

General data

	Comment	Source
Interest rate	6.5% Difficult to estimate and will vary over time. The average interest rate in Sweden during the last 10 years is 7.5%	
Overhead costs	8% General administration etc.	Nelldal, 2011
Unexpected costs	7% Margin to cover unexpected events.	Nelldal, 2011
Sum OH costs	15% Could be different depending on the size of the company. A lower value can be used if high cost equipment is used. Not included if a cost calculation is intended.	
Profit margin	0% Otherwise, 10% is appropriate.	Nelldal, 2011

A low cost train with high usage.

A high cost train with low usage.

Electric haul

Railway engine cost estimate

	Low	Comment	Source	Medium	Comment	Source	High	Comment	Source	General comment
Purchase price	10 000 000 kr	Used engine type RC	Nelldal, 2011	35 000 000 kr	New TRAXX-engine or equivalent	Nelldal, 2011	38 000 000 kr	TRAXX with ERTMS (2 000 000 kr) and dual voltage system (1 000 000 kr)	Nelldal, 2011	
Service life, years	20		Nelldal, 2011	35		Nelldal, 2011	35	Same service life for ERTMS and dual voltage	Nelldal, 2011	
Depreciation, years	20			35			35			Depreciation can also be made over a shorter time period for accounting and tax reasons.
Weight, tonnes	79		Diehl & Nilsson, 2003	83		Green Cargo, 2009	83		Green Cargo, 2009	
Length, meters	15,5			18,9			18,9			
Electricity consumption, kWh per grosstonkm	0,0212			0,0212			0,0212		Trafikverket, 2010b	This can be varied between 0,019 to 0,024 depending on total train weight. A heavier train has lower consumption per grosstonkm.
Maximum traction, tonnes	1600		Nelldal, 2011, Bark, 2005	2000		Nelldal, 2011	2000		Nelldal, 2011	Numbers refers to normal conditions. Total train weight might be limited by other factors, such as track gradient, etc.
Price (SEK) per kWh elec	0,7315 kr	type RC	Trafikverket, 2010a	0,6807 kr	type TRAXX	Trafikverket, 2010a	0,6807 kr	type TRAXX	Trafikverket, 2010a	Conversions and transmission losses included in the price. Price depends therefore on engine type.
Running distance per year, km	300 000	type RC		220 000	Assuming same utilisation as the wagons.		138 000	Statistical average.	Based on SIKA, 2009	
Average speed	70	km/h	CargoNet, 2006	70	km/h	CargoNet, 2006	70	km/h	CargoNet, 2006	
Time in traffic	4286	hours		3143	hours		1971	hours		
Maintenance costs per km	7,50 kr	type RC	Nelldal, 2011	6,00 kr	type TRAXX	Nelldal, 2011	6,50 kr	type TRAXX with ERTMS and dual voltage.	Nelldal, 2011	
Infrastructure charges										
Train path charge, per train km	0,27 kr	Base level fee for the general network.	Trafikverket, 2010b	0,74 kr	Assuming 1/3 on high quality network and 2/3 on general network.	Trafikverket, 2010b	1,67 kr	High level fee for using high quality parts of the network.	Trafikverket, 2010b	
Accident charge, per train km	0,81 kr		Trafikverket, 2010b	0,81 kr		Trafikverket, 2010b	0,81 kr		Trafikverket, 2010b	
Track charge, per gross tonne km	0,0036 kr		Trafikverket, 2010b	0,0036 kr		Trafikverket, 2010b	0,0036 kr		Trafikverket, 2010b	
Calculations per year										
Average cost of capital	325 000 kr			1 137 500 kr			1 235 000 kr			Average capital tied up during the depreciation period * interest rate. Assuming linear depreciation.
Depreciation	500 000 kr			1 000 000 kr			1 085 714 kr			Linear depreciation.
Overhead costs	123 750 kr			320 625 kr			348 107 kr			
Profit margin	- kr			- kr			- kr			
Fixed costs	948 750 kr			2 458 125 kr			2 668 821 kr			
per km	3,16 kr			11,17 kr			19,34 kr			
or per hour	221,38 kr			782,13 kr			1 353,75 kr			

