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Implications of New Waste Management Legislation in Finland

Jukka Salmela
Helsinki Region Environmental Services Authority,
Waste Management

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Framework

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- **Key driving mechanisms for Waste Management:**
- **The Waste Directive (2006/12/EC)**
  - Had to be implemented no later than 12.12.2010
  - Emphasis on prevention and energy utilisation
- **RES directive for renewable energy (2009/28/EC)**
  - ”20, 20, 20 by 2020”
  - Requires ”**National renewable energy action plans”**
  - Set’s ”**National overall targets”**
  - RES target for Finland is **38 %**

National Implementation 1/2

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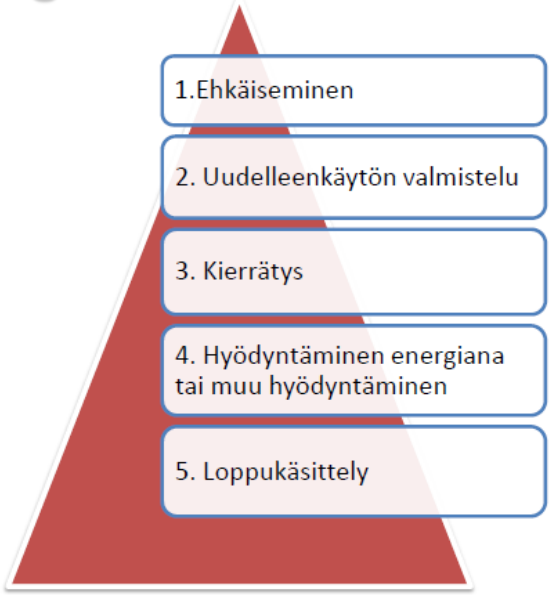
The Waste Directive :

- **Waste management based on landfilling and composting**
  - Land use has set's no limitations (enough space!)
  - WTE has not been subvented by the state
  - Waste incineration; slow market entry due to complaints
- **→ Requires both a political and technological shift**
- **The New Waste Act (646/2011)**
  - Promotion of waste hierarchy
  - Limitation for biowaste landfilling
  - Increased waste tax (landfilled waste)
  - Taget for MSW:
    - 50 % recyling
    - 30 % energy



National Implementation 2/2

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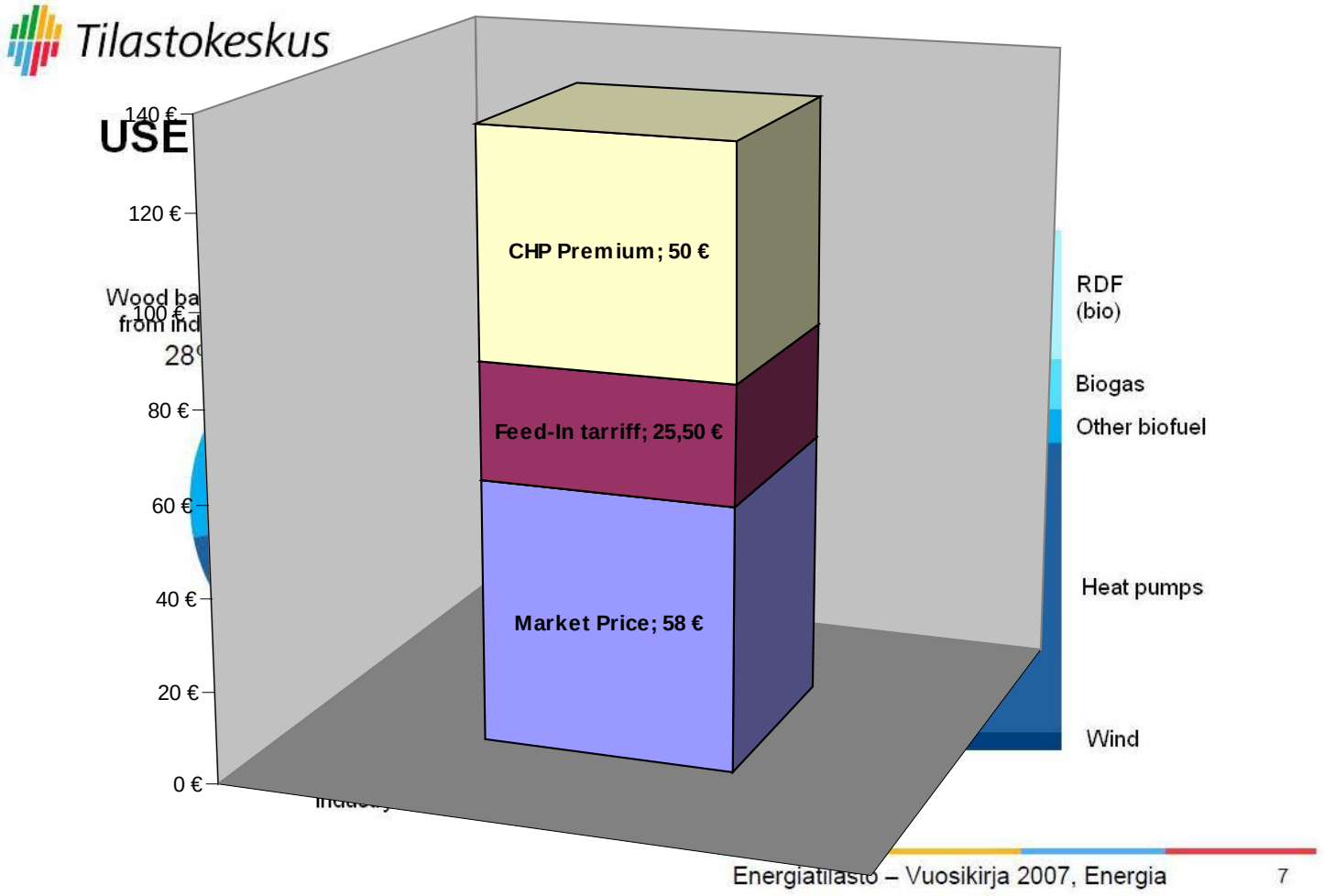
RES Directive :



