BETTER ORKNEY AND SHETLAND CONNECTIONS

A response to the Scottish Government's Islands Connectivity Plan

By

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BETTER ORKNEY AND SHETLAND FERRY CONNECTIONS

This is the second submission from Pedersen Consulting in response to Transport Scotland's draft public consultation on its Islands Connectivity Plan (ICP). It considers options as to how Orkney and Shetland's external and internal maritime connections can be developed in a more cost-effective manner to foster the social and economic development of these archipelagos.

While the communities on Orkney and Shetland have been spared the damaging ferry disruption and chaos experienced by the inhabitants of the Hebrides and Clyde islands there are a number of concerns, such as high operating costs, capacity constraints and ageing fleets that can test both the substantial call on central government funds to support and develop these services and disrupt the smooth running of islanders' lives.

This paper seeks to highlight the key issues and to outline options that are perhaps more radical and beneficial than those that may be thought of by officials in the Central Belt who for the most part have little concept of the realities of island life. The aim, therefore, is to maximise the well-being of the island communities while containing public expenditure within reasonable limits.

Roy Pedersen
Inverness
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BACKGROUND

The current external ferry connection serving Orkney and Shetland reflect in truncated form the network of shipping services developed in the 19th century by the North of Scotland Orkney and Shetland Steam Navigation Company, known colloquially as the “North Boat” or the “Sooth Boat”, depending on viewpoint. In former times the company’s scheduled steamship services emanated from Leith and Aberdeen to serve ports in Caithness, Orkney and Shetland. Nowadays, Aberdeen to Kirkwall and Lerwick, and Aberdeen to Lerwick direct remain as RoPax (roll on roll off vehicular and passenger ferry) services with nightly passages operated by Serco NorthLink under contract to the Scottish Government.

The old North Co. also operated two “local” services. These were:

- A daily (except Sundays) service across the Pentland Firth between Stromness, Scapa (for Kirkwall), St Margaret’s Hope (by tender) and Scrabster (Caithness). This passage is now operated by Serco NorthLink as a RoPax service, normally twice or thrice daily, but no longer with Scapa and Hope calls.
- Lerwick to Shetland’s North Isles and also formerly Shetalnd’s North Mainland, since last half century, superseded by Shetland Islands Council’s (SIC’s) frequent inter-island ferries.

Orkney’s North and South Isles were historically served by a number of private operators and are now served by a fleet of vehicle ferries run by Orkney Islands Council (OIC).

All of the above ferry services are subsidised from public funds; in the case of NortLink by the Scottish Government and in the case of the inter-island ferries, by SIC and OIC respectively.

In the course of the 21st century, the locally owned private company Pentland Ferries commenced operations on the Pentland Firth with a wholly unsubsidised RoPax service on the shorter crossing between St Margaret’s Hope and Gills Bay (Caithness). For some years now the service has been operated by medium speed catamarans.

With the exception of Pentland Ferries, the fleets of the other operators are nearing or past the age at which they should be replaced with more modern tonnage. While this raises the problem of how to finance such substantial fleet renewal, it also presents an opportunity to address a number of adverse issues that are a cause for concern and to consider how future provision may be arranged differently.

ISSUES

There is a commendable tradition of self-reliance extant among Orcadians and Shetlanders. Nevertheless, no modern economy can flourish without efficient communication with the outside world. To a considerable extent, in the circumstances under review, that means ferries for the import of necessities, the export of island products and of course the conveyance of people.

As regards passenger transport, it is important to note that, a relatively small proportion of passenger traffic between Orkney and the Scottish mainland is by air although air services are important for inter-island travel. For Shetland, on the other hand, the proportion of air passenger traffic with the more distant Scottish mainland is higher. This fact, neatly illustrates the point that vehicle ferries in general are neither a very efficient, nor speedy, means of moving people over longer distances.

NorthLink

NorthLink was originally created in 2000, as a partnership between state owned Caledonian MacBrayne (CalMac) and the Royal Bank of Scotland (RBS), to bid for and win the five-year contract for the services relinquished P&O Ferries (successors to the North Co.). Three new ships were built in Finland to CalMac's specification 125 metre, 600 pax, 149 car capacity, 24 knot twins *Hjaltland* and *Hrossay* to operate alternately on a rescheduled Aberdeen-Kirkwall-Lerwick route and Aberdeen-Lerwick direct. A third ship, 110 metre, 20 knot *Hamnavoe* which was destined to run between Stromness and Scrabster. The cost of ships and terminals was a considerable £140 million (equivalent to £300 million at current values), the ships being funded by the RBS and leased to the new company. The new service commenced in the autumn of 2002 with an agreed annual subsidy of £10.8 million, reducing to £7.8 million by the fifth year, equivalent to £16.6 million at the current value of the pound, which seemed at the time to be good value.

The high quality of the ships' appointments was much admired, but they had voracious fuel consumption and emissions, RBS leasing charges for the overpriced ships were high and traffic levels fell well below those anticipated. The company was quickly heading for insolvency and had to be bailed out by substantial additional government subventions. Not for the first (or last) time, had CalMac and Scottish officials totally misjudged their ship specifications and business plan.

