



“Lessons learned and way forward for RAS in the US.”

Marianne Naess
Great Northern Salmon

2013 – Fredrikstad Seafood established – first commercial RAS grow-out license in Norway

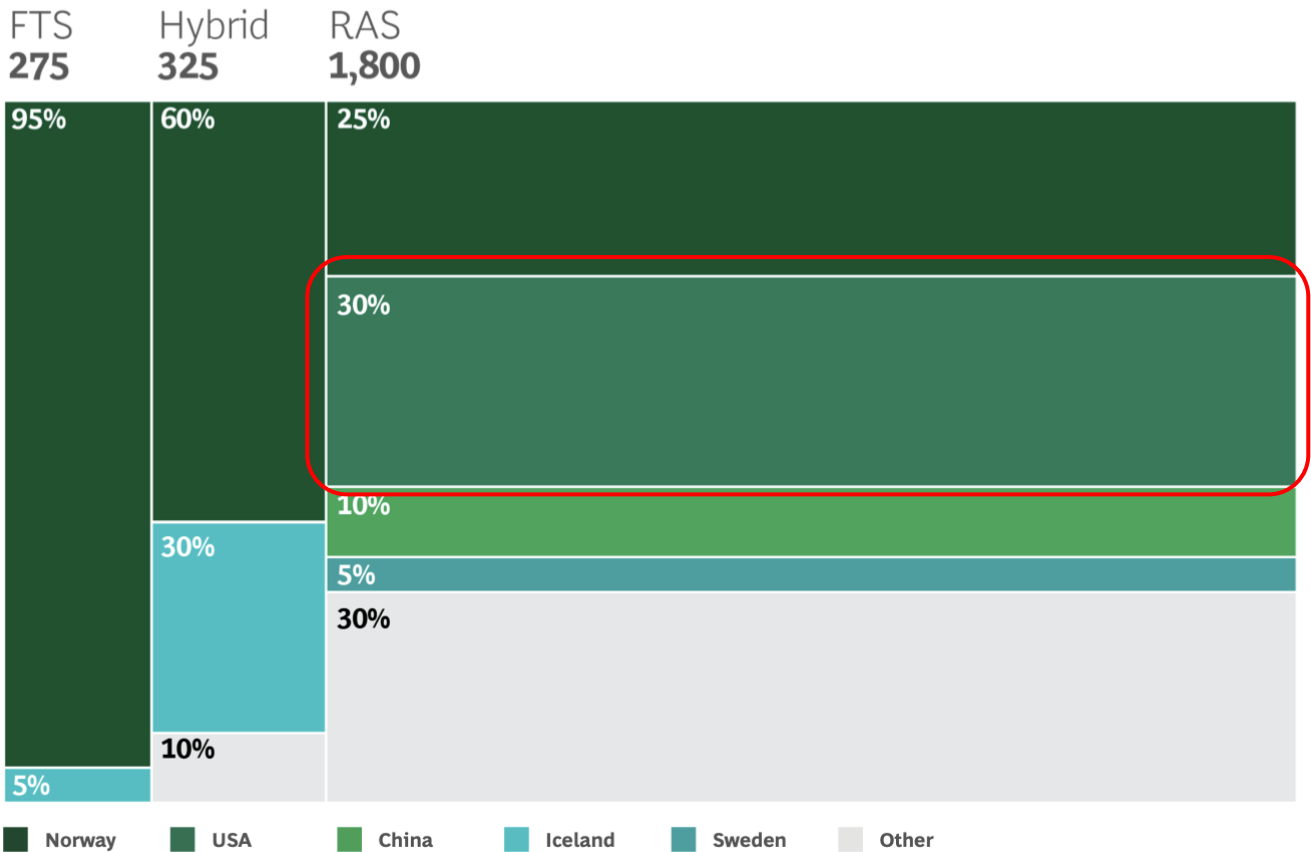


The exterior of the Fredrikstad Seafoods land-based fish farm in southeast Norway. Photo: Kyst.no.

This was the start of a wave of projects announced globally

Announced land-based capacity of Atlantic Salmon (k tonnes WFE)

Width: Share of announced capacity per technology
Height: Share of announced technology capacity per geo

