



Life-Cycle Cost Analysis:

Making Sense of the
“Alphabet Soup”

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CampusEnergy2019

February 26 - March 1, 2019 | New Orleans, LA

A close-up photograph of two people in dark business suits shaking hands. In the background, a laptop is visible, slightly out of focus. The scene is set against a light, neutral background.

Nothing happens until somebody SELLS something.

OUTLINE

- LCCA Overview
- Terms, Definition, Uses
- Payback Example
- NPV& IRR Examples
- LCOE
- Resources

Terms & Definitions

Payback

Initial investment / annual savings

Discounted Payback

Initial investment / discounted sav.

LCCA – Life-Cycle Cost Analysis

PV of Lifetime Costs & Savings

NPV – Net Present Value

Investment Value in today's \$

NPW (PV) – Net Present Worth

<ditto>

DCF – Discounted Cash Flow

<ditto>

IRR – Internal Rate of Return

Equiv Rate of Ret. from Investmnt

LCOE – Levelized Cost of Energy

Level Cost of Providing Energy

ROI – Return on Investment

$(\text{Gain} - \text{Cost}) / \text{Cost}$, Net Earn / Investmnt

ROE – Return on Equity

$(\text{Gain} - \text{Equity}) / \text{Eq}$, Net Earn / SH Eq

Pros & Cons

Advantages

Drawbacks

Payback

Intuitive, Simple

Ignores Savings > Paybk

Disc. Payback

Time Value of \$

Date <ditto>

LCCA

NPV

“Gold Standard”

Many Inputs, Less Intuitive

NPW (PV)

DCF

IRR

Intuitive, **Commonly Used**

Hidden Pitfalls

LCOE

Intuitive, “Market-Based”

More Complex Calcs

ROI

ROE

How are they Applied?

Decision Rule

Payback

Payback < target => "Accept"

Disc. Payback

Payback < target => "Accept"

LCCA

NPV

Stand-alone projects => "Accept" if NPV is (+)

NPW (PV)

Comparing projects => "Accept" higher NPV

DCF

IRR

If IRR > target => "Accept"

