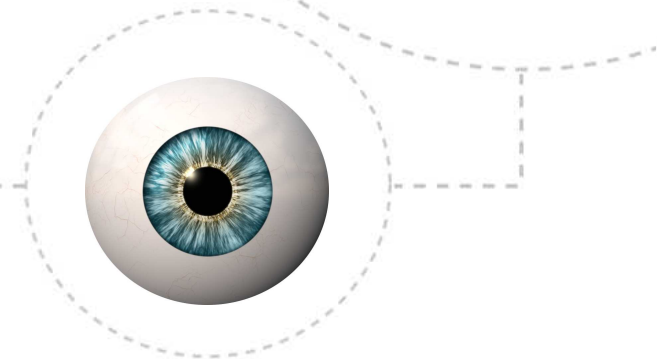


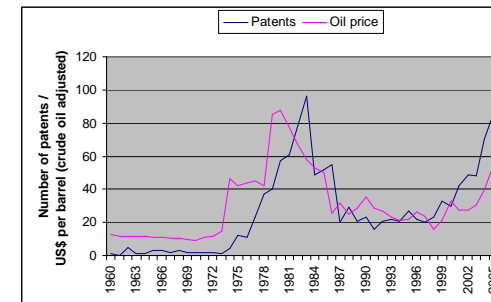
Wave & Tidal

– A bird's eye view –

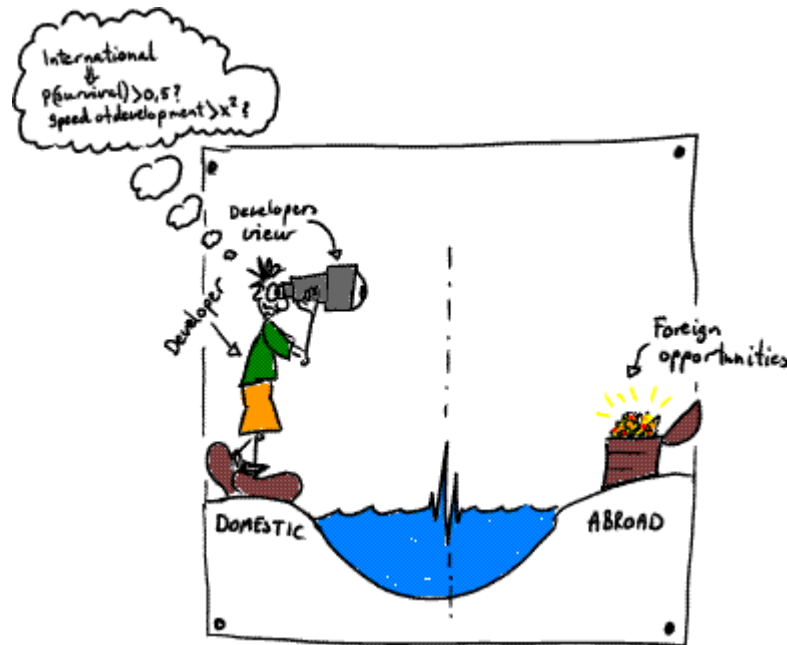


Nicolai Løvdal

Norwegian Centre for Renewable Energy



Challenging business opportunity!



- Dependent on governmental support
- High initial capital
- Difficult to differentiate
- Technology challenges
- (Very) Early internationalization

How do firms exploit foreign opportunities before commercialization?

How does it affect the development of the firm and the industry as a whole?

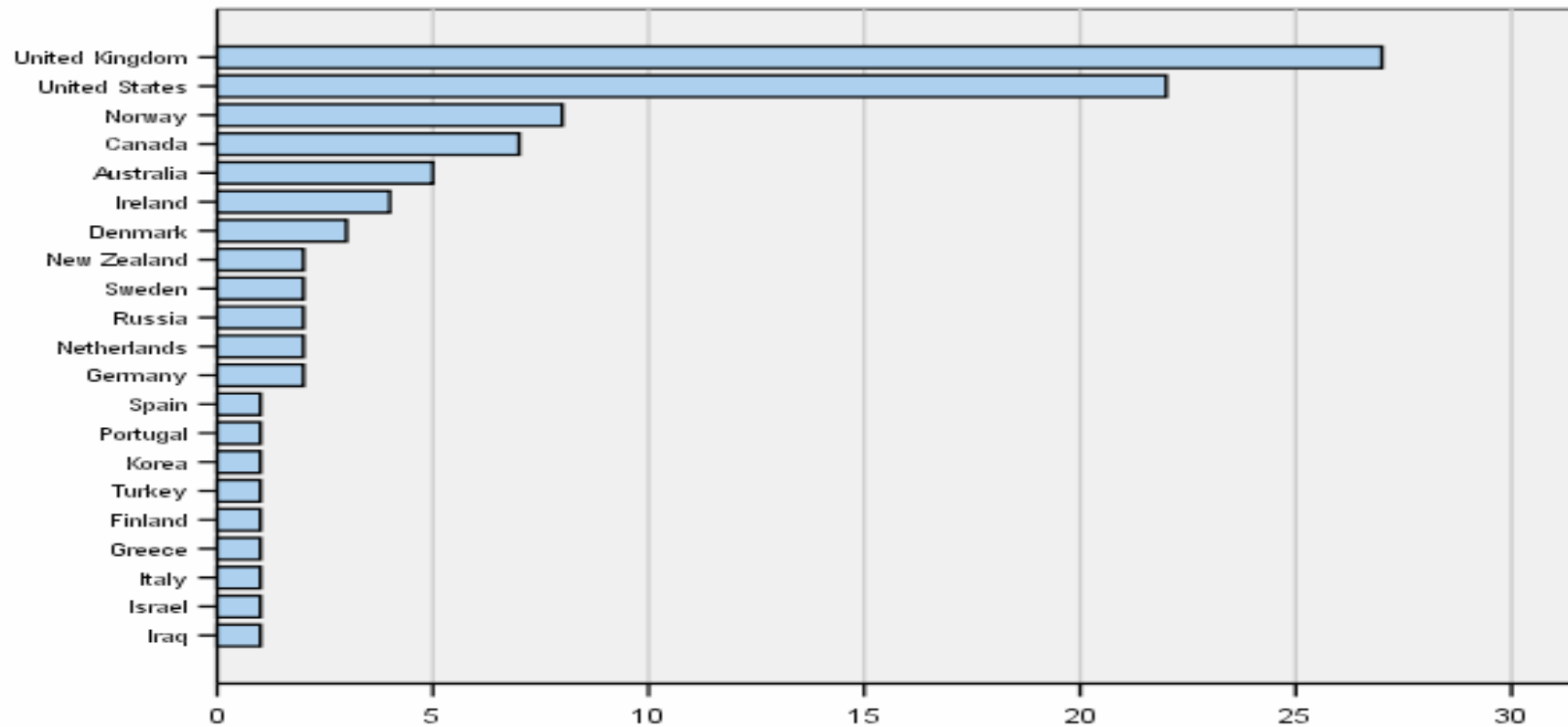
World wide survey – Wave & Tidal

- Everyone who
 - ...holds a concept to harness wave or tidal energy, and
 - ...aims for commercialization through a dedicated organization
- 90 firms identified (35 tidal / 55 wave) - 45 responses

- The respondents will get...

