



# Zur aktuellen Wirtschaftlichkeit von Atomkraftwerken

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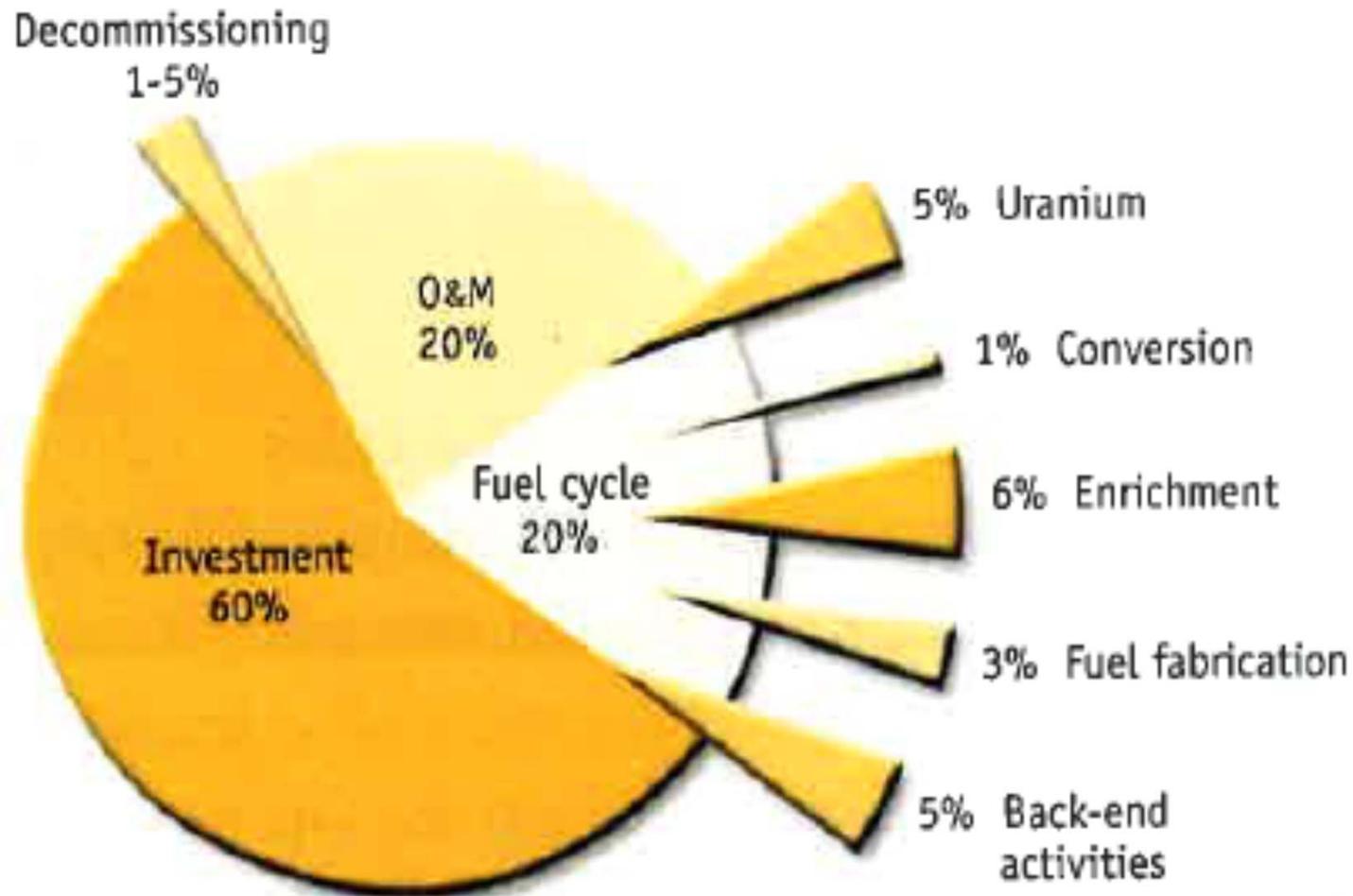
**Wien, 20. September 2019**

- 1. Introduction: Motivation**
- 2. Cost structure**
- 3. The economic impact of delays in construction times**
- 4. Historical cost developments**
- 5. Cost developments in Europe**
- 6. Historical costs: The big picture**
- 7. Technological Learning**
- 8. Construction times**
- 9. Conclusions**

## Motivation:

- **Atoms for peace →**  
→ **Too cheap to meter**
- **Cost escalations**
- **Competition & democracy**