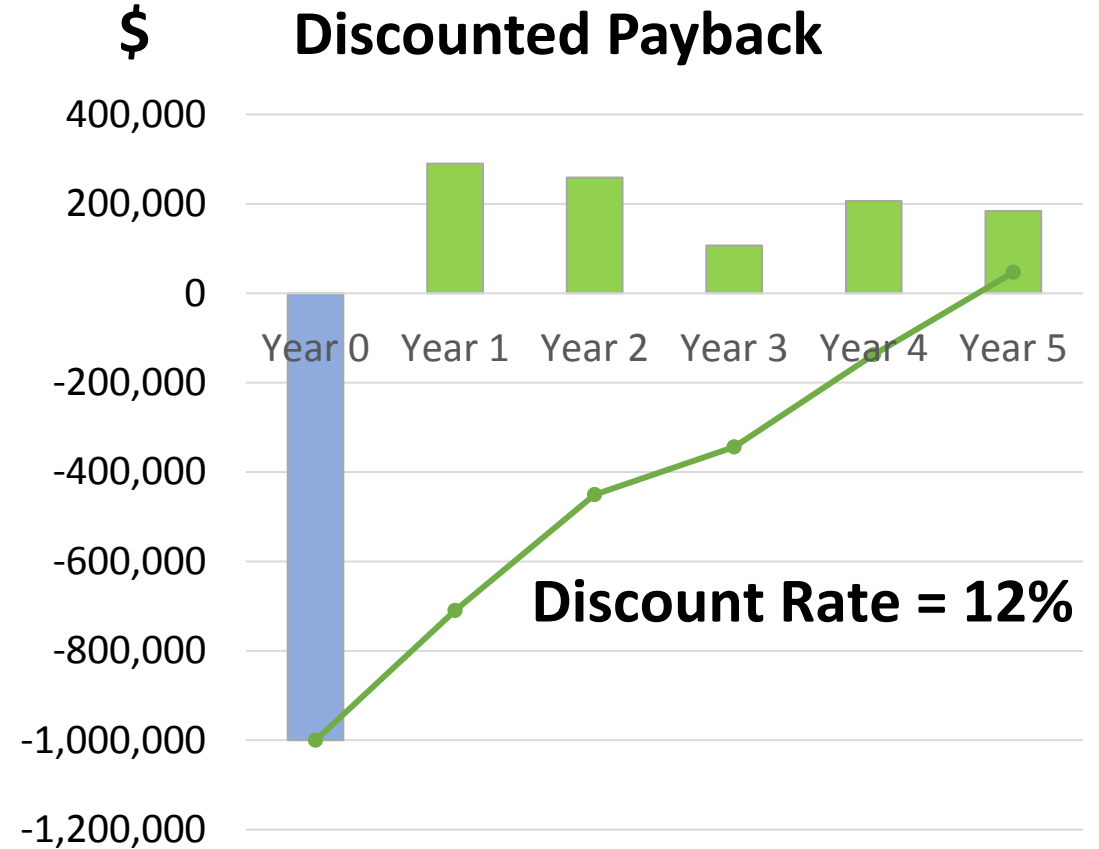
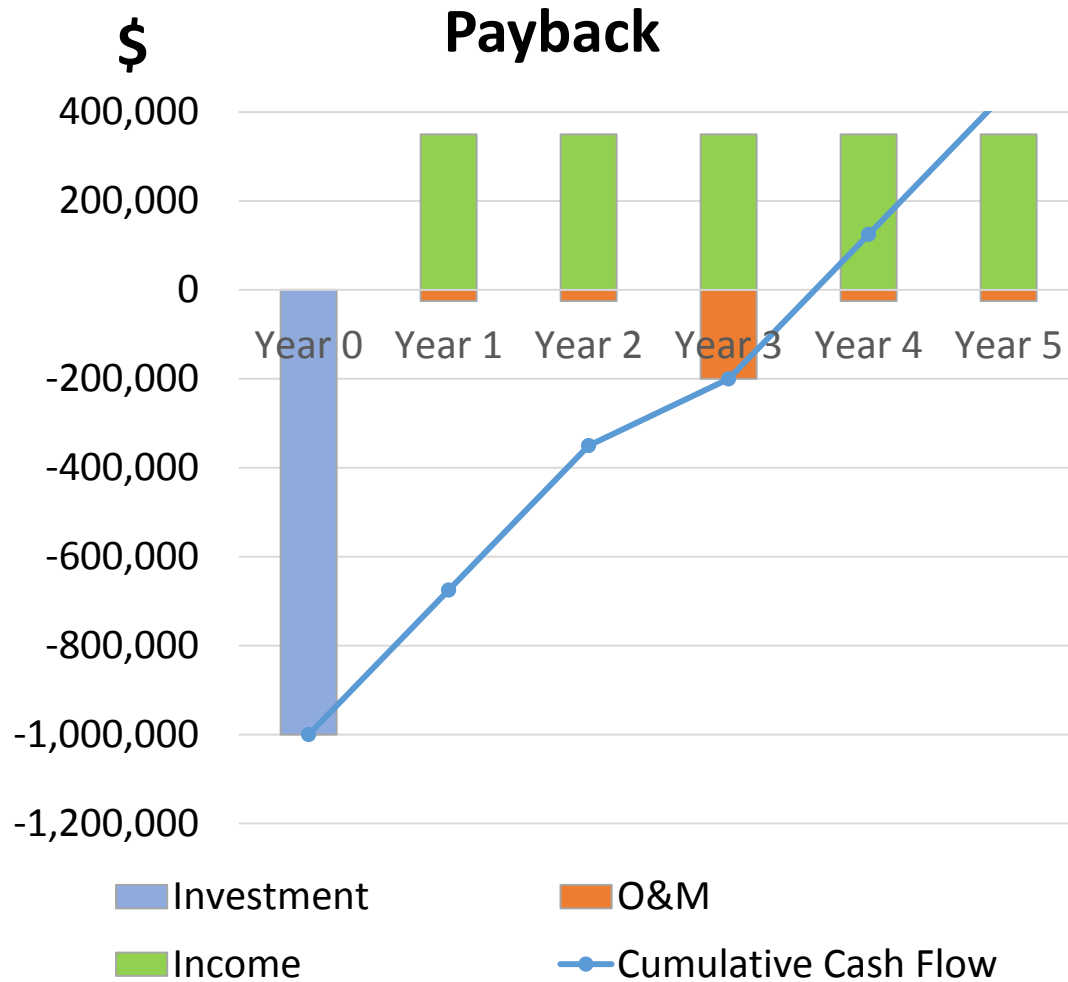
LCOE

If LCOE is market-competitive => "Accept"

