On the dramatic changes in the Economics of nuclear power

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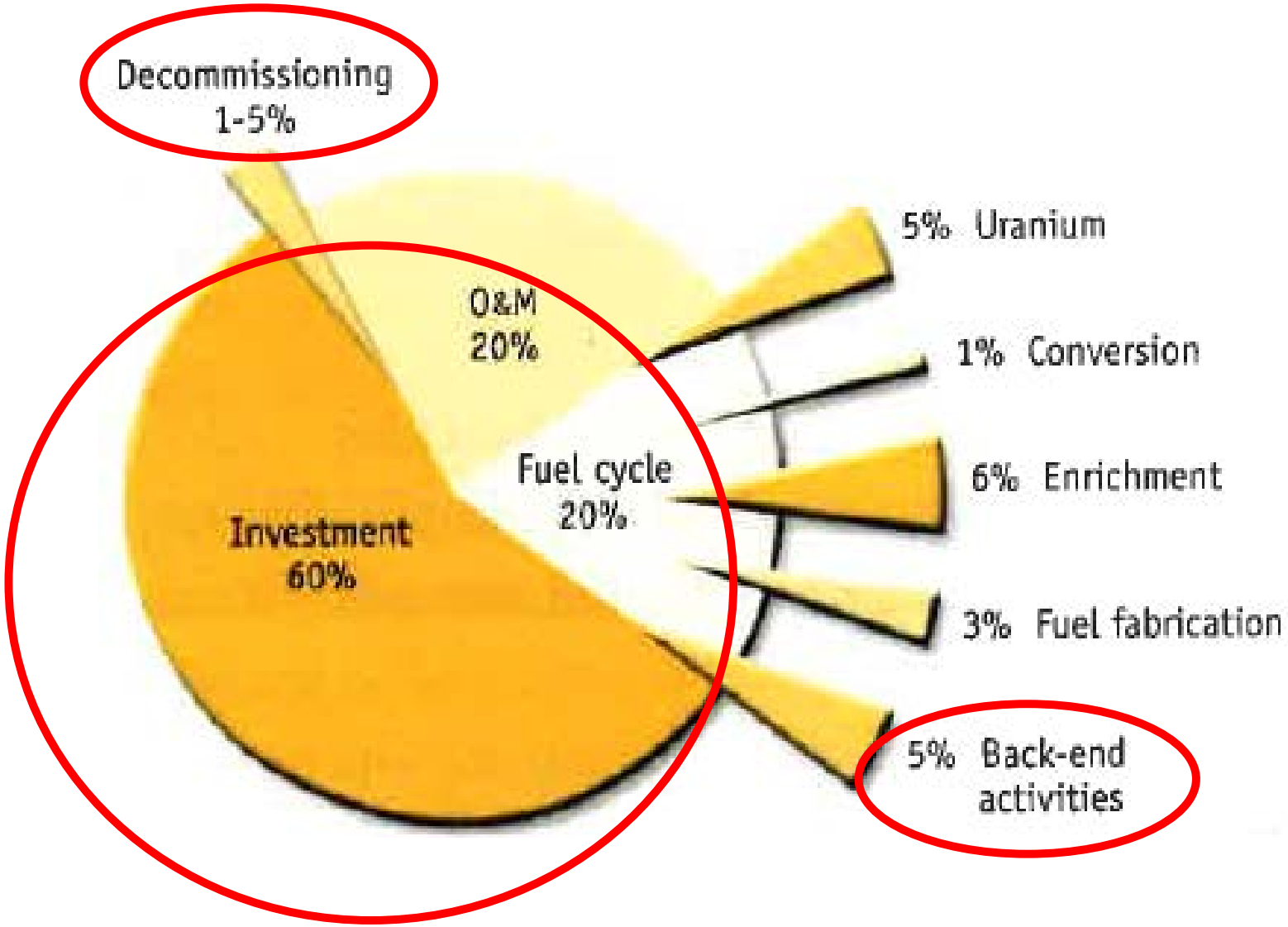
1. INTRODUCTION

Motivation:

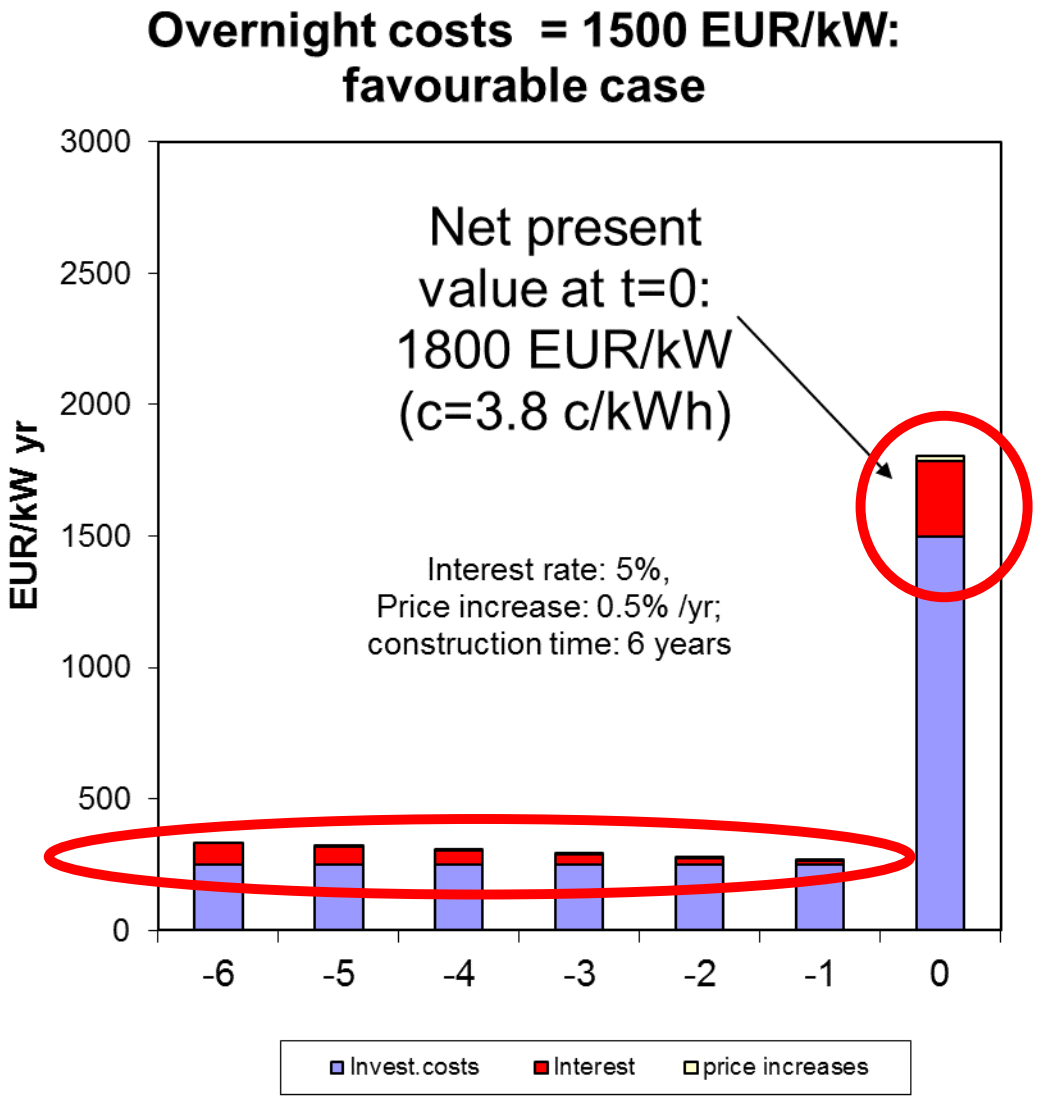
- **1950s:**
  - **Atoms for peace →**

    → Too cheap to meter

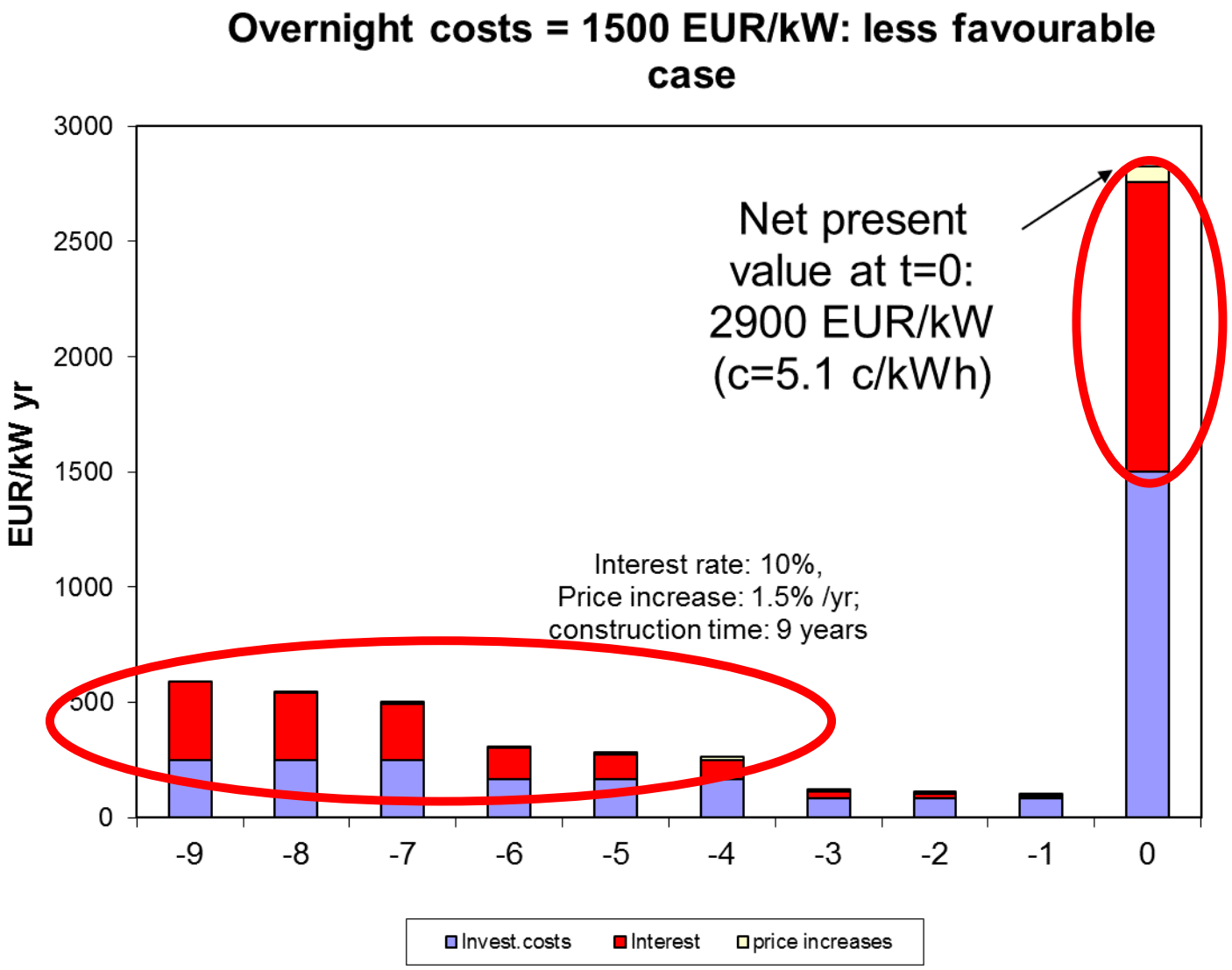
2. COST STRUCTURE



3. ECONOMIC IMPACT OF DELAYS

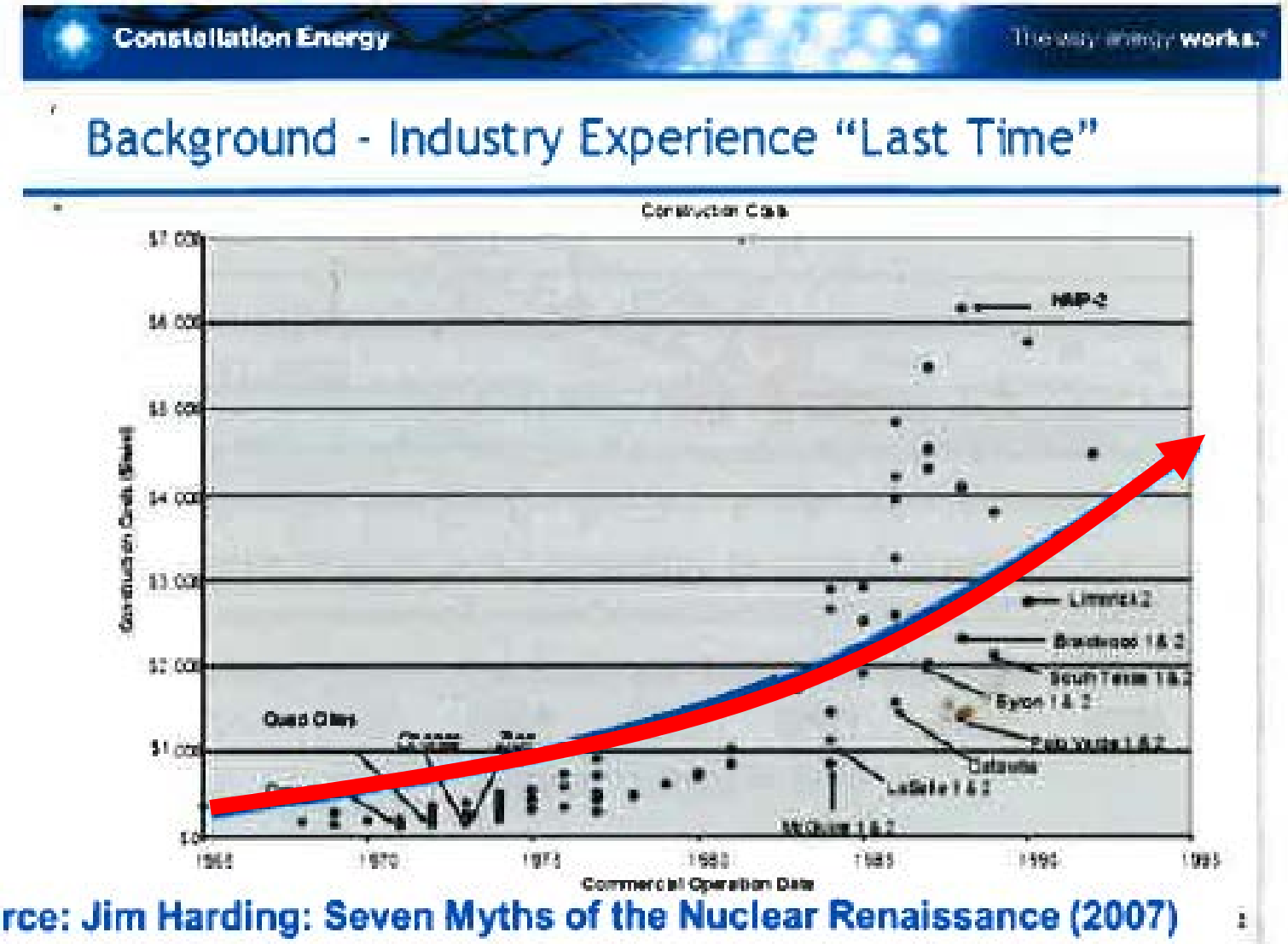


