Achieving 33GWe annual newbuild with startup model and financing in SMR depoyment industry

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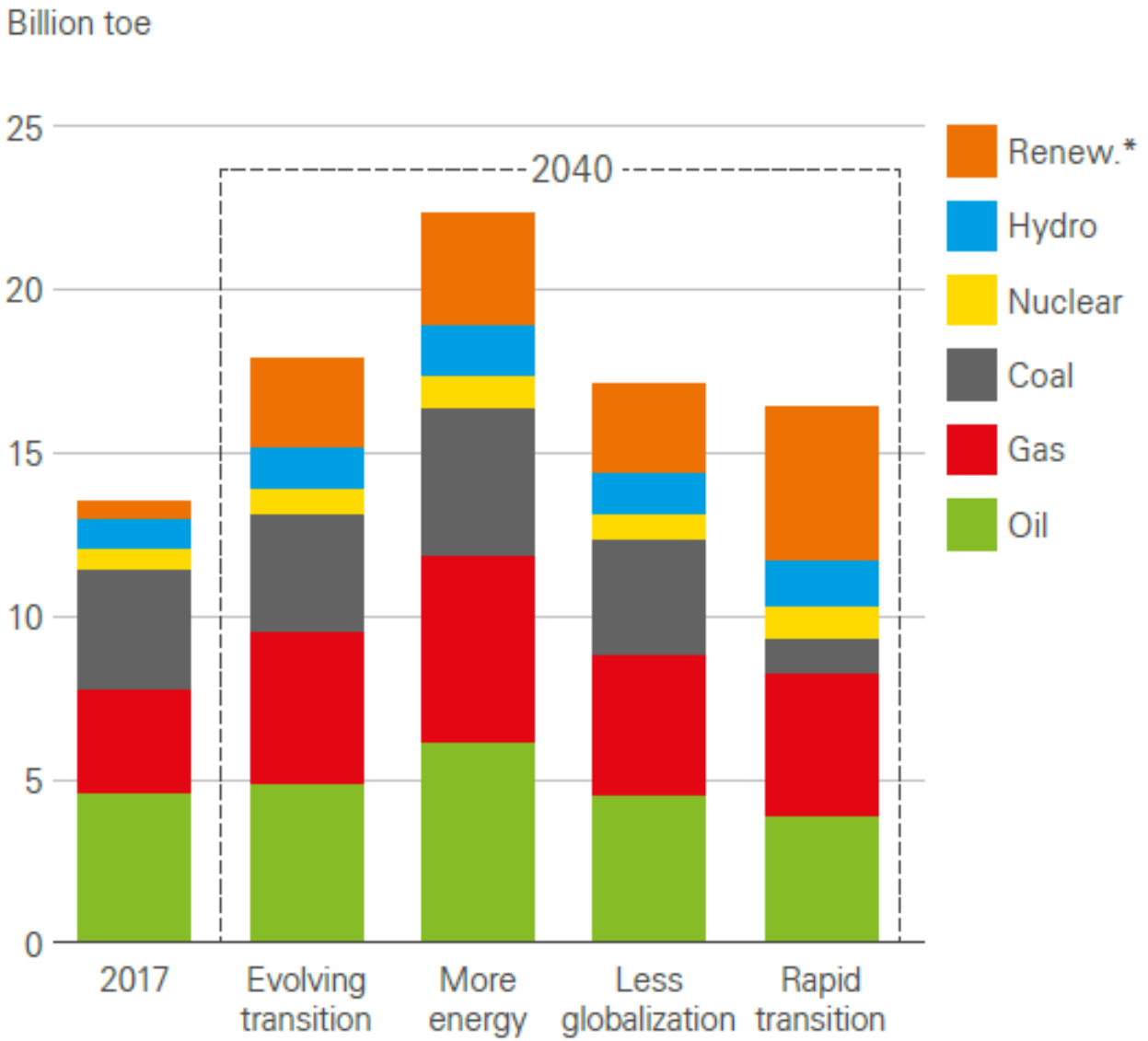
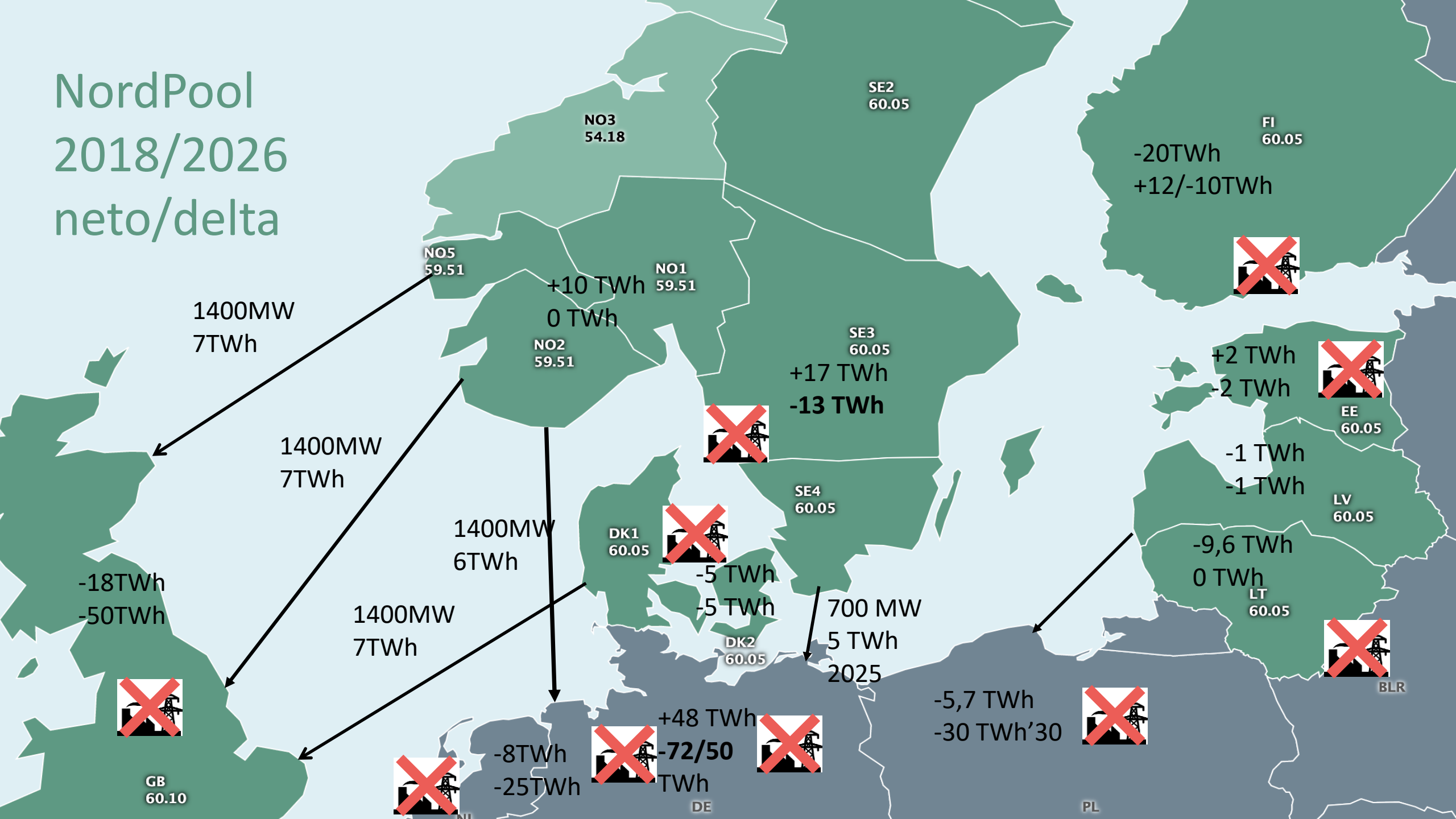
Problem - BAU