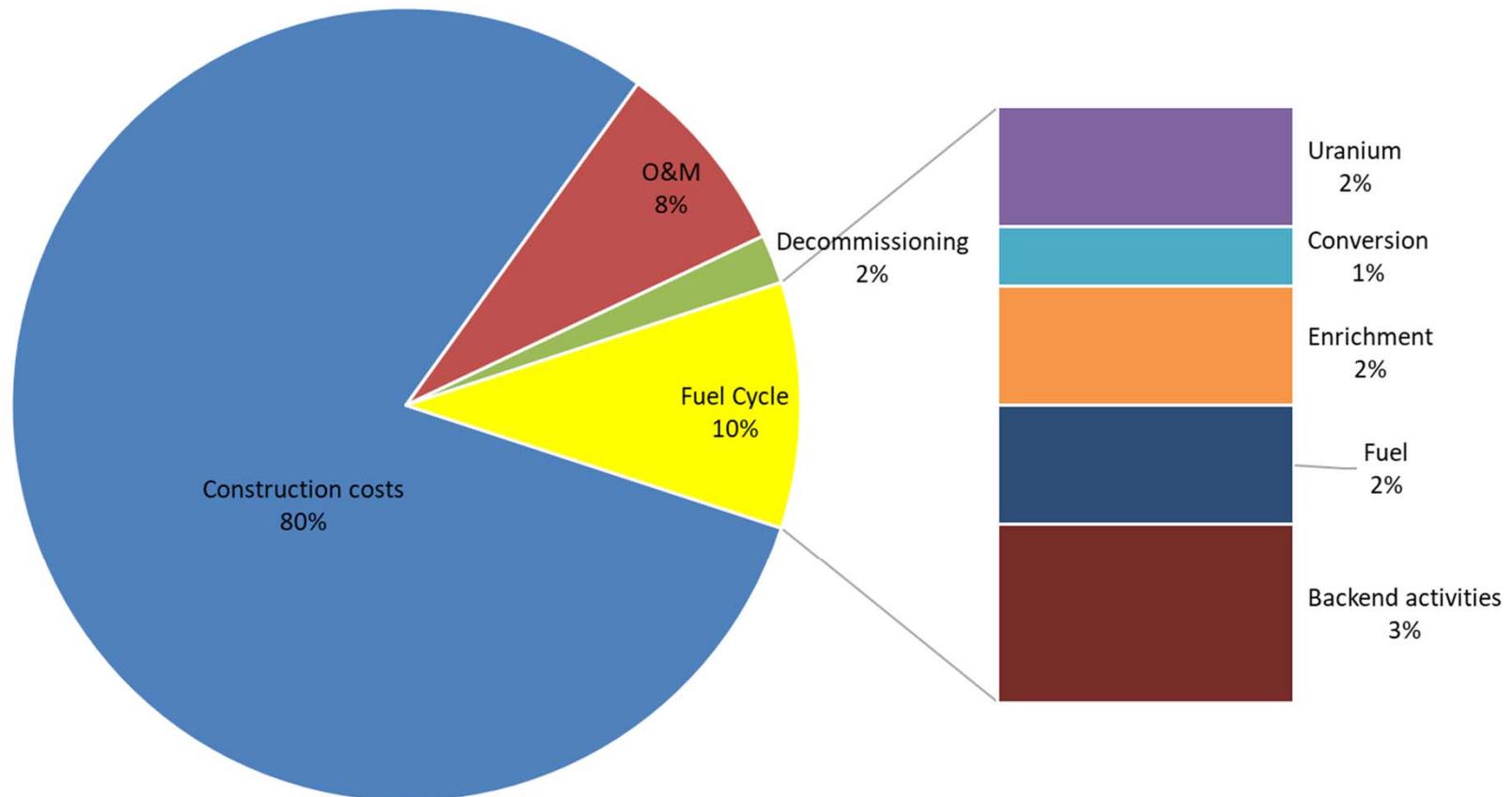
## 2. COST STRUCTURE



**OECD 2004**

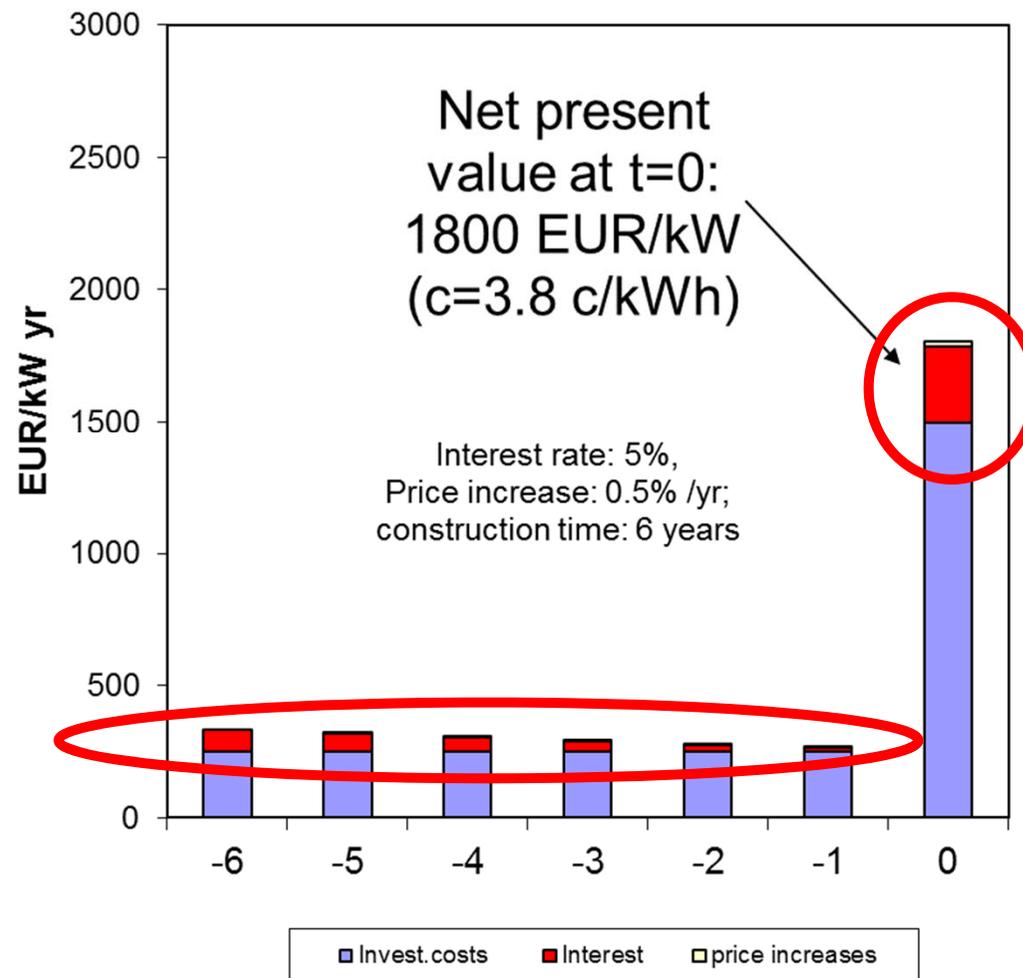
# COST STRUCTURE

Cost structure of nuclear power plants



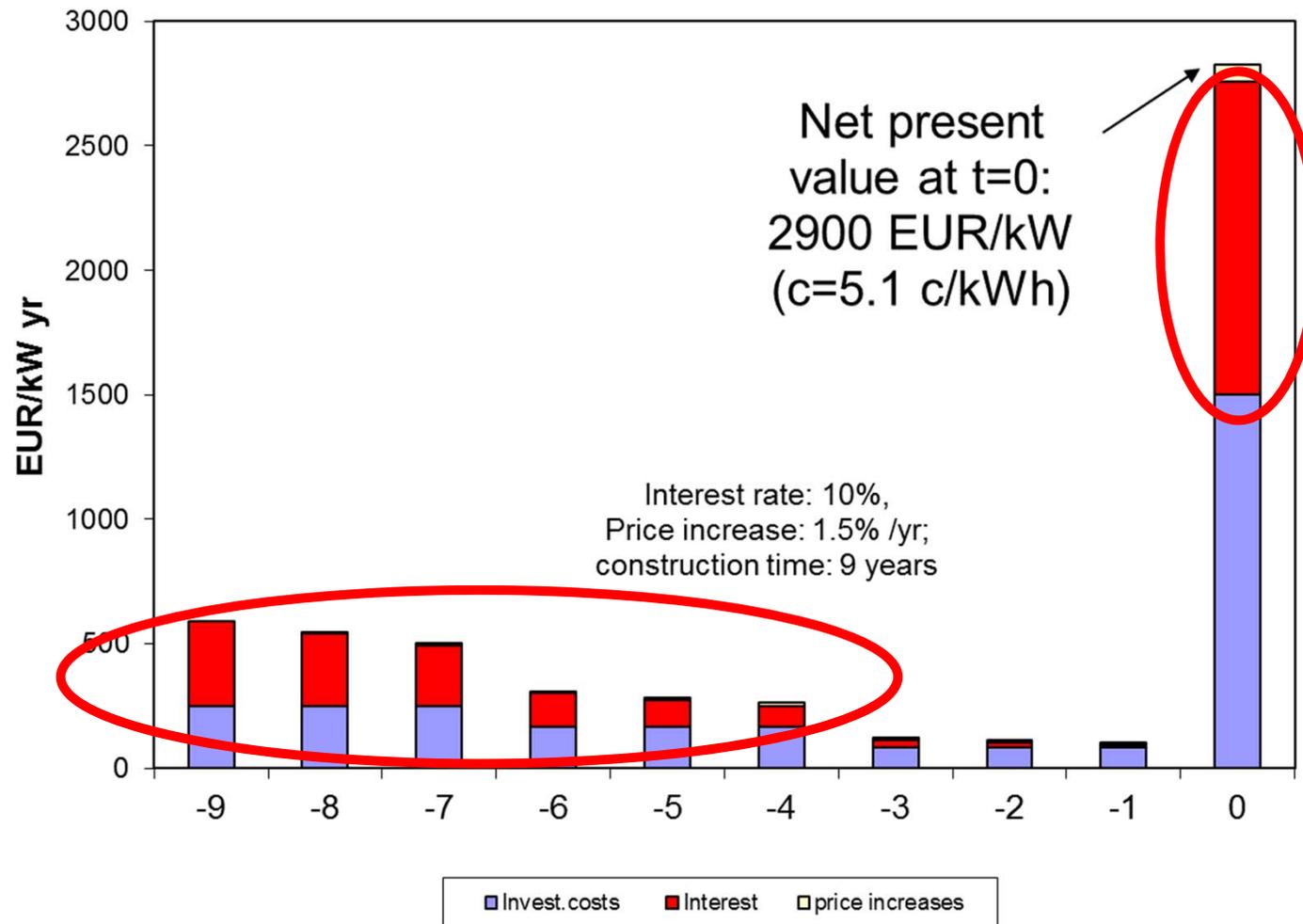
**Haas 2019**

Nuclear: overnight costs = 1500  