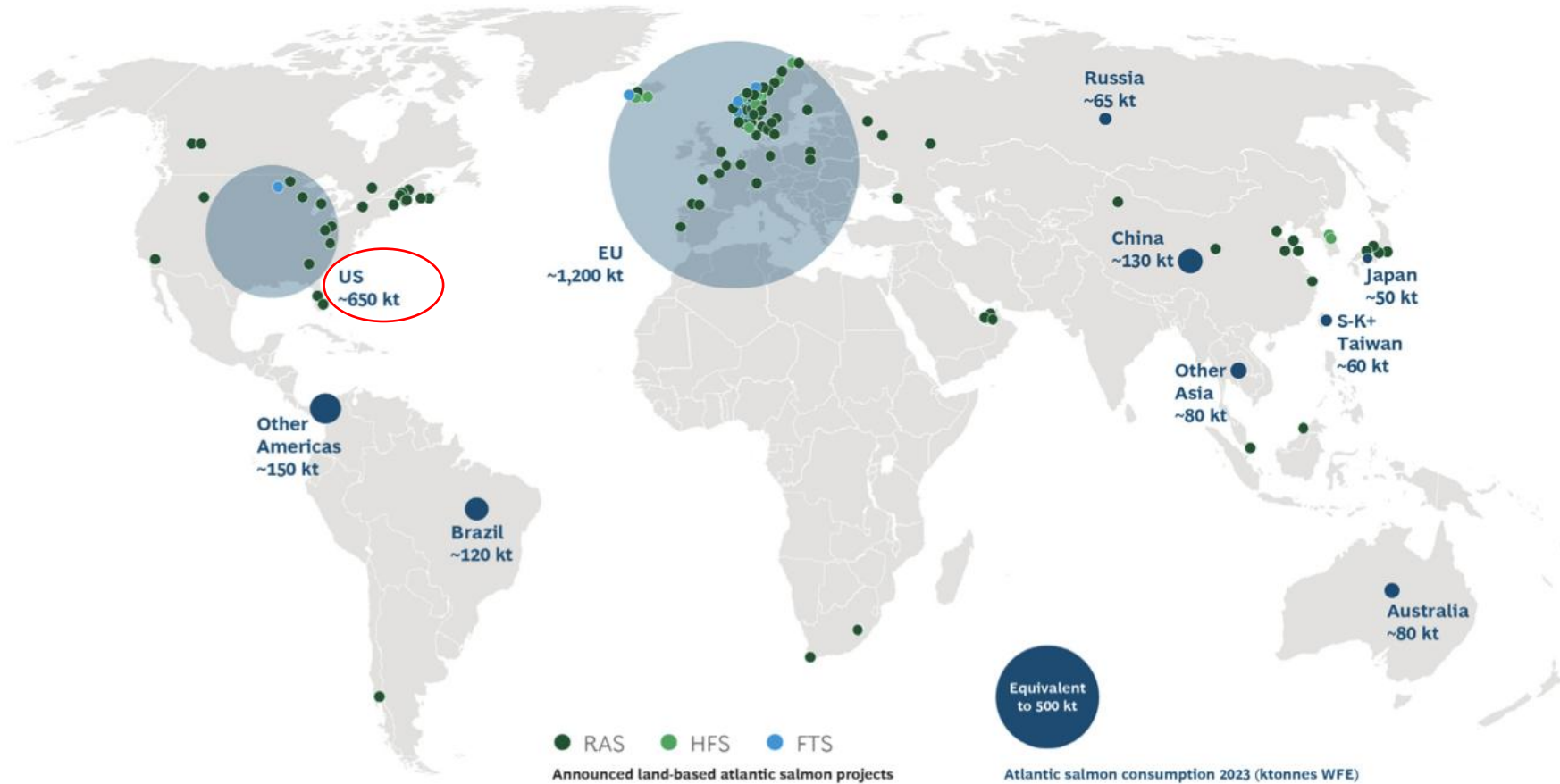


Source: BCG Land-Based Project Database

The US was seen as the land of opportunity with more with a high share of announced projects

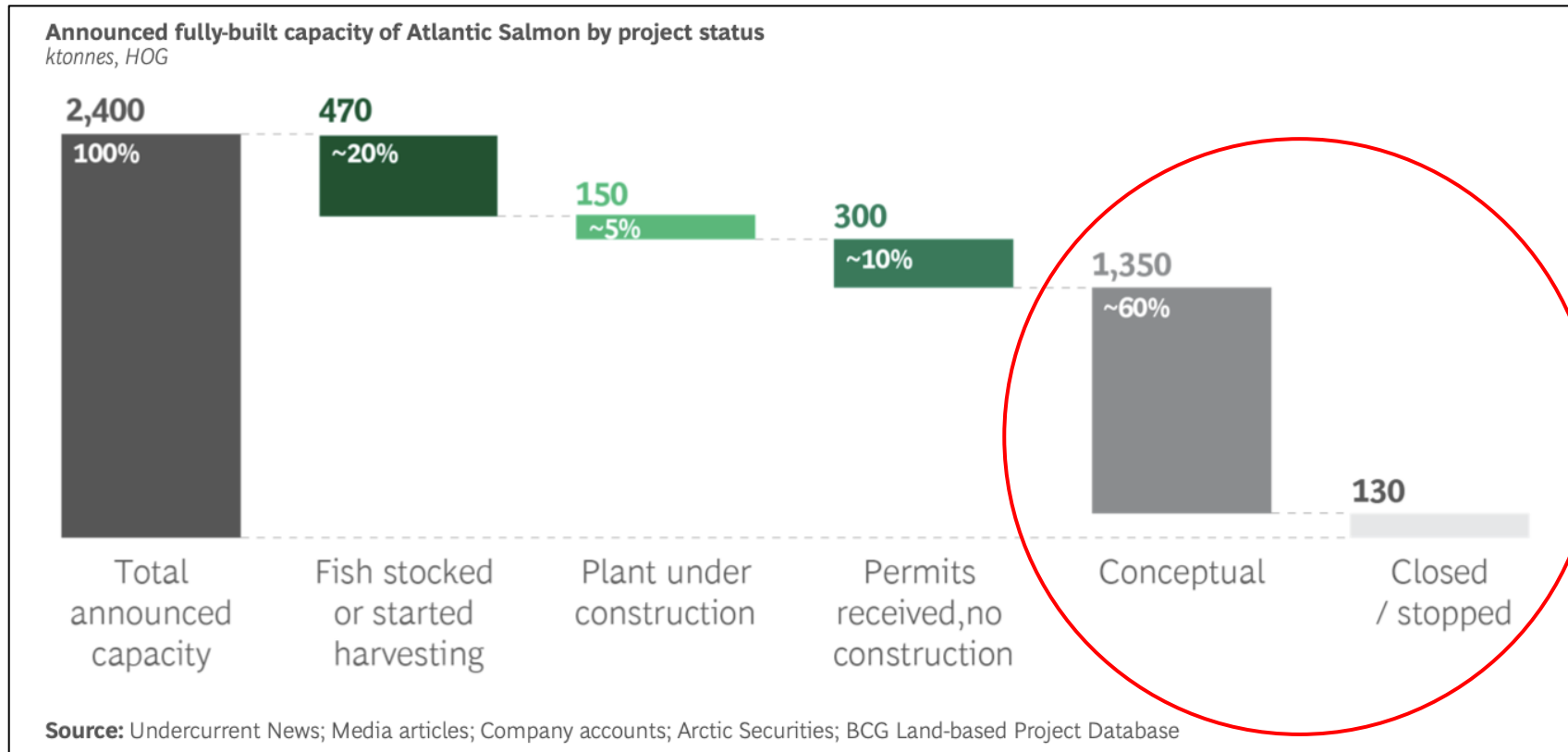


Some years later - less than 15-20,000 mt in the pipeline – what happened?