- At current setup, nuclear will even at „Rapid Transition“ **stay** at 6% total energy output.
- In OECD 50% **decline** by 2040
- In 2017 investments
  - $265 bn – Renewable (ex large hydro)
  - $103 bn –fossil capacity
  - $45 bl – large hydro
  - $42 bn – nuclear energy
- WNO Harmony goal 25% nuclear el
  - Newbuild - 33GW/pa
  - NOW – 10GW/pa



BP Energy Outlook 2019

NordPool 2018/2026 neto/delta



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Large NPPs are unsuccessful in US, EU

	Over schedule	Planned budget	Over budget	Project status
Olkiluoto3	9 years		6,3 billion eur	Likely criticality in 2020
Flamaville (3rd of kind)	6 years	$11 billion	7 billion eur	Likely criticality in 2023
VC Summer		$9 billion	$7 billion	Suspended, court. Westinghouse Ch11
Vogle	2-3 years	$14.3 billion	$7 billion	
Hinkley point C (5,6th of a kind)		£20 billion	3 million eur	92,5£/MWh guaranteed
Anglesey ABWR				Cancelled, £200m spent
Hanhikivi	3 years	7 billion eur		Expected criticality 2028

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SMRs deployment -110 units per annum!!!

1. **Profitable business in EU**: Climate neutrality – CO2 price beyond 50€/t & power price at 60+€/MWh. Coal, nuclear phase outs, increasing wind lifetime endings in 2020s (Ger, Dk).
   GEH BWRX-300 LCOE at 35€/MWh NOAK. FOAK in 2027 US/Can
2. Smaller construction and complexity scale, lower financial risk, and also much-improved safety, improved public perception can broaden the market to **multiple** of more customers.
3. WNA's Harmony goal of 33GWe per annum means the rate of building **110 SMRs with a capacity of 300MWe every year globally** this means given optimistic 7-year development (from idea to power generation) time actual ongoing development of about 300-500 NPP sites any point in time.

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(nuclear) Utilites for newbuild?

- Ca 20 nuclear energy utilities in Europe
- 25 in the USA,
- 11 in Japan.
- Only a few utilities have sights on the nuclear newbuild.
- Most utilities State owned, thus avoid political risks, have low incentive for innovation, high incentive to go with public perceptions (renewables).
- Thus UNLIKELY that current utilities would push for SMRs.
- More competition is GOOD for nuclear!

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Start-up financing 101

1. Start with personal capital + Family & Fools (€ 100k)
2. Add capital €300k with convertible notes with perspective of positive project development increased valuation. 2 year runway for 2-3 fully employed.
3. Raise more capital if needed at higher valuation, not diluting founders, maintaining management.
4. At project maturity add investors for execution or exit.

Start-up financing key driver in IT and cleantech business for **large scale capital & talent pooling**.

Maintain strong organisation- **value is in delivery** not the idea.

