

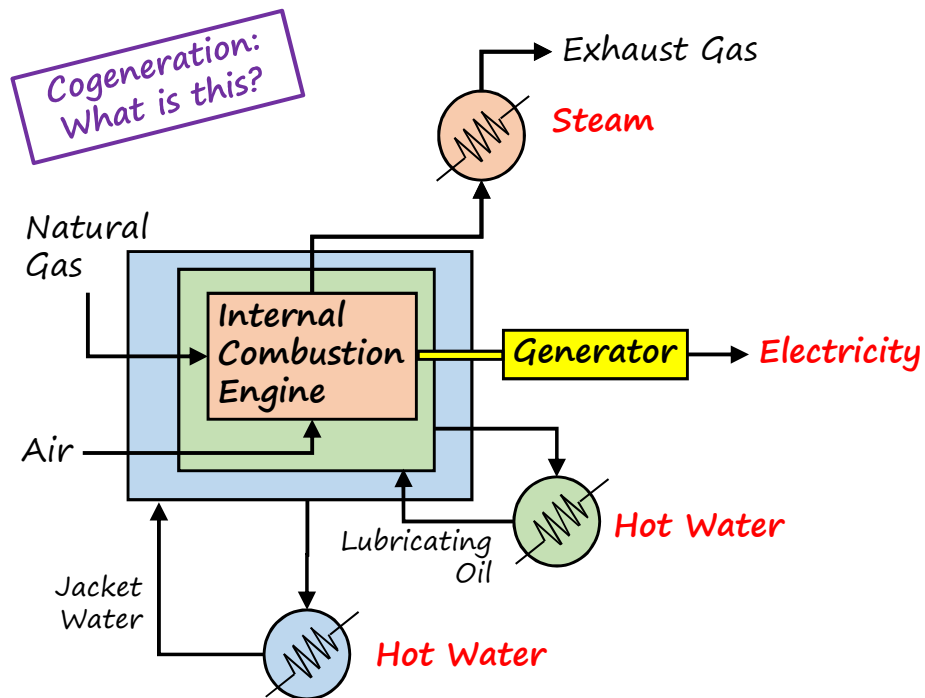
Heat and Power Cogeneration in Hotels and Hospitals
 ZB Maroulis, Yacht Club of Greece, 29/5/2017.

There are two crucial questions in this life:

- (1) to be or not to be?
- (2) to cogenerate or not?

Generally, cogeneration has two advantages:

- (1) we are more green
- (2) we pay less for energy



Project Evaluation

$$\rightarrow \text{Return On Investment (ROI)} = \frac{\text{Annual Savings}}{\text{Equipment Cost}}$$

$$\rightarrow \text{Simple Payback Period (SPB)} = \frac{\text{Equipment Cost}}{\text{Annual Savings}}$$

→ Rule of Thumb: for Energy Projects: SPB < 4 years

→ ROI > 25%

→ **LOAN**: Decreases Project ROI
but increases Equity ROI → Leverage!

→ **TAXES**: Decrease ROI
Current Taxes $1 - (1 - 0.29) \times (1 - 0.15) = 0.40$
Depreciation = 10 years

Greenhouse Heat and Power Cogeneration Economics ZB Maroulis, Athens Hilton, 18/4/2018.

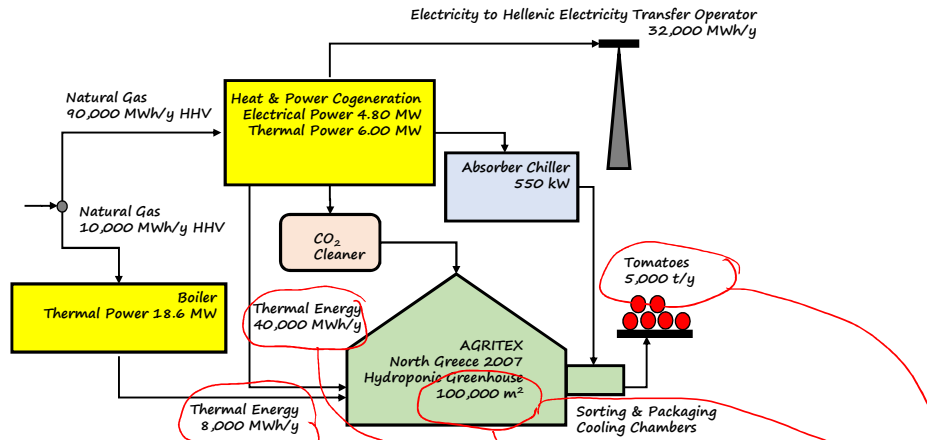


... Lets see a real case:
the AGRITEX

Crucial Questions:

Greenhouse Thermal Energy Consumption =

Land Productivity =



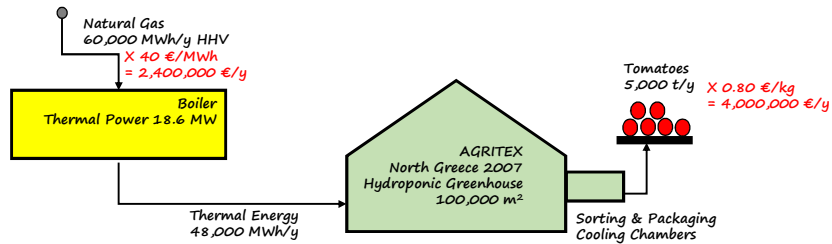
Crucial Questions:

Greenhouse Thermal Energy Consumption = 500MWh/y/1000m²

Land Productivity = 50ton/y/1000m²

→ 10 MWh/ton

→ 500€/ton

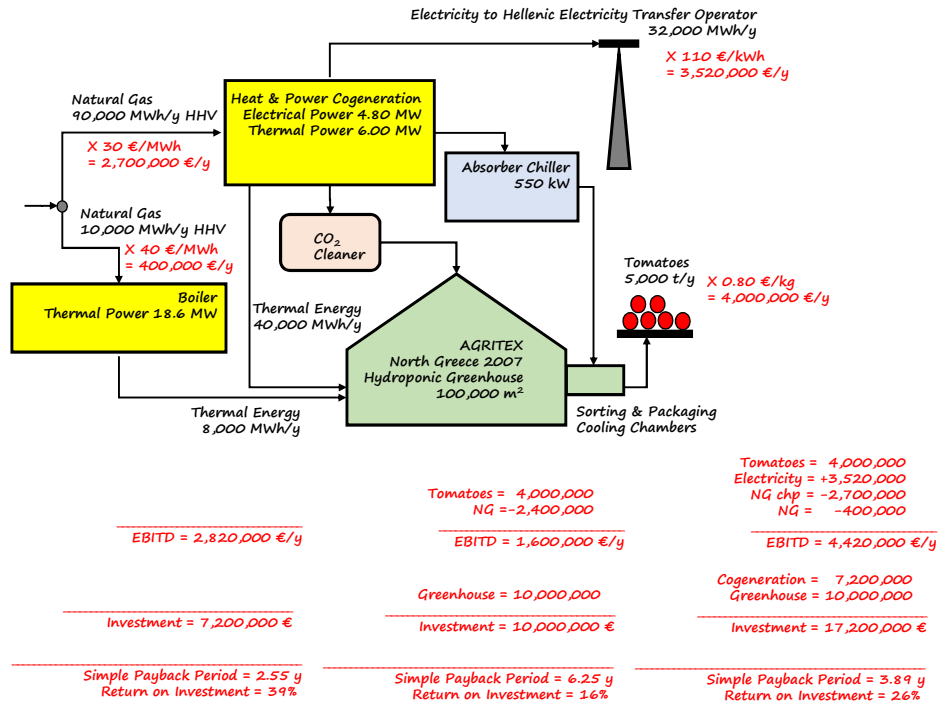


Tomatoes = 4,000,000
NG = -2,400,000

EBITD = 1,600,000 €/y

Greenhouse = 10,000,000
Investment = 10,000,000 €

Simple Payback Period = 6.25 y
Return on Investment = 16%



Energy Services Company

an Electricity Producer + a Farmer = Two in One

Energy Services Company	a Farmer	Two in One
EBITD = 2,820,000 €/y	EBITD = 1,600,000 €/y	EBITD = 4,420,000 €/y
Investment = 7,200,000 €	Investment = 10,000,000 €	Investment = 17,200,000 €
Simple Payback Period = 2.55 y Return on Investment = 39%	Simple Payback Period = 6.25 y Return on Investment = 16%	Simple Payback Period = 3.89 y Return on Investment = 26%

Process Design

➤ **Process Specifications:**
 ...Area, Greenhouse Thermal Energy Consumption...

➤ **Prices:**
 ...Product, Natural Gas, Electricity...

➔ ➔ ➔ **Optimize Return On Investment:**
 Cogeneration Size

eg: ...Simple Excel Calculations