Problem of delays

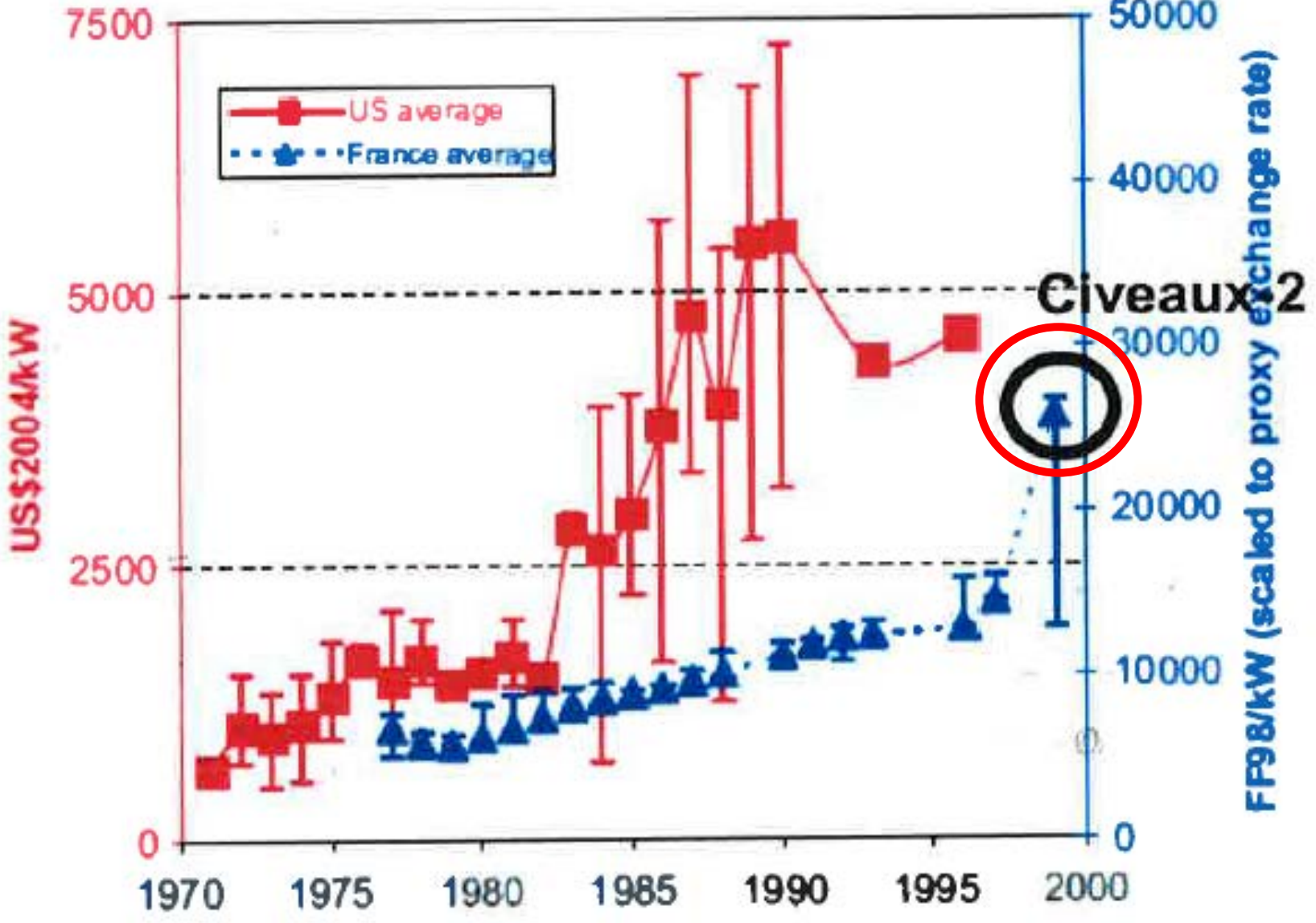


4. HISTORICAL COSTS DEVELOPMENTS

JIM HARDING: U.S. COSTS DEVELOPMENTS



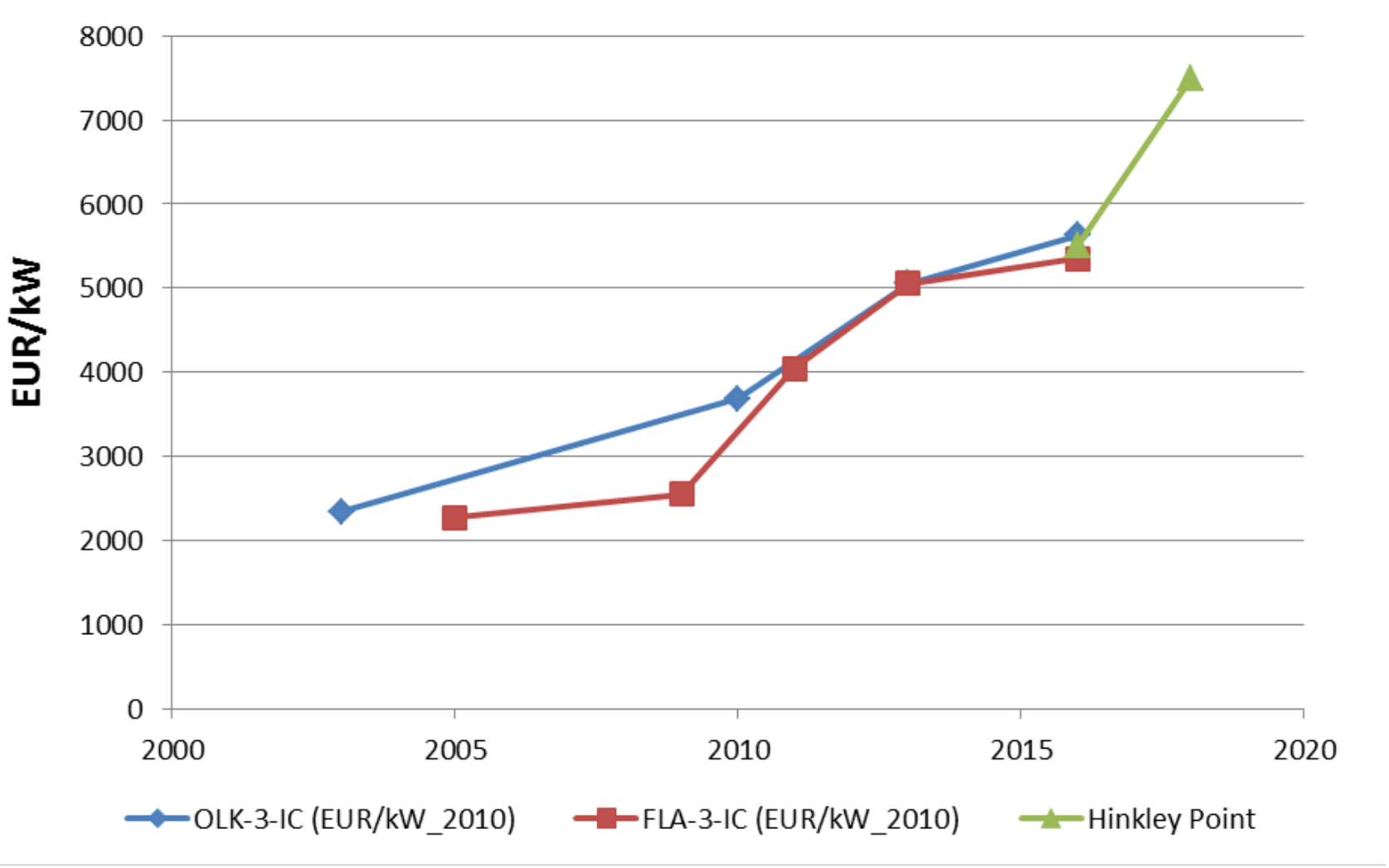
ARNULF GRUEBLER: U.S. AND FRANCE COSTS DEVELOPMENTS