EUR/kW: favourable case



# Problem of delays

Nuclear: Overnight costs = 1500 EUR/kW: less favourable case



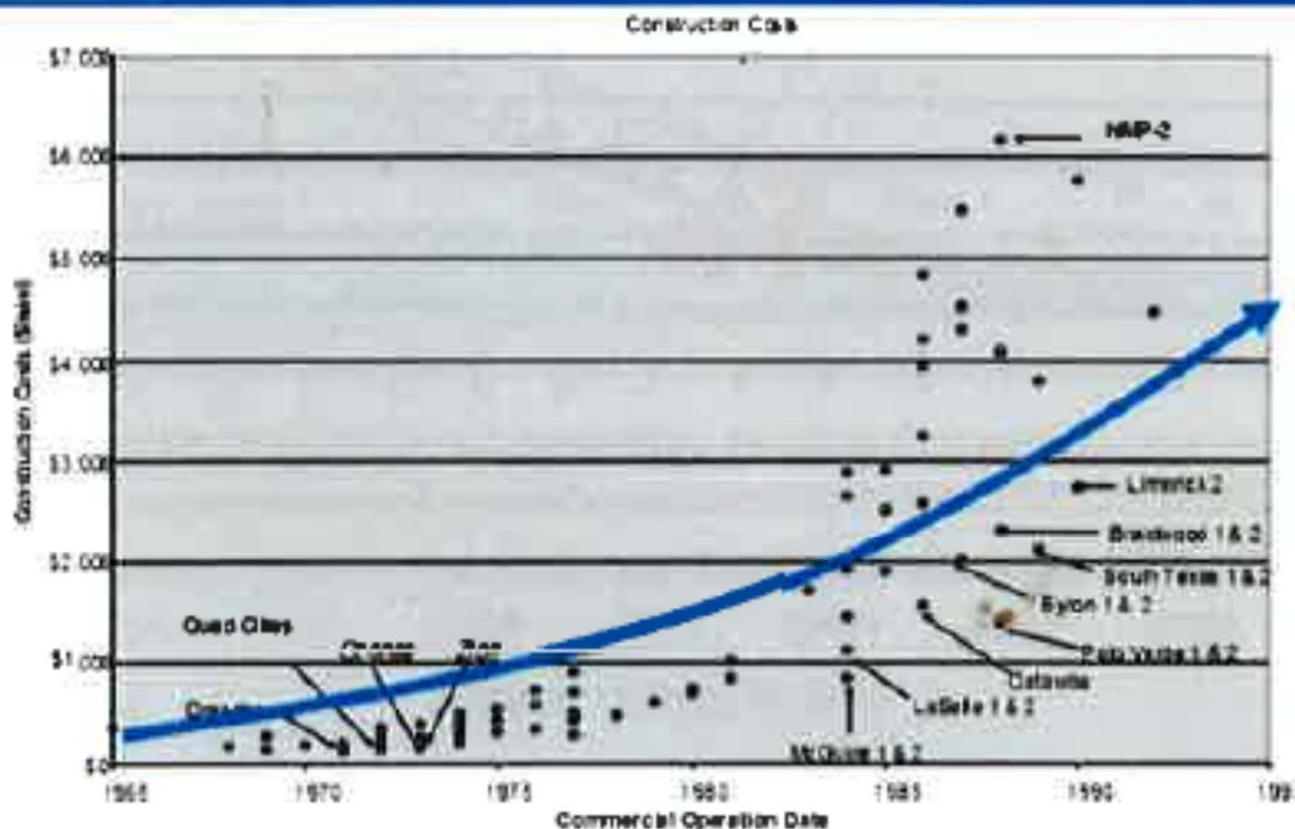
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## 4. HISTORICAL COSTS DEVELOPMENTS

