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. Company innovation strategy in the decades ahead

Part 1
BUILDING BLOCKS OF THE "CHANGE" MODEL

Part 2
THE THREE OPTIONS FOR ZERO CARBON-SIMPLIFIED

Part 3
AN UPDATED SCENARIO FOR GETTING TO ZERO CARBON BY 2050

Part 4
CASE STUDIES FROM PREVIOUS ERAS OF CHANGE

After each webinar participants will be able to download a set of slides and a page bullet point notes of the material covered in the webinar.

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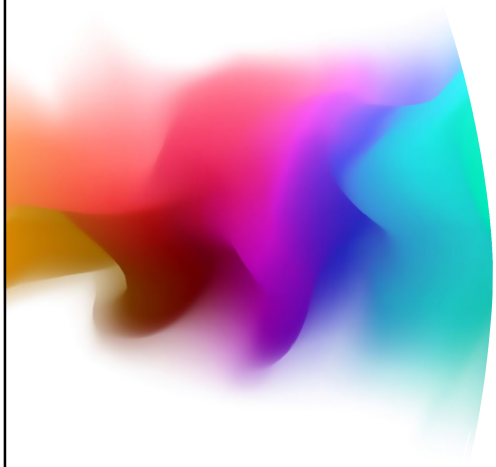

PART 1. BUILDING BLOCKS OF THE "CHANGE" MODEL

- The key issue for companies in all parts of the maritime industry is to understand how the business is changing and what, in practice, change will mean for them

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WEBINAR 4: Shipping company strategies for innovation. 13th July 2023

4.1 THE CHANGE MODEL

- Shipping companies have not needed strategic planning much in the last 40 years. Managing through volatile markets was the challenge.
- Cycles and asset play will continue, but technoeconomic change will take the lead in all THREE key areas, ship investment, operations and logistics.
- So even small shipping companies will need a development strategy.

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4.3 Two sorts of innovation:-

- EVOLUTIONARY: works OK within existing business model.
- DISRUPTIVE : business model must be changed for it to work.

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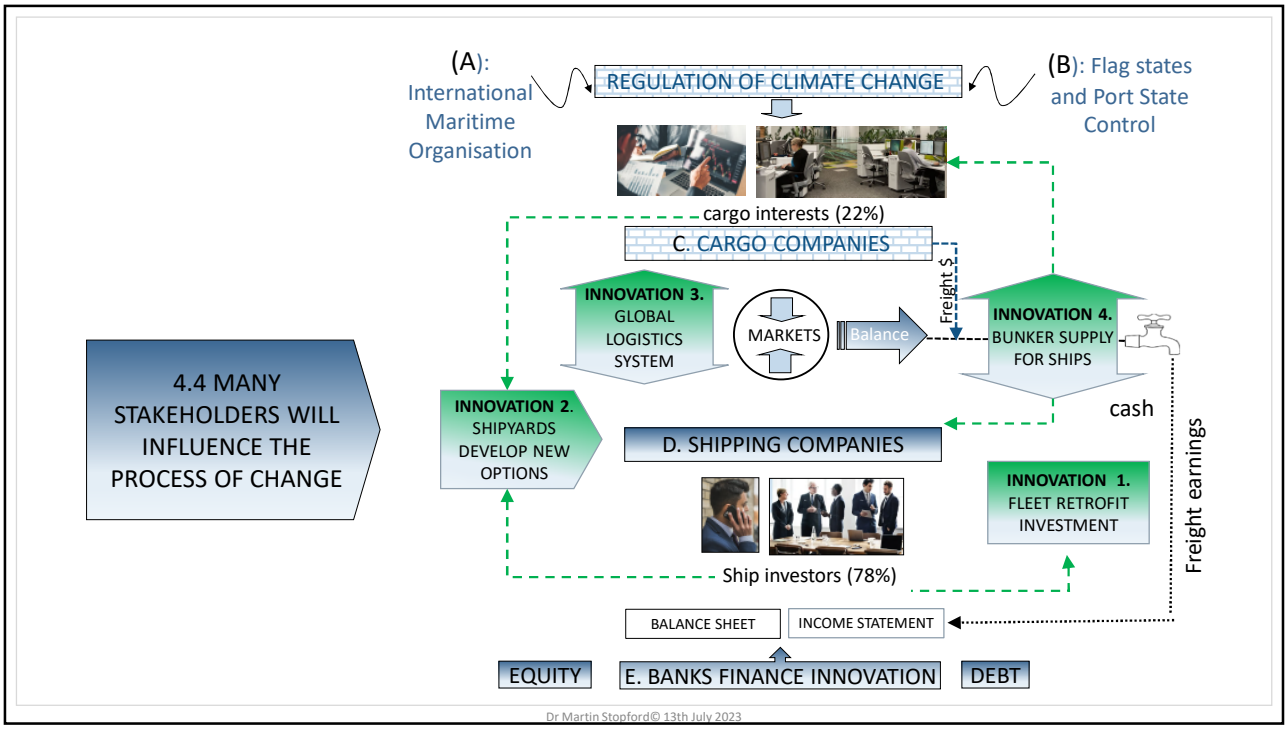