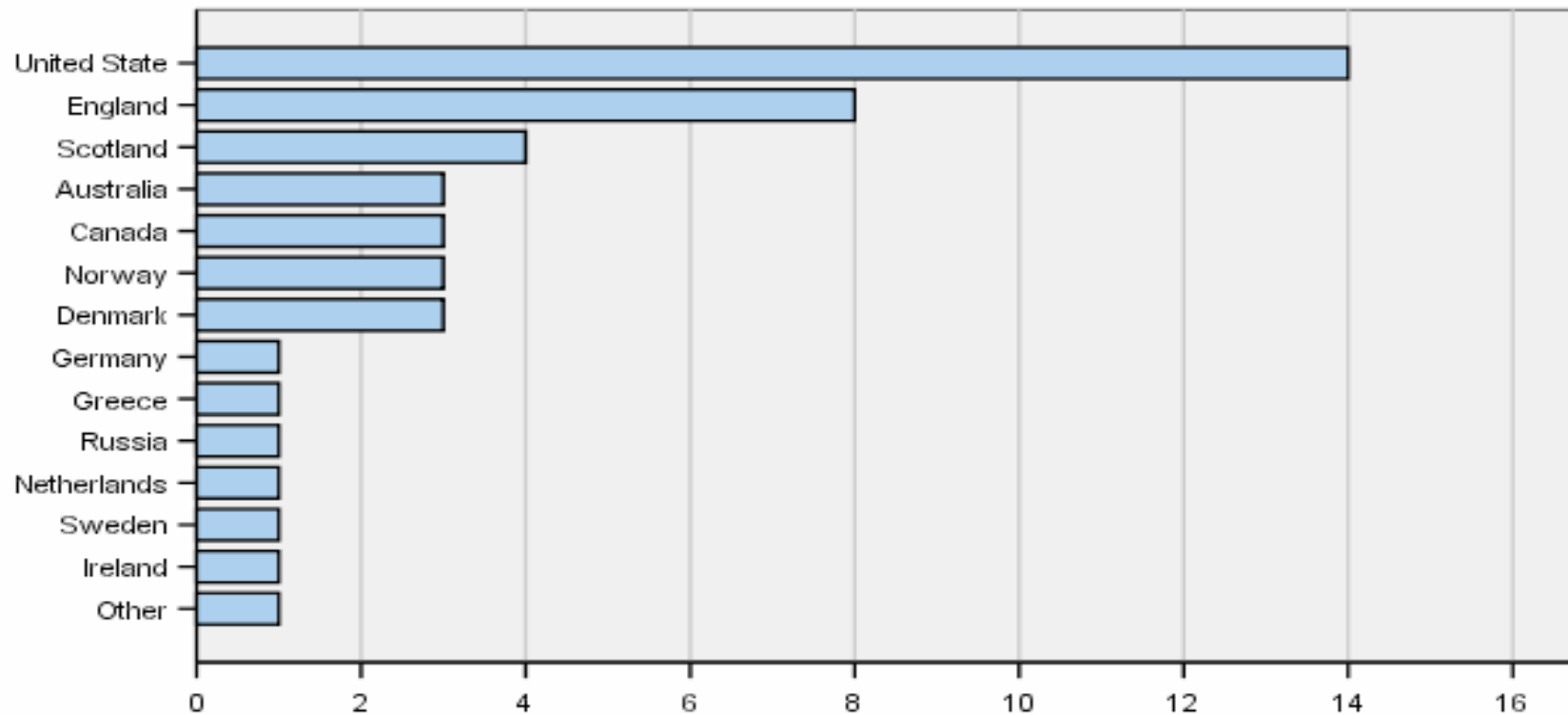


Where are they all from?