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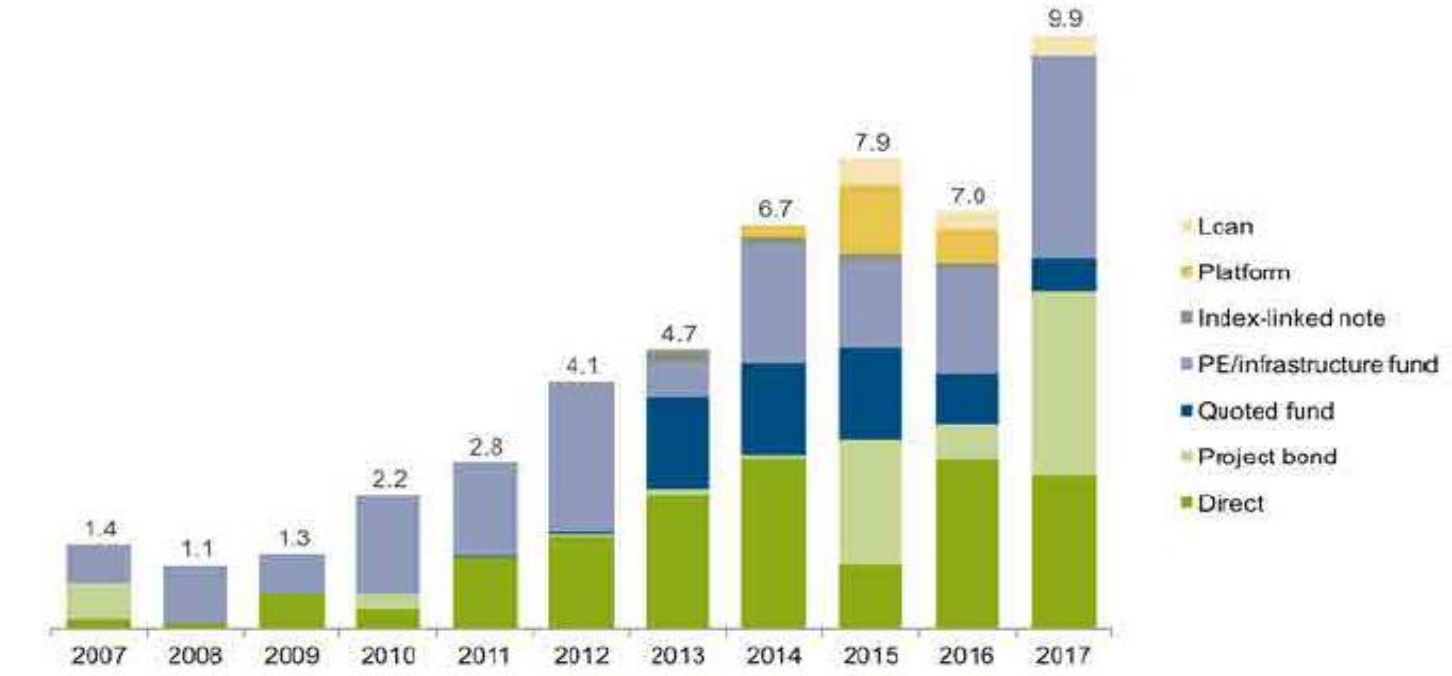
Renewable energy deployment

Deployment project RISK is front-end, capital intensity back-end.

Ecosystem of financing:

1. FF
2. High-net worth
3. Private Equity
4. Venture Capital
5. Corporate investments



Source: UN Environment, Bloomberg New Energy Finance

European Renewable Energy Projects, $bn

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Lessons & innovations for SMR deployment

1. Build team of nuclear, finance, energy industry, policy people.
2. SMR deployment is start-up financeable; risk will be rewarded
3. Feasibility study, site assesment, market study, licencing study, know-how development, public education is not huge investment; risk/ return ratio acceptable.
4. Widen shareholder structure/stakeholders to industrial consumers & municipalities – Finnish mankala
5. Site population has to get benefiits – free power most obvious.
6. SMR deployment actually a service to large (nuclear) utilities to invest into deployment if (political) risks reduced and official agreement reached.

