

Extra scenario with three versus four E-ferries for the total ferry service of Aereo

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1 Purpose of extra scenario

The purpose of this extra scenario is to evaluate the expected cost and income difference between operation with four small E-ferries versus operation with three bigger E-ferries investment costs included.

1.1 Methodology

An alternative with three large E-ferries will affect almost every operational and economic parameter of the case study. Therefore calculations in this annex are subject to higher uncertainties than for the three base scenarios made in the main analysis as many assumptions have to be made, e.g. when it comes to energy consumption of the larger ferry size for which no CFD calculations have been prepared.

New building prices are also subject to uncertainties as no indication price exists for the larger ferry design. Estimates are based on roughly made corrections to steel weights and requirements for extra equipment etc.

For changes to energy efficiency and operating cost these issues are discussed in brief analyses describing most important assumptions and impacts in the following chapters.

The same goes for the impacts to transport qualities affecting demand. For example will the total number of departures with three E-ferries only be marginally higher than now wherefore extra demand scenarios must be adjusted down.

Finally the found impacts to both investment cost, operating cost and revenues will be summarised in order to evaluate the overall pros and cons and indicate if there is an economies of scale effect of choosing larger E-ferries for the total ferry service of Aereo at present technological stage.

2 Energy efficiency and capacity

Energy efficiency of a longer vessel is better measured as deadweight to energy needed ratio. Capacity utilisation however will change. The flexibility of tonnage is less with three than with four ferries. Cuts have to be made in the departure plan. In peak season average load factor of only three ferries will become higher but in off season it will be dramatically lower if a sufficient number of departures should be obtained over the working day.

Thus average load factor and energy efficiency ratio is expected to be reduced some in total due to a higher number of "half empty" departures in the total sailing schedule. The energy consumption per trip is estimated to increase around 15 % due to the higher weight of ship and cargo despite a better deadweight to energy needed ratio. This is also caused by an expected increase in frequency of delays due to the higher number of cars per port call that entering and leaving the ferry. Two minutes shorter time for transit will increase energy consumption per trip around 25 %.

The total annual PCU capacity is increased more than for the three base scenarios with four smaller E-ferries but peak capacity will not meet the same standards

Scenario 1 & 2 time-tables

Schedule of principle Scenario 1 & 2

Peak Season (13 weeks) Monday to Friday

Ferry A

Sailing time approx. 50 minutes

Dep. Aeroe	0530	0730	0930	1230	1430	1630	1930
Arr. Fyn	0620	0820	1020	1320	1520	1720	2020
Dep. Fyn	0625	0825	1025	1325	1525	1725	2025
Arr. Aeroe	0715	0915	1115	1415	1615	1815	2115

Short crew watch

Ferry B

Sailing time approx. 50 minutes

Dep. Aeroe	0630	0830	1030	1330	1530	1730	2130
Arr. Fyn	0720	0920	1120	1420	1620	1820	2220
Dep. Fyn	0725	0925	1125	1425	1625	1825	2225
Arr. Aeroe	0815	1015	1215	1515	1715	1915	2315

Ferry C

Sailing time approx. 50 minutes

Dep. Soeby	0600	0800	1000	1300	1500	1700	1900
Arr. Als	0650	0850	1050	1350	1550	1750	1950
Dep. Als	0655	0855	1055	1355	1555	1755	1955
Arr. Soeby	0745	0945	1145	1445	1645	1845	2045

Ferry D

Sailing time approx. 50 minutes

Dep. Soeby	0500	0700	0900	1200	1400	1600	
Arr. Faaborg	0550	0750	0950	1250	1450	1650	
Dep. Als	0555	0755	0955	1255	1455	1655	
Arr. Soeby	0645	0845	1045	1345	1545	1745	

Schedule of principle Scenario 1 & 2 Peak Season (13 weeks) Saturday and Sunday

Ferry A Sailing time approx. 50 minutes

Dep. Aeroe	0730	0930	1230	1430	1630	1930
Arr. Fyn	0820	1020	1320	1520	1720	2020
Dep. Fyn	0825	1025	1325	1525	1725	2025
Arr. Aeroe	0915	1115	1415	1615	1815	2115

Short crew watch

Ferry B Sailing time approx. 50 minutes

Dep. Aeroe	0630	0830	1030	1330	1530	1730	2130
Arr. Fyn	0720	0920	1120	1420	1620	1820	2220
Dep. Fyn	0725	0925	1125	1425	1625	1825	2225
Arr. Aeroe	0815	1015	1215	1515	1715	1915	2315