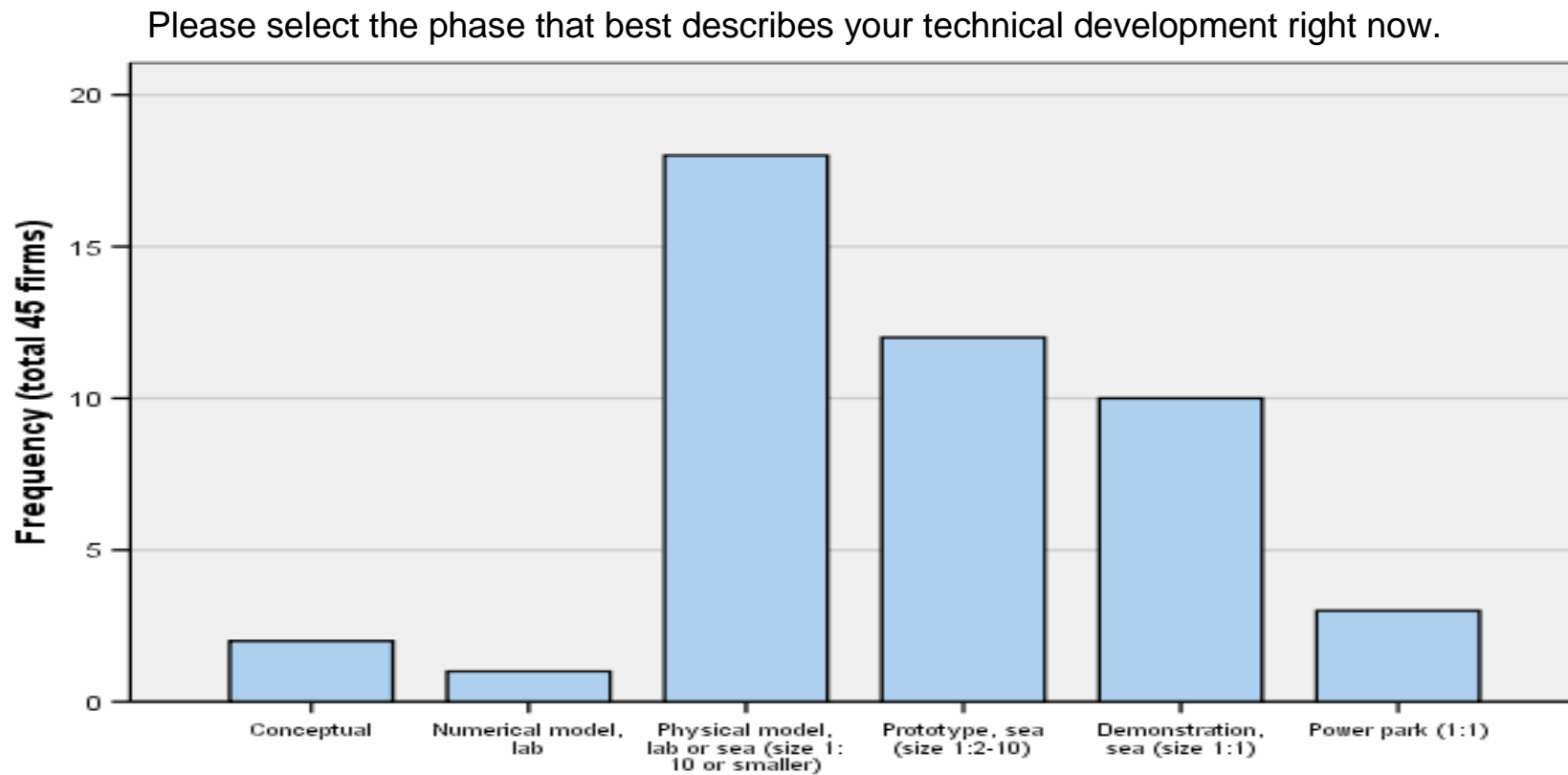


Who answered the survey?

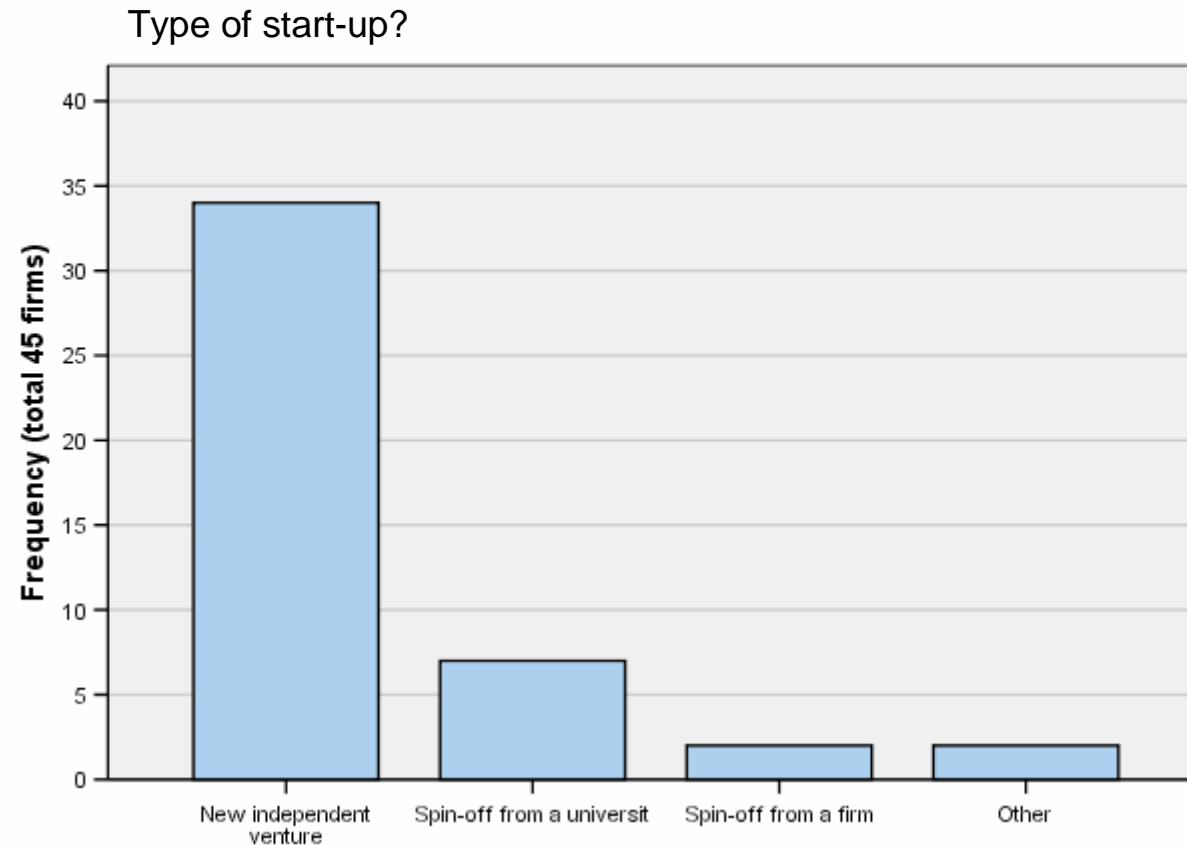
In which country is the main office currently located?