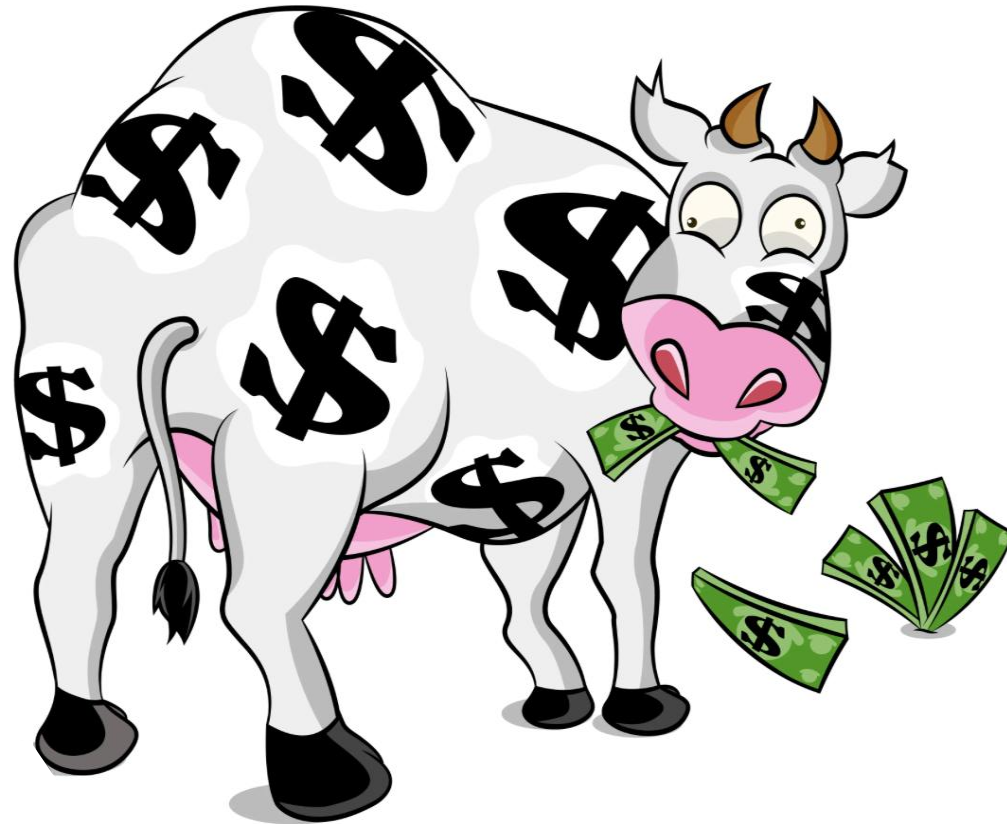


Source: Kontali Analyse; BCG Land-Based Project Database

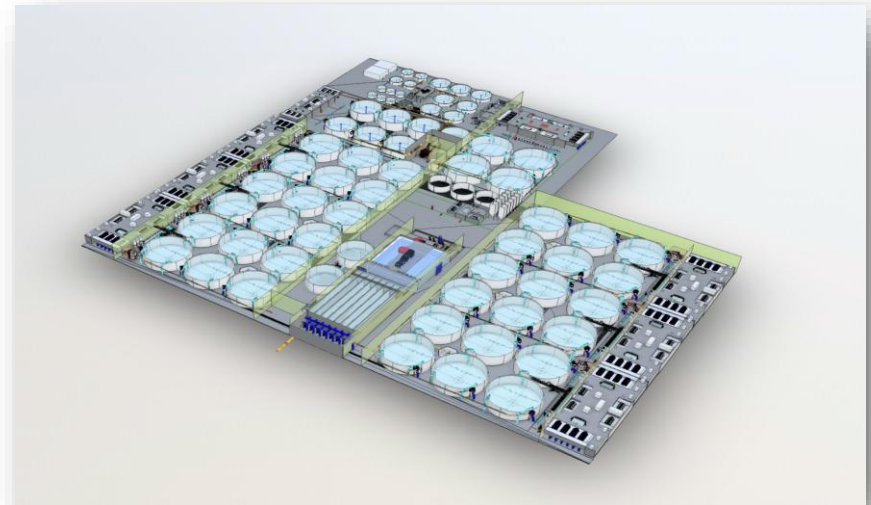
About 2/3 of the projects were not viable and should probably never have been announced



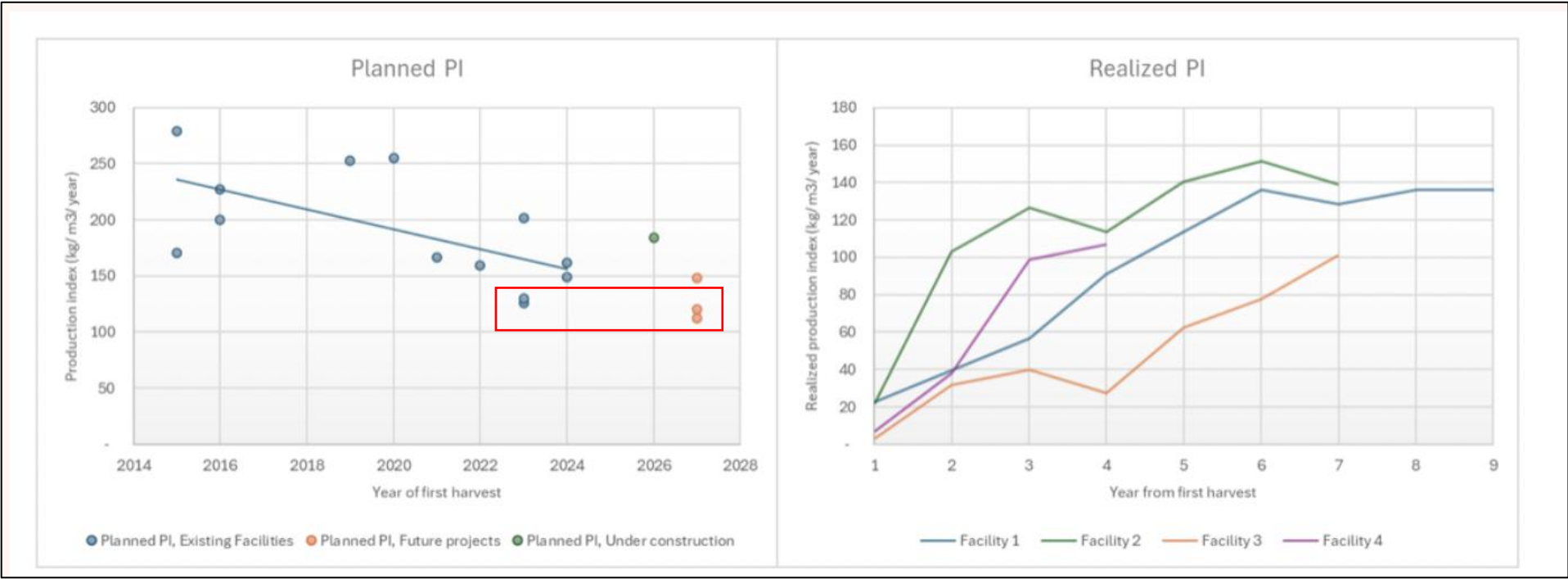
Lack of interest from the incumbent industry