Maintenance costs	2 250 000 kr		1 320 000 kr		897 000 kr	
Electricity costs (engine only)	367 535 kr		263 507 kr		165 291 kr	
Infrastructure fees	409 320 kr		406 003 kr		383 474 kr	Train related charges (train path and accident) and weight charges related to the engine.
Overhead costs	454 028 kr		298 426 kr		216 865 kr	
Profit margin	- kr		- kr		- kr	
Variable costs	3 480 883 kr		2 287 936 kr		1 662 630 kr	
per km	11,60 kr		10,40 kr		12,05 kr	
Total costs	4 429 633 kr		4 746 061 kr		4 331 451 kr	
<i>per km</i>	<i>14,77 kr</i>		<i>21,57 kr</i>		<i>31,39 kr</i>	

Wagon costs, empty wagon

Purchase price	100 000 kr	used type Lgjs	Nelldal, 2011	700 000 kr	Type Sgns	Nelldal, 2011	1 300 000 kr	Type Sdggmrs	Nelldal, 2011, Oehrstroem 2005
Service life, years	15		Nelldal, 2011	50		Nelldal, 2011	35		Nelldal, 2011
Depreciation, years	15			50			35		Nelldal, 2011
Tara weight, tonnes	12,5		GreenCargo, 2011	20		GreenCargo, 2011	35		AAE, 2005
TEU per wagon	2			3			4		
Length, meters	17,1			19,6			34,2		
Running distance per year, km	110 000		Nelldal, 2011	220 000		Nelldal, 2011	138 000	Assuming the same utilisation as for the engine.	
Average speed	70			70			70		
Time in traffic	1571	hours		3143	hours		1971	hours	Wagons are also tied up at the terminals for loading and unloading.
Maintenance costs per km	0,10 kr		Nelldal, 2011	0,15 kr		Nelldal, 2011	0,30 kr		Oehrstroem 2005
Infrastructure charges									
Track charge, per gross tonne km	0,0036 kr		Trafikverket, 2010b	0,0036 kr		Trafikverket, 2010b	0,0036 kr		Trafikverket, 2010b

Calculations per year and wagon

Average cost of capital	3 250 kr		22 750 kr		42 250 kr
Depreciation	6 667 kr		14 000 kr		37 143 kr
Overhead costs	1 488 kr		5 513 kr		11 909 kr
Profit margin	- kr		- kr		- kr
Fixed costs	11 404 kr		42 263 kr		91 302 kr
<i>per km</i>	<i>0,10 kr</i>		<i>0,19 kr</i>		<i>0,66 kr</i>
or per hour	7,26 kr		13,45 kr		46,31 kr

Maintenance costs	11 000 kr		33 000 kr		41 400 kr
Electricity costs (wagon only)	21 323 kr		63 496 kr		69 701 kr
Infrastructure charges	4 950 kr		15 840 kr		17 388 kr
Overhead costs	5 591 kr		16 850 kr		19 273 kr
Profit margin	- kr		- kr		- kr
Variable costs	42 864 kr		129 186 kr		147 762 kr
per km	0,39 kr		0,59 kr		1,07 kr

Total costs	54 268 kr		171 449 kr		239 064 kr
<i>per km</i>	<i>0,49 kr</i>		<i>0,78 kr</i>		<i>1,73 kr</i>

Wagon costs, loaded wagon

Weight loaded, tonnes	21	2 20' container	31,0	1 20' and 1 40'	34,0	2 trailers	Gross weight loaded, including load unit. 40% fill rate in each load unit.
Fixed costs	- kr		- kr		- kr		All fixed costs carried by the empty wagon
per km	- kr		- kr		- kr		