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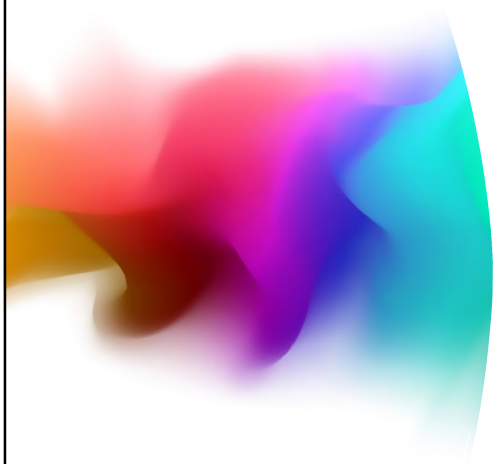

2. THE THREE OPTIONS FOR GREEN ENERGY - SIMPLIFIED

The many permutations for getting to zero carbon are confusing. I am going to focus in three areas: -

1: Green fuels – a step backwards

2: Carbon capture - a useful step sideways

3: Nuclear power – could be a big step forward

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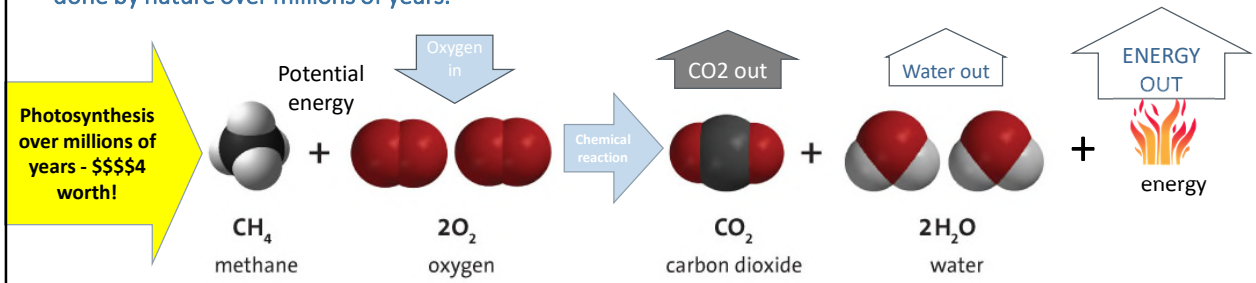
4.5: Hydrocarbons - cheap & powerful source of concentrated energy

Be realistic. No free lunch! Replacing fossil fuels will cost MUCH more because we must pay for the work done by nature over millions of years.



Hydrocarbon …combines with oxygen …..to form carbon dioxide…… water ……and energy (heat)

Note: In the reaction, the bonds in the methane and oxygen come apart, the atoms rearrange and then re-bond to form water and carbon dioxide. The little number written at the lower right after an atom (subscript) tells how many of that atom are in the molecule. The big number written in front of a molecule (coefficient) shows how many of that molecule there are. All the atoms in the products come from the atoms in the reactants.

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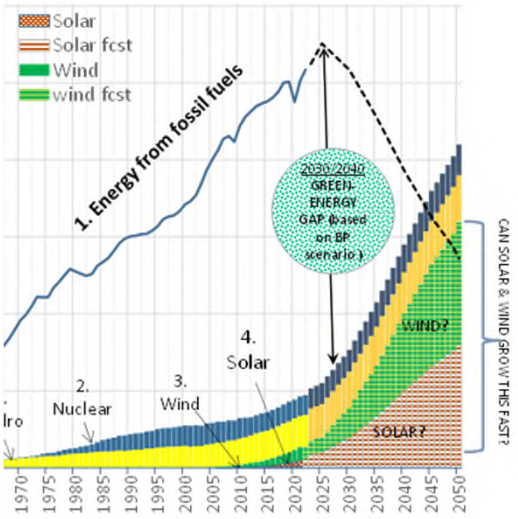
4.6 : Green fuels – a small step backwards

- Green fuels are a relatively easy "evolutionary" option, but their high cost, lower efficiency, and technical disadvantages make them a step backwards.
- Supply will take time to develop (see chart) and so will bunkering.
- Electric cars are already in the queue and have a big appetite. In 2021 gasoline energy was about half world's electricity production!



