s) and previous IFE studies
    - Using MIT's economic model for COE calculation (discounted cash flow approach)
    - Including new info on fusion specific systems (e.g., from ITER tritium processing, but adjusted for first of a kind cost)
    - Evaluating how level of safety assurance (LSA) affects construction costs
    - Re-evaluating how indirect costs should be applied to parts that are factor built vs. site built
    - Recently engaged an engineering firm on BOP costs

Partial list of references

HIF

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Osiris, Sombrero, Prometheus

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Z-IFE

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HAPL

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