Transition from ocean-based net pens to land-based systems



Hitting the biomass targets has been / is one of the biggest challenges



Conclusion from the study

1

It has also been noted that the data for both RAS and Hybrid flowthrough facilities are similar. This demonstrates that the fish do not care about technology. Growth suppression will kick in at a certain density, regardless of technology.

2

Some existing and future projects have looked at previous experience and have adjusted their production targets accordingly. However, they are continuously being benchmarked against less realistic peers in the market. Everyone is competing for the right funding, so without insight, it is easy to get misled.

This is not good for the industry..... We need credible #s and updates

JUNE 2, 2025

██████████ cites human error in mortality event that killed 170,000 fish

In a statement it shared about the event, ██████████ referenced a lack of tank capacity that was slowing production, which it had previously discussed in its Q1 2025 report.

“The loss of fish will free up such tank capacity going forward and permit changes in harvest plan to optimize production and increase average harvest weight achievements. In addition, it is expected to positively impact price achievement,” the company said.

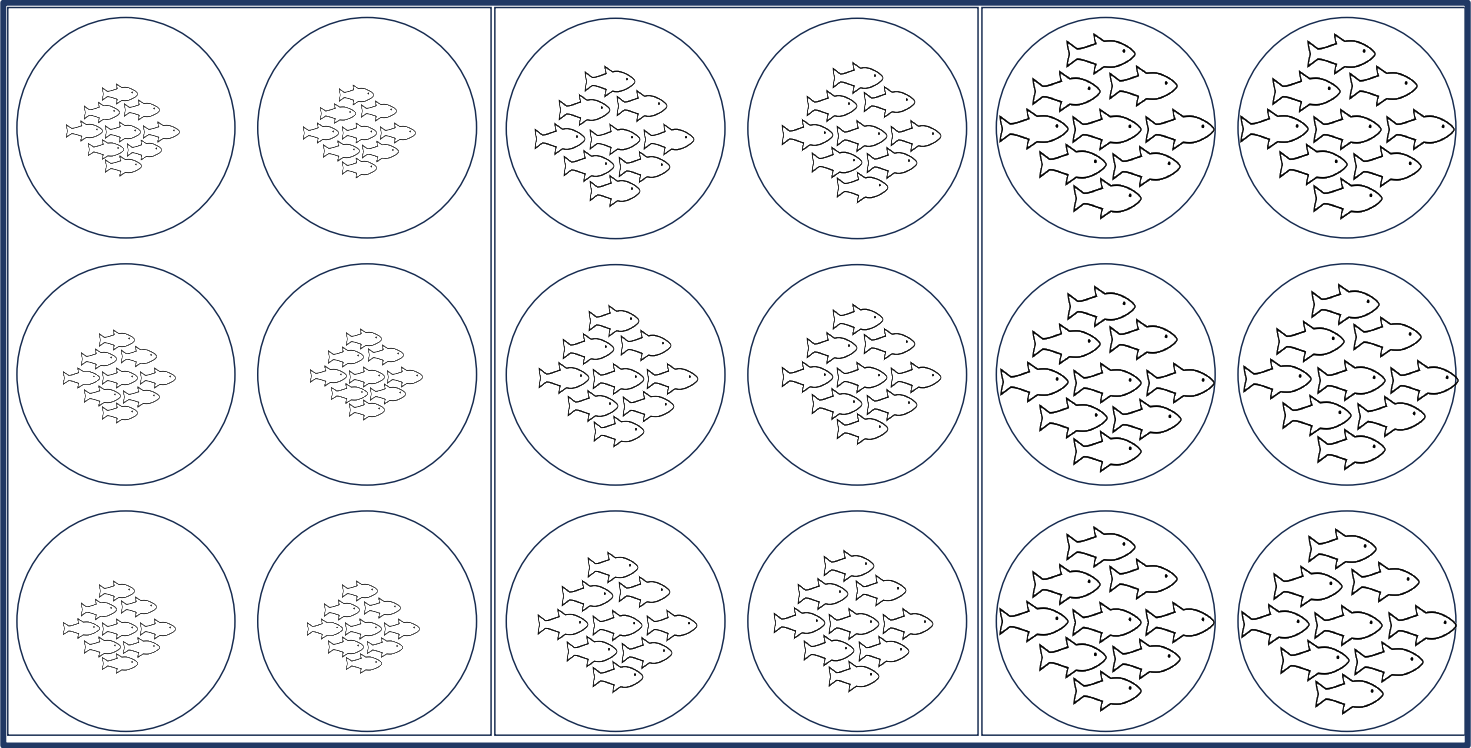
Harvest weights were negatively impacted by issues in the quality of the smolts stocked in H1 last year and the need to restock new smolt groups within a short timeframe, requiring partial harvesting of certain groups at suboptimal weights.