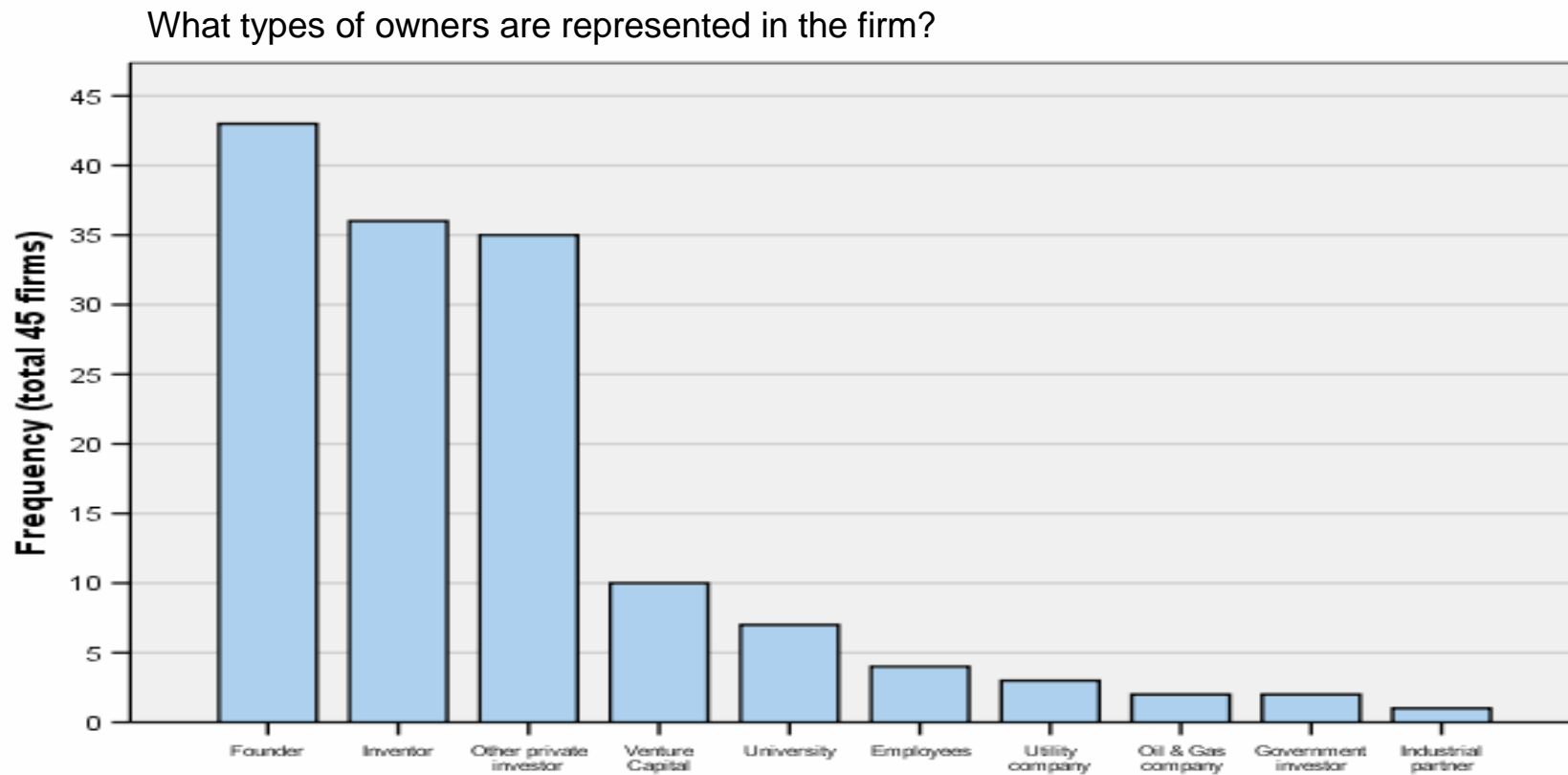
Which phase are they in?



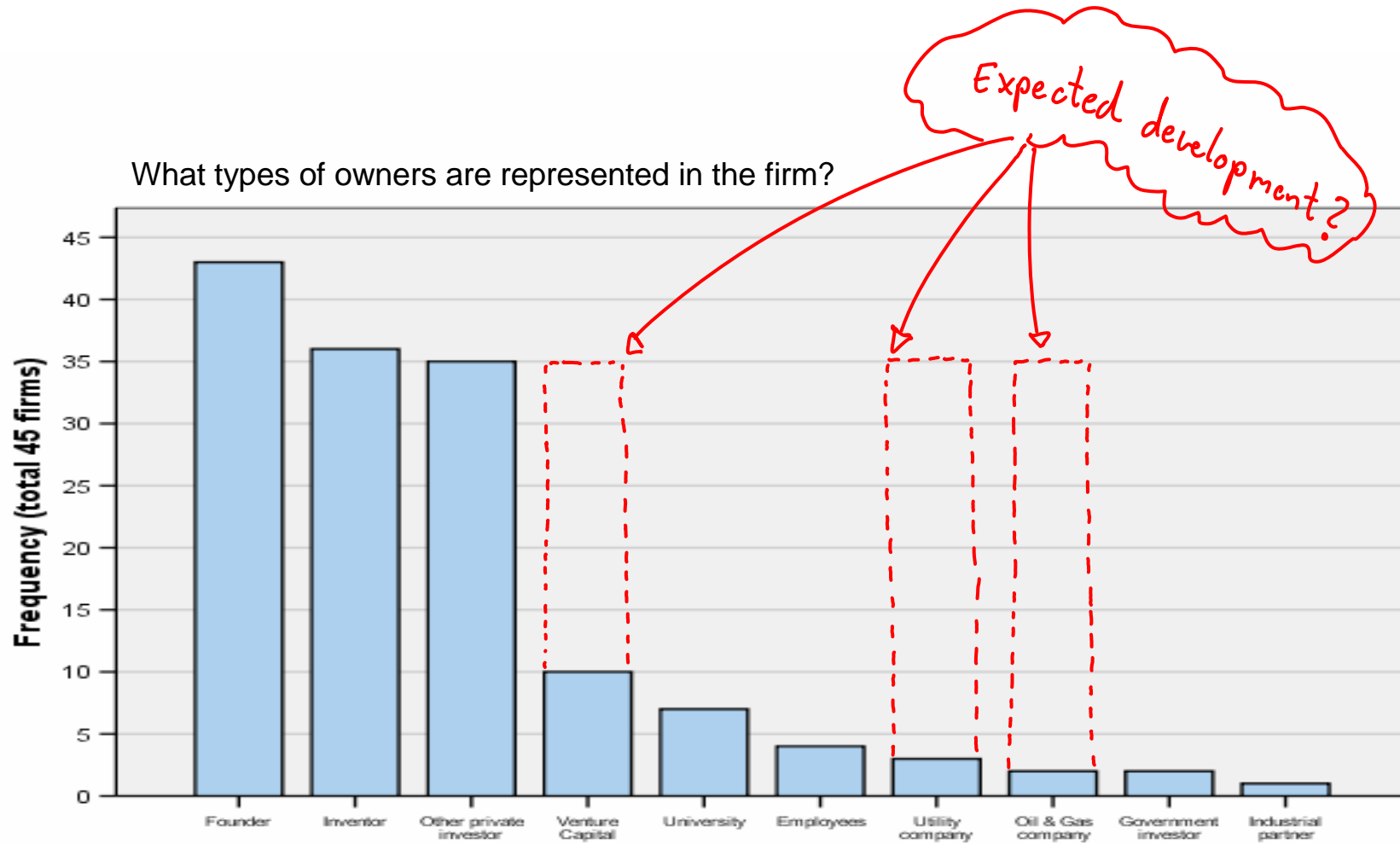
More private – less universities



Who owns the technology?