ROI

ROE

Payback & Cash Flow



NPV & IRR



540i

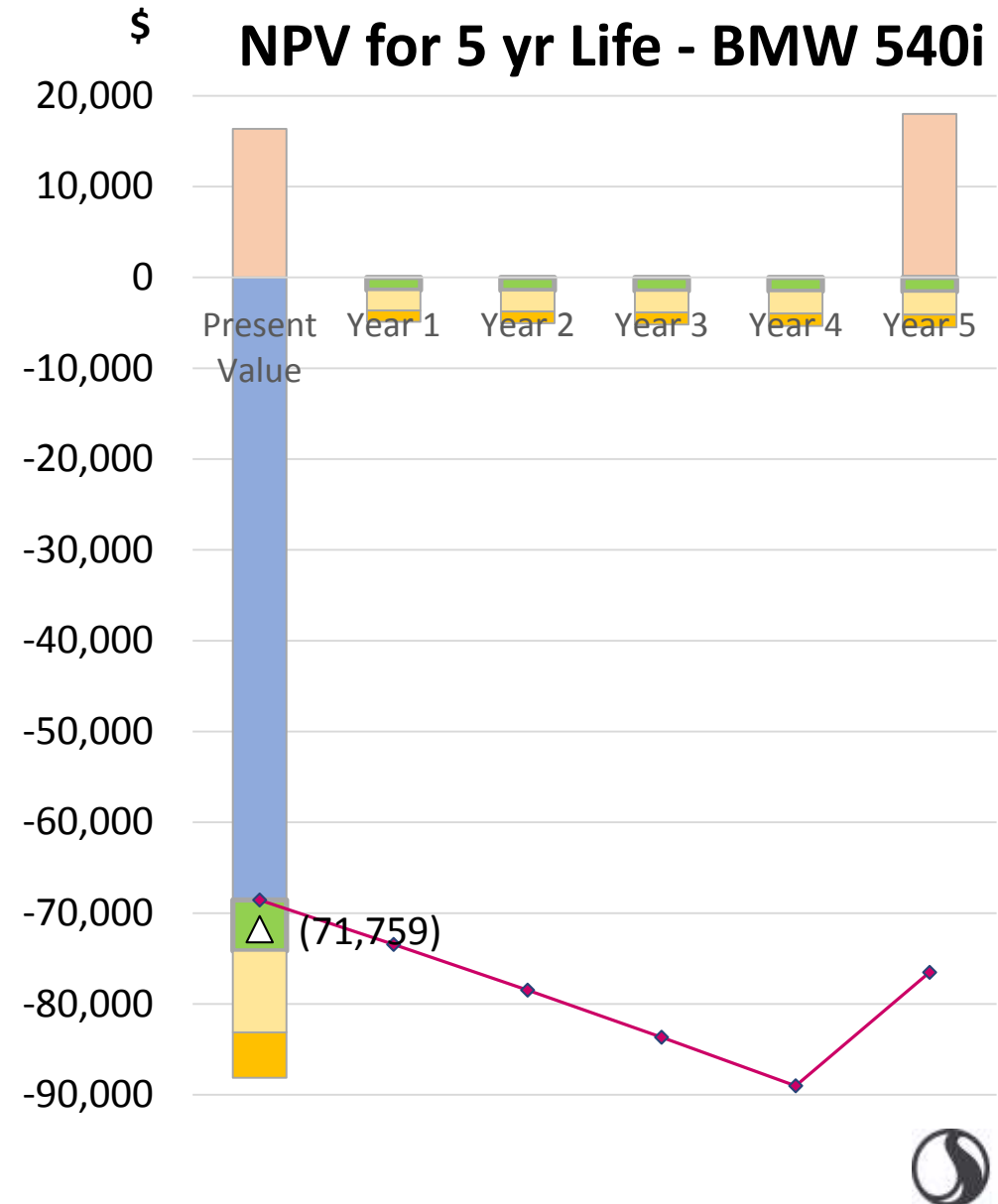
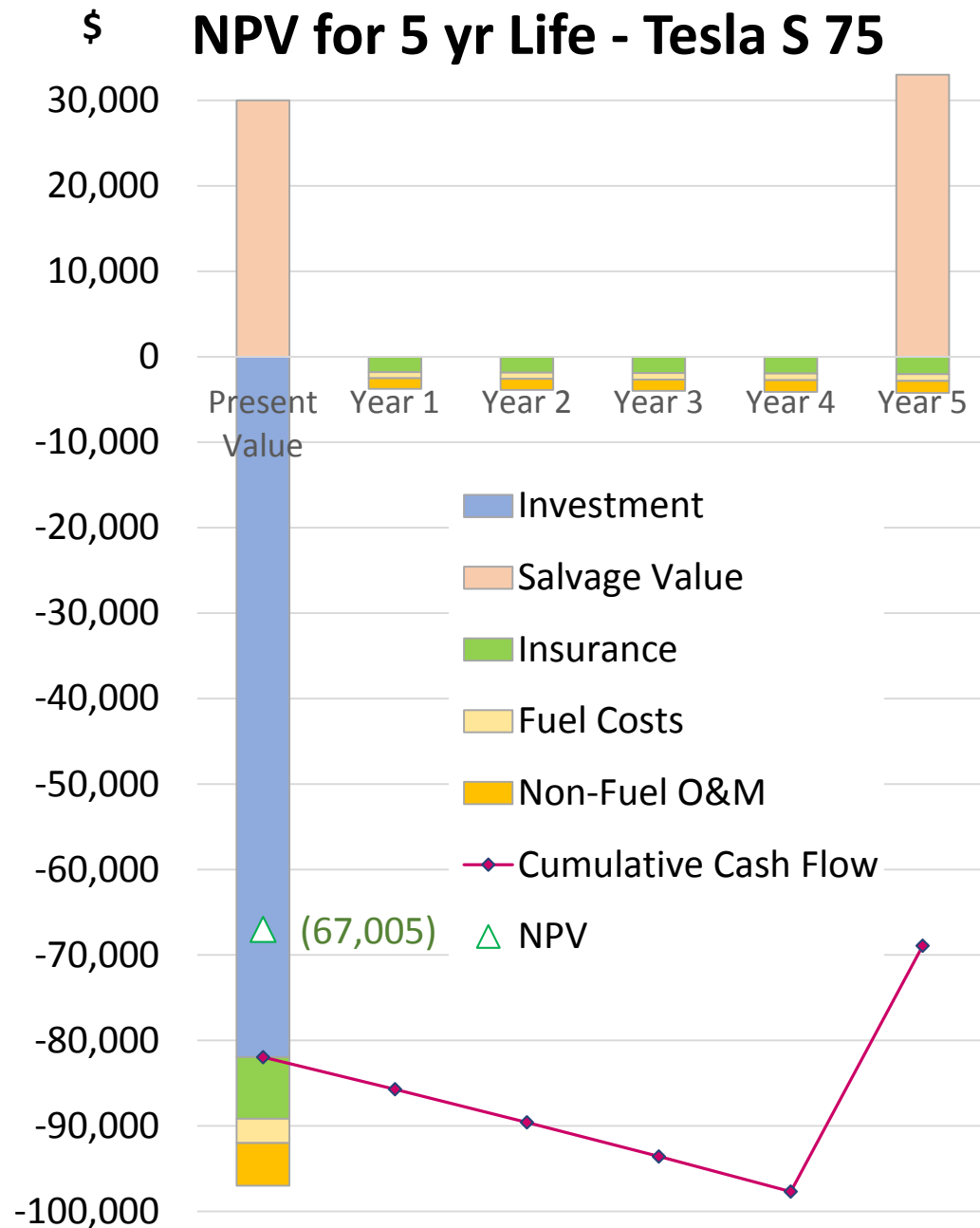