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4.7: Carbon capture – a useful step sideways

- Relatively "easy" evolution - similar technical challenge to water ballast management?
- Ships using Heavy Fuel Oil (HFO) or LNG, would need to find a home for the CO2, about 3 tonnes for every tonne of fuel oil burned. Maybe discharge dry ice when bunkering?
- Good fit with LNG, which also needs refrigeration.
- Might work best optimised in new designs; or older ships that reduce carbon volumes by slow steaming.

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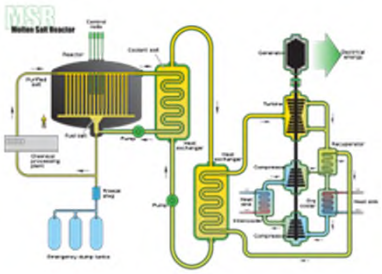
4.8: Nuclear – big step forward or a step too far?



- If it works, serious power would be back on the agenda. But disruptive technology for shipping companies
- Marine units are expected to range from 20 to 70 MW, with an all-up weight of less than 5000 tons.
- Modular nuclear reactor technology is being developed, for example by TerraPower in the United States and Rolls Royce in the UK
- Molten Salt Reactors (MSRs) use salt, heated to 700°C, as the heat exchanger., with nuclear fuel dissolved in the salt.
- Operates at ambient pressure. so if the MSR reactor-casing fractures, there is no pressure. Any liquid salt that seeps solidifies and the rest drains into a tank below the reactor
- Commercial version in the early 2030s.
- Enriched fuel an issue that will be resolved with time.

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3. AN UPDATED ZERO CARBON SCENARIO 2020-2050

I have updated my previous scenarios to focus on the energy sources used by shipping, as technologies develop and shipyard capacity adjusts in the coming decades

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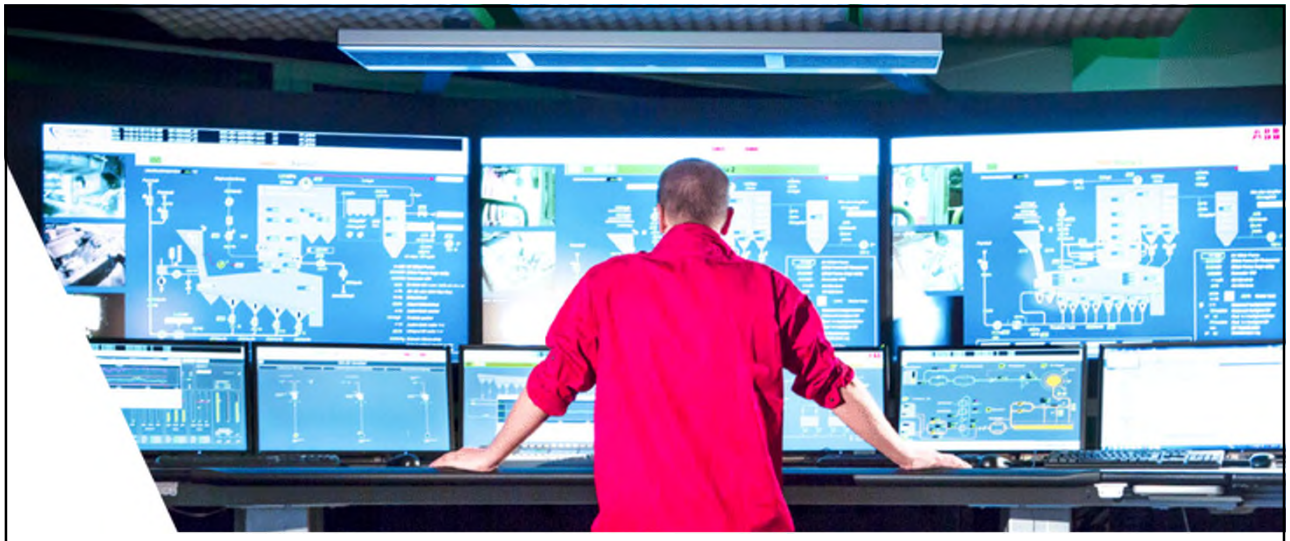

4.9: Information – needed to make it all work

successful company energy strategy will depend on developing information and automation strategies to measure performance and improve decision making (discussed in webinar 3)