# JIM HARDING: U.S. COSTS DEVELOPMENTS

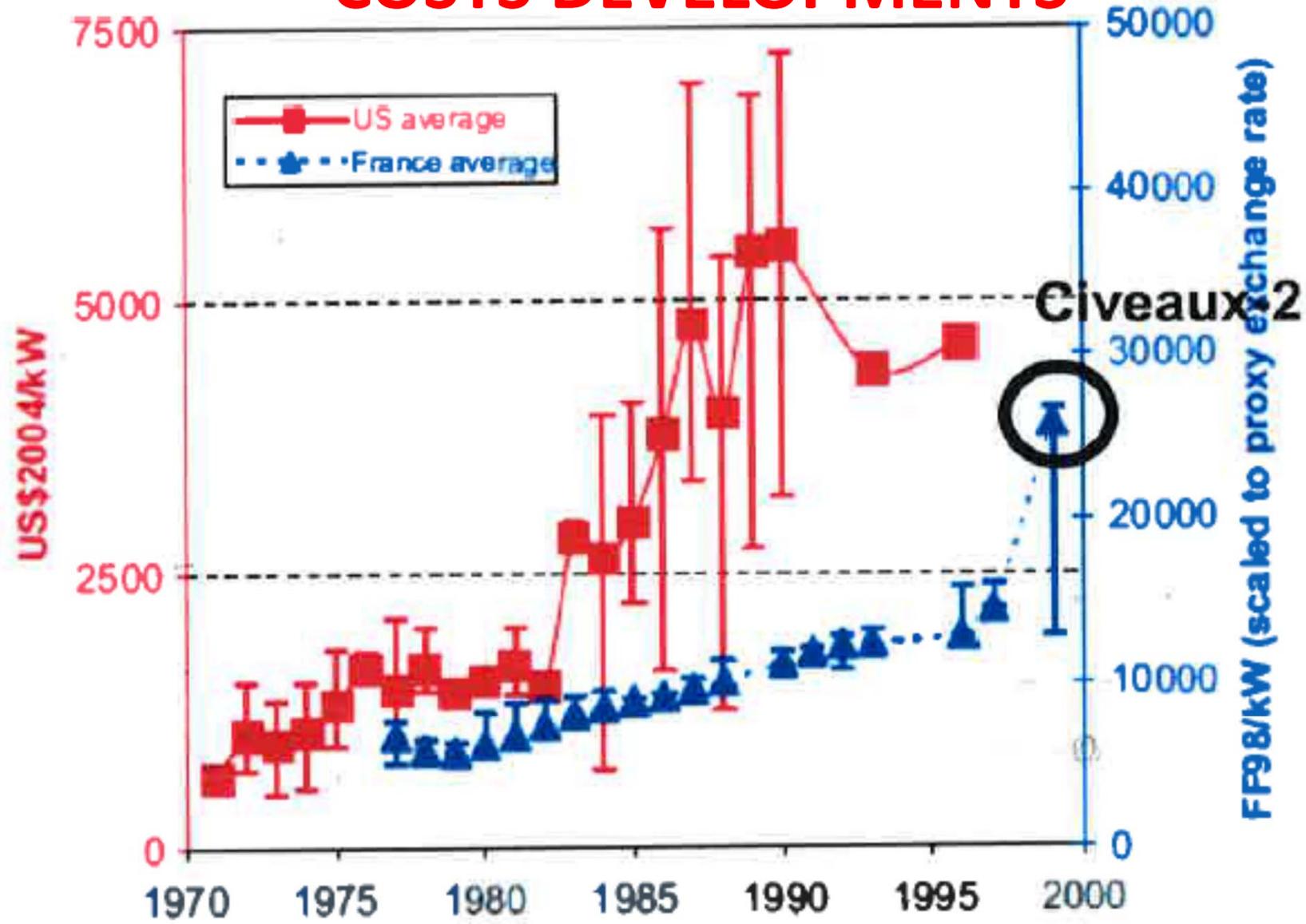


## Background - Industry Experience "Last Time"



Source: Jim Harding: Seven Myths of the Nuclear Renaissance (2007)

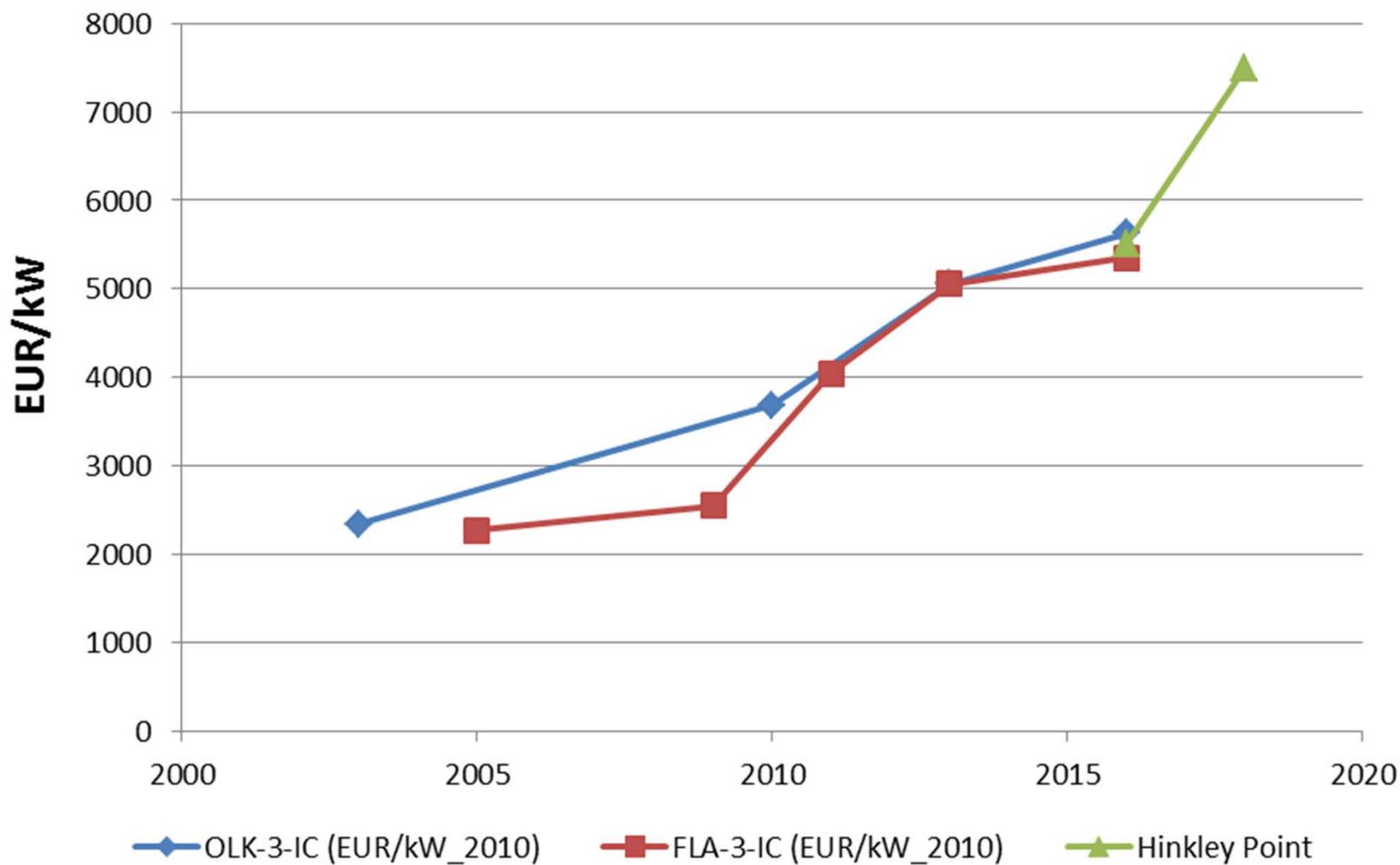
# ARNULF GRUEBLER: U.S. AND FRANCE COSTS DEVELOPMENTS