The contract was retendered in 2006 and after eliminating a number of contenders on financial grounds, a re-formed NorthLink Ferries, now wholly owned by CalMac won it with an annual subsidy this time of £31 million (£60 million at current values). One of the reasons for NorthLink's poor financial performance was the very high installed power and the limited vehicle carrying capacity of *Hjaltland*/*Hrossay* being just 450 metres on a single freight deck. This compared badly with other multiple-deck vessels of similar power, crewing and passenger capacity, but up to four times the freight payload. To make good the freight capacity deficit, *Hjaltland* and *Hrossay* are supplemented by two freight vessels, *Helliar*, with

1,055 lane metres of trailer space, giving capacity of up to 63 trailers, and *Hildisay* with 1,057 metres lane capacity and provision for 12 passengers.

The current annual subsidy to NortLink, now operated by Serco, is £77 million, carryings in 2021 being 230,000 pax and 63,000 vehicles.

Pentland Ferries

In comparison with the above NorthLink inefficiencies, in 2001, after constructing terminals at Gills Bay (Caithness) and St Margaret's Hope (South Ronaldsay), Andrew Banks, owner of Pentland Ferries, commenced his profitable thrice daily return vehicle ferry service initially with second hand vessels. This was achieved without any public funding and indeed in the face of official obstruction, yet its introduction was a revolution in Orkney's connectivity. For the first time Orcadians could take a car or van to the Scottish mainland for business or pleasure and return the same day and at an affordable price. Likewise, a more convenient and economical freight service was created, such that hauliers switched to the new service.

In 2009 Pentland Ferries introduced the custom-built catamaran *Pentalina* on the route, designed by Messrs Sea Transport Solutions of Queensland, Australia. Patronage soared, such that by 2019, Pentland Ferries, with not a penny of public funding, were carrying the majority of passengers, cars and commercial vehicles across the firth, in the face of heavily subsidised competition from NorthLink's, CalMac specified *Hamnavoe*. The table below compares the characteristics and performance of the two operations.

	Hamnavoe	***Pentalina***
Build Cost	£28m	£7m
Cars	98	78
Passengers	600	350
Crew	28	11
Passage distance ml	28	15
Engine power kW	8,680	3,700
Service speed knots	16	16
Litres fuel per trip	2757	708
CO2 emissions per car space	118	34
Return trips per day (max)	3	4
Vehicle capacity per day (max)	588	624
Annual subsidy	c£10m	Zero

It will be observed that for a quarter of the capital cost and about a third of the fuel/emissions, *Pentalina* provides more vehicular capacity and travel options on the shorter route with less than half the crew and requires no subsidy.

While the benefit of the shorter route is manifest, *Pentalina* , and more recently the larger 98 car *Alfred*, also demonstrate the vastly superior cost effectiveness of a well-designed medium speed catamaran compared with a traditional monohull. Monitoring of service reliability also shows the benefits of *Pentalina's* design with less superstructure, lower less

windy profile, in exhibiting better reliability and sailing more often in adverse weather conditions than high-sided monohull *Hamnavoe*. As confirmed by CalMac Ferries Marine Manager, "Major Vessels (i.e. monohulls) have to contend with considerable windage effects making berthing and unberthing challenging." As a demonstration of this, during January and February storms and gales in 2020, *Hamnavoe* was unable to sail for five full days and for parts of another two days while *Alfred*, with her much lower profile and reduced windage sailed as normal and with much greater operational economy.

With *Pentalina*'s and *Alfred*'s quadruple screws and easily accessed relatively small diesel engines, downtime due to breakdown is reduced as an engine can be changed overnight.

The superiority of the short crossing was further demonstrated by a study carried out in 2011 comparing CO2 emissions for overall journeys by different routes between Edinburgh and Orkney via Aberdeen, Scrabster and Gills Bay.[1] The bar chart below summarises and compares CO2 emissions per passenger, by each combined transport option (kg CO2) between Edinburgh-Orkney.

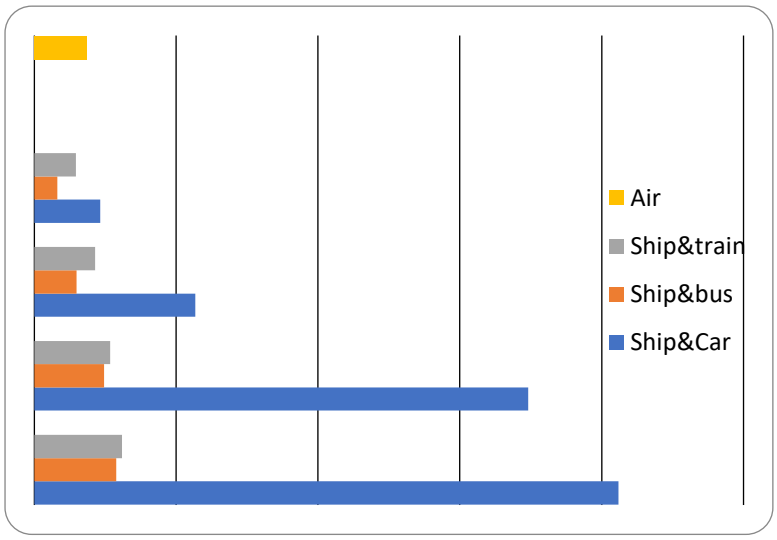
Air Edinburgh-Kirkwall (Passenger only)

