

WtE in Iceland



Waste Amount, Transport and Economical Comparison

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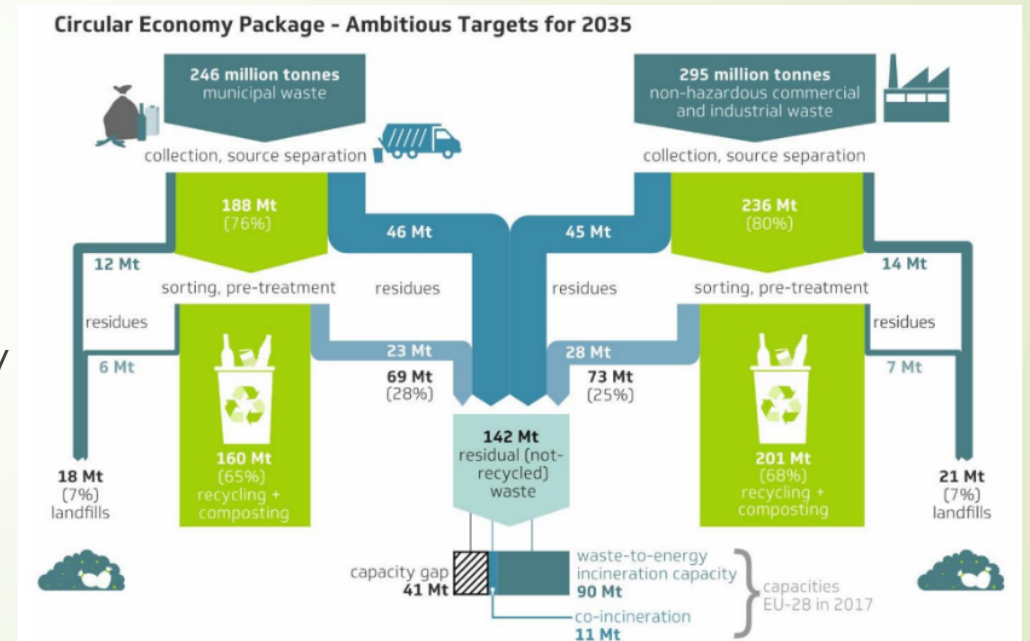
Waste amount & Energy

- Information retrieved from Environmental agency
- Total amount estimated 140k tonn annually for the whole country or 120/20 if split into two plants.
- Population comparison (330.000/58.000) citizens
- Calculated energy value according to BREF would be ca 9.7 Mj/kg
- Uncertainty regarding further recycling and affect on energy value, might go closer to 11 Mj/kg



Waste amount 2035

- If looked at estimated population increase and recycling goals CEWEP, ca. 131.000 tonn
- Population increase and increase due to consumer index, 159.000 ton
 - This might not be likely where Iceland today ranks relatively high compared to other european country's
- Iceland's municipal goals consider 140 k tonn annually
- All numbers are built on recycling goals



Waste amount and origin

- Majority of the waste is originated at the southwest/south/west corner of Iceland, this is more than 80% of the total amount of waste.
- Remaining 20% of waste has its origin around the coast in the north and eastern part of Iceland
- The main transport today is with truck hauling
- This study looks at the possible use of ship transport from few harbours around the coastline

Waste transport cost

- ▶ A single large plant located in Helguvík would carry approx. 1.013 M ISK in transport cost annually (7,3 ISK/kg, 0.05EUR/kg)
 - ▶ This would be only using longhaulers
- ▶ Using partly seatransport would lower the cost to 6.4 ISK/kg or 0.043 EUR/kg
- ▶ These numbers are based on a total average
 - ▶ An idea is that all communities carry the same transport cost regardless of the length. This can for example be included in the gatefee and reimbursed to the communities with the highest tranport cost.
- ▶ Using two plants gives lower total transport cost where the average would be around 4.6 ISK/kg or 0.03 EUR/kg
 - ▶ Two plants give shorter routes and therefore lower transport cost

Main Options

A: One WtE in the SW (Helguvík) 140 Ktpa

B: Two WtEs, one in SW (Helguvík) 120 Ktpa and another in the north of Iceland, Eyjafjörður (Dysnes) 20 Ktpa.





Methodology

- Profitability models in Excel, NPV and IRR
- A company owned by an infrastructure fund
- Criteria:
 - NPV > 0
 - IRR > MARR = 8,5% total, 13% equity
- The models are based on investment cost, operating cost and revenue
- The models simulate operations, cash flow and balance sheet over the 30 years planning horizon
- Financing: 50% Loan over 20 years 4% loan interest (real term)

Revenue (140 Ktpa)

➤ Gate Fee	28 kr/kg			
➤ Quantity	140 mill kg/ári	Income	3.920	MIKR/ári
➤ Hot water	100 kr/m ³			
➤ Quantity	5,2 mill m ³ /ári	Income	520	MIKR/ári
➤ Electricity	6 kr/kWh			
➤ Quantity	86 TWh/ári	Income	516	MIKR/ári