Source: Grubler 2010

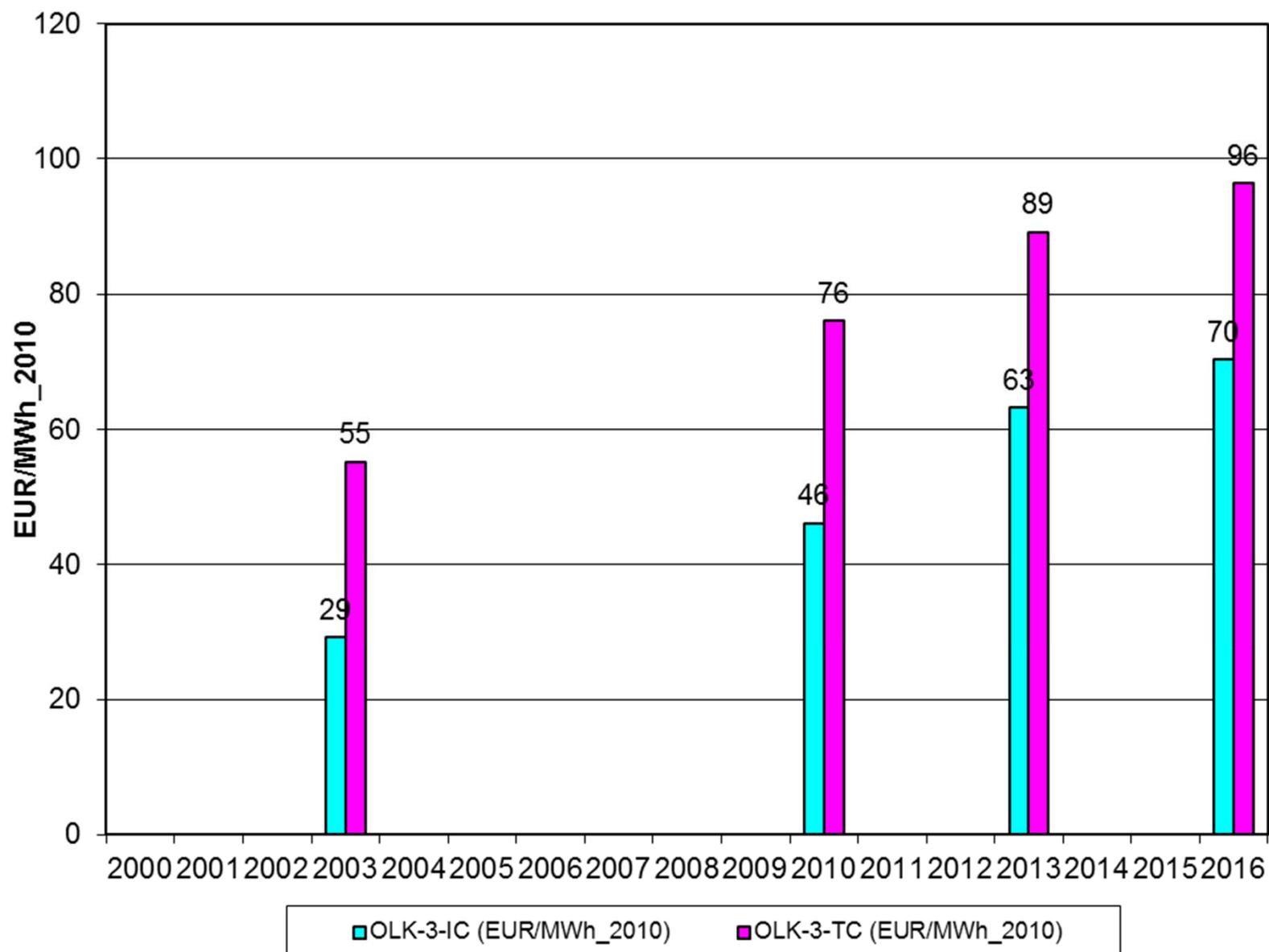
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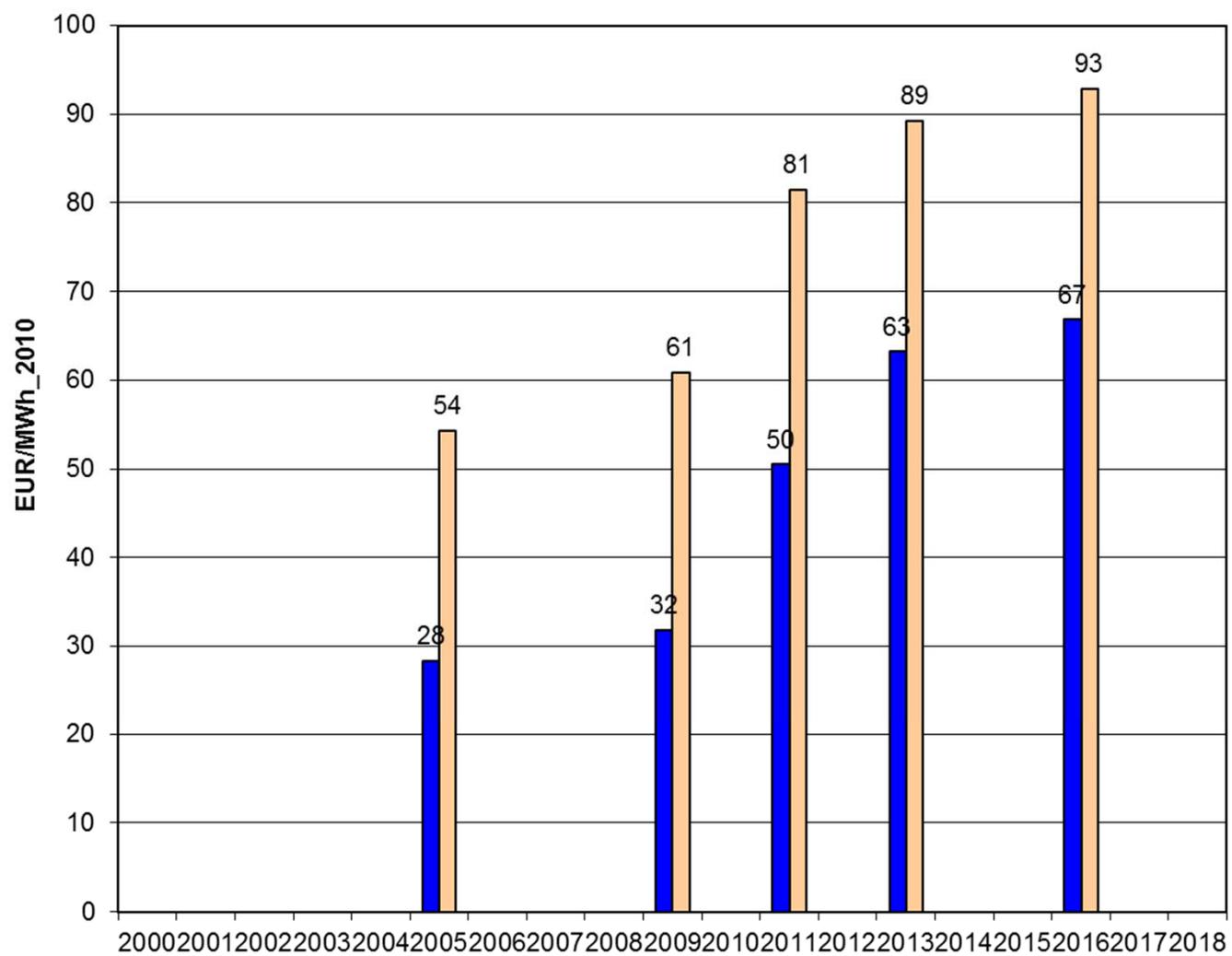
## 5. COST DEVELOPMENT OF OLKILUOTO-3, FLAMANVILLE-3 AND HINKLEY POINT C