Pentalina Edinburgh-Gills-St Margaret's Hope

Hamnavoe Edinburgh-Scrabster-Stromnes

Hjaltland Kirkwall-Aberdeen-Edinburgh

Hjaltland Edinburgh-Aberdeen-Kirkwall



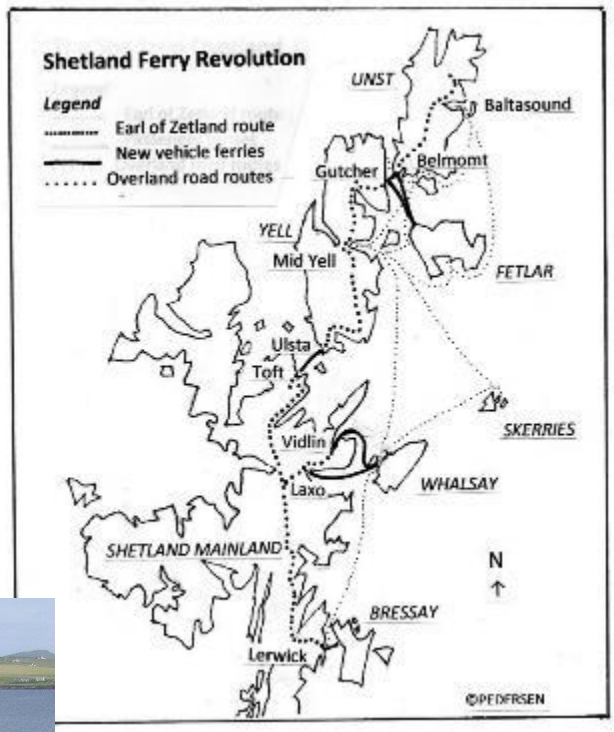
It will be noted that the blue bar in each case represents the Ship & Car value, inclusive of carriage of car on the ship. The comparison reveals that northbound driving Edinburgh-Orkney via Aberdeen, when the ship steams at full power, CO2 emissions are nine times those of driving via Gills Bay thence on *Pentalina* to Orkney. Even for the bus or train foot passenger combination, the Aberdeen route compares badly with the Gills Bay/Pentalina option. Similar outcomes are found when commercial vehicle and ship combinations are compared. It is interesting that for foot passengers, air (shown in yellow) emits less CO2 per passenger than all the Aberdeen ferry route options. The upshot of this study is that selecting the shortest feasible ferry route is both cheaper and more environmentally friendly than any other ferry option.

[1] Orkney sea freight transport emissions study ii: co2 emissions for commercial vehicles, cars & passengers by the Transport Research Institute and Pedersen Consulting, March 2011

Pentland Ferries second and larger 98 car catamaran *Alfred* is currently on charter to CalMac. If the principle of selecting much more cost-effective catamarans on shorter passages were extended to other services, such as Orkney inter-island, considerable sums could be saved while more frequent, cheaper, faster overall journeys could be offered, providing significantly greater capacity to cater for the increased traffic so generated.

Shetland Islands Council Ferries

The story of how the then Zetland County Council defied the then Scottish Office who had offered to finance a side-loading car ferry, for a thrice-weekly multi-port service to the North Isles, was a master class in practicality over dogma. Instead, the local authority proceeded between 1972 and 1975 to create a Norwegian style fleet of simple drive-through (3 crew) ferries operating frequently from early till late to new unmanned "lock-on" terminals, to provide convenient low-cost island-hopping connections with the Shetland Mainland at any time of the day or evening. Within a year of full implementation, passenger traffic had increased nine-fold and vehicular traffic by no less than 434-fold, such was the transformational impact of the Norwegian model. In 2021, total carryings were 333,000 vehicles and 623,700 passengers.



Bressay ferry, MV *Leirna*

The services operated by SIC Ferries are:

- Yell service to between Toft and Ulsta.
- Bluemull service linking the North Isles at Gucher, Yell: Belmont, Unst and Hamars Ness, Fetlar.
- Bressay service to the Isle of Bressay from Lerwick.
- Fair Isle service operated to Grurness or Lerwick.
- Foula service (passenger only) between and Walls operated by BK Marine,
- Out Skerries service operated from Symbister, Whalsay, Vidlin or Lerwickto the

- Papa Stour service (passenger only) operated from West Burrafirth.
- Whalsay service Symbyster from Laxo or Vidlin, depending on weather.

There are 12 ferries in the SIOC fleet, most being ro-ro varying in capacity from 31 cars/144 pax to 9 cars/30 pax and with two lift on/off vessels.

Together with Western Ferries on the Clyde, the Shetland inter-island ferries are models of best practice that have aided the retention of population and contributed to the quality of community life on Shetland's North Isles and Cowal respectively.

Orkney Islands Council Ferries

In 1987, Orkney Islands Council took over the inter-island ferry services, and in 1995 Orkney Islands Shipping Company was renamed Orkney Ferries Ltd. There are now 10 vessels in the fleet serving 13 islands. Annual carryings are over 82,000 vehicles and 320,000 passengers.

Three ro-ro ships *Earl Sigurd*, *Earl Thorfin* and *Varagan*, working to Norwegian style lock-on link spans, serve what is described as the Outer North Isles service on a varied schedule between Kirkwall and Eday, Stronsay, Sanday, Westray and also less frequently Papa Westray and North Ronaldsay. Each of these vessels date from 1998/9

MV *Hoy Head* (built 1994), working to linkspans, serves the South Isles connecting Houghton on the Orkney Mainland to Lyness, Flotta and Longhope.