Ferry C Sailing time approx. 50 minutes

Dep. Soeby	0800	1000	1300	1500	1700	1900
Arr. Als	0850	1050	1350	1550	1750	1950
Dep. Als	0855	1055	1355	1555	1755	1955
Arr. Soeby	0945	1145	1445	1645	1845	2045

Ferry D Sailing time approx. 50 minutes

Dep. Soeby	0700	0900	1200	1400	1600	
Arr. Faaborg	0750	0950	1250	1450	1650	
Dep. Als	0755	0955	1255	1455	1655	
Arr. Soeby	0845	1045	1345	1545	1745	

Schedule of principle Scenario 1 & 2
Shoulder Season (13 weeks) Monday to Friday

Ferry A Sailing time approx. 50 minutes

Dep. Aeroe	0530	0730	0930	1230	1430	1630	1930
Arr. Fyn	0620	0820	1020	1320	1520	1720	2020
Dep. Fyn	0625	0825	1025	1325	1525	1725	2025
Arr. Aeroe	0715	0915	1115	1415	1615	1815	2115

Short crew watch

Ferry B Sailing time approx. 50 minutes

Dep. Aeroe	0630	0830	1030	1330	1530	1730	2130
Arr. Fyn	0720	0920	1120	1420	1620	1820	2220
Dep. Fyn	0725	0925	1125	1425	1625	1825	2225
Arr. Aeroe	0815	1015	1215	1515	1715	1915	2315

Ferry C Sailing time approx. 50 minutes

Dep. Soeby	0600	0800	1000	1330	1530		
Arr. Als	0650	0850	1050	1420	1620		
Dep. Als	0655	0855	1055	1425	1625		
Arr. Soeby	0745	0945	1145	1515	1715		

Postponed 30 minutes relative to peak season

Ferry D Sailing time approx. 50 minutes

Dep. Soeby	0500	0700	0900	1200	1400	1600
Arr. Faaborg	0550	0750	0950	1250	1450	1650
Dep. Als	0555	0755	0955	1255	1455	1655
Arr. Soeby	0645	0845	1045	1345	1545	1745

Schedule of principle Scenario 1 & 2 Shoulder Season (13 weeks) Saturday and Sunday

Ferry A Sailing time approx. 50 minutes

Dep. Aeroe	0730	0930	1230	1430	1630	1930
Arr. Fyn	0820	1020	1320	1520	1720	2020
Dep. Fyn	0825	1025	1325	1525	1725	2025
Arr. Aeroe	0915	1115	1415	1615	1815	2115

Short crew watch

Ferry B Sailing time approx. 50 minutes

Dep. Aeroe	0630	0830	1030	1530	1730	2130
Arr. Fyn	0720	0920	1120	1620	1820	2220
Dep. Fyn	0725	0925	1125	1625	1825	2225
Arr. Aeroe	0815	1015	1215	1715	1915	2315

Ferry C Sailing time approx. 50 minutes

Dep. Soeby	0800	1000	1300	1500	1700	1900
Arr. Als	0850	1050	1350	1550	1750	1950
Dep. Als	0855	1055	1355	1555	1755	1955
Arr. Soeby	0945	1145	1445	1645	1845	2045

Ferry D Sailing time approx. 50 minutes

Dep. Soeby			1200	1400	1600	
Arr. Faaborg			1250	1450	1650	
Dep. Als			1255	1455	1655	
Arr. Soeby			1345	1545	1745	

Schedule of principle Scenario 1 & 2
Off Season (26 weeks) Monday to Friday (Each ferry docking 7-10 days)
Ferry A Sailing time approx. 50 minutes

Dep. Aeroe	0530	0730	0930	1230	1430	1630	1930
Arr. Fyn	0620	0820	1020	1320	1520	1720	2020
Dep. Fyn	0625	0825	1025	1325	1525	1725	2025
Arr. Aeroe	0715	0915	1115	1415	1615	1815	2115

Short crew watch

Ferry B Sailing time approx. 50 minutes

Dep. Aeroe	0630	0830	1030	1330	1530	1730	2130
Arr. Fyn	0720	0920	1120	1420	1620	1820	2220
Dep. Fyn	0725	0925	1125	1425	1625	1825	2225
Arr. Aeroe	0815	1015	1215	1515	1715	1915	2315