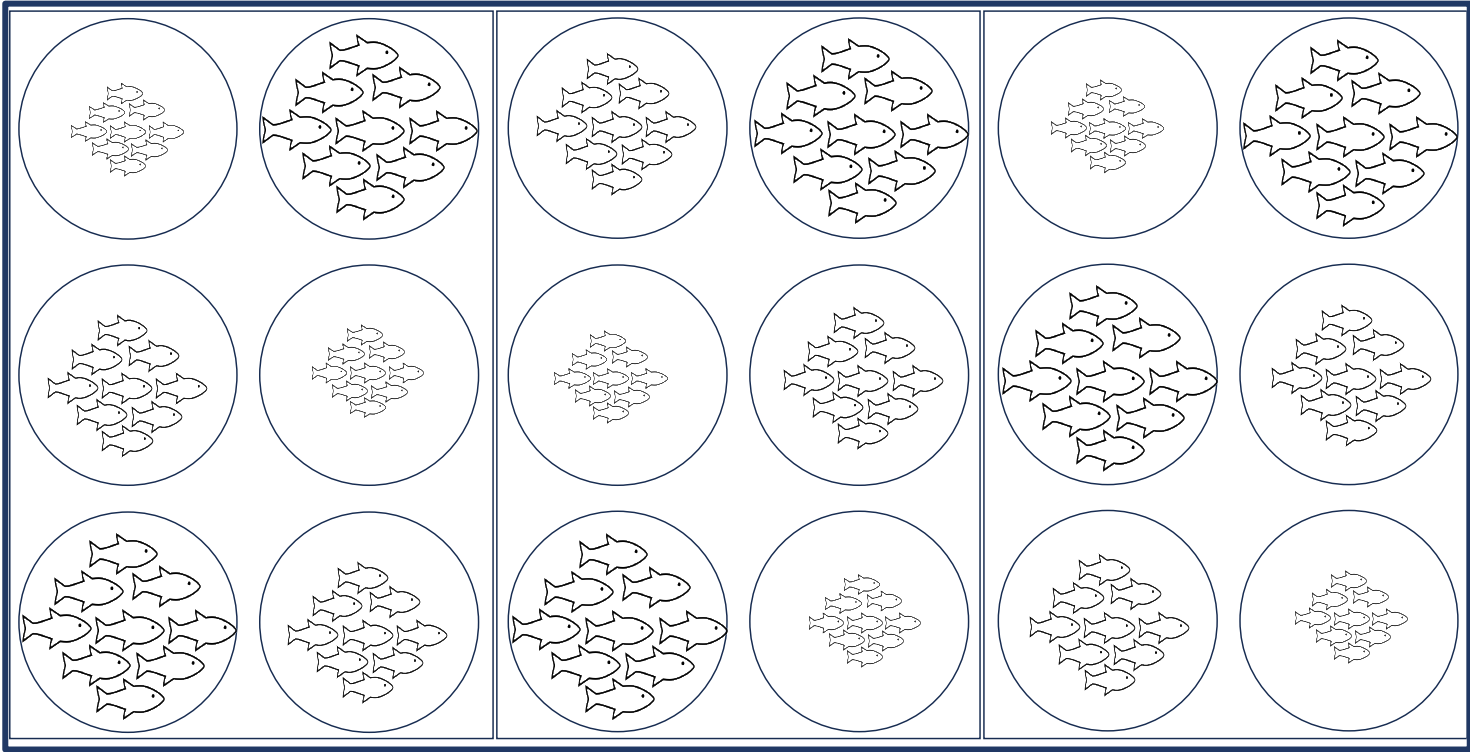
– Vi fikk en liten utfordring da vi konstaterte at fisken i første innsett vokste betydelig raskere enn hva som lå i planen

“We encountered a challenge when we realized that the fish grew much faster than anticipated”

Conventional bioplan



Optimized RAS bioplan for RAS grow-out



Other issues seen from an investor perspective (the list is not exhaustive....)

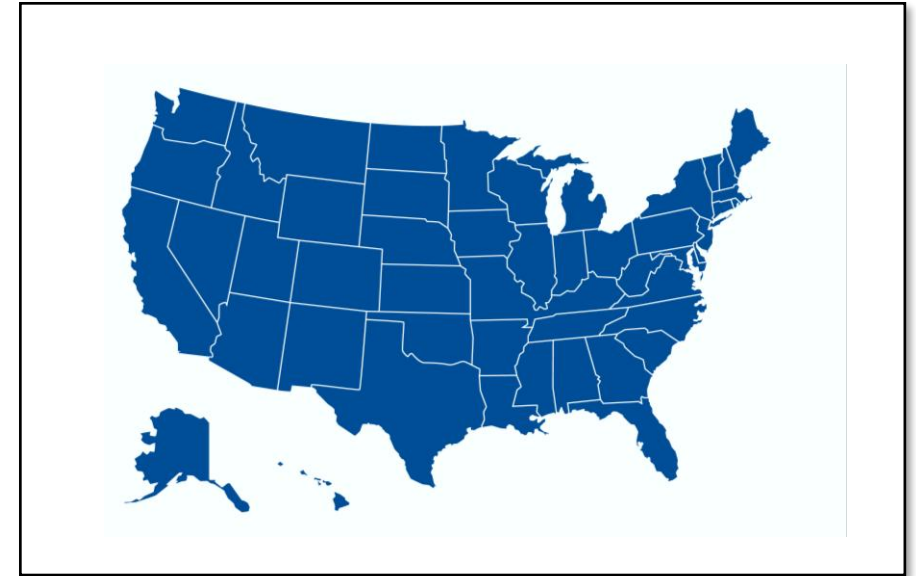
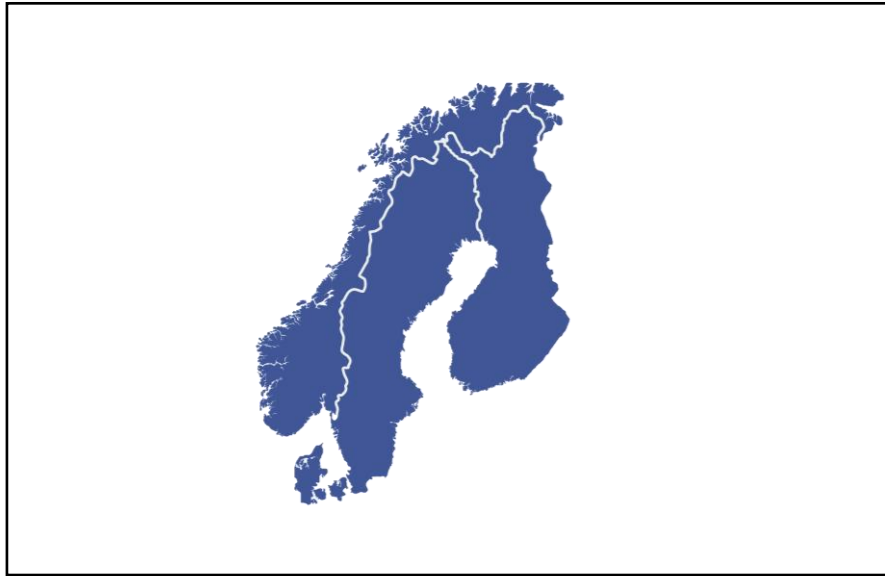
- Capex risks
- Project execution risks
- Quality of management
- Workforce availability / knowledge
- Operational planning and risks
 - Water quality
 - Density
 - Geosmin
 - Accidents / mass mortalities
- Off-take risks