The small one-car capacity ferry *Graemsay* (1996) serves Graemsay and Hoy (Moness) from Stromness

Three bow loading vessels, *Shapinsay* (1988), *Thorsvoe* (1991)and *Eynhallow* (1987) work to slipways on the Inner Isles of Shapinsay (from Kirkwall) and Rousay, Egilsay and Wyre (from Tingwall).

Small passenger ferry MV *Nordic Sea* (2012) is relief vessel.

The two key issues of concern are that the fleet is elderly and capacity for vehicles and at times passengers, is constrained.

MV *Thorsvoe*

Successes and Challenges Summarised

The undoubted success of the 21st century was Pentland Ferries combination of a short frequent crossing with Australian medium speed catamaran technology. The advance in productivity was a game changer, such that, compared with heavily subsidised competition, much improved connectivity and new traffic was achieved at no cost at all to the taxpayer. Perversely, the Scottish Government and its agencies have been slow to recognise these advantages. Furthermore, Orkney Islands Council have thus far refused to allow Pentland

Ferries access to Burwick, so as to enable an even shorter, more frequent and cheaper crossing with the traffic generational effect and socio-economic impact such a development would enable.

The ground-breaking success from some decades earlier, was the adoption of the Norwegian style simple, minimal crew, frequent short crossing inter-island connections adopted by the local authority in Shetland, the proof being the high level of usage. Nevertheless, again looking to Nordic neighbours – Faeroes and Norway in particular, there is a desire replace these excellent ferries with fixed links and, in particular, tunnels. Such a development, if implemented, would allow 24/7 island access and virtually unlimited capacity.

The poor productivity of *Hjatland* and *Hrossay*, that is to say the very high cost for the level of service provided, has led to capacity constraints, on the one hand for freight, necessitating supplementary freight ships, and on the other hand for passengers and their cars particularly in summer. Likewise, on the Pentland Firth, *Hamnavoe*, when compared with *Pentalina* or *Alfred*, while lavishly appointed, is vastly more expensive to operate. The fact that *Hamnavoe* seldom runs at capacity, and never approaches her full passenger complement indicates that she represents an over-provision for the service on which she operates.

As indicated above the Orkney Ferries fleet is elderly and in view of current capacity constraints, is in need both of replacement and capacity increase. In examining the overall requirement, the option of fixed links should be considered.

SOLUTIONS

In setting out a best scenario for future Orkney and Shetland connectivity, it will be prudent to avoid the mistakes of the past and build on what works best. In so doing, it will be important to be mindful of maximising value for money in all circumstances, but especially where taxpayer funds come into play.

It is also useful to draw on the Islands (Scotland) Act of 2018, whereby after consultation, the main "improving outcomes" sought for island communities were:

> Increasing population levels,
> Improving and promoting—
> (i) sustainable economic development,
> (ii) environmental wellbeing,
> (iii) health and wellbeing, and
> (iv) community empowerment,
> Improving transport services,
> Improving digital connectivity,
> Reducing fuel poverty,
> Ensuring effective management of the Scottish Crown Estate
> Enhancing biosecurity

Of all the above outcome "sustainable economic development" is the one from which most if not all of the other outcomes flow. Solutions that rely on subsidy levels, that are greater than the benefits that may accrue from them, are by definition unsustainable, especially so where more cost-effective options are available. This paper seeks to explore the best balance between public subvention and economic sustainability.

The analysis which follows relates to ferry operations and does not include cruise ships, shipping of bulk cargoes, hydrocarbons, or servicing the oil and gas industry. In achieving the best future connectivities for the Northern Isles and bearing in mind the above "improving outcomes", a number of issues need to be addressed.

- How to maximise the frequency and traffic generation advantage of short crossing and catamaran technology on the Pentland Firth?
- In view of the limitations of the Upper Dock terminal in Aberdeen, what better alternatives are available?
- Assuming a more capacious terminal facility can be selected and developed, what type of more efficient ship specifications might be appropriate?
- How best to provide and arrange acceptable capacity on Orkney and Shetland services in the most convenient and cost-effective manner?
- How best and most economically to replace the ageing fleet of the inter-island services and re-arrange provision while providing greater capacity and convenience, including exploring the opportunity for creating fixed links.

Orkney External Access – Pentland Firth

The economic and social advantages of shortest feasible crossing, coupled with simple minimal-crew ships as a means of increasing capacity, carryings and revenue while reducing unit cost to operator and user are proven. As regards enhancing Orkney access by ferry, the most obvious way of exploiting this philosophy is to seek the shortest practicable crossing of the Pentland Firth by developing Burwick as the nearest Orkney landfall to Caithness on the Scottish Mainland.

The Caithness port offering the shortest connection with Burwick at 7 statute miles is John O'Groats, as utilised by the erstwhile John O'Groats seasonal passenger ferry. The harbour at John O'Groats, however, is restricted in size and is in an exposed position, while the nearby more sheltered port of Gills Bay is already developed as an efficient working ro-ro facility, albeit involving a somewhat longer 10 mile passage. There may be a debate to be had weighing up the pros and cons of the two ports:

- John O'Groats shorter passage, more exposed port, high cost of adaption to ro-ro
- Gills Bay longer passage, more sheltered port, no development costs

In the medium term at least, the potentially greater reliability and lower capital cost of Gills Bay option is in its favour, especially as Gills Bay is better placed for passage to St Margaret's Hope (using Stroma and Swona as shelter) as an alternative relief port in the event that Burwick were untenable in adverse weather.