Ferry C Sailing time approx. 50 minutes

Dep. Soeby	0600	0800	1000	1330	1530	
Arr. Als	0650	0850	1050	1420	1620	
Dep. Als	0655	0855	1055	1425	1625	
Arr. Soeby	0745	0945	1145	1515	1715	

Postponed 30 minutes relative to peak season

Ferry D Sailing time approx. 50 minutes

Dep. Soeby	0500	0700	0900	1200	1400
Arr. Faaborg	0550	0750	0950	1250	1450
Dep. Als	0555	0755	0955	1255	1455
Arr. Soeby	0645	0845	1045	1345	1545

Crew

Schedule of principle Scenario 1 & 2
Off Season (26 weeks) Saturday and Sunday (Each ferry docking 7-10 days)
Ferry A Sailing time approx. 50 minutes

Dep. Aeroe				1230	1430	1630		
Arr. Fyn				1320	1520	1720		
Dep. Fyn				1325	1525	1725		
Arr. Aeroe				1415	1615	1815		
							1930	
							2020	
							2025	
							2115	

Short crew watch

Crew

Crew

Ferry B Sailing time approx. 50 minutes

Dep. Aeroe	0630	0830	1030				2130
Arr. Fyn	0720	0920	1120				
Dep. Fyn	0725	0925	1125				
Arr. Aeroe	0815	1015	1215				
				1530	1730		
				1620	1820		
				1625	1825		
				1715	1915		
							2220
							2225
							2315

Ferry C Sailing time approx. 50 minutes

Dep. Soeby			Only Sat.			Only Sun.			Only Sun.	
Arr. Als			0800	1000	1300	1500	1700	1900		
			0850	1050	1350	1550	1750	1950		
Dep. Als			Only Sat.			Only Sun.			Only Sun.	
Arr. Soeby			0855	1055	1355	1555	1755	1955		
			0945	1145	1445	1645	1845	2045		

Ferry D Sailing time approx. 50 minutes

Dep. Soeby									
Arr. Faaborg									
Dep. Als									
Arr. Soeby									
				1200	1400				
				1250	1450				
				1255	1455				
				1345	1545				

Crew

Crew

Ferry D

Scenario 1 & 2 roundtrips and capacity

Capacity comparison, Scenario 1 & 2

2x25 PCU and 2x28 PCU E-ferries

Daily double trips

	Peak season 13 weeks						Trips	
	Monday-Friday		Saturday		Sunday		Today	E-ferries
	Today	E-ferries	Today	E-ferries	Today	E-ferries		
Ærøsk.-Fyn	11 *	14	10	13	10	13	975	1248
Søby-Fynshav	3	7	3	6	2	6	260	611
Søby-Fåborg	3	6	2	5	2	5	247	520
Total	17	27	15	24	14	24	1482	2379
PCU capacity	1152	1434	1104	1278	1104	1278	3360	3990

	Shoulder season 13 weeks						Trips	
	Monday-Friday		Saturday		Sunday		Today	E-ferries
	Today	E-ferries	Today	E-ferries	Today	E-ferries		
Ærøsk.-Fyn	11	14	8	12	8	12	923	1222
Søby-Fynshav	3	5	3	4	2	6	260	455
Søby-Fåborg	3	6	2	2	1	3	234	455
Total	17	25	13	18	11	21	1417	2132
PCU capacity	1152	1334	930	972	870	1122	2952	3428

	Off season 26 weeks (Docking 7-10 days)						Trips	
	Monday-Friday		Saturday		Sunday		Today	E-ferries
	Today	E-ferries	Today	E-ferries	Today	E-ferries		
Ærøsk.-Fyn	11	14	8	10	8	10	1704	2160
Søby-Fynshav	3	5	3	4	2	5	480	816
Søby-Fåborg	3	5	2	2	1	2	432	696
Total	17	24	13	16	11	17	2616	3672
PCU capacity	1152	1284	930	860	870	910	2952	3054

*12 at thursdays and fridays

NB: Nominal capacity for M/F Skjoldnæs reduced to 33 PCU. All ferries lose 6 PCU if suspended car decks are blocked by trucks

	3-hour peak capacity		No reductions	3-hour peak capacity	
	Today	E-ferries		Today	E-ferries
Ærøsk.-Fyn	156	168	Ærøsk.-Fyn	168	168
Søby-Fynshav	33	75	Søby-Fynshav	33	75
Søby-Fåborg	32.4	75	Søby-Fåborg	39.6	75
PCU capacity	221.4	318	PCU capacity	240.6	318
		44%			32%