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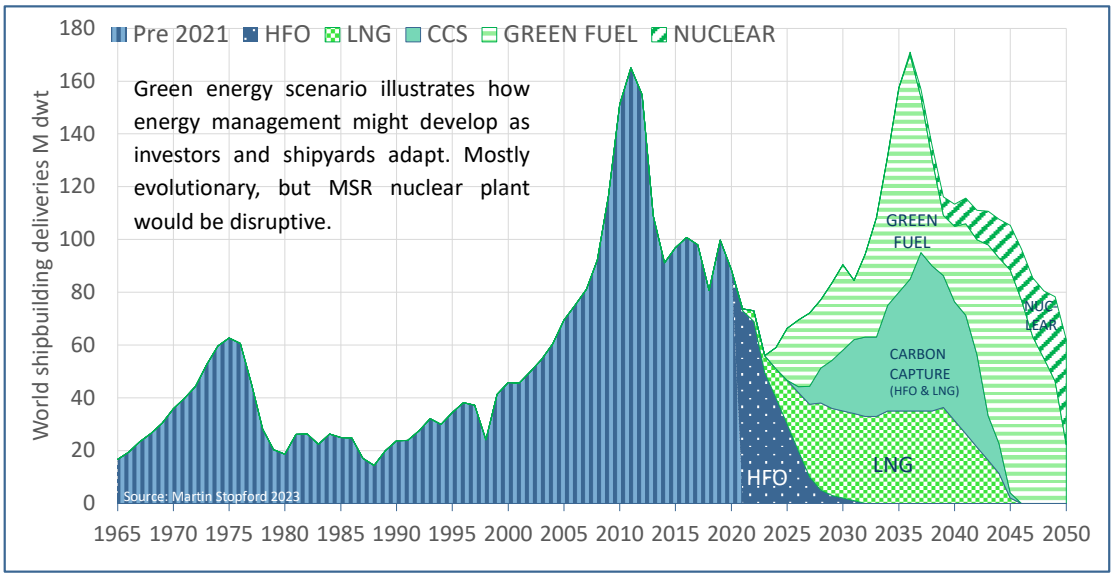
4.10: Maritime energy investment scenario 2020-2050



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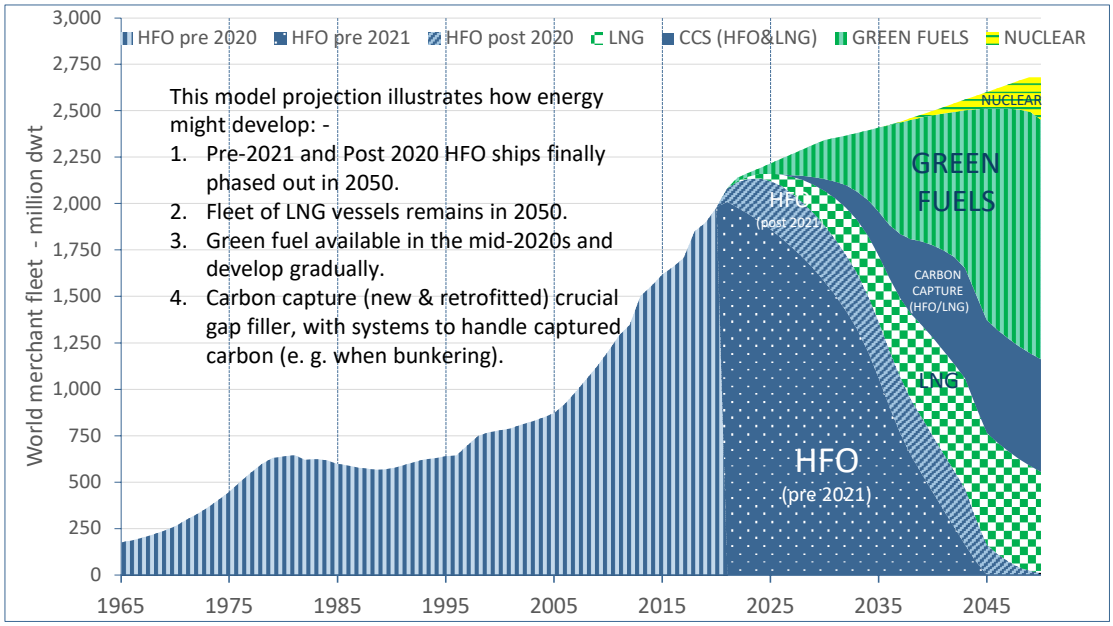
4.11: World Fleet Scenario – a course to zero carbon?