That being the case, by drawing on the experience of Pentland Ferries, two drive-through 75 metre, 13 crew, catamarans of around 95 cars, 450 pax capacity and about 4 mW power, could provide an hourly clock-face schedule from 06:00 until say 22:00 in summer – providing up to 16 return crossings daily. A single vessel would provide a two hourly rotation in winter. The summer capacity offered, thereby, would be 3,000 car equivalents per day in summer, that is to say two and a half times that of the combined daily capacities of *Hamnavoe* and *Pentalina*. The winter capacity of the proposed single vessel short sea arrangement would still be 25% greater than the current combined *summer* capacity of both vessels. Such an arrangement would be about as close to a fixed road link to and from Orkney, as an actual fixed link, which see later under "Fixed Links".

One of the features of reducing passage time and increased frequency is significant growth in patronage and, therefore, revenue. Applying the frequency of demand elasticities revealed by the study, the Future Transport Provision in the Western Isles[2], an uplift of some 50% of the current combined passenger and car carryings of *Hamnavoe* and *Pentalina* may be anticipated, with a further increase if a Shetland – Orkney daylight service were to be created, which see later under "Shetland Daylight". In either event, if fares were around

[2] Future Transport Provision in the Western Isles, January 2003, by TRI Maritime Research Group, Napier University Business School and Pedersen Consulting

current levels or somewhat less, the short crossing should be financially self-sustaining, although subsidised passage for local residents would be a matter for consideration, which see later under “Fares and Charges”.

The quality of connection that an hourly, high capacity, 35 minute crossing would render the Stromness – Scrabster service redundant saving the public authorities an estimated £10 million annually.

Aberdeen Connections

Since Leith sailings ceased following the introduction of ro-ro, Aberdeen has been the traditional Scottish mainland port catering for a significant proportion of Orkney’s road freight carryings, although, increased capacity and frequency on the Pentland Firth over the last two decades has shifted the balance in that direction. Passenger and car carryings on the Aberdeen – Kirkwall service are minimal, being only about one eighth and one fifteenth respectively compared with those collectively on the Pentland Firth crossings.

On the other hand, almost all of Shetland’s road freight, livestock and the majority of ferry-borne passengers (circa 120,000 pax and 22,000 cars annually pre covid) 190 nautical miles route via Aberdeen. However, about 18,000 pax and 3,000 cars (but effectively no commercial vehicles) route via Kirkwall, the latter connection being highly seasonal.

In considering how the somewhat different Orkney and Shetland “long route” connections might best be reconfigured, to serve the needs of both archipelagos, key issues are now considered.

Alternative Southern Landfalls

The very poor productivity, environmental performance and limited freight capacity of *Hjaltland* and *Hrossay* is partly a function of the limited dimensions of the seaward approach to the Upper Dock terminal in Aberdeen. While this terminal is close to Aberdeen’s railway and bus stations (and to Marks & Spencer), the question is posed: are more cost-effective options are available? The most obvious alternatives would appear to be Aberdeen’s new South Harbour or, more radically, an extension of Peterhead’s Smith and Merchant Quays. Both sites have more than adequate deep water, but in both cases new ro-ro facilities and marshalling areas would require to be developed. Clearly, a rigorous assessment would have to be made of each option, but, broadly, the pros and cons of each are:

Aberdeen South Harbour is 2.5 miles, or about 10 minutes, distant from the railway and bus stations and city centre facilities, although provision of a shuttle bus for foot passengers would present no difficulties. The new port has fairly direct access to A90 trunk road and the south. The new port would also offer a saving of about half an hour in steaming time, by avoiding the slow approach to the upper dock.

Peterhead’s Smith and Merchant Quays are located within the Harbour of Refuge, which is tenable even in storm conditions. Peterhead is 32 miles from Aberdeen, however, either

port acts merely as an inter-modal transfer point for traffic in transit between any location in Orkney or Shetland and any location in the UK or beyond. The selection of Peterhead as Orkney and Shetland landfall would save two hours in steaming time, which would not only result in significant savings in ship operating cost, but as Peterhead is also served by the A90 and less than an hour's drive from Aberdeen, would also result in an hour's less overall journey time from say Edinburgh to Shetland.

Ship Requirements and Specifications

Assuming a more capacious terminal facility can be selected and developed, it is necessary to consider what types of more efficient ship specifications might be appropriate to serve the different requirements of Orkney and Shetland.

It is useful to compare the characteristics of *Hjaltland/Hrossay* with other Ro-Pax vessels of similar or less installed power.

Hjaltland/Hrossay

125m x 20m x 5.4m draft.
Installed power 4 x MAK 6M43 5400 kW each = 21.6 mW.
Max speed 24 knots
600 pax, 117 cabins, 356 berths
140 cars or freight capacity 450 metres on a single freight deck

Manxman

Ro-Pax service Isle of Man – Heysham
Built 2023 at a cost of £79 million by Hyundai Mipo of South Korea and delivered from first steel cutting to arrival at Douglas in under two years.
133m x 25m x 5.8 draft
Installed power 2 x 7,850 kW each = 15.7 mW,
Service speed 19.25 knots on 80% power
949 pax, 140 berths
1,250 lane metres at 4.8 metres height

Stena Lagan
Built 2005 by Cantiere Navale di Visentini Francesco & C., Donada
served on the Ro-Pax route between Belfast and Liverpool (Birkenhead)
186m x 26m x 6.6m draft
Installed power 2 x MAN B&W 9L 48/60B – 10,800 kW each = 21.6 mW,
Max/service speed 24/20-22 kts
720 passengers (in 492 berths)
2,238 lane metres freight plus 85 cars

It will be noted that *Manxman* and *Stena Lagan*, while somewhat different in size and layout, can ship between twice and four times the freight payload and at least as many passengers/cars as *Hjaltland/Hrossay* with no greater installed power. This suggests that a vessel or vessels embodying these broad characteristics (between 1,200 and 2,200 freight lane metres, c700 pax and c500 berths) would serve the needs of Shetland in a much more economic manner than at present.