Ærøsk.-Fyn reduced from 42 to 39 due to trucks blocking suspendable car decks

Søby-Fåborg reduced from 33 to 27 due to trucks blocking suspendable car decks

	Trips total	
	Today	E-Ferries
Ærøsk.-Fyn	3602	4630
Søby-Fynshav	1000	1882
Søby-Fåborg	913	1671
	5515	8183
		48%

Scenario 3 time-tables

Schedule of principle Scenario 3 Ærøskøbing-Svendborg
Peak Season (13 weeks) Monday to Friday

Ferry A Sailing time approx. 65 minutes

Dep. Aeroe	0500	0730	1000	1330	1600	1830	2130
Arr. Fyn	0605	0835	1105	1435	1705	1935	2235
Dep. Fyn	0615	0845	1115	1445	1715	1945	2245
Arr. Aeroe	0720	0950	1220	1550	1820	2050	2350

Ferry B Sailing time approx. 65 minutes

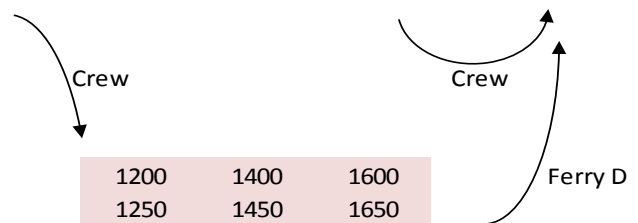
Dep. Aeroe	0600	0830	1100	1430	1700	1930
Arr. Fyn	0705	0935	1205	1535	1805	2035
Dep. Fyn	0715	0945	1215	1545	1815	2045
Arr. Aeroe	0820	1050	1320	1650	1920	2150

Ferry C Sailing time approx. 50 minutes

Dep. Soeby	0600	0800	1000	1300	1500	1700	1900
Arr. Als	0650	0850	1050	1350	1550	1750	1950
Dep. Als	0655	0855	1055	1355	1555	1755	1955
Arr. Soeby	0745	0945	1145	1445	1645	1845	2045

Ferry D Sailing time approx. 50 minutes

Dep. Soeby	0500	0700	0900	1200	1400	1600
Arr. Faaborg	0550	0750	0950	1250	1450	1650
Dep. Als	0555	0755	0955	1255	1455	1655
Arr. Soeby	0645	0845	1045	1345	1545	1745



Schedule of principle Scenario 3 Ærøskøbing-Svendborg Peak Season (13 weeks) Saturday and Sunday

Ferry A Sailing time approx. 65 minutes

Dep. Aeroe	0730	1000	1330	1600	1830	2130
Arr. Fyn	0835	1105	1435	1705	1935	2235
Dep. Fyn	0845	1115	1445	1715	1945	2245
Arr. Aeroe	0950	1220	1550	1820	2050	2350

Ferry B Sailing time approx. 65 minutes

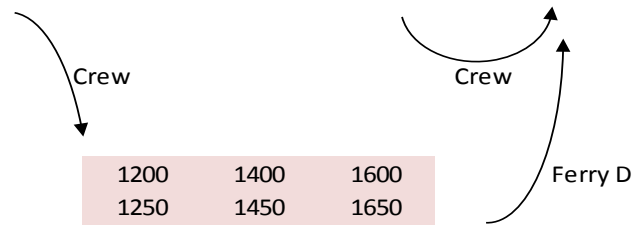
Dep. Aeroe	0600	0830	1100	1430	1700	1930
Arr. Fyn	0705	0935	1205	1535	1805	2035
Dep. Fyn	0715	0945	1215	1545	1815	2045
Arr. Aeroe	0820	1050	1320	1650	1920	2150

Ferry C Sailing time approx. 50 minutes

Dep. Soeby	0800	1000	1300	1500	1700	1900
Arr. Als	0850	1050	1350	1550	1750	1950
Dep. Als	0855	1055	1355	1555	1755	1955
Arr. Soeby	0945	1145	1445	1645	1845	2045

Ferry D Sailing time approx. 50 minutes

Dep. Soeby	0700	0900	1200	1400	1600
Arr. Faaborg	0750	0950	1250	1450	1650
Dep. Als	0755	0955	1255	1455	1655
Arr. Soeby	0845	1045	1345	1545	1745



Schedule of principle Scenario 3 Ærøskøbing-Svendborg Shoulder Season (13 weeks) Monday to Friday