Who owns the technology?



Perceived barriers

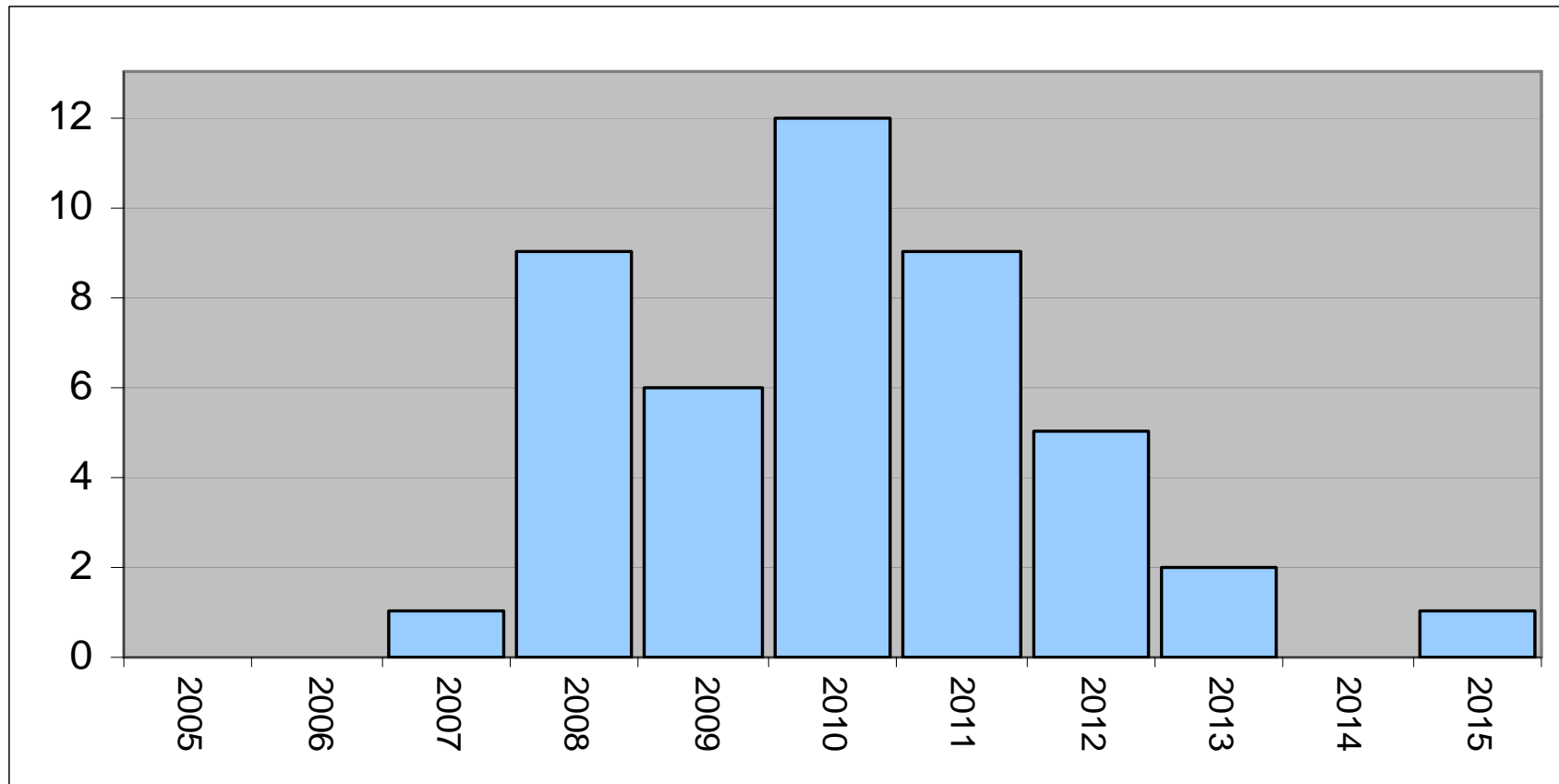
In your case / what is the most important barrier for a more rapid development towards commercialization?

Barrier	Replies
• Funding issues	15
• Regulatory issues	6
• Technology issues	6
• Political vision	1
• Building a team	1