In short two vessels approximating to the *Manxman* specification, could handle all of Shetland's freight requirements without the need for supplementary freight ships and provide a nightly connection. A single vessel of the Visentini *Stena Lagan* type, of which many very successful examples have been built over the last two decades, could handle all the freight traffic, this being by far the most cost-effective solution, but with the downside of a less frequent schedule. One advantage of the Visentini class of vessel is that it is a common design that, given an arrangement with another operator of such vessels, it should be possible to charter in a replacement vessel at time of overhaul or other contingency, or indeed such an operator may wish to tender for the service and bring their own ship to the trade.

If, in addition, Peterhead, with its all-weather harbour, were adopted as southern mainland landfall, and if, for reasons described below, the current Kirkwall call *en route* were dropped for all Shetland sailings, then the current requirement for 20 plus knots for certain legs of the passage would be unnecessary. In fact, to cover the 160 nautical miles between Lerwick and Peterhead in 12 hours, that is to say between 18:00 to 06:00, a service speed of only 14 knots is required, with a maximum speed of say 17 knots to provide a good sea margin. For a well-designed Ro-Pax ship along the lines illustrated above with 2,250 freight lane metres and c700 pax capacity with c500 berths), 10mW installed power would be adequate, reducing thereby the emissions per unit carried to between a half and a quarter those emitted by *Hjaltland/Hrossay*.

In the case of the Orkney "long route", in view of the very high levels of pubic subvention required for the current *modus operandi*, poor environmental performance and low

passenger/car loadings, the justification for an Aberdeen – Kirkwall passenger/car service is at best questionable, given an improved low-cost high frequency car ferry capacity on the Pentland Firth and regular scheduled air services to Aberdeen and other Scottish cities?

It will be recalled that the former Orcargo vessel *Contender* operated profitably between Orkney and Invergordon until killed off by heavily subsidised NorthLink competition. There is no to reason to prevent a similar freight service either to Aberdeen, Peterhead or for that matter Invergordon from providing Orkney's freight needs, but with the possible provision for accommodating a limited number of passengers and their cars. The International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended, and UK Merchant Shipping legislation allow a cargo ship to carry up to 12 passengers in addition to the crew. NorthLink/CMAL cargo vessel, MV *Hildasay* for example, with 1,057 metres lane capacity, has such provision for carrying 12 passengers.

It may be feasible, if thought necessary, to arrange for such a predominantly cargo vessel to accommodate say 50 passengers. The SOLAS Convention, however, states that a ship carrying more than 12 passengers is by definition a passenger ship, and is subject to enhanced constructional and operational requirements to ensure the safety of the passengers. The challenge would be to ascertain if a suitable and economical predominantly ro-ro cargo vessel of 1,000 plus lane metres, but with provision for circa 50 passengers (with berths) can be acquired or designed for this service.

To cover the periods of annual overhaul for the fleet and exceptional contingencies, such as breakdown, special livestock sailings, etc., it may be expedient to retain a freight vessel of the *Hildasay* class, with provision for 12 passengers, as relief vessel. When not required on such duties this ship should be available for charter if and when the opportunity arises. This class of ship with her small crew is relatively economical to operate, compared with the larger passenger vessels.

Shetland Daylight

One way in which Shetland is disadvantaged, is that for passengers and their cars, the current ferry access to and from Scottish mainland centres involves an overnight passage, which means that travel can be expensive for families when the cost of overnight berths is taken into account or alternately relatively uncomfortable if reclining seats are selected. Demand is also highly seasonal, such that capacity is limited in high season and underutilised in low season.

There is a way in which these disadvantages can be overcome. That is a summer daylight service connecting Grutness adjacent to Sumburgh Airport with Kirkwall. Completing the connection necessitates a 37 km (23 miles) road link to Burwick (assuming Pentland Ferries access thereto) and a ferry connection thence to Gills Bay. It is a six-hour drive between Gills Bay and Edinburgh, such that the overall time between Lerwick and Edinburgh would be some 14 hours – a long day, but feasible bearing in mind opportunities for rest and refreshments on the ferry passages. With a frequent Burwick – Gills Bay ferry connection as

recommended, the sailings connecting with Shetland traffic would be prioritised for those flows, although some travellers may opt to stay over in Orkney *en route*.