# Investment costs and total costs of Olkiluoto per MWh

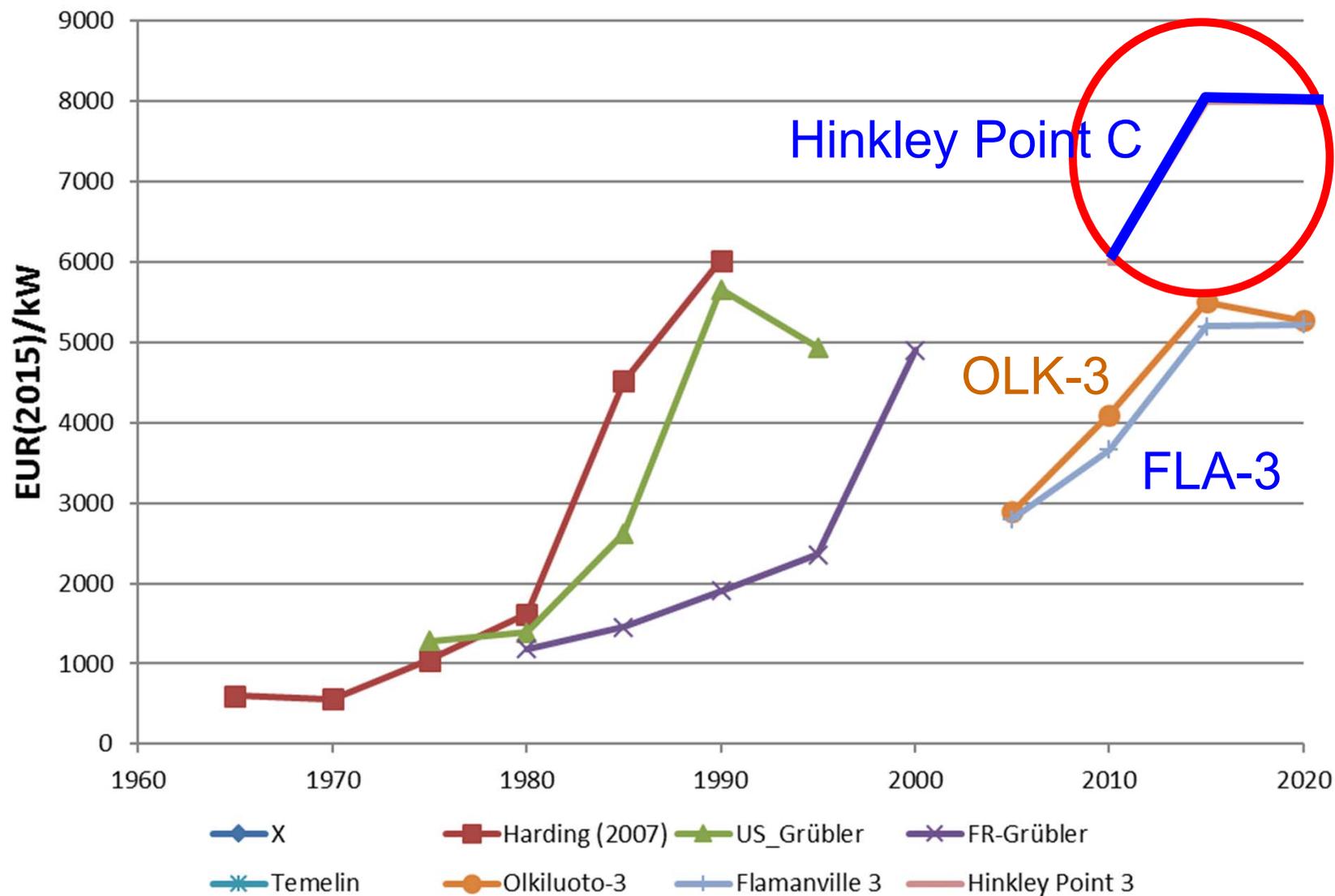




■ FLA-3-IC (EUR/MWh\_2010)

■ FLA-3-TC (EUR/MWh\_2010)