Ferry A Sailing time approx. 65 minutes

Dep. Aeroe	0500	0730	1000	1330	1600	1830	2130
Arr. Fyn	0605	0835	1105	1435	1705	1935	2235
Dep. Fyn	0615	0845	1115	1445	1715	1945	2245
Arr. Aeroe	0720	0950	1220	1550	1820	2050	2350

Ferry B Sailing time approx. 65 minutes

Dep. Aeroe	0600	0830	1100	1430	1700
Arr. Fyn	0705	0935	1205	1535	1805
Dep. Fyn	0715	0945	1215	1545	1815
Arr. Aeroe	0820	1050	1320	1650	1920

Ferry C Sailing time approx. 50 minutes

				Postponed 30 minutes relative to peak season		
Dep. Soeby	0600	0800	1000	1330	1530	
Arr. Als	0650	0850	1050	1420	1620	
Dep. Als	0655	0855	1055	1425	1625	
Arr. Soeby	0745	0945	1145	1515	1715	

Ferry D Sailing time approx. 50 minutes

Dep. Soeby	0500	0700	0900	1200	1400	1600
Arr. Faaborg	0550	0750	0950	1250	1450	1650
Dep. Als	0555	0755	0955	1255	1455	1655
Arr. Soeby	0645	0845	1045	1345	1545	1745

Crew



Schedule of principle Scenario 3 Ærøskøbing-Svendborg Shoulder Season (13 weeks) Saturday and Sunday

Ferry A Sailing time approx. 65 minutes

Dep. Aeroe	0730	1000	1330	1600	1830	2130
Arr. Fyn	0835	1105	1435	1705	1935	2235
Dep. Fyn	0845	1115	1445	1715	1945	2245
Arr. Aeroe	0950	1220	1550	1820	2050	2350

Ferry B Sailing time approx. 65 minutes

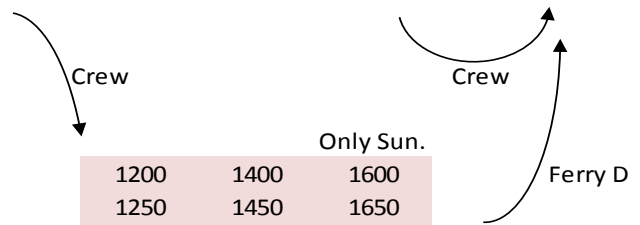
Dep. Aeroe	0600	0830	1100	1430	1700
Arr. Fyn	0705	0935	1205	1535	1805
Dep. Fyn	0715	0945	1215	1545	1815
Arr. Aeroe	0820	1050	1320	1650	1920

Ferry C Sailing time approx. 50 minutes

Dep. Soeby	0800	1000	1300	1500	1700	1900
Arr. Als	0850	1050	1350	1550	1750	1950
Dep. Als	0855	1055	1355	1555	1755	1955
Arr. Soeby	0945	1145	1445	1645	1845	2045

Ferry D Sailing time approx. 50 minutes

Dep. Soeby			1200	1400	1600
Arr. Faaborg			1250	1450	1650
Dep. Als			1255	1455	1655
Arr. Soeby			1345	1545	1745



Schedule of principle Scenario 3 Ærøskøbing-Svendborg Off Season (26 weeks) Monday to Friday (Each ferry 7-10 days of drydocking)

Ferry A Sailing time approx. 65 minutes

Dep. Aeroe	0500	0730	1000	1330	1600	1830	2130
Arr. Fyn	0605	0835	1105	1435	1705	1935	2235
Dep. Fyn	0615	0845	1115	1445	1715	1945	2245
Arr. Aeroe	0720	0950	1220	1550	1820	2050	2350

Ferry B Sailing time approx. 65 minutes

Dep. Aeroe	0600	0830	1100	1430	1700
Arr. Fyn	0705	0935	1205	1535	1805
Dep. Fyn	0715	0945	1215	1545	1815
Arr. Aeroe	0820	1050	1320	1650	1920

Ferry C Sailing time approx. 50 minutes

				Postponed 30 minutes relative to peak season		
Dep. Soeby	0600	0800	1000	1330	1530	
Arr. Als	0650	0850	1050	1420	1620	
Dep. Als	0655	0855	1055	1425	1625	
Arr. Soeby	0745	0945	1145	1515	1715	

Ferry D Sailing time approx. 50 minutes

Dep. Soeby	0500	0700	0900	1200	1400
Arr. Faaborg	0550	0750	0950	1250	1450
Dep. Als	0555	0755	0955	1255	1455
Arr. Soeby	0645	0845	1045	1345	1545