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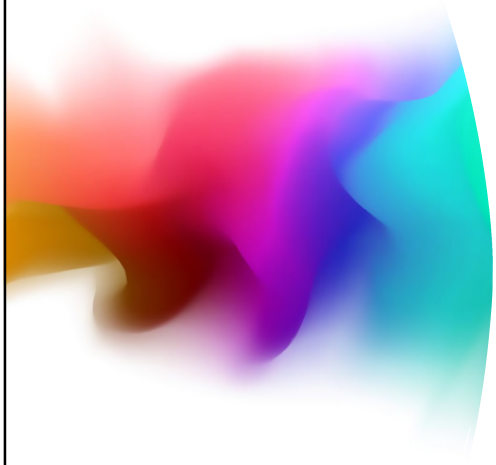

4. INNOVATION CASE STUDIES FROM THE PAST

Since innovation will be managed by people, let's windup the session by remembering a few of the great individuals in the past who changed the maritime industry

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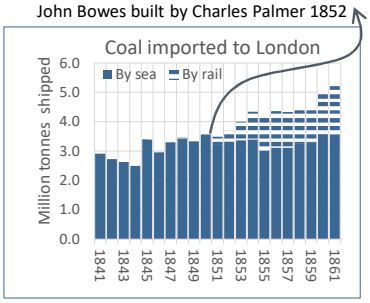
4.12: First modern bulk carrier in 1852 – built to fight off competition from rail freight

John Bowes built by Charles Palmer 1852



- Charles Palmer was a shipbuilder with coal mining interests. The coal trade by sea from Newcastle to London was threatened by the railways. He designed a ship to replace the sailing barques used in the coal trade – innovations included size, speed, propulsion, transmission, cargo handling, ballasting.
- 30th June 1852 JOHN BOWES launched by the General Iron Screw Collier Company.
  1. 437 grt, iron hull, 60 foot long hatch,; 150 ft x 25.7 ft x 15.6 ft.
  2. Single screw, two 35 hp steam engines geared to one shaft; 9 knots (re-engined 1864 and 1883).
  3. Double bottom for water ballast & pumped out by steam – much cheaper than loading solid ballast and paying for it to be dumped.
- Made the round trip between the Tyne and London in 5 days and with 650 tons of coal (two sail colliers would take a month).

Source: The Box & other publications

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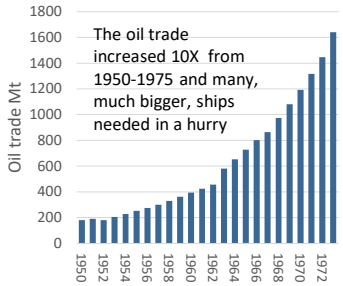
4.13 Owners, charterers, builders & banks manage 1950s bulk revolution

Photo: Laszio Montgomery

Sir Y.K Pao



1. **Sir Y K Pao** was a Lawyer and shrewd businessman, who *used charter back finance* to help Japan build the fleet of supertankers they needed to provide oil for its miracle growth economy from 1956 to 1973.
2. Dr Helmut Sohmen, recalls that in contractual negotiations he was often first to spot complex legal issues.
3. 1953 Pau's company *New Pacific Development* moved to Hongkong and In 1954 purchased its first vessel, a 28 year old coal carrier, renamed Golden Alpha, for £160,000.
4. The Japanese government was encouraging the "zaibatsu" – their large industrial and financial conglomerates, to renovate old shipyards and build new ones. Ship exports got export credits and financial guarantees, so foreign owners could offer cheaper timecharter rates than local companies who also had Japanese crew.
5. YK Pao's built trust and developed long term relationships, persuading the Japanese charterers to enter into timecharter contracts before the vessels had been built.
6. In 1961 YK Pao ordered his first new in Japan's Hakodate Shipyard. The vessel, the Eastern Sakura was delivered in December 1962, the first of many vessels ordered from Japanese shipyards.

Source: various publications

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4.14: Container revolution kick started by an entrepreneur

McLean - **hands-on** entrepreneur

1. Malcolm McLean made it work. Starting with a few old tankers, and substantial capital he believed the liner business needed a complete change in ships, organisation and cargo systems.
2. It took over 12 years and a staggering amount of work to develop the first transatlantic service: -
3. Built a new organisation, hiring top technical people to design & test containers, cranes, ships, cell guides all needed innovation.
4. Developed staff departments to sell cargo, to monitor fleet performance.
5. Endlessly calculated, quantified and monitored total cost savings by containers.
6. Supervised all detail for first 12 years, constantly "walking around" to check what was going on.
7. Persuaded regulators (initially ABS and the coast guard) and the unions that containers were safe.
8. Raised capital and managed the competition.
9. Stuck with it for 12 years until his first N Atlantic container ships went into service in 1966.

Source: The Box & other publications

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4.15 Complex global roll-out of container services by liner companies.