Back to the US challenge – what have we learned and what can we do going forward?



Additional dimensions to handle when building RAS-facilities in the US



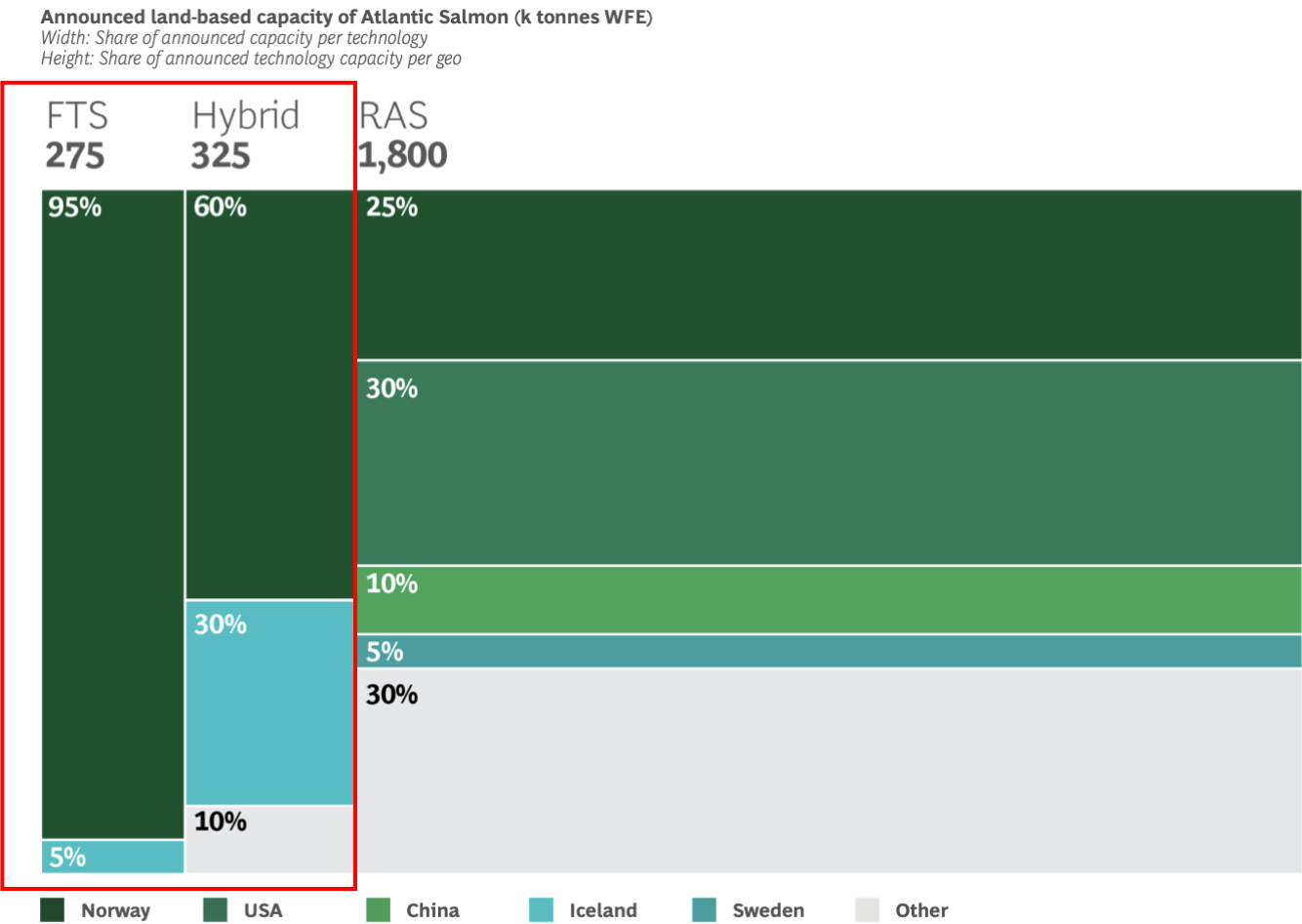
Venturing overseas adds risks and complexity

*“The generally accepted wisdom for founders with big home markets was to **win your domestic market first** before thinking about going international after that”*

*“If **you** want to **expand** globally, **You need** to first think local”*

*“**Before you** venture **abroad**, equip yourself with these best practices to ensure your brand thrives on foreign shores”*

Norway and Iceland – mostly FTS and HFT – transferability?