# 6. HISTORICAL COST DEVELOPMENT: THE BIG PICTURE

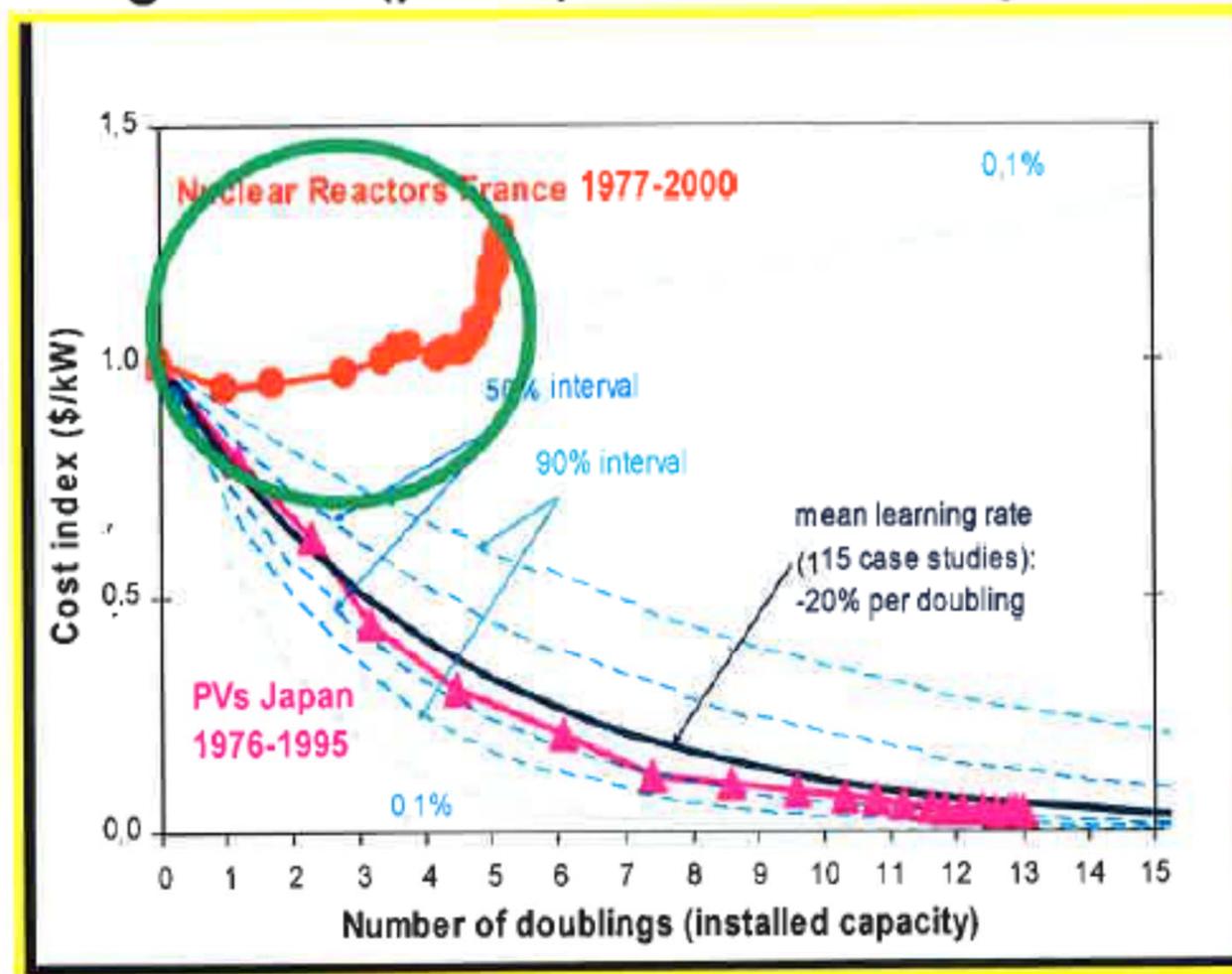


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# Why Hinkley Point is different

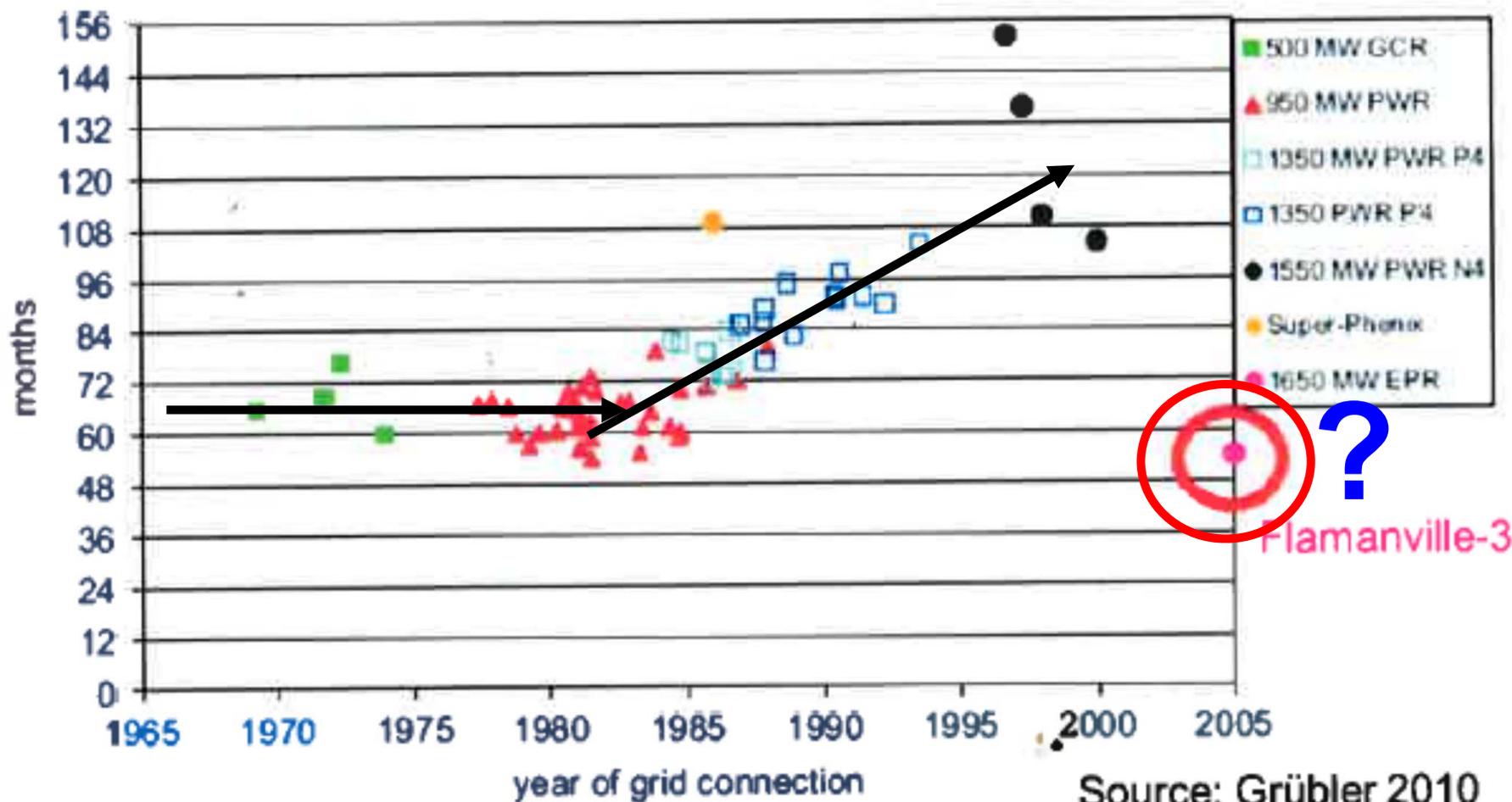
# 7. TECHNOLOGICAL LEARNING: WHY NOT FOR NUCLEAR?

Technological Uncertainties:  
Learning rates (push) and market growth (pull)