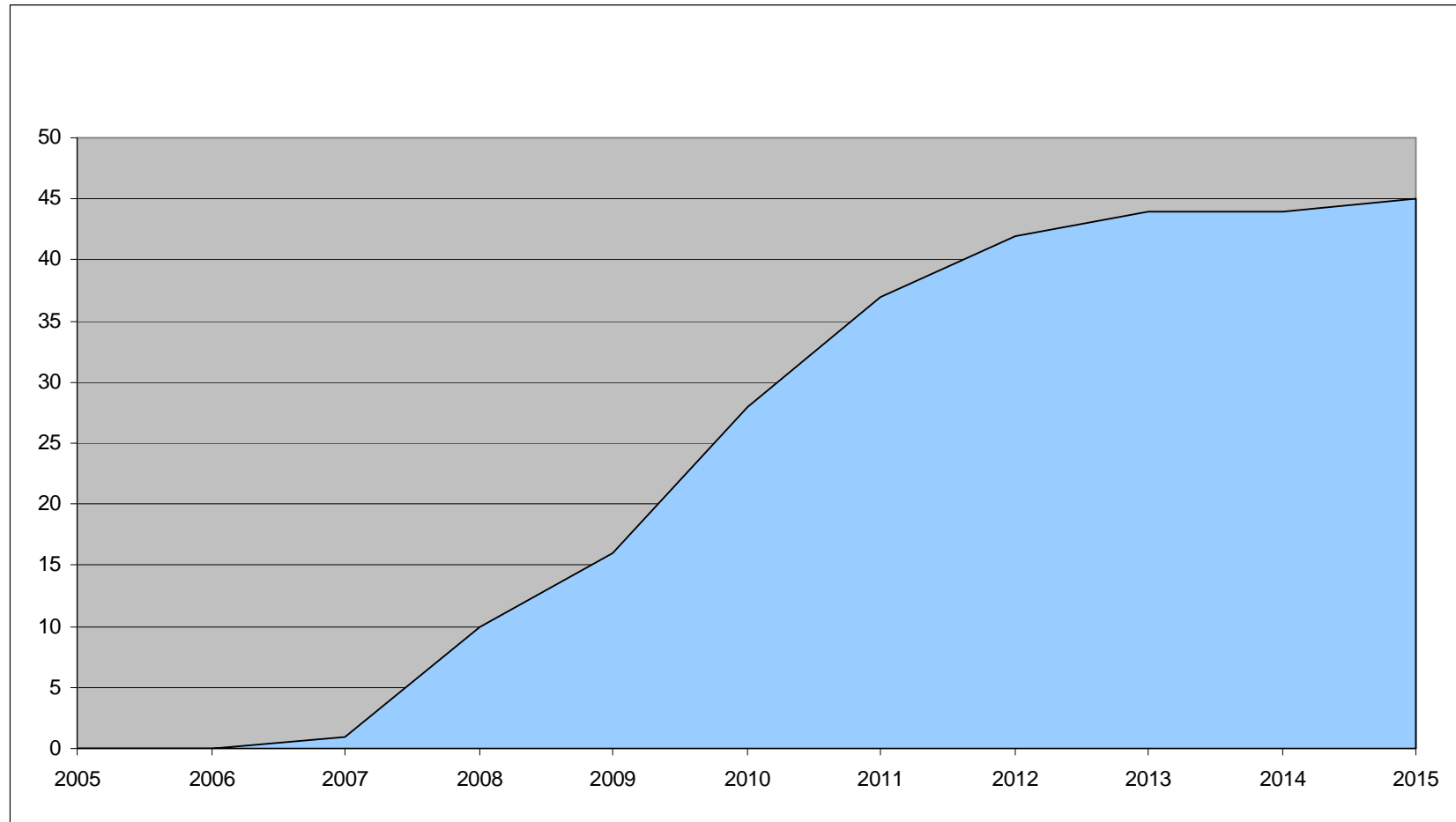
“We lack people with balls and cash”

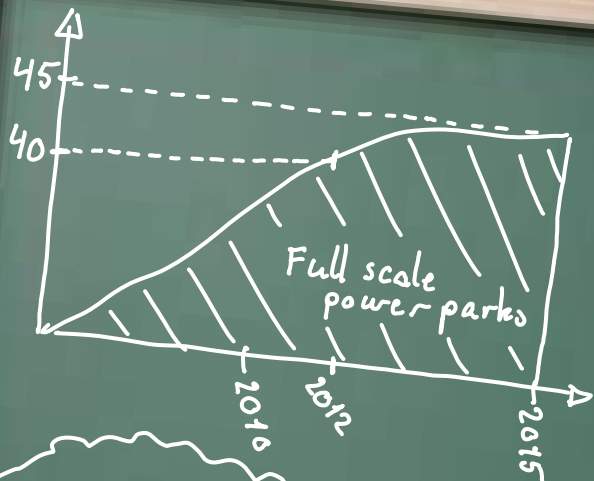
Full scale park in operation

First operation of full scale power park?



Aggregated - Full scale power parks





NB! Just based on
1st full size park
from each company



Power
prod.
2015

$$45 \text{ parks} \times (365 \times 24) \text{ h} \times 3 \text{ MW} \times 30\% \times 95\% =$$

$$= 337\,041 \text{ MWh} \approx \underline{\underline{340 \text{ GWh}}}$$

Carbon Trust - Marine Energy challenge \rightarrow 2000-5000 MW (2020)

Assumptions

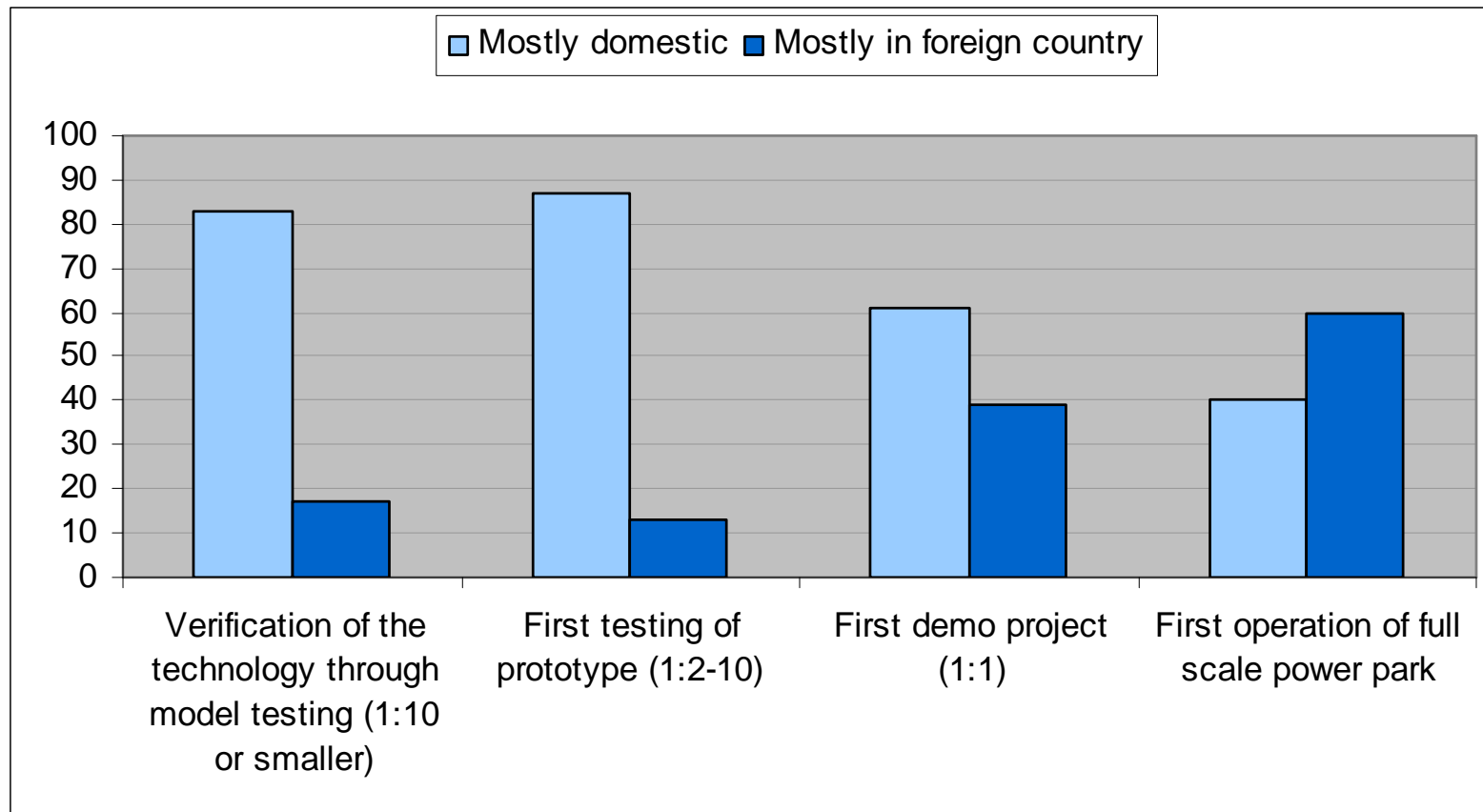
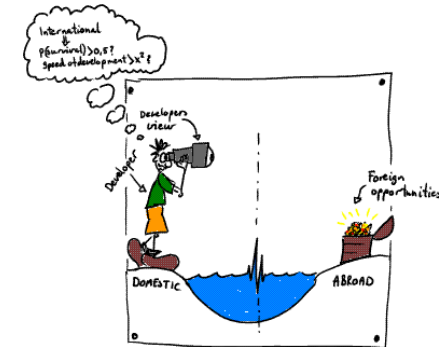
- ① Average park size: 3 MW
- ② Device capacity factor: 30%
- ③ Availability: 95%