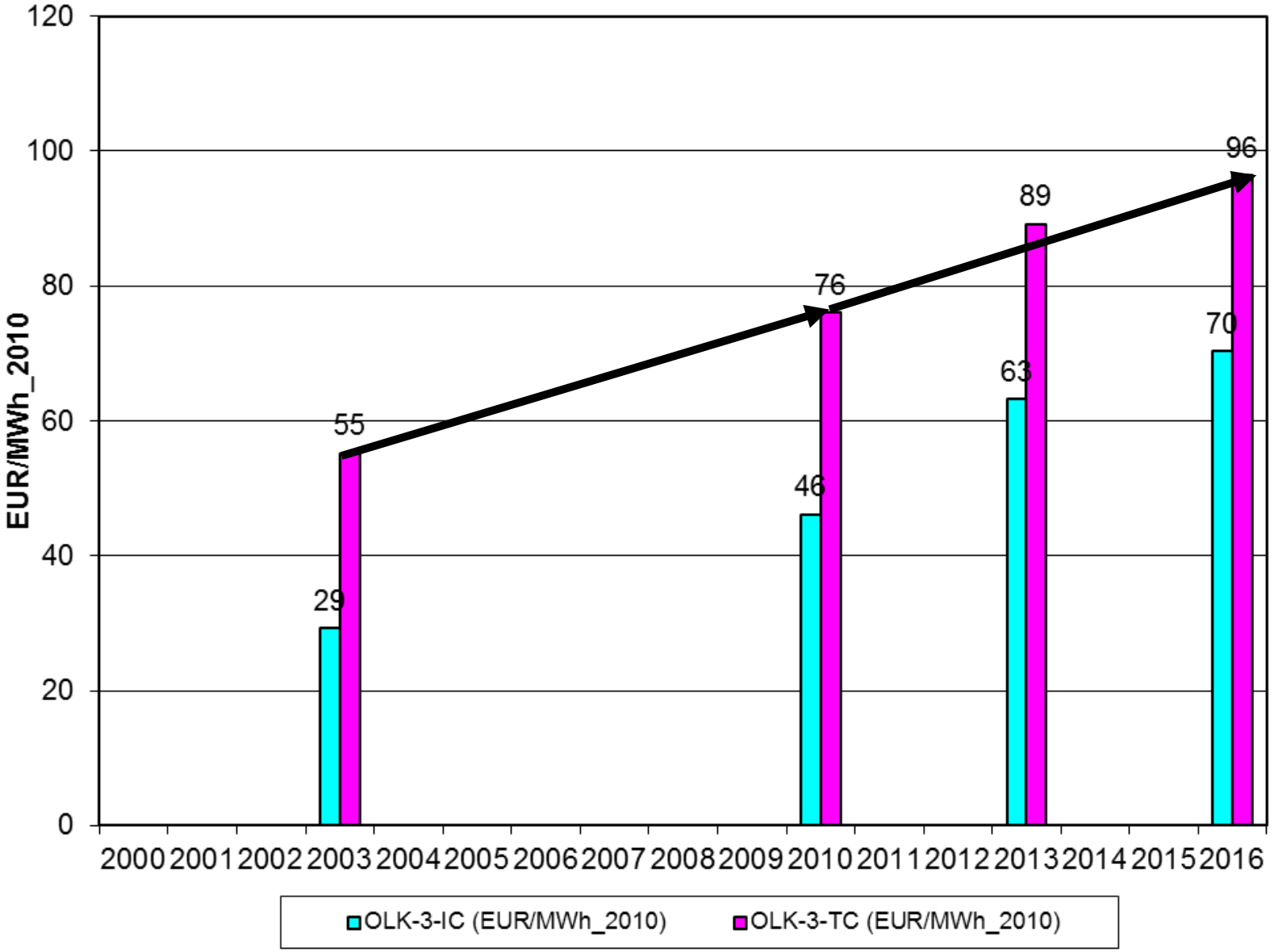
Source: Grübler 2010

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

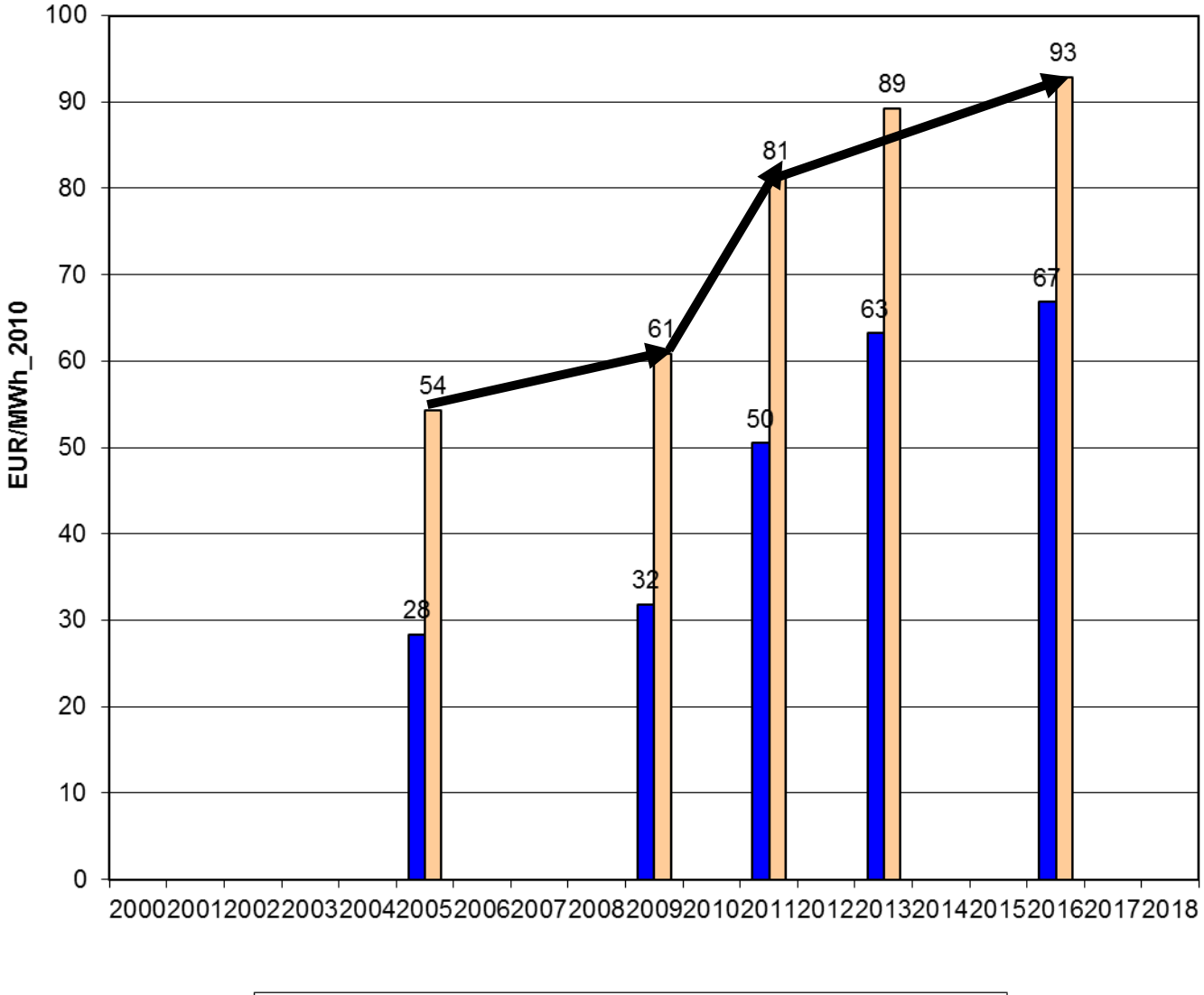
Development of Investment costs



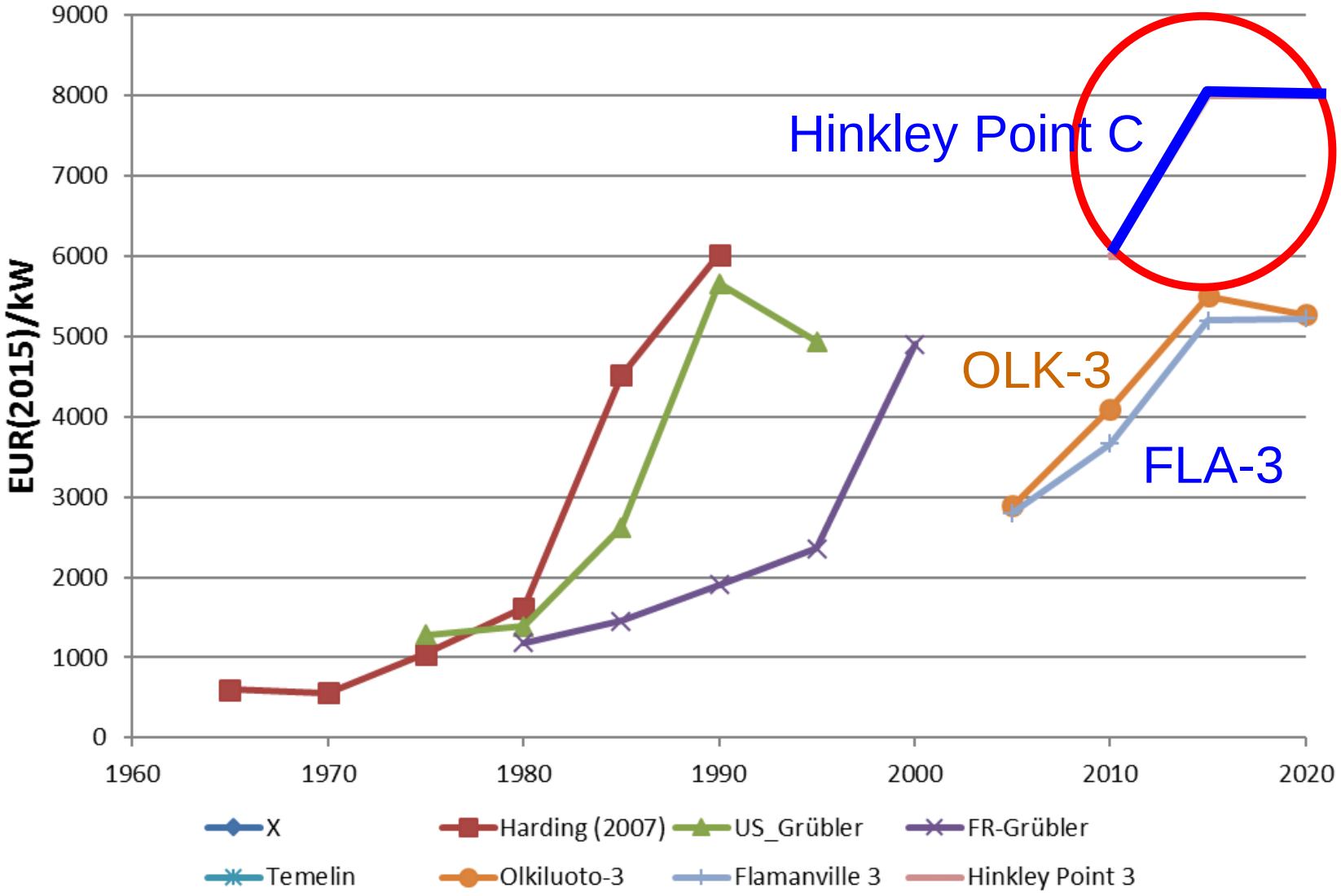