Such a development would not only reduce the cost of the ferry crossings, but would enable passenger/car frequency and capacity to be doubled. It is understood that a 120 car vessel of the Torgatten Nord Lofoten Class may become available. If so, such a vessel would be ideal for the Shetland – Orkney crossing, the operating cost would be about one quarter that of the current Aberdeen service. One ship compared with two, less than half the crew, a third of the power requirement and about half the steaming distance. It is suggested that this arrangement be introduced as a summer supplementary service and that it would be particularly attractive with its lower costs to both Shetland families heading south on vacation and tourists traveling to Shetland in both cases at an affordable cost. One practical arrangement would be for Torgattan Nord, with its substantial back-up capacity, to be invited to operate the service with a suitable but not excessive financial inducement. The benefits to Shetland and also Orkney could be significant. A suggested schedule is set out below:

Lerwick Bus	*dep*	08:00
Grutness	*dep*	**09:15**
Kirkwall	*arr*	**14:00**
Bus to Burwick	*arr*	15;00
Burwick	*dep*	**15:30**
Gills Bay	*arr*	**16:00**
Gills Bay	*dep*	**11:30**
Burwick	*arr*	**12:00**
Bus to Kirkwall		**14:00**
Kirkwall	*dep*	**15:15**
Grutness	*arr*	**20:00**
Lerwick Bus	*arr*	21:15

Torgattan Nord Ferry *Landegode*

Orkney Inter-island Services

As alluded to above, with the exception of one recently purchased passenger vessel from Norway, the inter-island RoPax fleet is life-expired and outdated. The service is also capacity constrained especially in terms of vehicles, thereby frustrating demand, reliability and limiting revenue. Replacement is urgently required if the island communities are to enjoy the level of service required to fulfil the ambitions of the Islands Act.

The reliability, economy and environmental credentials of catamarans are now well proven in the Orkney environment following over a decade of operational experience by Pentland Ferries of *Pentalina* and more recently *Alfred* when compared with traditional monohulls.

A recent presentation by Dr Alfred Baird[3] set out a scheme that would most effectively address the Orkney inter-island requirement. He compared the capacity and speed of the

[3] https://www.orkneysnp.scot/campaigns/orkney-ferries-fleet-should-be-replaced/

existing inter-island fleet with replacement proven catamarans of equivalent length, as shown in Table 1 below.

Table 1 – Existing Monohulls and Proposed Catamarans Compared

	35 metre length		**50 metre length**	
	Existing Monohull	*Catamaran*	*Existing Monohull*	*Catamaran*
Beam	10m	17m	11.4m	18m
Draft	1.8m	1.8m	3m	2.2m
Power	0.7 Mw	0.9 Mw	1.6 Mw	1.8 Mw
Speed	10 / 11 knots	12 knots	12 / 14 knots	14 knots
Cars	16	30	28	50
Pax	121	125	142	250

It will be noted that for equivalent length and power. The catamaran enjoys almost twice the vehicle carrying capacity compared with the current monohull vessels.

The effect of replacing the whole existing fleet with catamarans of equivalent length compares in terms of speed and capacity, is shown in Table 2 below.

Table 2 – Existing Monohull Fleet and Proposed Catamaran Fleet Compared

Existing Fleet	***Service***	***Date***	***Length***	***Speed***	***Pax***	***Cars***
Earl Sigurd	Outer North Is	1989	45	12	190	22
Earl Thorfinn	Outer North Is	1989	45	12	190	22
Varagen	Outer North Is	1988	50	14	144	28
Shapinsay	Inner Isles	1988	35	11	91	11
Thorsvoe	Inner Isles	1987	35	11	121	16
Hoy Head	South Isles	1994	53	11	125	22
Monohulls >>	**Totals/Averages**	**31 yrs**		**12**	**861**	**121**
Proposed Fleet	***Service***		***Length***	***Speed***	***Pax***	***Cars***
50m Catamaran	Outer North Is		50	14.5	250	50
50m Catamaran	Outer North Is		50	14.5	250	50
50m Catamaran	Outer North Is		50	14.5	250	50
25m Catamaran	Inner/South Is		35	13	125	30
25m Catamaran	Inner/South Is		35	13	125	30
25m Catamaran	Inner/South Is		35	13	125	30
Catamarans >>	**Totals/Averages**			**14**	**1125**	**240**
	CAPACITY INCREASE	**>>**		**16%**	**30%**	**98%**

Dr Baird demonstrated that the capital cost of replacing the Orkney inter-island fleet (6 vessels) with catamarans was around £60 million as compared with £108 million for monohull replacements which translates as annual capital repayments plus interest at 4% over 25 years of £3.8 million for the catamaran option as compared with £6.9 million for monohulls. Alternatively ship lease over 15 years would come in at monthly payments of

£418k for the catamaran fleet as compared with £798k for the monohull option. Alternative funding sources/options for such a ferry replacement and development plan include: 100% Scottish Government, 100% OIC, joint funding Scottish Government & OIC, combination of grants AND loans, contribution from OIC Oil Wealth Fund, Scottish National Investment Bank, or private operator via tender.

In summary Orkney's outdated ferries need replaced and catamarans offer the best option.

- New ferries will reduce fleet R&M and downtime
- Catamaran price per car space is just 30% of monohull
- Catamarans have 50% less operating cost/car space
- Catamarans have 50% less emissions per car space
- Catamarans can double ferry capacity, at reduced cost
- Funding can be secured by government loans; lease; grants; joint funding
- Doubling of vehicle capacity will raise farebox revenues
- New ships can be built in Scotland (STS proposal)
- Global ferry industry management/expertise critical

Shetland Inter-island Services

The Shetland inter-island ferries are a model of best practice in terms of delivering frequent ferry connections of adequate capacity in a cost-effective manner for the island communities that they serve. The fleet, however, is ageing and where Improvement may be sought is in powering the next generation of vessels in a more environmentally sustainable way, either by battery electric or fuelled by hydrogen.

Alternatively, SIC have for some time been considering replacing ferries by fixed links and in particular tunnels.