SMRs @40€/MWh outcompete **everything**

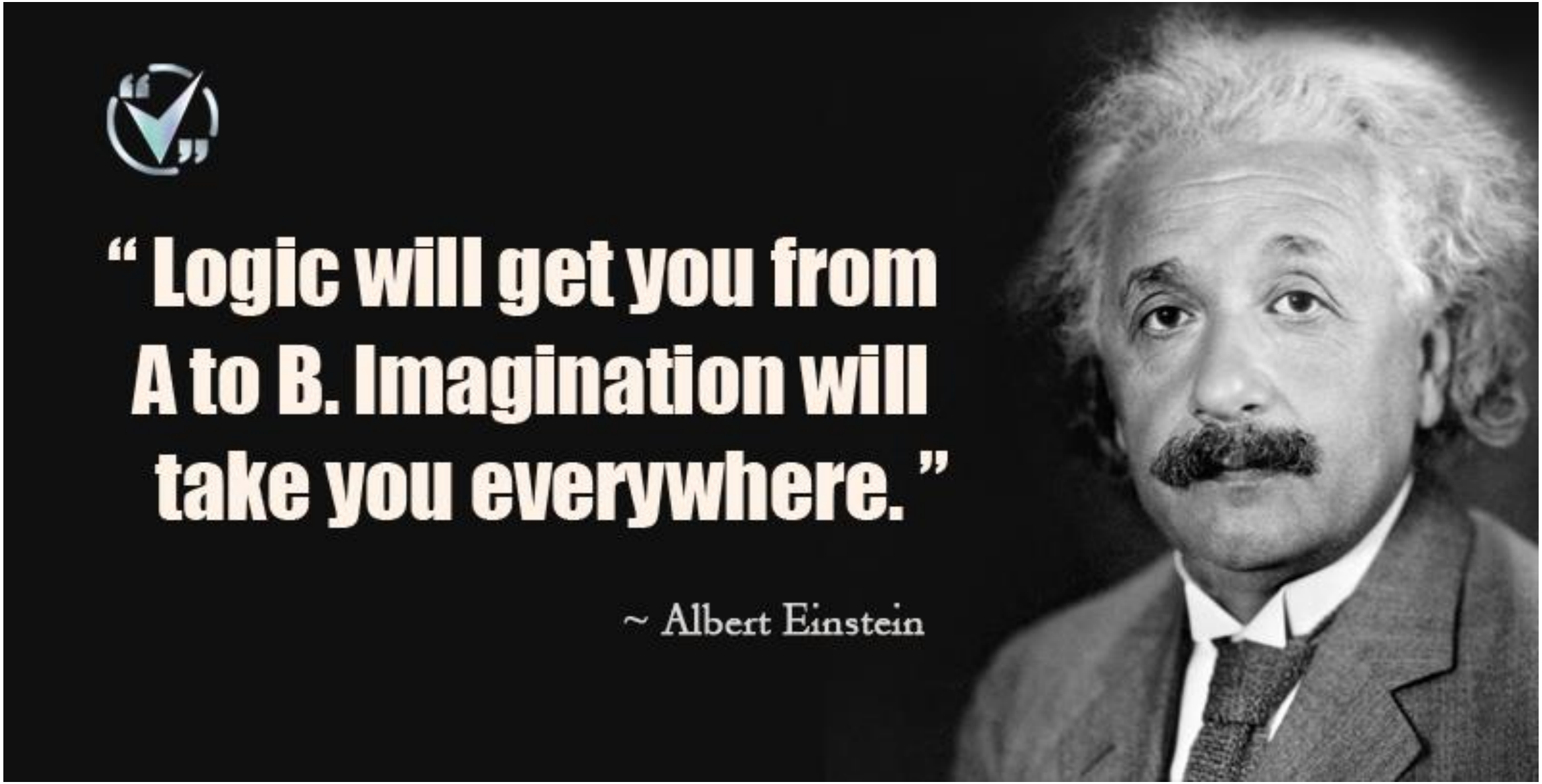
Markets with XGW dispachable closures:

- Baltics (Estonia)
- Poland
- UK
- Nederlands
- Greece
- Germany
- Spain
- Italy

Not only reactor tech needs to be in 21st century, but also nuclear energy business model & ambition.

Considering development of new venture with US/EU partners for EU wide SMR deployments.

50+ of SMRs by 2040 in EU.


“ Logic will get you from A to B. Imagination will take you everywhere. ”
~ Albert Einstein