Maintenance costs	- kr		- kr		- kr		Slightly dependent on the weight, but very hard to estimate.
Electricity costs (freight only)	35 823,02 kr		98 418,33 kr		67 709,50 kr		
Infrastructure charges	8 316 kr		24 552 kr		16 891 kr		Charged per tonnekm
Overhead costs	6 620,85 kr		18 445,55 kr		12 690,11 kr		
Profit margin	- kr		- kr		- kr		
Variable costs	50 759,87 kr		141 415,88 kr		97 290,81 kr		
per km	0,46 kr		0,64 kr		0,71 kr		
Personnel costs							
Salary	341 600 kr	Green Cargo, 2009a,b	341 600 kr	Green Cargo, 2009a,b	341 600 kr	Green Cargo, 2009a,b	Salary for class F10 driver (27 120kr) including holiday pay (0,08%) per vacation day.
Night surcharges, per hour	37,20 kr	Green Cargo, 2009	37,20 kr	Green Cargo, 2009	37,20 kr	Green Cargo, 2009	For work between 7 p.m. and 6 a.m.
Share of night work	50%	Green Cargo, 2009	50%	Green Cargo, 2009	50%	Green Cargo, 2009	Intermodal trains are often run during the night. No driver should work more than a total of 1/3 total night time per work scheduling period (10 p.m. to 6 a.m.), excluding travel time. Note that this definition of night is different from the salary surcharge times. Can vary depending on the share of night work, number of holidays worked etc. 36 hours per week for night time workers.
Working hours per year	1600	Green Cargo, 2009	1600	Green Cargo, 2009	1600	Green Cargo, 2009	
Night cost	29 760 kr		29 760 kr		29 760 kr		On call time, allowances during travel, overtime pay etc. and other added supplements to the salary. Included as a general percentage as the exact amount will depend and the specific schedule for the driver.
Other surcharges, %	5%		5%		5%		
Other surcharges, SEK	17 080 kr		17 080 kr		17 080 kr		
Salary costs	388 440 kr	32 370 kr	388 440 kr		388 440 kr		
Taxes, %	31,42%	Skatteverket, 2011	31,42%	Skatteverket, 2011	31,42%	Skatteverket, 2011	
Taxes, SEK	122 048 kr		122 048 kr		122 048 kr		
Collective insurances, pension etc.%	7,5%		7,5%		7,5%		Based on agreements with the union. The amount will vary depending on the employer and union and increases with a higher salary.
Collective insurances, pension etc.SEK	29 133 kr		29 133 kr		29 133 kr		
Total cost	539 621 kr		539 621 kr		539 621 kr		
Cost per hour	337,26 kr		337,26 kr		337,26 kr		
Share of work time driving a train	75%	Nelldal, 2011	75%	Nelldal, 2011	75%	Nelldal, 2011	
Cost per train hour	449,68 kr		449,68 kr		449,68 kr		
Overhead costs	80 943 kr		80 943 kr		80 943 kr		
Profit margin	- kr		- kr		- kr		
Other costs	80 943 kr		80 943 kr		80 943 kr		
per train hour	67,45 kr		67,45 kr		67,45 kr		
Total cost	620 564 kr		620 564 kr		620 564 kr		
per train hour	517,14 kr		517,14 kr		517,14 kr		
Input to the HIT-model							
<u>Engine</u>	Used RC		TRAXX		Full TRAXX		
Time dependant costs, kr	739 kr		1 299 kr		1 871 kr		
Distance dependant costs	11,60 kr		10,40 kr		12,05 kr		
<u>Empty rail wagon</u>	used Lgjs		Sgns		Sdggmrs		
Time dependant costs, kr	7,26 kr		13,45 kr		46,31 kr		
Distance dependant costs	0,39 kr		0,59 kr		1,07 kr		
<u>Used rail wagon</u>							
Time dependant costs, kr	- kr		- kr		- kr		
Distance dependant costs	0,46 kr		0,64 kr		0,71 kr		

A typical train						
Number of wagons in the train	30	20	15	Number of wagons selected to give the same loading capacity in TEU on all trains.		
Loading capacity TEU	60	60	60			
Share of loaded wagons	75%	75%	75%			
Weight loaded on train, tonnes	473	465	383			
Train weight, tonnes	927	948	991			
Train length, meters	529	411	532			
Reserve wagons, %	20%	20%	20%	Not all wagons can be in service all the time. Extra wagons needed during repairs, maintenance etc. Time dependent cost.		
Total number of wagons	36,0	24,0	18,0			
Distance, km	500,0	500,0	500,0			
Average speed, km/h	70,0	70,0	70,0			
Running time, hours	7,1	7,1	7,1			
Engine and salary costs	11 077 kr	14 480 kr	19 387 kr			
Empty wagon costs	7 711 kr	8 177 kr	13 985 kr			
Used wagon costs	5 191 kr	4 821 kr	3 966 kr			
Total cost per train	23 979 kr	27 479 kr	37 338 kr			
per trainkm	47,96 kr	54,96 kr	74,68 kr			
per grosstonnekm	0,05 kr	0,06 kr	0,08 kr			
per nettonnekm	0,10 kr	0,12 kr	0,20 kr	Including tara weight of load units		
per TEUkm	1,07 kr	1,22 kr	1,66 kr			

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Information

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See also the sheet "Information".