Model S 75

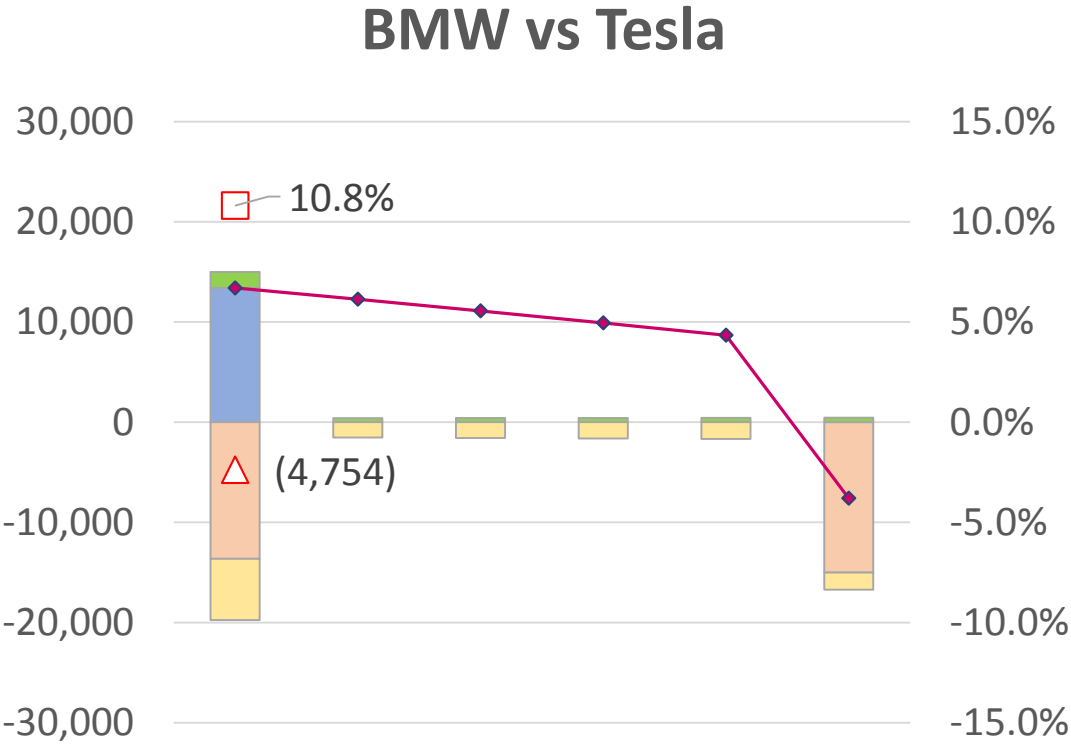
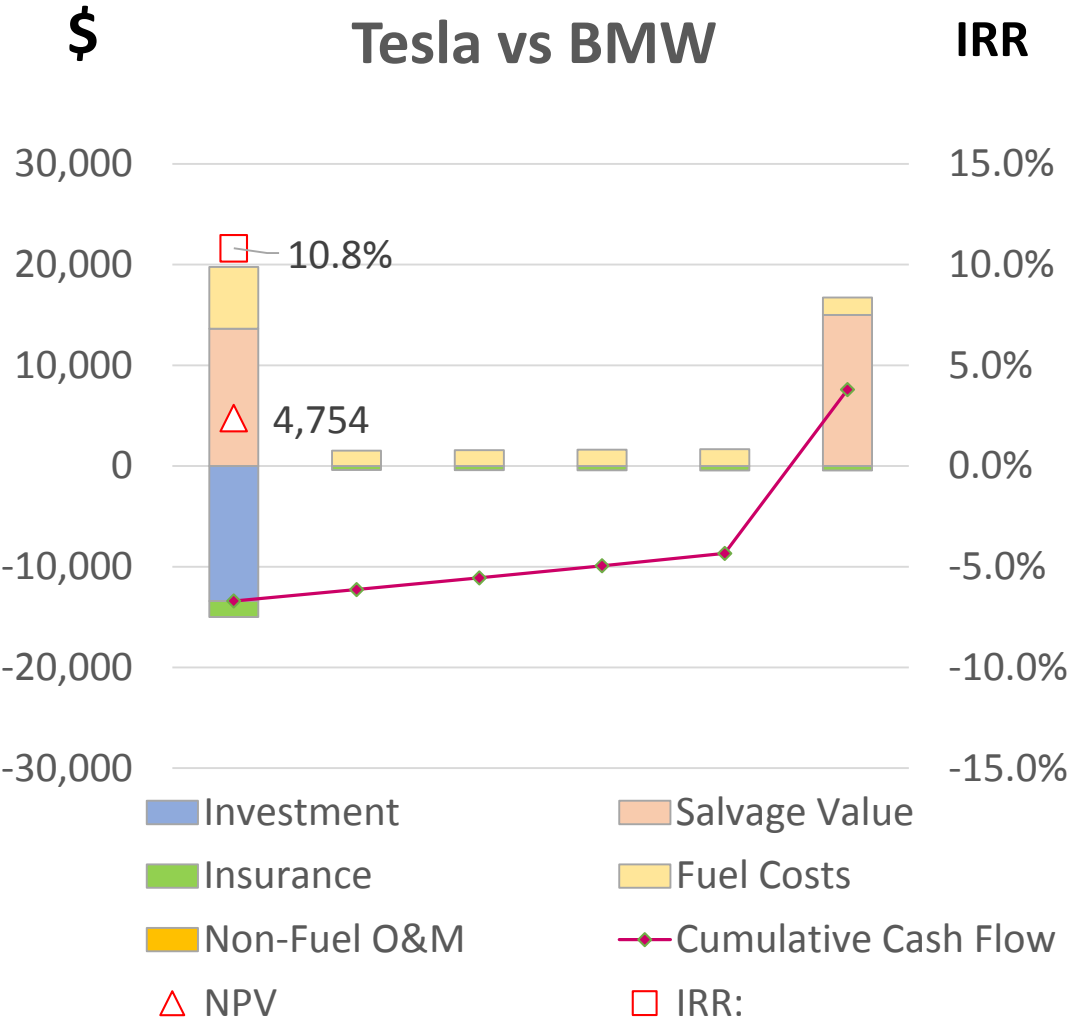