Investment costs and total costs of Olkiluoto per MWh



Investment costs and total costs of Flamanville-3 per MWh



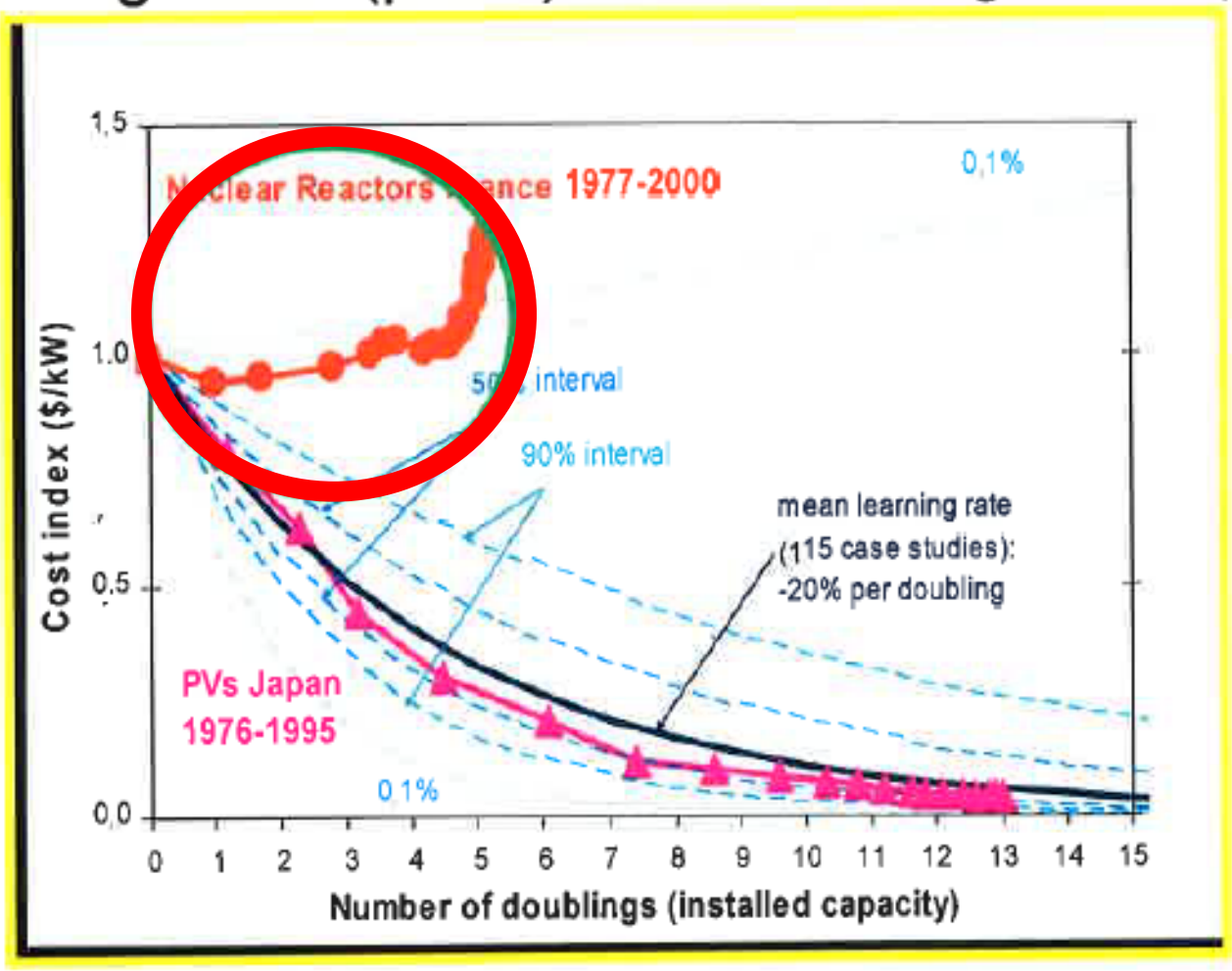
6. HISTORICAL COST DEVELOPMENT: THE BIG PICTURE



