Electrodialysis

Data from Visser´s thesis

Electric energy consumption			0.3	kwh/mol NaOH		
	or		7500	kWh/t NaOH		
Product ratio	1	t	NaOH	1	mol	
	0.91	t	HCl	1	mol	theoretical
	0.025	t	Hydrogen	0.5	mol	

Chlor alkali electrolysis

(Data from chapter on Chlorine in Kirk Othmer)

Electric energy consumption			1950	to	2300	kWh/t NaOH	
	or		0.078	to	0.092	kWh/mol NaOH	
Product ratio	1	t	NaOH	1	mol		
	0.91	t	Chlorine	0.51	mol		
	0.025	t	Hydrogen	0.5	mol		theoretical

The hydrogen and chlorine can be used to produce 0.93 t HCl per t NaOH

Hydrogen by water electrolysis

Electric energy consumption 55 kWh/kg H2

0.025	t	Hydrogen	requires	1375	kWh for electrolysis

By conventional chlor alkali electrolysis, reacting chlorine and hydrogen to HCl and by producing hydrogen by water electrolysis it is possible to produce with 3325 to 3675 kWh of electricity

1	t	NaOH
0.93	t	HCl
0.025	t	Hydrogen

Conclusion

Production of NaOH, HCl and H2 by electrodialysis (in the product ratio given above)
requires at least twice the electric energy needed to produce the same quantity of NaOH, HCl and H2
by conventioanl chlor alkali electrolysis, hydrocloric acid synthesis and water electrolysis.

Ref: Electrodialytic Recovery of Acids And Bases by Cornelis Ronald Visser 2001, Rijksuniversiteit Groningen

Thesis work on a simple non-optimized system with wire mesh electrodes and wide electrode spacing demonstrated ~ 36% efficiency for hydrogen generation compared with ~ 70% for optimized industrial electrolyzers.