Year	£ per dwt	Actual value 1870=100	Value in 1870 terms
1870	0.03	100	100
1910	0.05	1,662	208
1930	0.09	300	280
1940	0.17	566	468
1950	0.52	1,733	737
1960	0.73	2,433	647
1970	3.33	11,100	1989
1975	8.03	26,777	1598

Source: "Costs of Operating British General Cargo Ships, 1870-1970" P.M.Alderton

Swayne – a lifetime in liner trades

1. In 1962 many of the larger liner companies, faced with steeply rising shipbuilding and labour costs, have been studying unitisation: P & O, Ocean and British and Commonwealth in particular.
2. They watched the operations of Sea-Land, and had to do something. Fleets were older, labour costs had risen, the equipment and systems needed for container shipping were available, and Maclean had proved in the US coastal trade that the system worked.
3. P&O, Ocean and British and Commonwealth, had all concluded in May 1965 that they should must examine the feasibility of specialised tonnage for the carriage of containers or unit loads.
4. They concluded that, since the new system would be capital intensive, a large volume of traffic would be required to work it efficiently, which would undermine the rest of their business.
5. In June 1965 at they decided to undertake a joint feasibility study; and to invite British and Commonwealth to join us.
6. By April 1966 the four companies had decided to design and order containerships for the Australian trade, and to develop OCL into a new company standing on its own feet to operate containers.

Source: Creating Global Opportunities, by Chris Jephson (2014)

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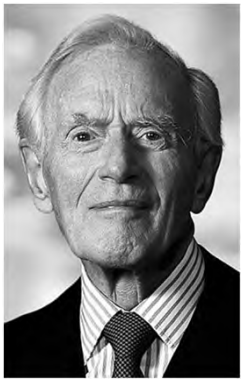
4.16 Entry into container market based on strategic planning

Starting as a small liner player, Mr Moller meticulously researched the business, developed a strategic plan, supported by all members of the leadership team, and entered the business, 10 years later with powerful new organisation, ….



Moller – gifted strategic thinker

1. The container race started in mid 1960s when Sea-Land and OCL the new consortium launched their first purpose-built services. Maersk had a fleet of about 40 general cargo ships and their main business was tankers.
2. The group focused on strategic planning. In 1967 Mr Moeller commissioned a consultancy report on containerisation and decided they were not ready. He introduced a divisional organisation, separating Tankers, Maersk Line, Bulk and Supply Services. McKinsey were closely involved.
3. By February 1973, the **leadership group** agreed to "move Maersk line into containerisation, to take on competition and to do so with unprecedented tools"..
4. Their goal -"to develop a large-scale door-to-door full container service that will replace the present services operated between the United States, Canada and the Far East".
5. Over the next two years they developed carefully researched systems dealing with marketing, terminals (all visited), communications technology, training, including sales, ops and admin. "We carefully rethought traffic operations, and a new sales organisation."
6. The first terminal in New Jersey was opened in September 1975, ten years after the competition.
7. By 1980 they were fourth largest with capacity of 3500 TEU. Ahead of them were OCL, Hapag Lloyd, and Sea-Land. By 2000 they were number 1.

Source: Creating Global Opportunities, by Chris Jephson (2014)

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4.17 CONCLUSIONS

1. However smart we are with technology, the cost of carrying cargo, which may reach 15 billion tonnes by 2050, will cost much more than it did with fossil fuels.
2. Heavy fuel oil (HFO) will be phased out in favour of greener fuels and nuclear power - carbon capture will be be a valuable "balancing item", to narrow the green energy gap, made viable by the high cost of green fuels and their limited supply.
3. Nuclear maybe a promising option, with plenty of time to get used to the idea and prepare. Companies seriously interested would need to start building their organisation and systems sooner rather than later.
4. Not a bad scenario. For shipping mainly an evolution, but with far more difficult choices than in the past.
5. Leaving aside nuclear energy, not too disruptive, using an upgraded version of the existing business model.
6. So shipping companies must figure out what will work in their sector and how to add value surfing the Tsunami .

