

# SEF Journal Club

## The economics of nuclear propulsion for containerships

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**Paper:** “The economics of nuclear propulsion for containerships”, Locatelli, Guglielmetti, Dei, Skliarenko (2026), Progress in Nuclear Energy

**Main question:** Under what conditions could a nuclear-powered containership be economically competitive with conventional or alternative-fuel ships?

### Big picture

- Maritime shipping carries around 80% of global trade by volume and is responsible for roughly 3% of global greenhouse-gas emissions.
- The sector now faces tightening decarbonisation pressure from the IMO, the EU ETS, and FuelEU Maritime.
- Containerships are especially important because they carry a very large share of the value of traded goods.
- The main decarbonisation candidates discussed today are fuels like methanol and ammonia, but nuclear is re-emerging as a serious option because of interest in small modular reactors (SMRs).

### What makes nuclear attractive and difficult

- Near-zero direct CO<sub>2</sub> emissions during operation.
- Very low fuel consumption and reduced exposure to fuel-price volatility.
- Ability to sustain high operating speeds without the huge fuel penalty of combustion engines.
- Very high CAPEX — estimated at roughly 10 to 30 times the cost of a conventional engine.
- Regulatory complexity, uncertain insurance/liability frameworks, public acceptance, crew training, waste management, and port/canal access constraints.

### What the authors did

→ Built a scenario-based economic model that assesses the Levelised Cost of Transport (=the cost to transport one TEU over 1000 nautical miles) for:

- four propulsion options
- with different cruising speeds
- carbon prices
- nuclear CAPEX
- A 12,000 TEU containership with 70 MW propulsion power

### Assumptions

- Nuclear propulsion is assumed to have a 50-year reactor life, but the model does not credit the residual value of the reactor at year 25
- Nuclear fuel consumption is assumed to be almost independent of speed, unlike fuel oil, methanol, and ammonia, whose fuel use rises strongly with speed.
- Carbon pricing is applied only to direct CO<sub>2</sub> emissions, which benefits ammonia and nuclear in the model.

## Results

Competitiveness depends on:

- high ship speed (25 kn)
- favourable or average nuclear CAPEX

LCOT ranges between 60-80 \$/(TEU\*1000nm)

Nuclear could support a different operating model:

- faster services,
- possibly fewer ships needed for the same service frequency

## Debate

Nuclear not a green replacement but a tech for high speed

Political acceptance of nuclear for shipping

Reactor CAPEX assumptions based on land power stations

Impact on shipping operations.