Crew



Schedule of principle Scenario 3 Ærøskøbing-Svendborg
 Off Season (26 weeks) Saturday and Sunday (Each ferry 7-10 days of drydocking)

Ferry A Sailing time approx. 65 minutes

Dep. Aeroe	1000	1330	1600	1830	2130
Arr. Fyn	1105	1435	1705	1935	2235
Dep. Fyn	1115	1445	1715	1945	2245
Arr. Aeroe	1220	1550	1820	2050	2350

Ferry B Sailing time approx. 65 minutes

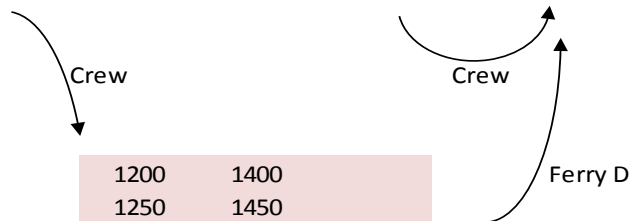
Dep. Aeroe	0600	0830	1100	1430	1700
Arr. Fyn	0705	0935	1205	1535	1805
Dep. Fyn	0715	0945	1215	1545	1815
Arr. Aeroe	0820	1050	1320	1650	1920

Ferry C Sailing time approx. 50 minutes

		Only Sat.	Only Sun.	Only Sun.
Dep. Soeby	0800	1300	1500	1900
Arr. Als	0850	1350	1550	1950
Dep. Als	0855	1355	1555	1955
Arr. Soeby	0945	1445	1645	2045

Ferry D Sailing time approx. 50 minutes

Dep. Soeby		1200	1400
Arr. Faaborg		1250	1450
Dep. Als		1255	1455
Arr. Soeby		1345	1545



Scenario 3 roundtrips and capacity

Capacity comparison, Scenario 3 Ærøskøbing-Svendborg
2x25 PCU and 2x28 PCU E-ferries

Daily double trips

	Peak season 13 weeks						Trips	
	Monday-Friday		Saturday		Sunday			
	Today	E-ferries	Today	E-ferries	Today	E-ferries	Today	E-ferries
Ærøsk.-Fyn	11 *	13	10	12	10	12	975	1157
Søby-Fynshav	3	7	3	6	2	6	260	611
Søby-Fåborg	3	6	2	5	2	5	247	520
Total	17	26	15	23	14	23	1482	2288
PCU capacity	1152	1378	1086	1222	1104	1222	3342	3822

	Shoulder season 13 weeks						Trips	
	Monday-Friday		Saturday		Sunday			
	Today	E-ferries	Today	E-ferries	Today	E-ferries	Today	E-ferries
Ærøsk.-Fyn	11	12	8	11	8	11	923	1066
Søby-Fynshav	3	5	3	4	2	6	260	455
Søby-Fåborg	3	6	2	2	1	3	234	455
Total	17	23	13	17	11	20	1417	1976
PCU capacity	1152	1222	930	916	870	1066	2952	3204

	Off season 26 weeks (Docking 1 week each ferry)						Trips	
	Monday-Friday		Saturday		Sunday			
	Today	E-ferries	Today	E-ferries	Today	E-ferries	Today	E-ferries
Ærøsk.-Fyn	11	12	8	10	8	10	1704	1920
Søby-Fynshav	3	5	3	4	2	5	480	816
Søby-Fåborg	3	5	2	2	1	2	432	696
Total	17	22	13	16	11	17	2616	3432
PCU capacity	1152	1172	930	860	870	910	2952	2942

*12 at thursdays and Fridays

NB: Nominal capacity for M/F Skjoldnæs reduced to 33 PCU. All ferries loose 6 PCU if suspended car decks are blocked by trucks

	3-hour peak capacity			3-hour peak capacity			
	Today	E-ferries		No reductions	Today		E-ferries
Ærøsk.-Fyn	156	134	-14%	Ærøsk.-Fyn	168	134	-20%
Søby-Fynshav	33	75		Søby-Fynshav	33	75	
Søby-Fåborg	32.4	75		Søby-Fåborg	40	75	
PCU capacity	221.4	284		PCU capacity	241	284	
		28%				18%	

Ærøsk.-Fyn reduced from 42 to 39 due to trucks blocking suspendable car decks

Søby-Fåborg reduced from 33 to 27 due to trucks blocking suspendable car decks

Trips total		
Ærøsk.-Fyn	3602	4143
Søby-Fynshav	1000	1882
Søby-Fåborg	913	1671
	5515	7696