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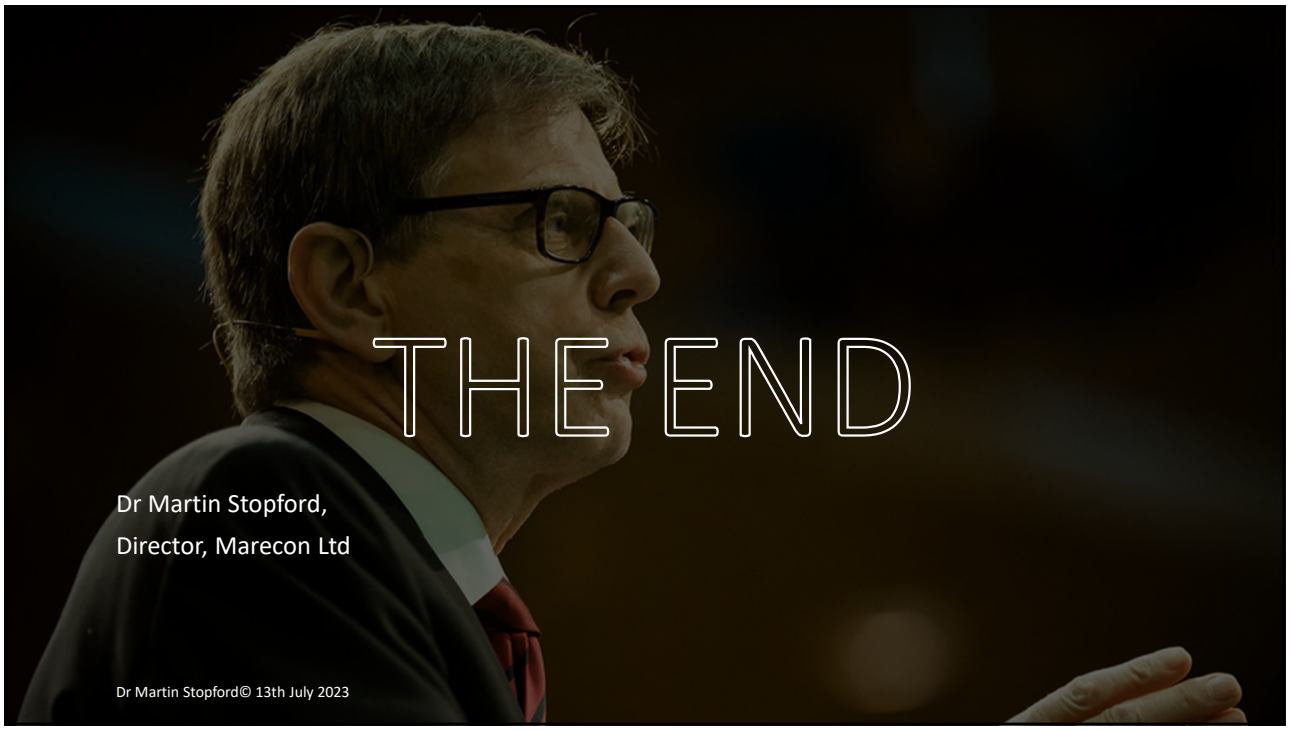
THE END
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MMI Webinar 4: Shipping company strategies for innovation

WELCOME: In the previous three webinars we discussed why decarbonisation means energy, including fossil fuels, will be more expensive; why investment will develop in waves; why a "one size fits all" strategy will not work; and why cargo owners, the major stakeholders, will develop a different transport strategy.

INTRODUCTION: in the past 30 year shipping companies did not need strategic planning, but now they do. Even small companies will need to think about strategy. What would this mean in practice? Will a different business model be needed, to deal with changing cost structures and technical obsolescence? Or can new systems be evolved one step at a time?

Slide 4.1 Agenda: we start with building blocks of the change model in Part 1; the three options for green energy in Part 2; an updated scenario for getting to zero carbon by 2050 in Part 3; and, to put some flesh on the bones, case studies to remind us that change depends on people as well as technology and regulations.

PART 1: BUILDING BLOCKS OF THE "CHANGE" MODEL.

The key issue for companies in all parts of the maritime industry is to understand how the business is changing and what, in practice, change will mean for them.

Slide 4.2: The change model: The new era of innovation calls for a different business model, as rapid change results in NEW cost structures; NEW viable energy technology; NEW practical information technology; and NEW waves of technical obsolescence.

Slide 4. 3: Two types of innovation: *evolutionary* change work OK within existing business model but *disruptive* change means the business model must be changed for it to work.

Slide 4.4: Many stakeholders will influence the process of change: the model in this slide shows FOUR key areas of change and at least six stakeholders. Companies in each market will have to develop the resources they will need when the time comes.

PART 2: THE THREE OPTIONS FOR ZERO CARBON SIMPLIFIED:

With so many permutations of technology for getting to zero carbon it quickly becomes confusing. We need to focus on the really important issues.

Slide 4.5 Hydrocarbons – a cheap & powerful source of concentrated energy: Be realistic! There's no free lunch. Replacing fossil fuels will cost much more because we have to pay for the work done for free by nature over millions of years. It's a matter of choosing the best of a not very attractive bunch!