Implications on Waste Management

- **Operators expect zero allowance on landfilling of biowaste in the future**
- **Waste incineration has/will become dominant in the treatment of MSW**
- **Treatment of biowaste will shift from composting towards anaerobic digestion**
- **Local CHP capasity is expected to be build >19 MW (by 2020) due to introduced subventions (LFG, biogas, syngas…)**
- **Investments on new technology become viable (f.ex waste heat recovery)**

Utilisation of product gas / LFG

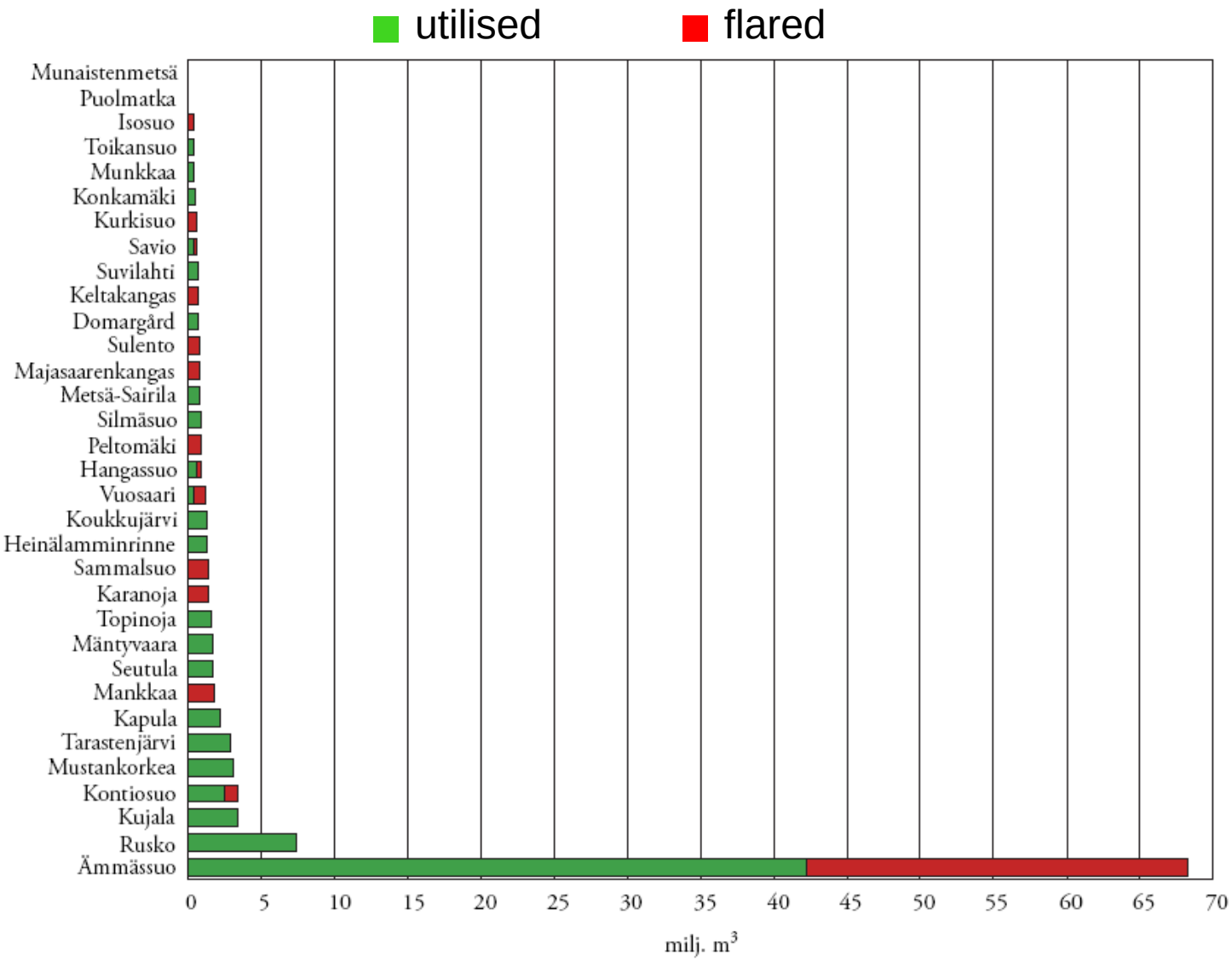


Figure by Kuittinen et. al. 2009