	Tesla S 75 (RWD)	BMW 540i
Sales Price:	\$ (85,000)	\$ (65,000)
Sales Tx & Regist.	\$ (2,050)	\$ (1,450)
Extended warranty	\$ (2,400)	\$ (2,100)
Tax credit:	\$ 7,500	\$ -
Salvage Value:	\$ 33,000	\$ 19,500
Economic Life (yrs):	5	5
Inflation:	3%	3%
Discount Rate:	10%	10%
Annual Costs:		
Miles Driven/yr:	20,000	20,000
Energy Cost:	\$ 0.11 /kWh	\$2.80 /gal
Mileage:	3.09 mi/kWh	25.0 mi/gal
Fuel Costs/yr:	\$ (711)	\$ (2,240)
Non-fuel O&M:	\$ (1,250)	\$ (1,250)

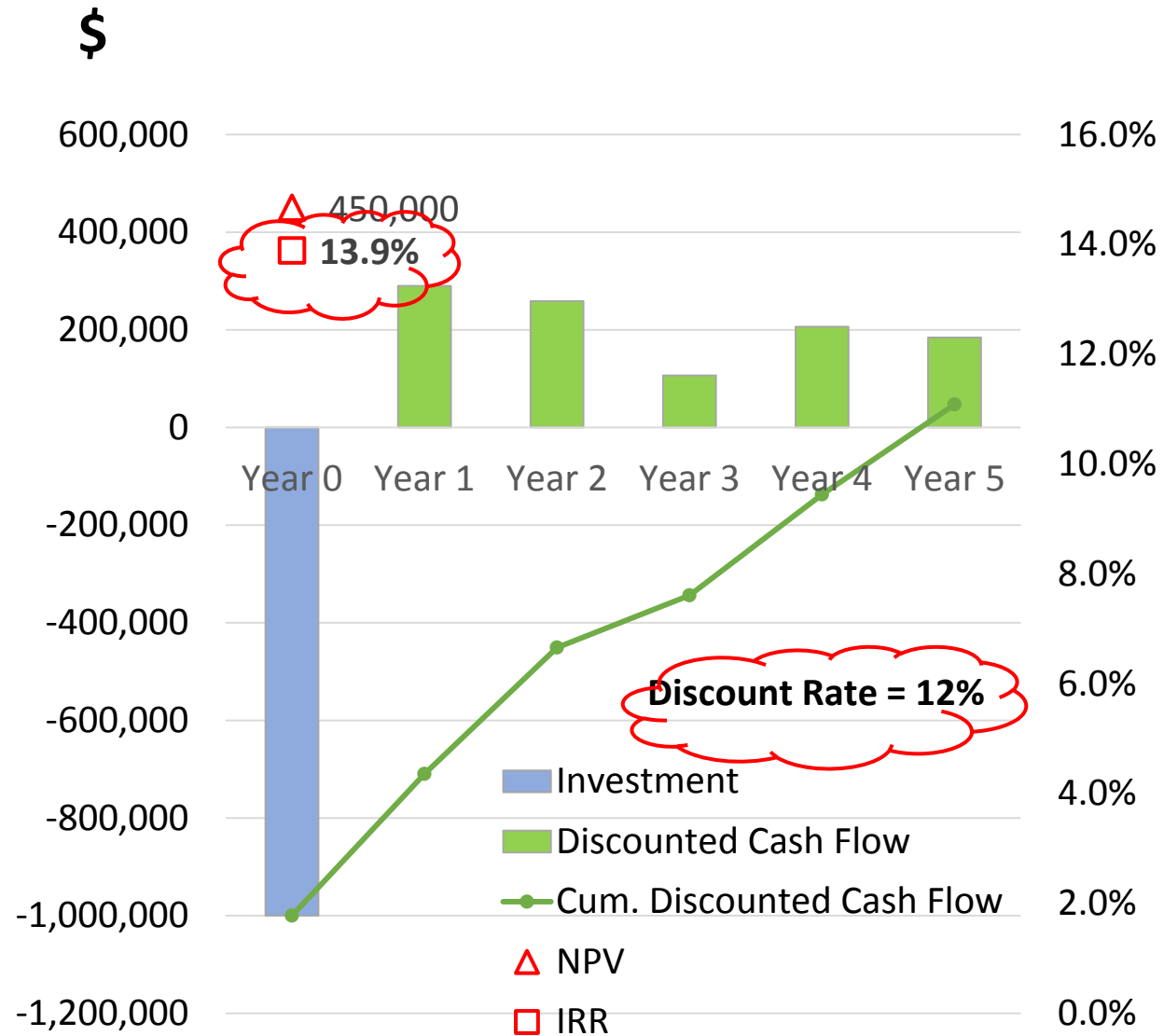
NPV & IRR



NPV & IRR



NPV & IRR



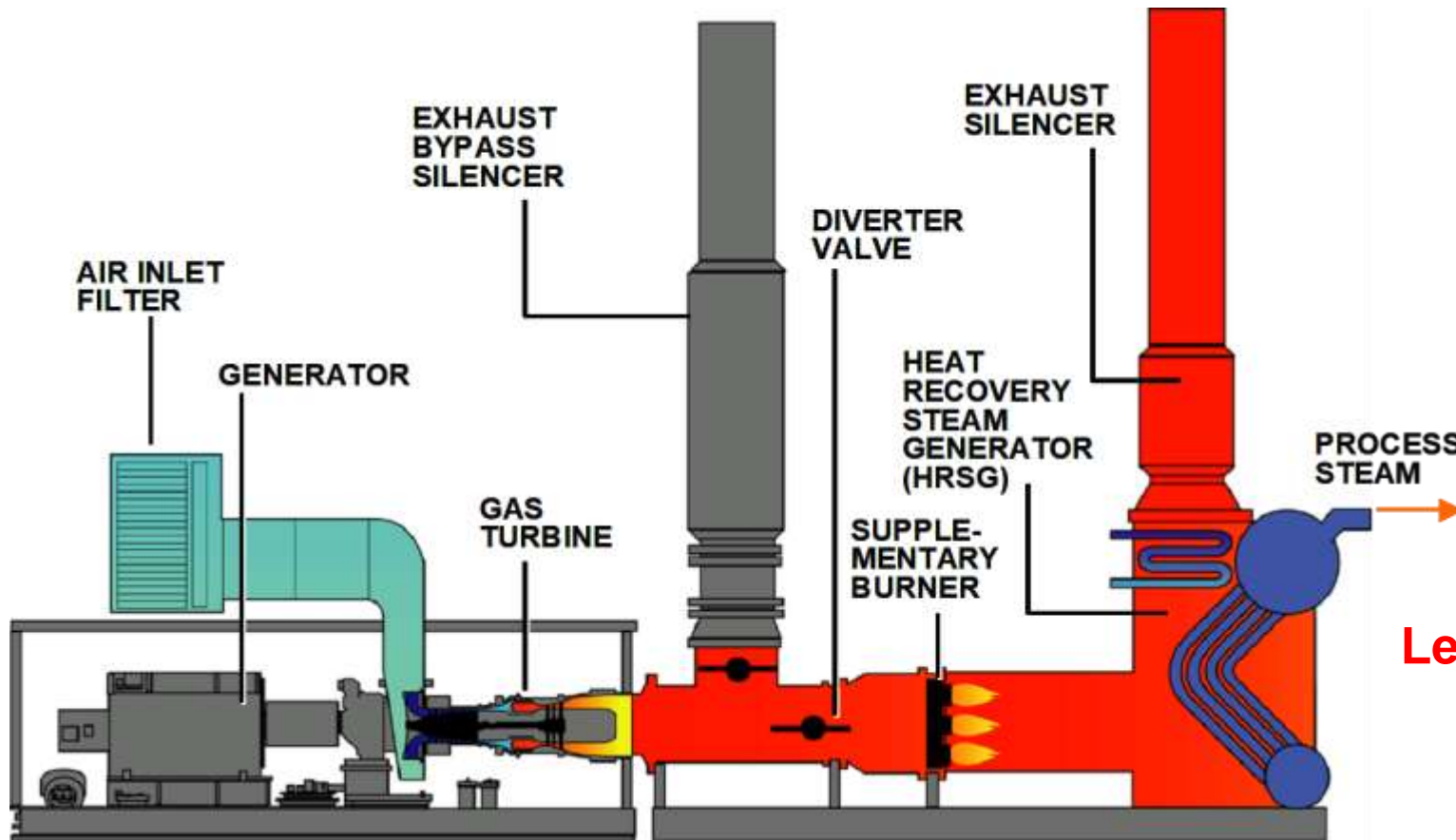
LCOE - Levelized Cost of Energy (miles)