Investment Cost (CAPEX)

- 140 Ktpa 24 ma 171 MIKR/Ktpa
- 120 Ktpa 21,5 ma 179 MIKR/Ktpa
- 20 Ktpa 10 ma 500 MIKR/Ktpa



Operating Cost (OPEX)

- 140 Ktpa 1.857 MIKR/year 13,3 MIKR/Ktpa or kr/kg
- 120 Ktpa 1.644 MIKR/year 13,7 MIKR/Ktpa or kr/kg
- 20 Ktpa 822 MIKR/year 41,1 MIKR/Ktpa or kr/kg



Transport Cost

- Option A land 1.013 MKR/year or 7,3 kr/kg
- Option A see+land 893 MKR/year or 6,4 kr/kg
- Option B land 636 MKR/year or 4,6 kr/kg

- Difference added to operating cost of A





Main Results

- First we look at Gate Fees required:

WtE:	Gate Fee:
140 Ktpa	28 kr/kg
120 Ktpa	29 kr/kg
20 Ktpa	100 kr/kg

Special case for 20 Ktpa: Lowering both CAPEX and OPEX by -30%: Gate Fee required: 75 kr/kg.

Comparison A vs B

- Next we compare options A and B, same Gate Fee all around Iceland:

WtE:

A 140 Ktpa

B 120+20 Ktpa

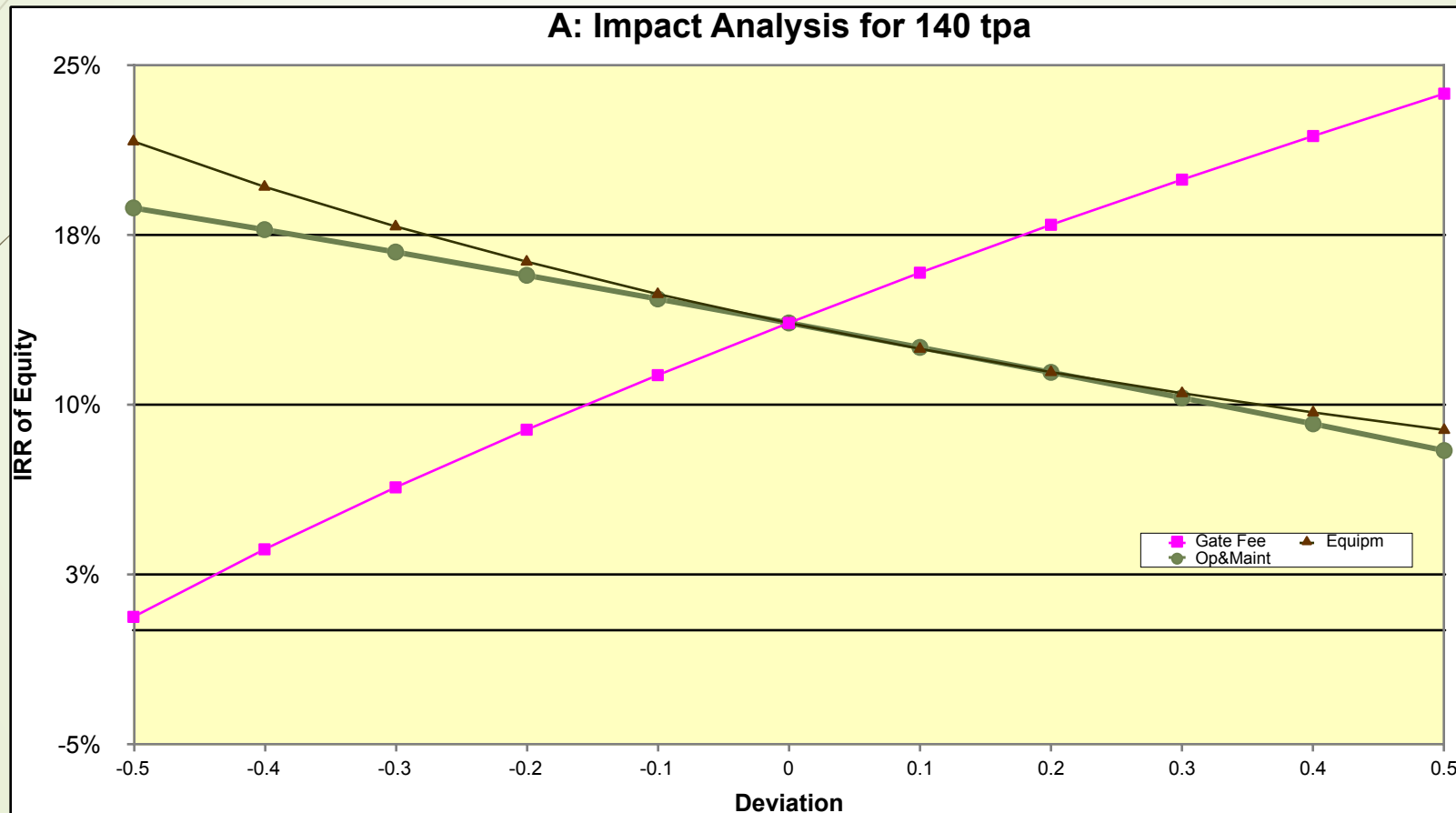
Gate Fee:

28 kr/kg

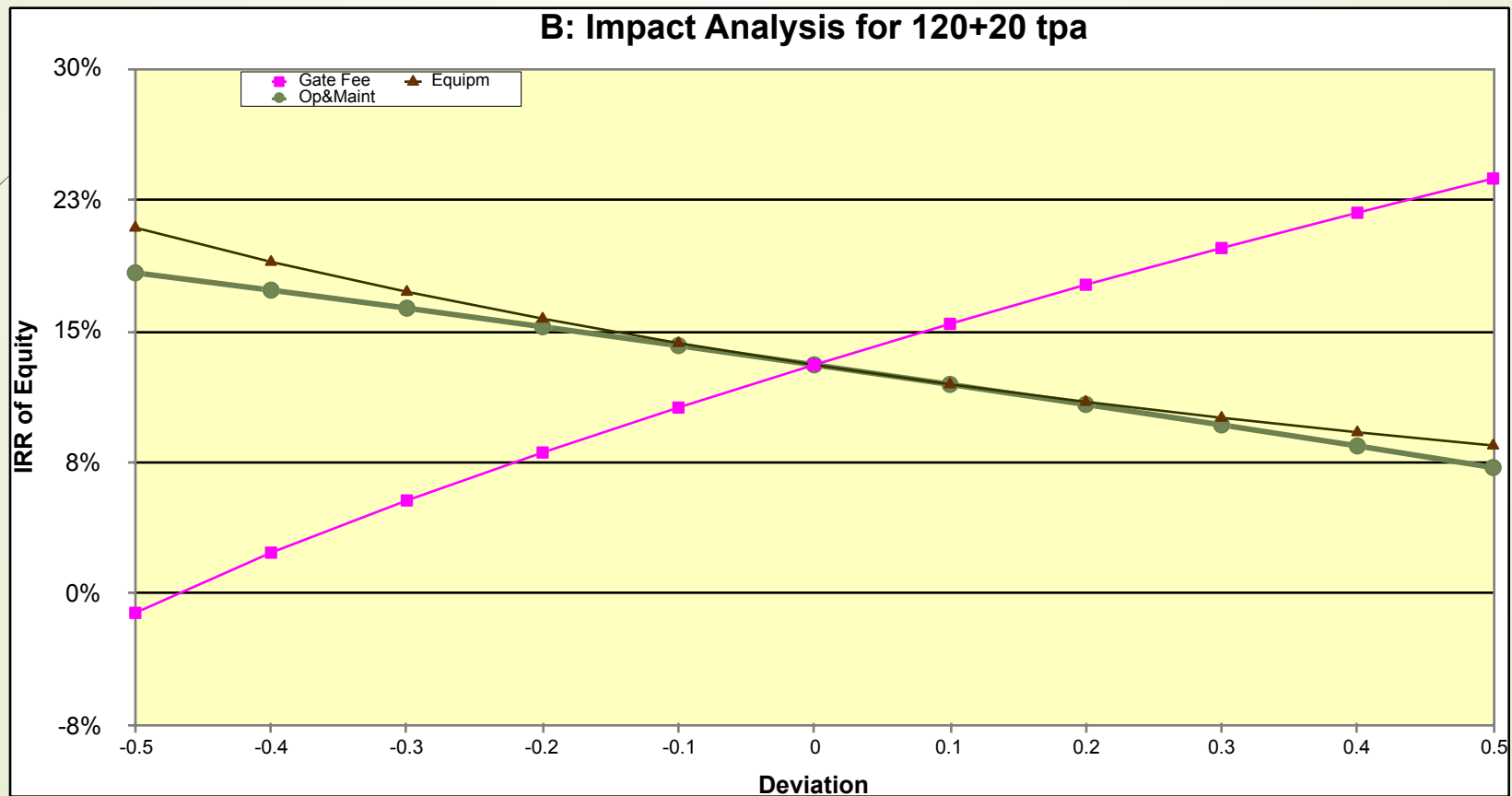
38 kr/kg



Sensitivity Analysis A



Sensitivity Analysis B



Scenarios A Gate Fee 28 kr/kg

Scenarios					
		Base Case	10% higher	20% higher	30% higher
Assumptions					
	CAPEX	100%	110%	120%	130%
	OPEX	100%	110%	120%	130%
Results					
	IRR_Project	10%	9%	8%	6%
	IRR_Equity	14%	11%	9%	8%

Scenarios B Gate Fee 38 kr/kg

Scenarios					
		Base Case	10% higher	20% higher	30% higher
Assumptions					
	CAPEX	100%	110%	120%	130%
	OPEX	100%	110%	120%	130%
Results					
	IRR_Project	10%	8%	7%	6%
	IRR_Equity	13%	11%	9%	7%