Slide 4.6: Green fuels – a small step backwards: Green fuels which can be used in modified slow speed diesels are an "evolutionary" option, which is good. But their high cost, lower efficiency, and technical disadvantages make them a NET step backwards. Maritime bunker supply likely to take years to develop (chicken and egg syndrome).

Slide 4.7: Carbon capture – a useful step sideways: this is another evolutionary scenario - similar technical challenge to water ballast management? The ships adopting CCS would

need to find a home for the CO2 (c. 3 tonnes/ tonne of fuel). Maybe handle dry ice while bunkering and sell it to local green methanol plant (i.e. the CCS ship takes the carbon out and the methanol ship puts it back, then the CCS takes it out again etc). Good fit with LNG (which also needs refrigeration); new ships (purpose built); and older ships (slow steaming combination).

Slide 4.8: Nuclear– big step forward or a step too far?: If nuclear works, serious power would be back on the agenda. But for existing shipping companies I would be disruptive technology.

PART 3 AN UPDATED ZERO CARBON SCENARIO 2020-2050

I updated my previous scenarios to focus on the energy sources used by shipping, as technology develops and shipyard capacity adjusts in the coming decades

Slide 4.9: Information – needed to make it all work: successful company energy strategy will depend on developing information and automation strategies to measure performance and improve decision making (discussed in webinar 3)

Slide 4.10: Maritime energy investment scenario 2020-2050: Green energy scenario illustrates how energy management might develop as investors and shipyards adapt. Mostly evolutionary, but MSR nuclear plant would be disruptive. Lots of heroic assumptions!

Slide 4.11: World Fleet Scenario – charting a course to zero carbon?: This model projection illustrates how things might develop: -

1. Pre-2021 and Post 2020 HFO ships finally phased out in 2050.
2. Fleet of LNG vessels remains in 2050.
3. Limited green fuel available in the mid-2020s and supply develops gradually.
4. Carbon capture (new & retrofitted) was used as a gap filler, with systems to handle captured carbon (e. g. when bunkering).

PART 4. INNOVATION CASE STUDIES FROM THE PAST

Since innovation will be managed by people, let's wind up the session by remembering a few of the great individuals in the past who changed the maritime industry.

Slide 4.12: First modern bulk carrier in 1852 – built to fight off competition from rail freight: Charles Palmer, a shipbuilder with coal mining interests designed a more efficient ship to replace the sailing barques used in the coal trade – his innovations were truly revolutionary and included size, speed, propulsion, transmission, cargo handling and ballast management. The ship was twelve times as productive as a sailing collier.

Slide 4.13 1950s bulk revolution managed by owners, charterers, builders & banks manage: Sir Y K Pao, a lawyer and shrewd businessman, used charter back finance to help Japan build the supertankers needed to provide oil for its "miracle growth" economy from 1956 to 1973. His great skill was to engage with all stakeholders and Timecharter ships before they were built.

Slide 4.14: Container revolution kick started by an entrepreneur: Malcolm Maclean made it work. Starting with a few old tankers, and capital, he believed the liner business

must change its ships, organisation and cargo systems. It took him 12 years to do it and a staggering amount of work to develop the first transatlantic service which proved the concept and provided a business model for others to follow.

Slide 4.15: Complex global roll-out of container services by liner companies: liner companies watched Maclean's Sea-Land as he proved in the US coastal trade that the system worked. Their labour costs were rising, and the capital intensive new system required a high traffic volume to work it efficiently, undermining the rest of their business. In 1966 four UK companies decided to order containerships for the Australian trade, and developed OCL, a new company.

Slide 4.16: Entry into container market based on strategic planning: Starting as a small liner player, in the mid 1960s Mr Möller meticulously researched the container business; developed a strategic plan; gained the support of all members of the company's leadership team;, and entered the business, 10 years later, with a powerful new organisation that became number 1.

Slide 4.17: Conclusions: time to think seriously about planning the business: - however smart we are with technology, the cost of carrying cargo, which may reach 15 billion tonnes by 2050, will be much more expensive than it was with fossil fuels.

As heavy fuel oil (HFO) is phased out in favour of LNG; green fuels and nuclear power, the carbon capture could become a valuable "balancing item" to narrow the green energy gap, made viable by the high cost of green fuels and their limited supply.

Nuclear could prove a really good option, with plenty of time to get used to the idea and prepare. But companies seriously interested would need to start building their organisation and systems soon.

So not a bad scenario. For shipping zero carbon will be expensive, so the market will force the many difficult decisions. But with the possible exception of nuclear energy, not too disruptive. Companies might develop upgraded versions of their existing business model. In short an interesting and hopefully rewarding 30 years ahead.

1,297 words
Martin Stopford
13th July 2023