5 years @ 20,000 miles/yr = 100,000 miles

(NPV) => \$ 67,005 / 100,000 = **\$ 0.67 /mile**



LCOE - Levelized Cost of Energy

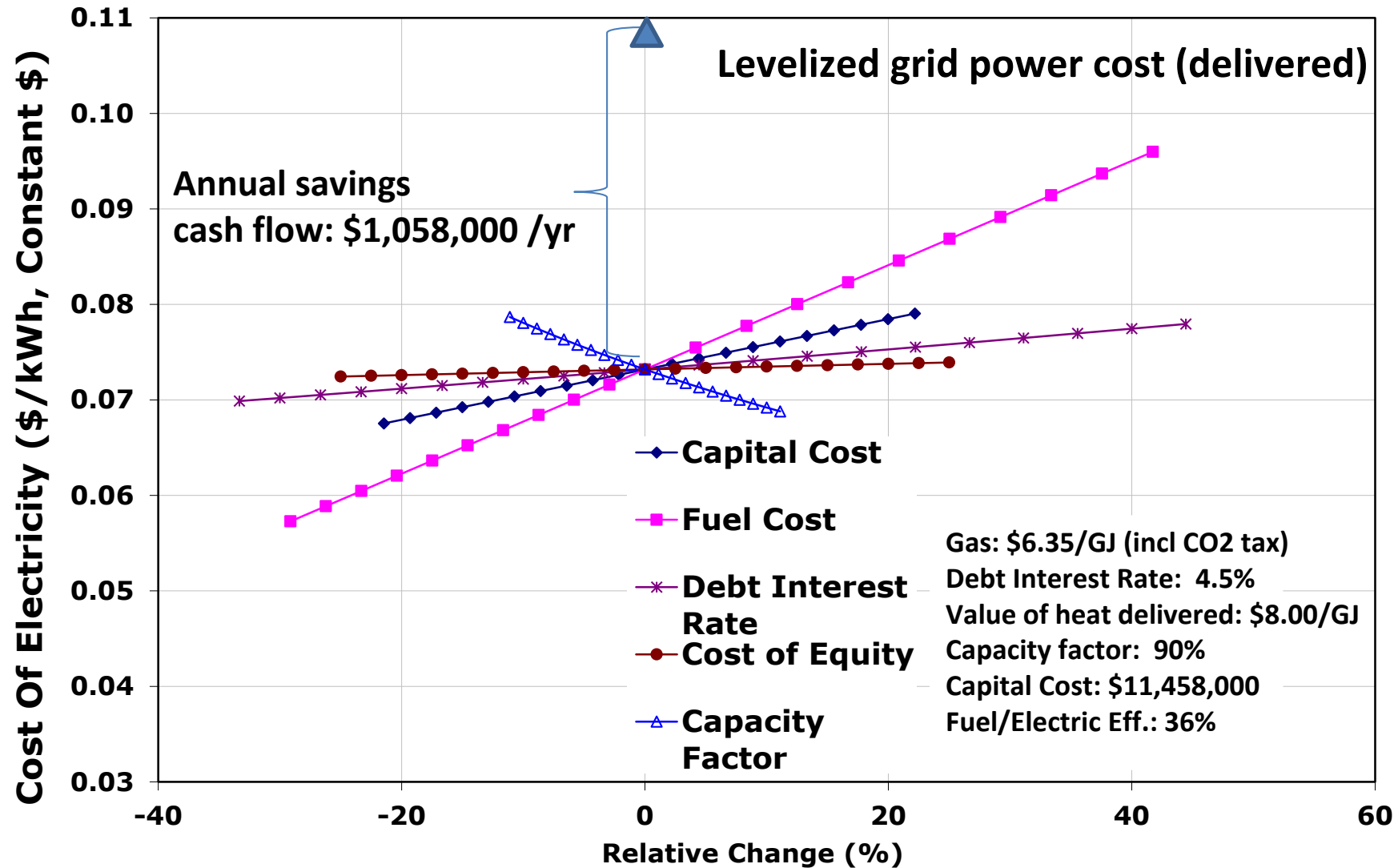


Total Facility Capital Cost (\$)	11,458,250
Net Electrical Capacity (kWe)	3,750
Capacity Factor (%)	90%
Fuel Cost (\$/GJ)	6.35
Labor Cost (\$/y)	150,000
Maintenance Cost (\$/y)	380,000
Income from heat sales (\$/y)	764,815
General Inflation (%/y)	2.10%
Interest Rate on Debt (%/y)	4.50%
Economic Life (y)	20 y

**Level Cost of Electricity \$ 0.073 /kWh
(in constant \$)**

LCOE - Levelized Cost of Energy

Sensitivity Analysis



References of Interest:

Formulas, definitions, examples:

- ✓ <https://accountingexplained.com/managerial/capital-budgeting>

Levelized Cost of Energy Excel Templates:

California Biomass Collaborative

- ✓ <https://biomass.ucdavis.edu/tools/energy-cost-calculator/>

Danish Energy Agency “District Heating Assessment Tool”

- ✓ <https://ens.dk/en/our-responsibilities/global-cooperation/district-heating-assessment-tool-dhat>

Questions / Comments ?



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