Source: BCG Land-Based Project Database

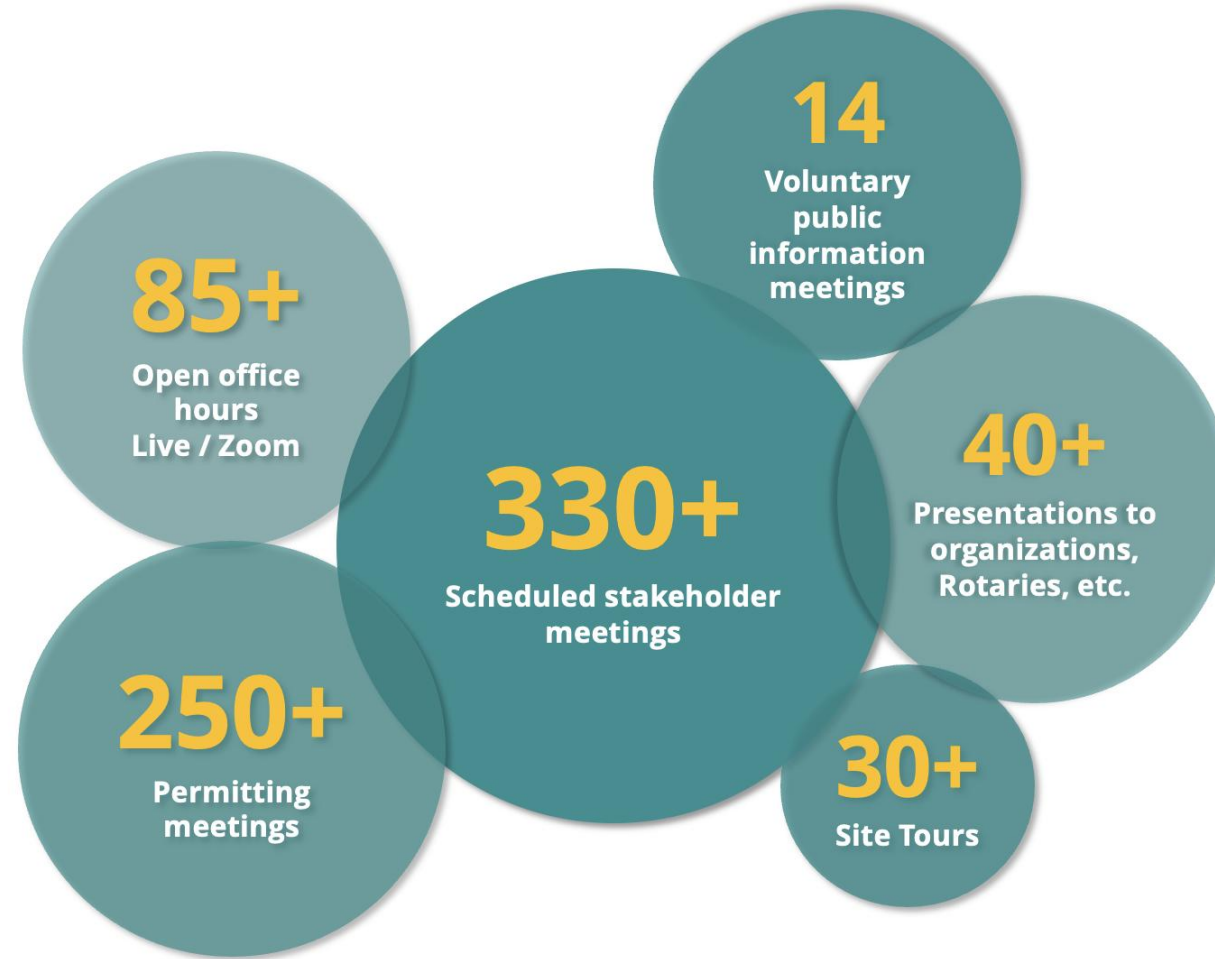
The US – a classic CATCH-22 problem

Needing job experience to get a job, but needing a job to get job experience.....

- Understanding of business climate / culture
- Relationships and support
- Difficult to assess risks
- Permitting challenges
- Litigation risks – how to manage
- Can't remote control projects
- Transferability of knowledge

- Underdeveloped industry
- Not enough proven cases
- Lack of sufficient workforce
- Lack of domain expertise among investors
- “small is beautiful mentality”
- Media focus

It takes a village to permit an aquaculture project in the US!



Is there a solution for the development of land-based aquaculture in the US?

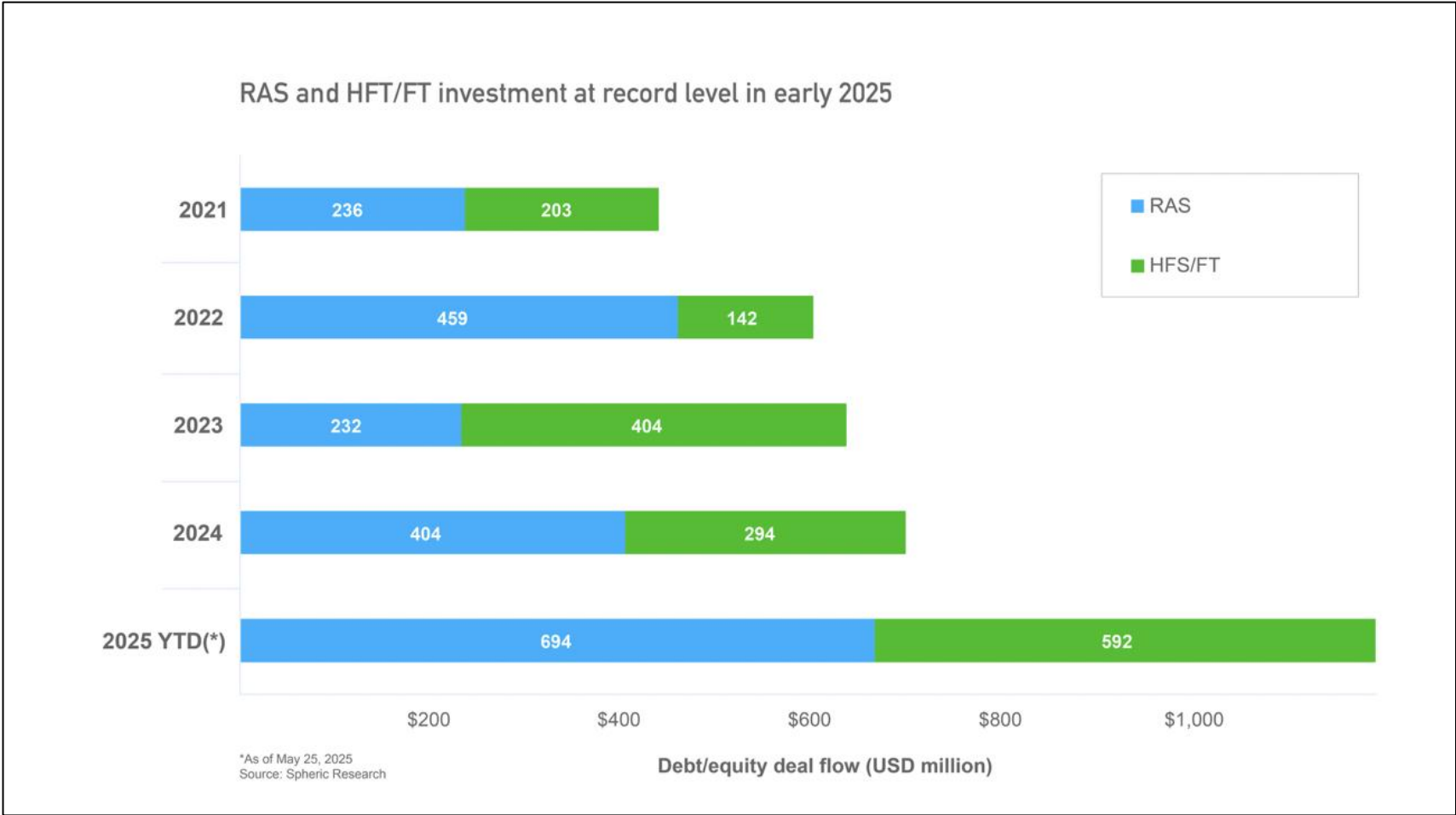
Land-based aquaculture investors ditch salmon megafarms for modular ecosystems