Installed power

$$2012: 40 \times 3 \text{ MW} = \underline{120 \text{ MW}}$$

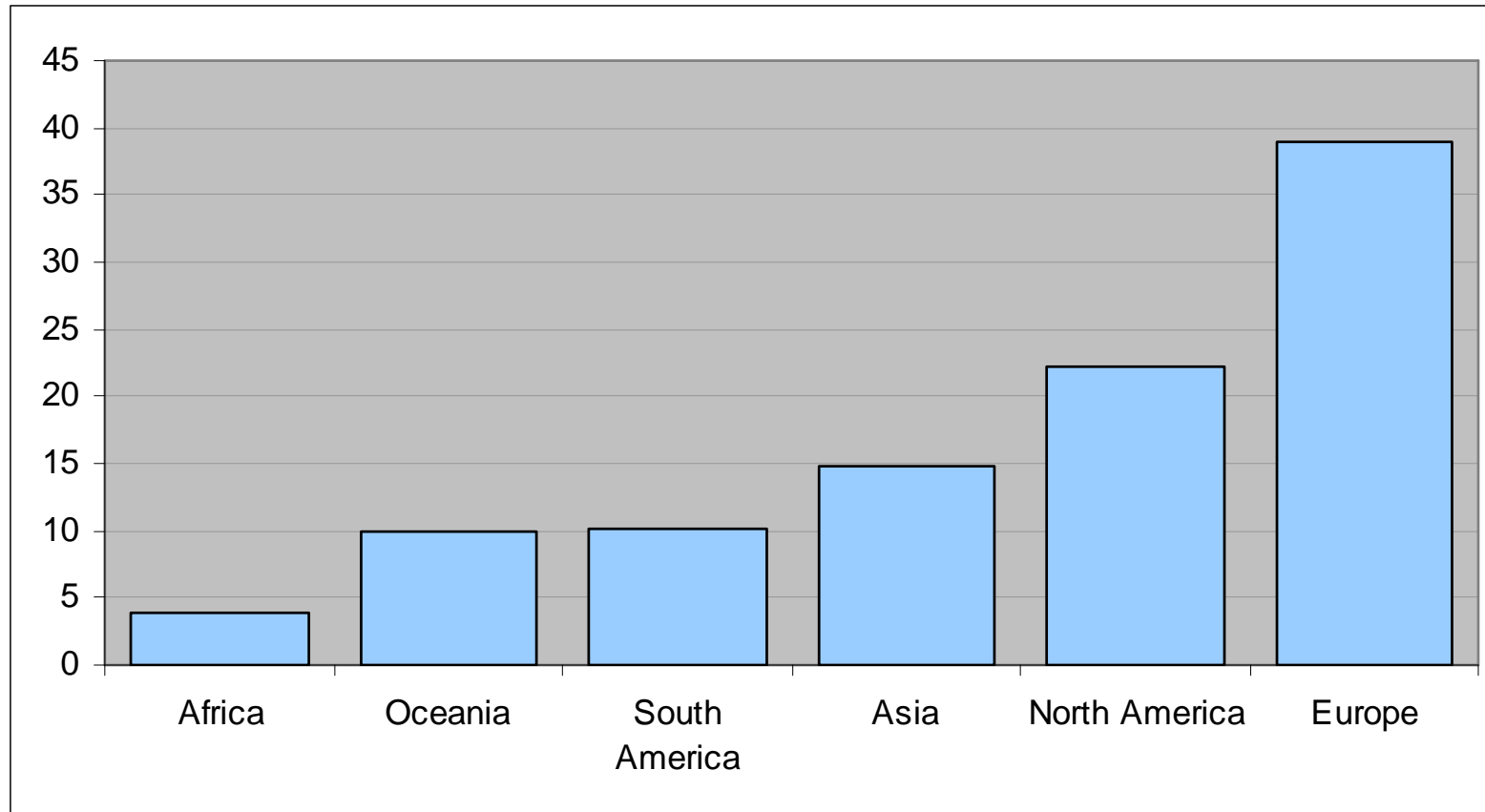
$$2015: 45 \times 3 \text{ MW} = \underline{135 \text{ MW}}$$

The international dimension...



If you install 100 power parks?