Why Hinkley Point is different

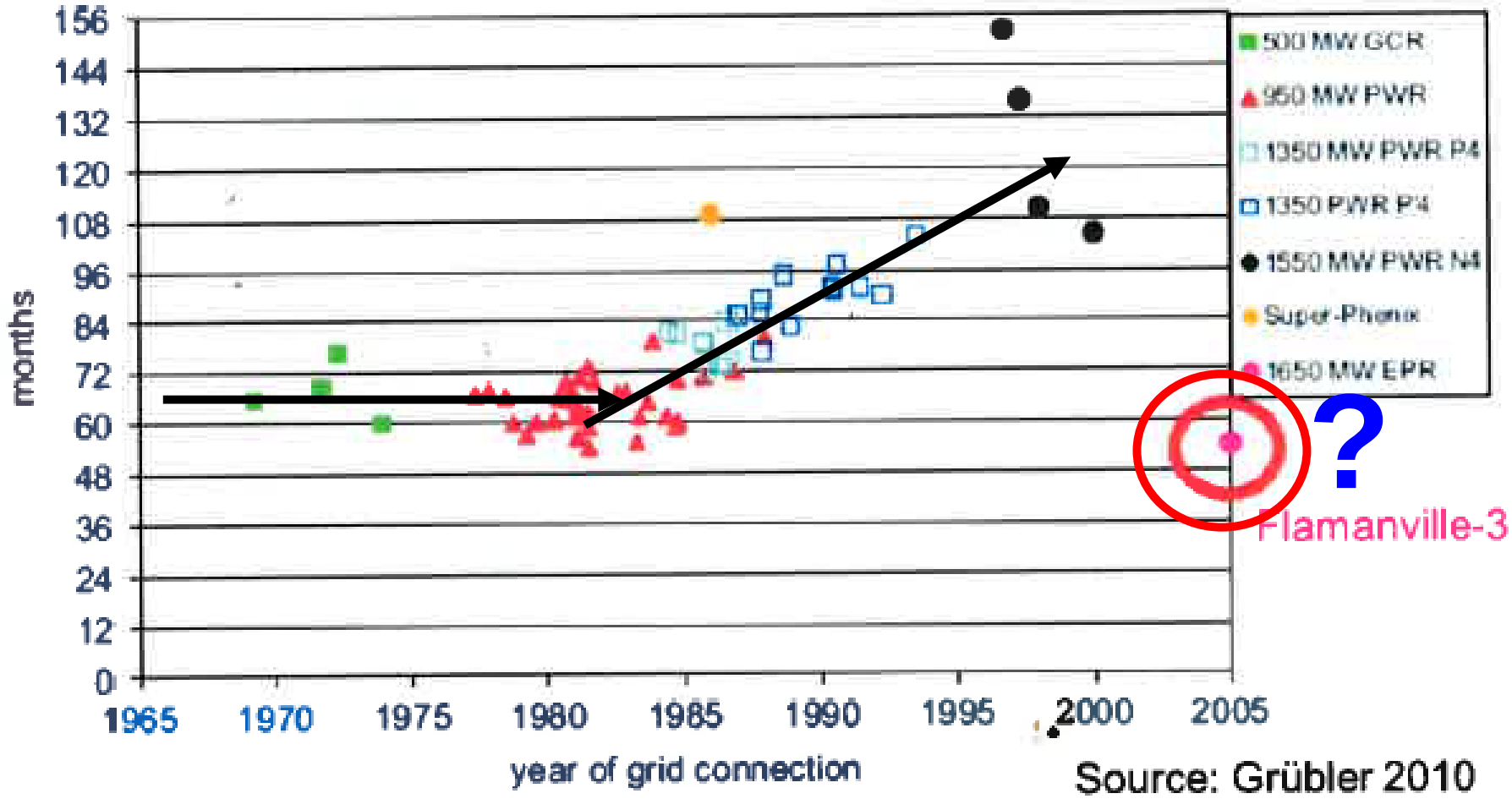
7. TECHNOLOGICAL LEARNING: WHY NOT FOR NUCLEAR?

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



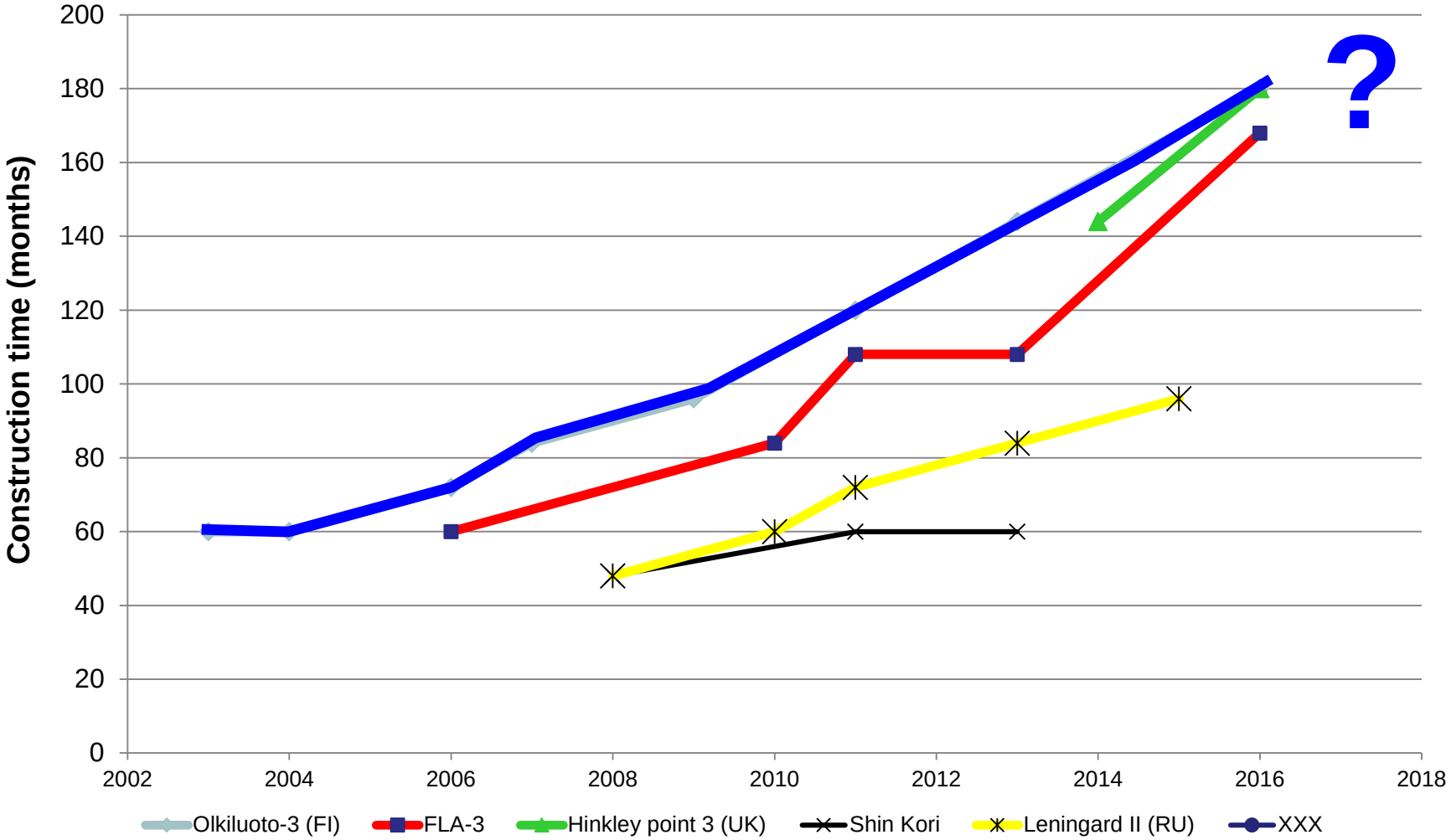
Source: Nakicenovic, Schrattenholzer, Grübler various papers