RASTECH 2025: Why small-scale RAS is gaining ground in a post-hype market

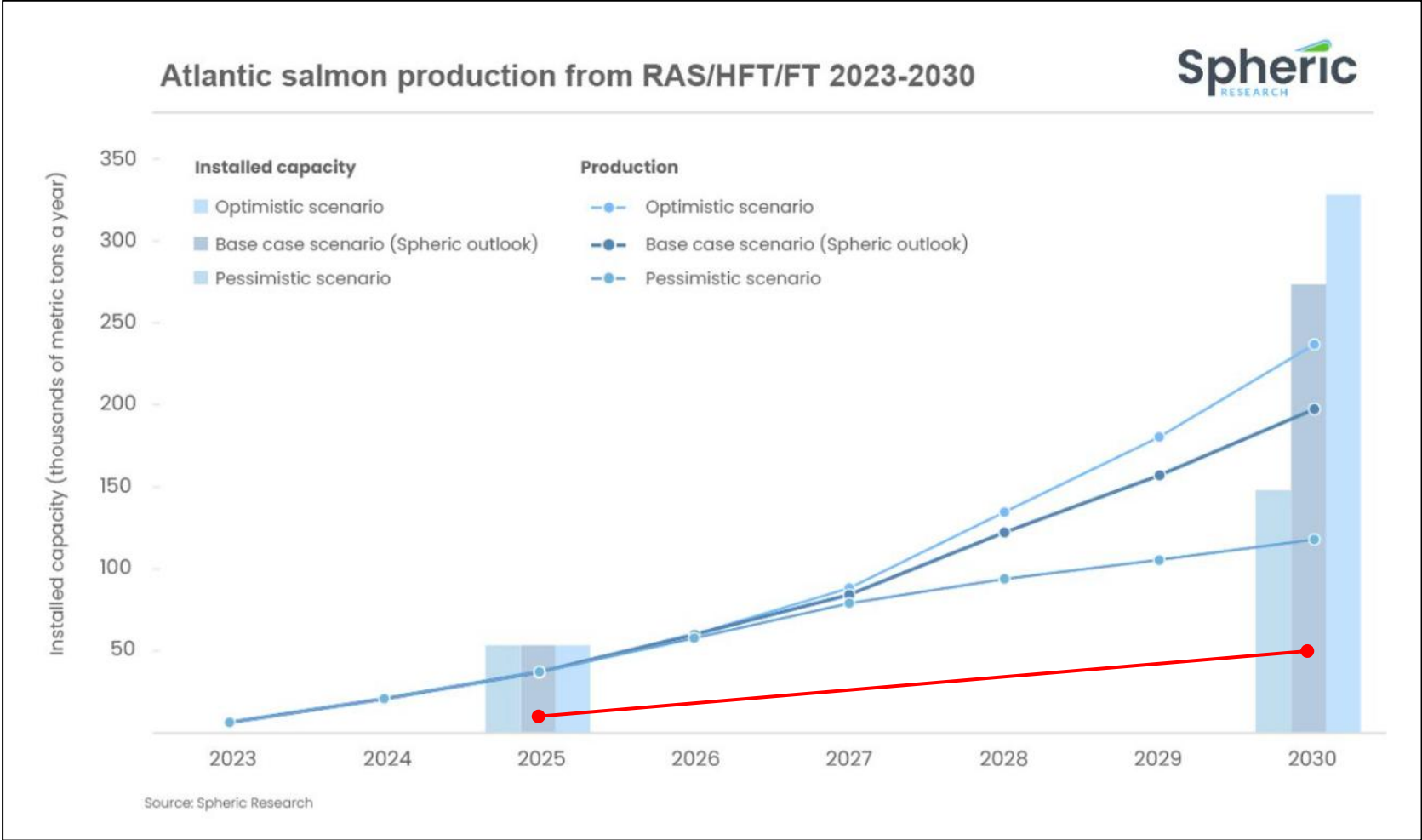
Nestle-backed \$200m fund nixes massive RAS builds, bets on small-scale, distributed facilities

"We're not talking about giga-projects of 30,000-50,000 metric tons and above, but a scale that delivers a competitive IRR (internal rate of return) for investors. If we look to Europe and Asia, there seems to be a clear focus on 8,000-12,000 metric tons, which is also aligned with our approach," Marianne Naess, CEO of Great Northern Salmon (formerly Katahdin Salmon), told *Undercurrent* on the sidelines of the RAS Tech conference.

Record level investments into the land-based aquaculture industry in 2025



How much of this will be in the US?



Possible solutions for the US are partnering along different dimensions

Investments (domain expertise & local knowledge combined)

Companies/projects/JVs

Workforce & knowledge transfer

Industry collaboration & transparency