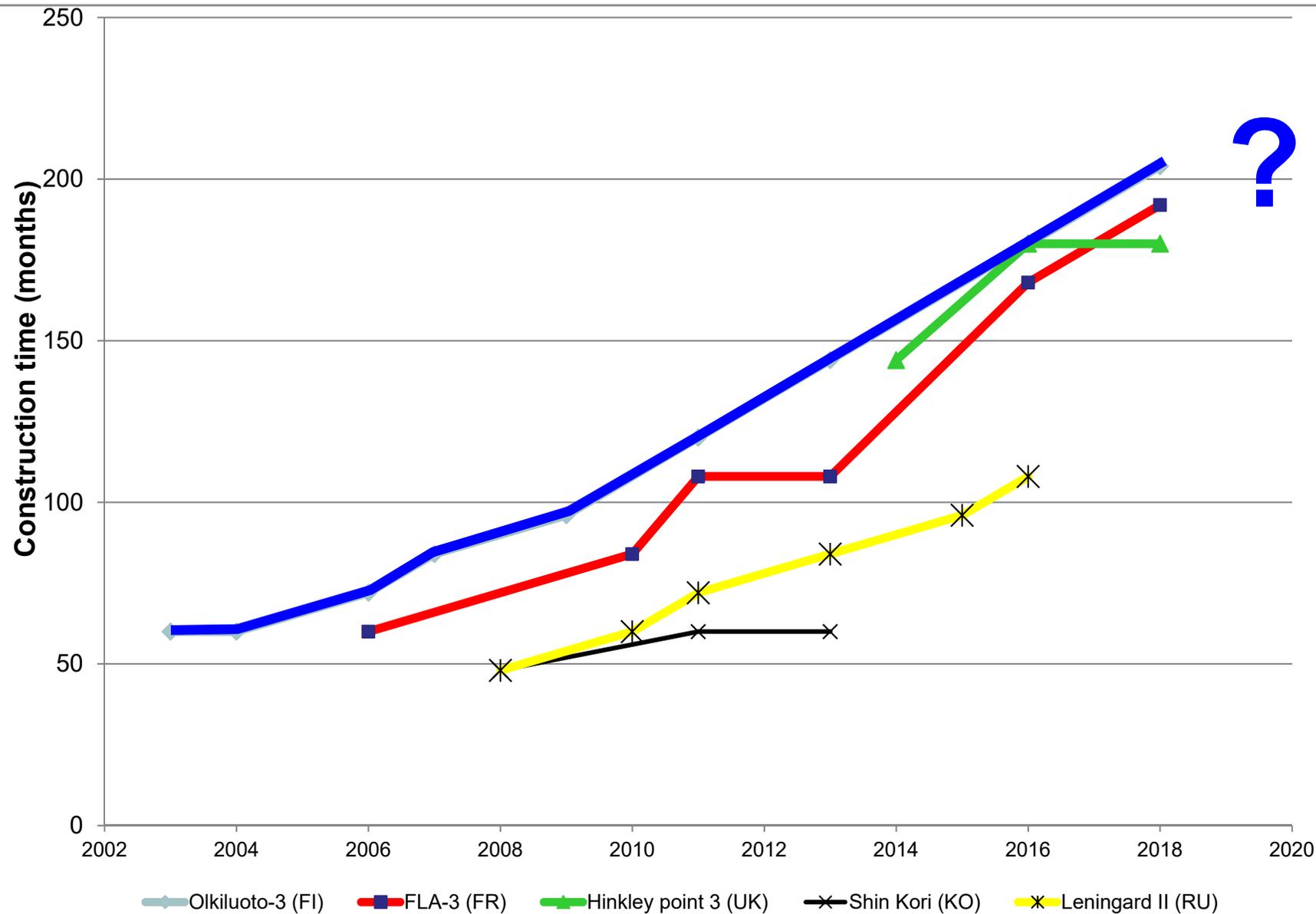


Source: Nakicenovic, Schratzenholzer, Grübler various papers

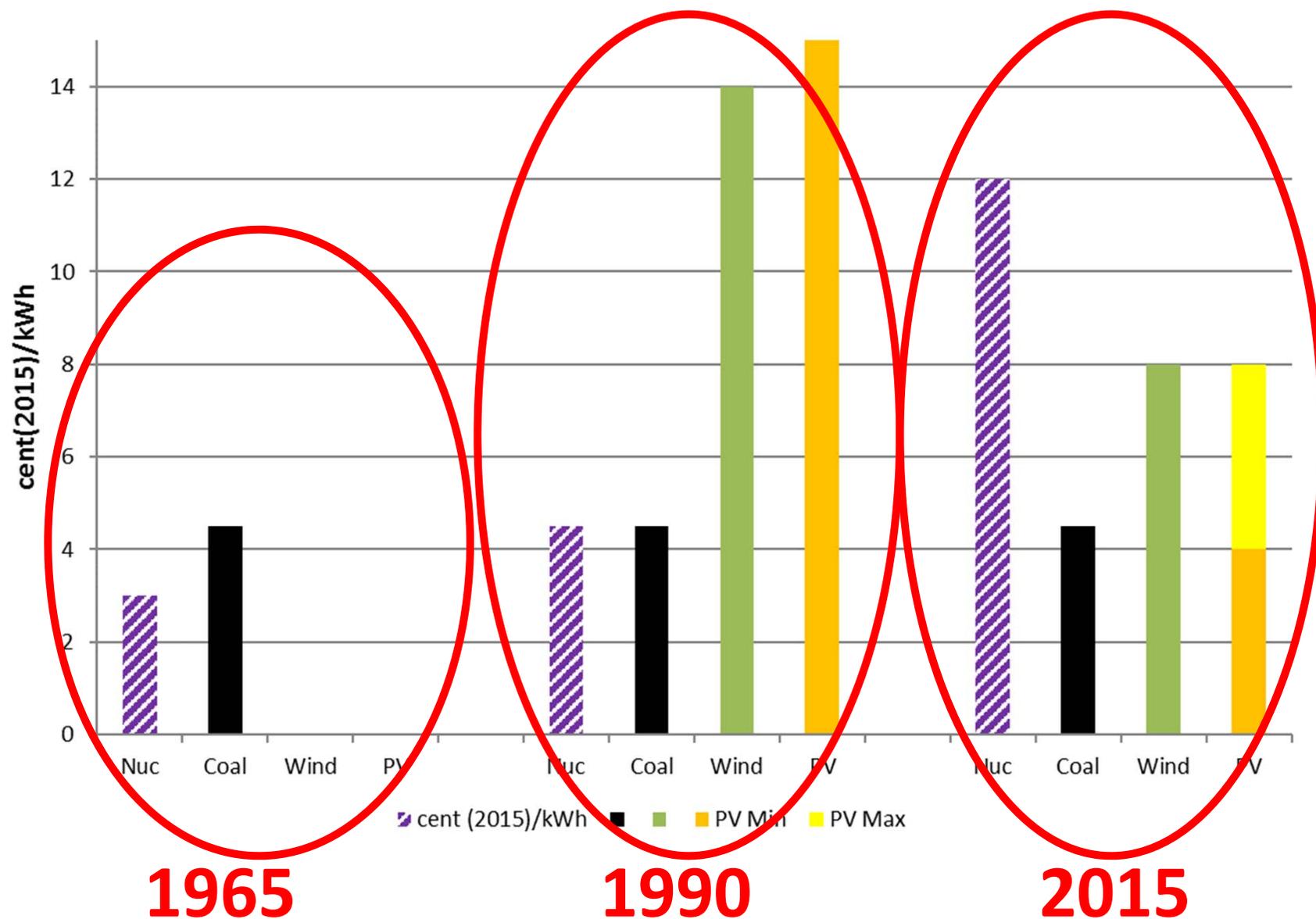
# 8. DEVELOPMENT OF CONSTRUCTION TIMES



# Recent dynamics of construction times



# 8. ECONOMIC COMPARISON OVER TIME



### Europe:

- No reliability regarding construction times.
- With respect to economics nuclear has NEVER in history in Western countries fulfilled its promises
- Actual investment costs were always higher than costs announced
- **Are China & Korea different ?**

## 9. CONCLUSIONS

- It is **impossible** to find any sound **economic** argument in Europe in favour of nuclear
- Currently, in Europe **nuclear** is the **most expensive option** to generate electricity
- **Military** reason No. 1 world-wide?
- If not, **what** is the reason?

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# **The (last) and final chapter: The Economics of Decommissioning ...**