Fixed Links

The inspiration for replacing ferry connections with tunnels comes from Norway and the Faeroe Islands where they have become commonplace. To a considerable extent geology determines the ease or otherwise with which tunnels may be driven and therefore, the cost. For comparison the 11.2 km (7 miles) Faroese Eysturoyartunnilin cost £320 million, or about £45 million per mile. The Faroese geology is particularly favourable with a well-positioned layer of soft tuffa, which makes tunnelling relatively easy. In Norway the underlying geology is usually hard granite in which the Norwegians have long developed an efficient rock-picking method. The Norwegian 14.4km (9 mile) Ryfylke twin bore tunnel near Stavanger cost £672 million, or about £40 million per mile per bore.

There are several locations in the Northern isles where tunnels could make a significant impact on connectivity. A tunnel across the Pentland Firth would probably be a little over eight miles and would not only serve Orkney's 22,000 population, but also be a gateway to Shetland's 23,000 inhabitants too. We are not in a position to opine on the geology, but if favourable, and if built by competent engineers, experienced in Scandinavian tunnel boring techniques, the cost

may be estimated at around £500 million – not much more than the final combined cost of *Glen Sannox* and *Glen Rosa*.

There are several other potential inter-island fixed links whereby ferry routes could be shortened and partially or wholly replaced by fixed links.

Tunnels do have running and maintenance costs, but these are less than ferry operations. A toll of say £20 per car (higher for a commercial vehicle, coach, etc.) raising perhaps £4 million annually, would cover such costs and possibly go some way to covering a proportion of the interest costs on capital, depending on traffic volumes.

Fares and Charges

As several of the revised ferry services, or bundles, as outlined in this paper should be capable of operating commercially and without direct subsidy, the adoption of demand management charging is well worth considering. As exemplified in the submission by Pedersen Consulting's A Better Future for Scotland's West Coast Ferries[4], such a scheme is that operated by Red Funnel between Southampton and the Isle of Wight. An October Saturday booking in 2019 for one car plus driver can vary between £25.75 and £48.50 depending on time of travel and whether a saver or flexi ticket. Some aims to be considered in introducing such a scheme in Scotland could be:

- Maximising revenue to reduce subsidy levels, thereby releasing funds for education and health
- Higher fares at times of peak demand especially to enable tourism to contribute to, rather than abstract from the economy
- Higher fares for camper vans and caravans as users are likely to spend less on island facilities
- Surcharging for use of a premium or 1st class on-board lounge on longer routes
- Reduced fares for island residents especially the low paid

If more market orientated fares were to be aimed at tourists, non-island residents and hauliers, it would make sense for reduced fares to be available to all island residents regardless of who the operator might be. This may best be achieved by using the National Entitlement Card (bus pass). It should be possible for such cards to be made available to any person with a permanent island address and for the licence number of any car registered at an island address to an island resident keeper to be added to the keeper of such a car's card. In this way islanders and their cars could secure an agreed discount on ferry charges pertaining to their island or archipelago. Such a card, could also be used for islander air travel discount. If, in time, a full smart travel card system is created Scotland-wide for use on all or most forms of public transport, the above functions could readily be incorporated.

[4] A Better Future for Scotland's West Coast Ferries - a response to the Scottish Government's draft public consultation on its Islands Connectivity Plan, April 2024

CONCLUSION

Replacement of the ageing ferry fleets currently serving the Northern Isles of Orkney and Shetland, presents several opportunities to upgrade the quality of provision of freight, passenger and car ferry services in terms of capacity, frequency, reliability and environmental performance, while reducing or eliminating the level of state subvention. The primary object of such improved transport arrangements should be the sustainable economic development of our island communities. The main opportunities for improvement are:

1. Doubling Pentland Firth capacity by developing a frequent hourly "clock-face" vehicle ferry service between Burwick and Gills Bay with two drive-through 95 car, 450 pax catamarans, reduced to two-hourly with one vessel in winter. This will render the Stromness – Scrabster service obsolete.
2. Replacement of Orkney calls by the Aberdeen – Lerwick service with a dedicated freight ship with limited passenger accommodation.
3. Replacement of the Orkney inter-islands ferries with efficient catamarans.
4. Improving the efficiency of the southern access to Orkney and Shetland and reducing the steaming distance by replacing the limited dimensions of the terminal at Aberdeen Mathew's Quay with a new more capacious terminal at Peterhead.
5. Replacing the inefficient *Hjaltland*, *Hrossay* and the supplementary freight service with either:
    a. Two RoPax ships with at least 1,200 lane metres freight capacity each and 600 pax with 300 berths. A service speed of 15 knots (max 17 knots) giving nightly direct Lerwick sailings of 12 hours duration.
    b. A single Visentini class vessel with at least 2,200 lane metres freight capacity plus 85 cars and 750 pax with 500 berths. Giving thrice weekly direct Lerwick sailings of 12 hours duration. This is the most cost-effective option, but with the disadvantage of a less frequent service.
6. Creation of a daily return summer vehicle ferry services between Grutness (Shetland) and Kirkwall to provide additional capacity and daylight travel between Shetland and the main centres on the Scottish mainland.
7. Consideration of replacing some ferry services with fixed links including tunnels.
8. As several of the above services (bundles) should be capable of operating commercially and without direct subsidy, demand responsive fares strategies should be considered, with discounts for island residents managed through the National Entitlement Card (bus pass).

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