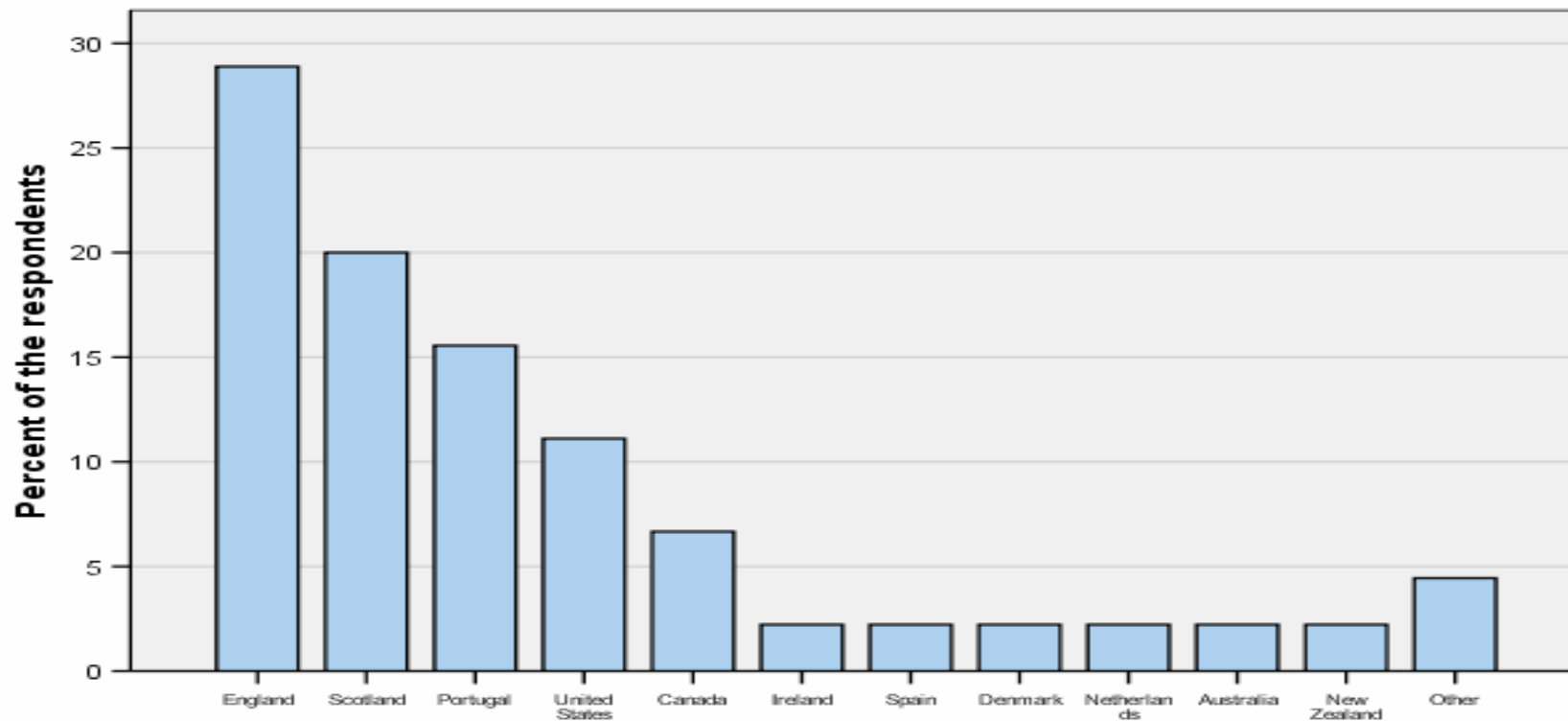
Assume you have sold 100 full scale power parks. How many will be in different parts of the world?



Highest value creation

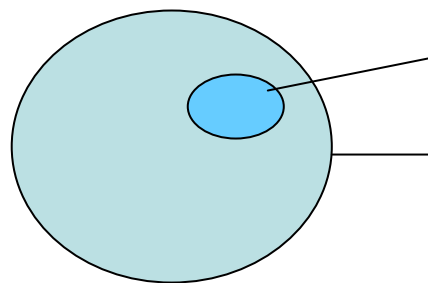
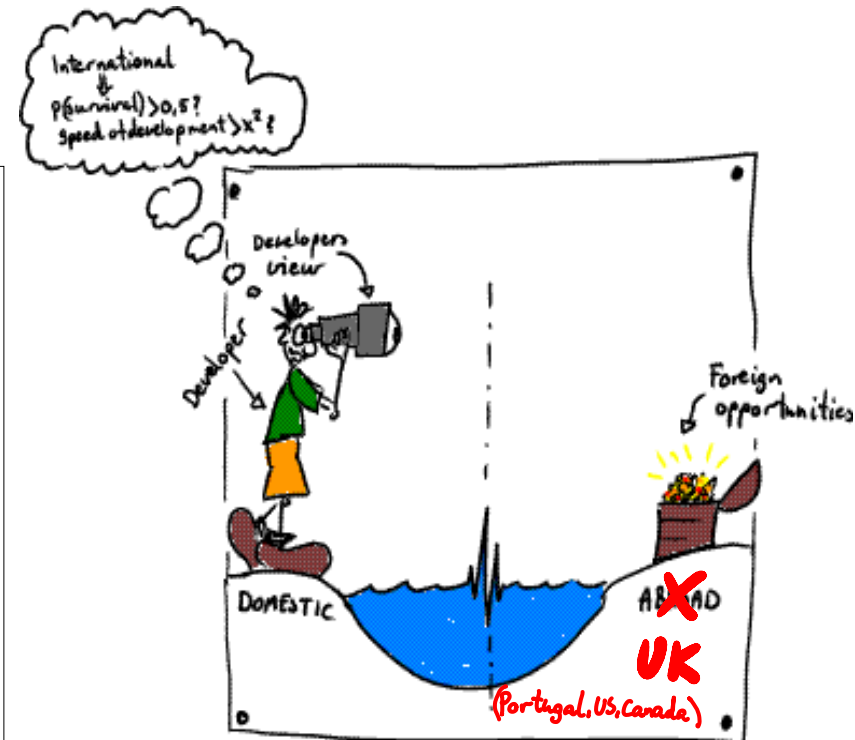
In your opinion –

Which country will have the highest value creation from the marine energy industry 10 years from now?



Summing up

- Challenging business
- More than 90 companies
- Opportunities for private investors
- UK is the motor
- US is coming fast
- Portugal is an attractive market
- Strong will to internationalization
- Europe expected to be market leader



Full concept to harness energy

All the other business opportunities made possible because of wave and tidal exploitation