8. DEVELOPMENT OF CONSTRUCTION TIMES

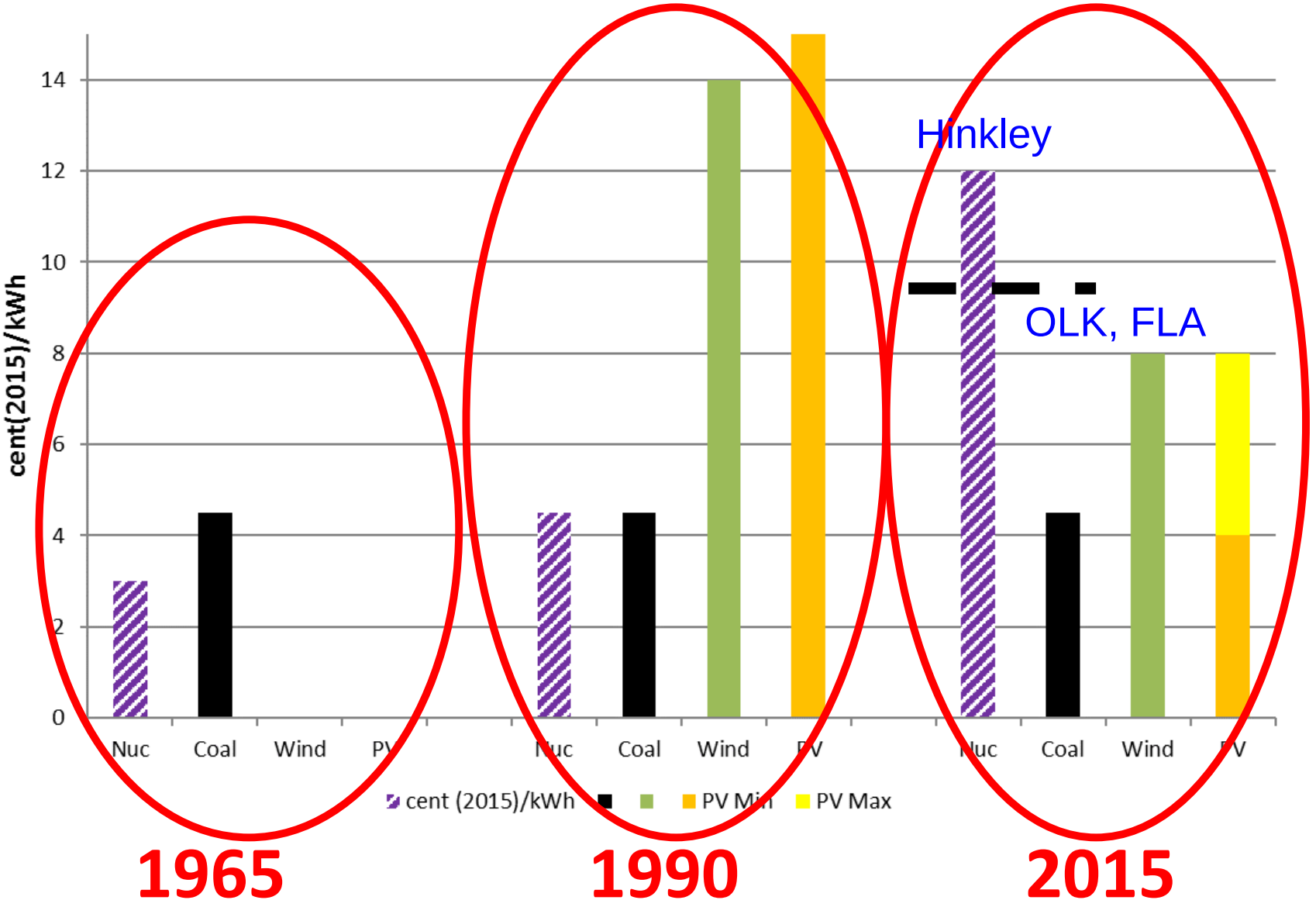


Source: Grübler 2010

Recent dynamics of construction times

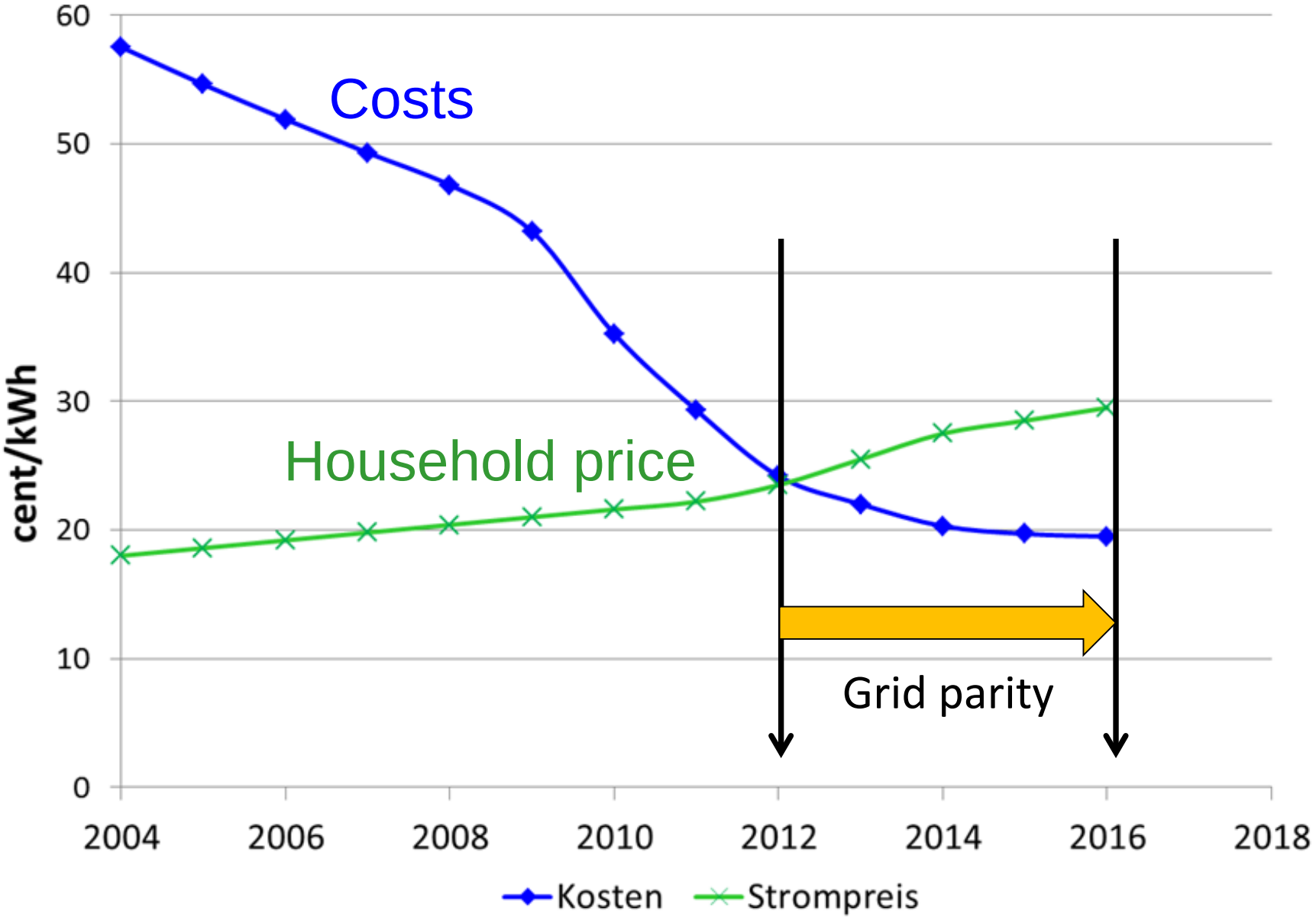


8. ECONOMIC COMPARISON OVER TIME



9. THE ALTERNATIVES

Grid parity: PV-costs and household electricity prices



Bidding Zero for off-shore wind

Tender for wind farms to be constructed between 2021 and 2025:

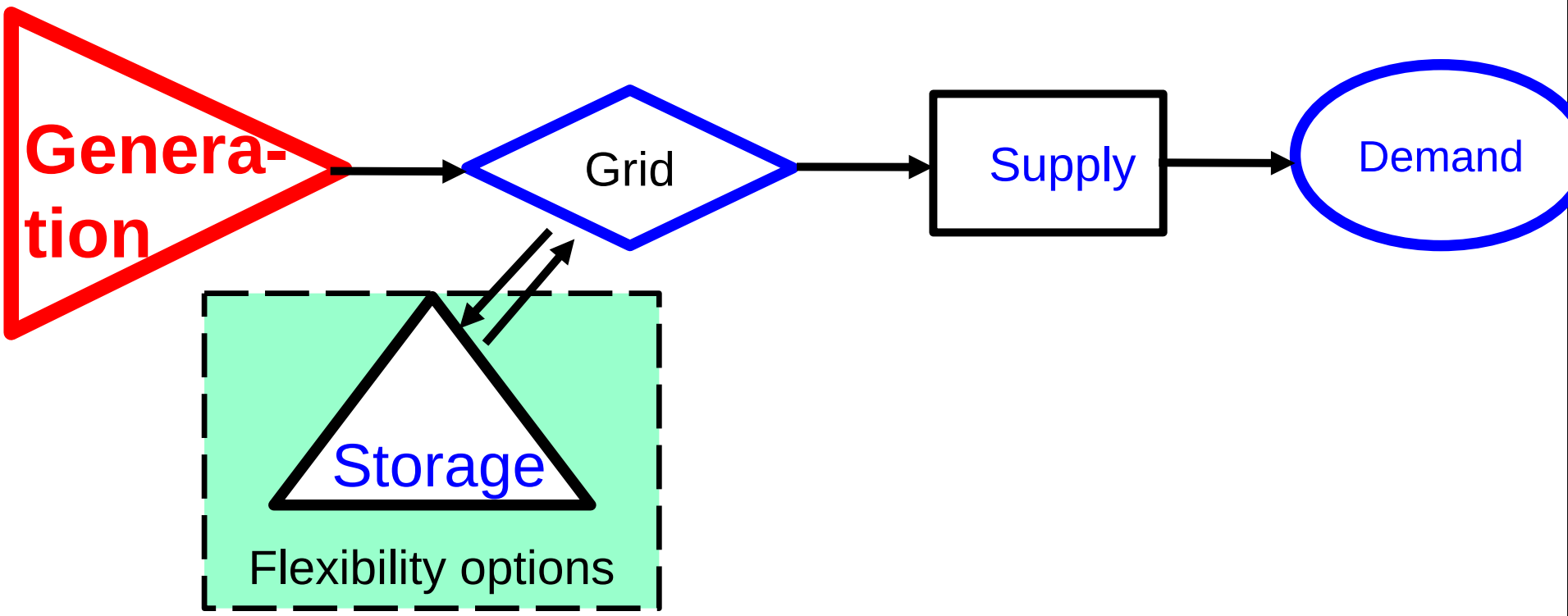
Project	MW	ct/kWh
EnBW He Dreiht GmbH	900	0.0
DONG Energy Borkum Riffgrund West II GmbH	240	0.0
Dong Energy Northern Energy OWP West GmbH	240	0.0
Dong Energy Gode Wind 03 GmbH	110	6.0*
Weighted average	**1,490**	**0.44**

Source: Innogy

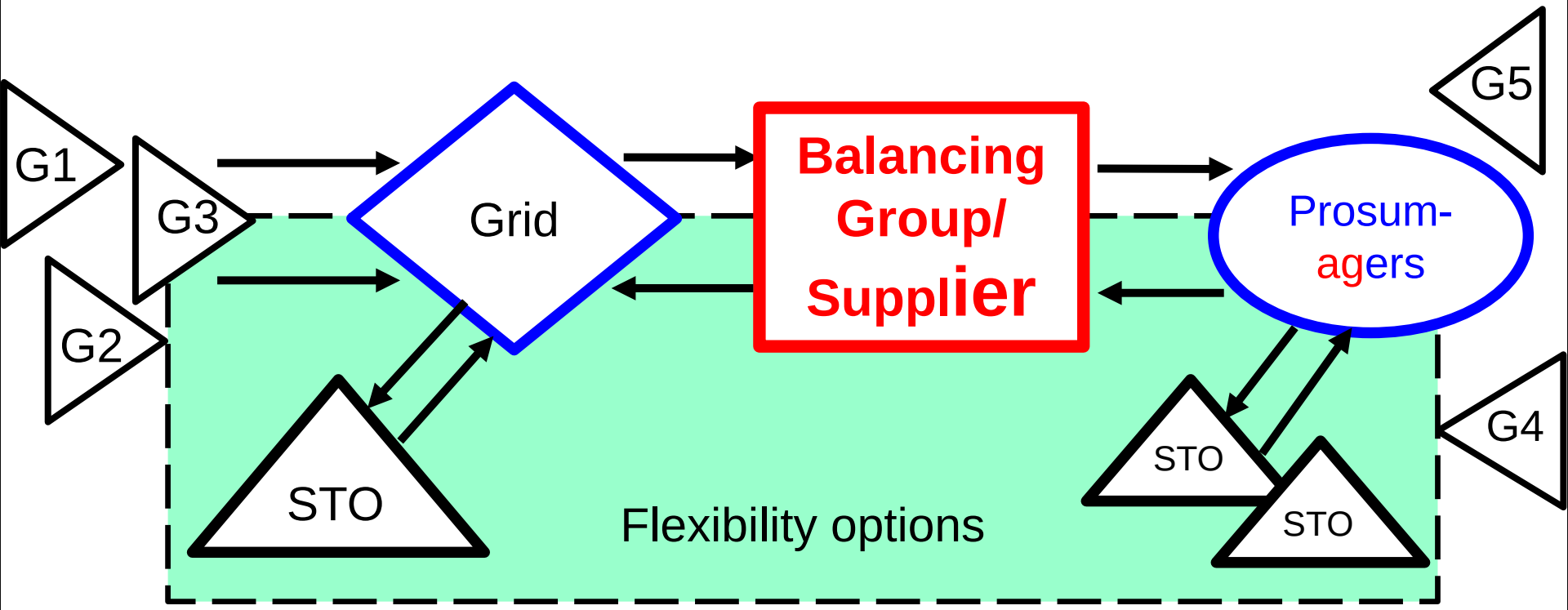
Bets on:

- Increasing electricity prices
- Decreasing technology costs
- Sector coupling works

Old thinking



New Thinking: Making the electricity system more democratic



10. CONCLUSIONS II

- Sustainable electric. system → integration of a broad technology portfolio & demand-side options!
- Larger market areas favourable
- Very important: correct price signals (incl. CO2)
- most urgent: exhaust full creativity for flexibility of all market participants incl. decentralised PV systems
- Capacity payments: Any CP will distort the system towards more conv. and less RES capacity
- New key player: Balancing group (Supplier), no more the generator
- Phasing out of Subsidies!

10. CONCLUSIONS I

- 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?