Utilisation of product gas / MWWTP

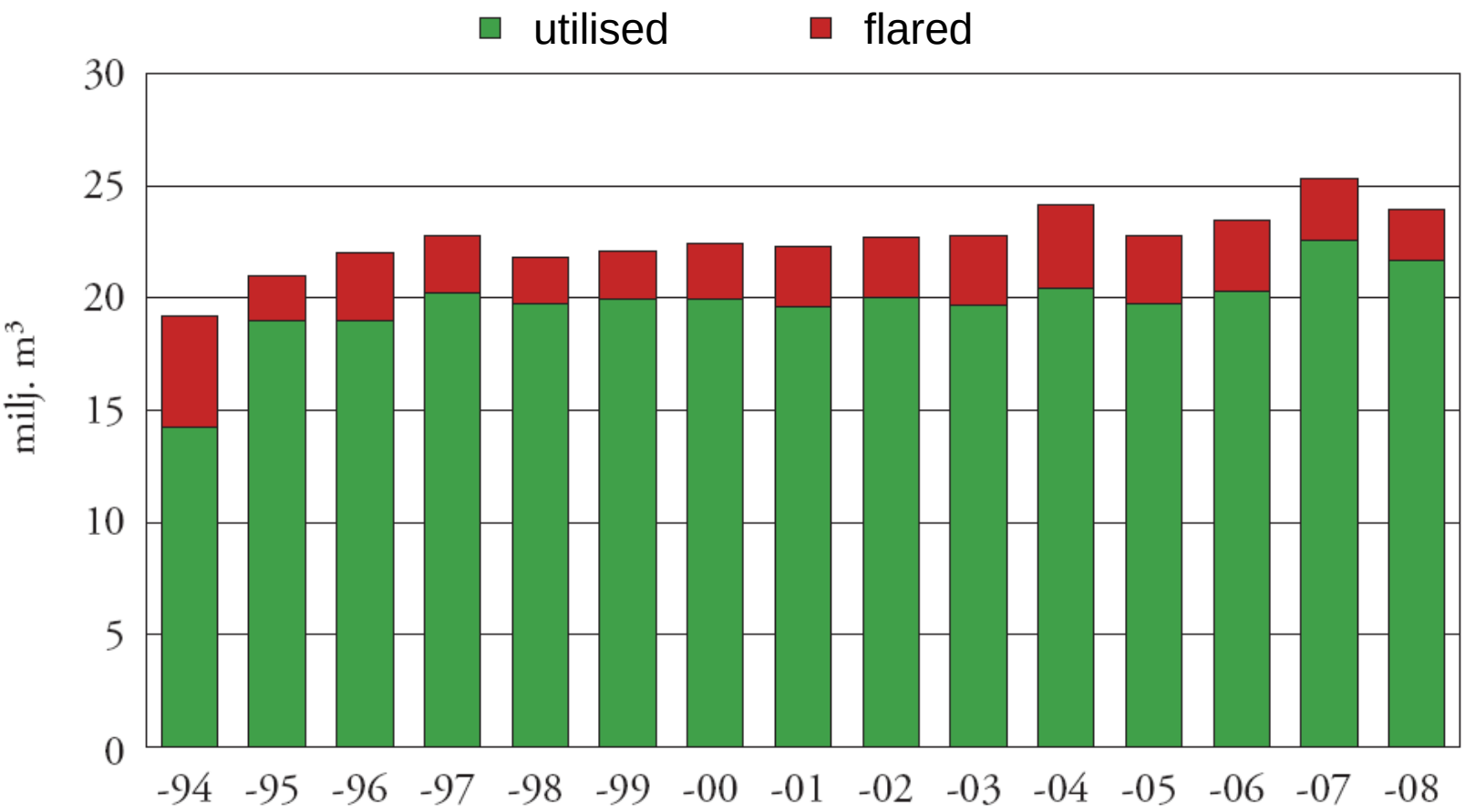


Figure by Kuittinen et. al. 2009

Utilisation of product gas / IWWTP

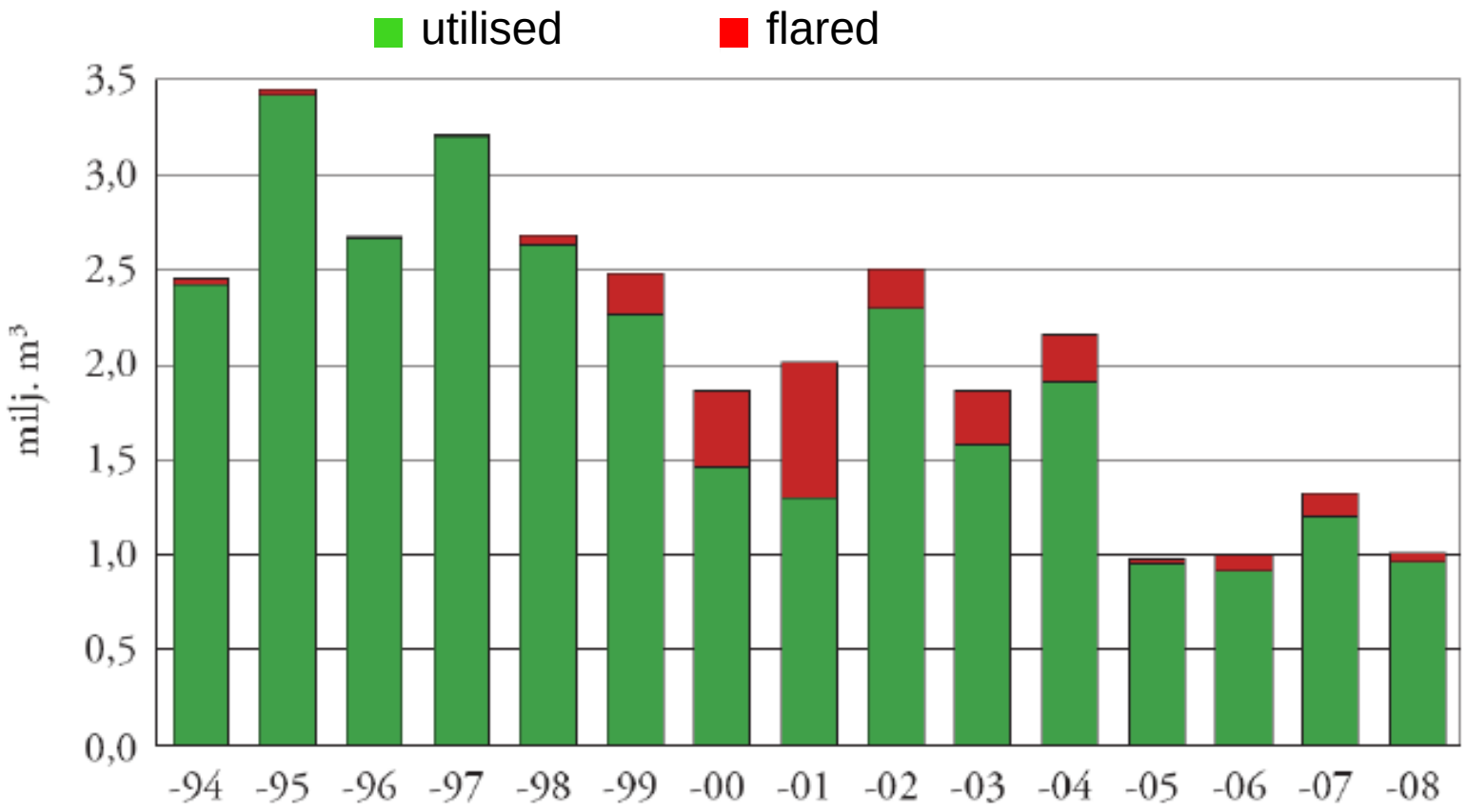


Figure by Kuittinen et. al. 2009

Utilisation of product gas / co-digestion

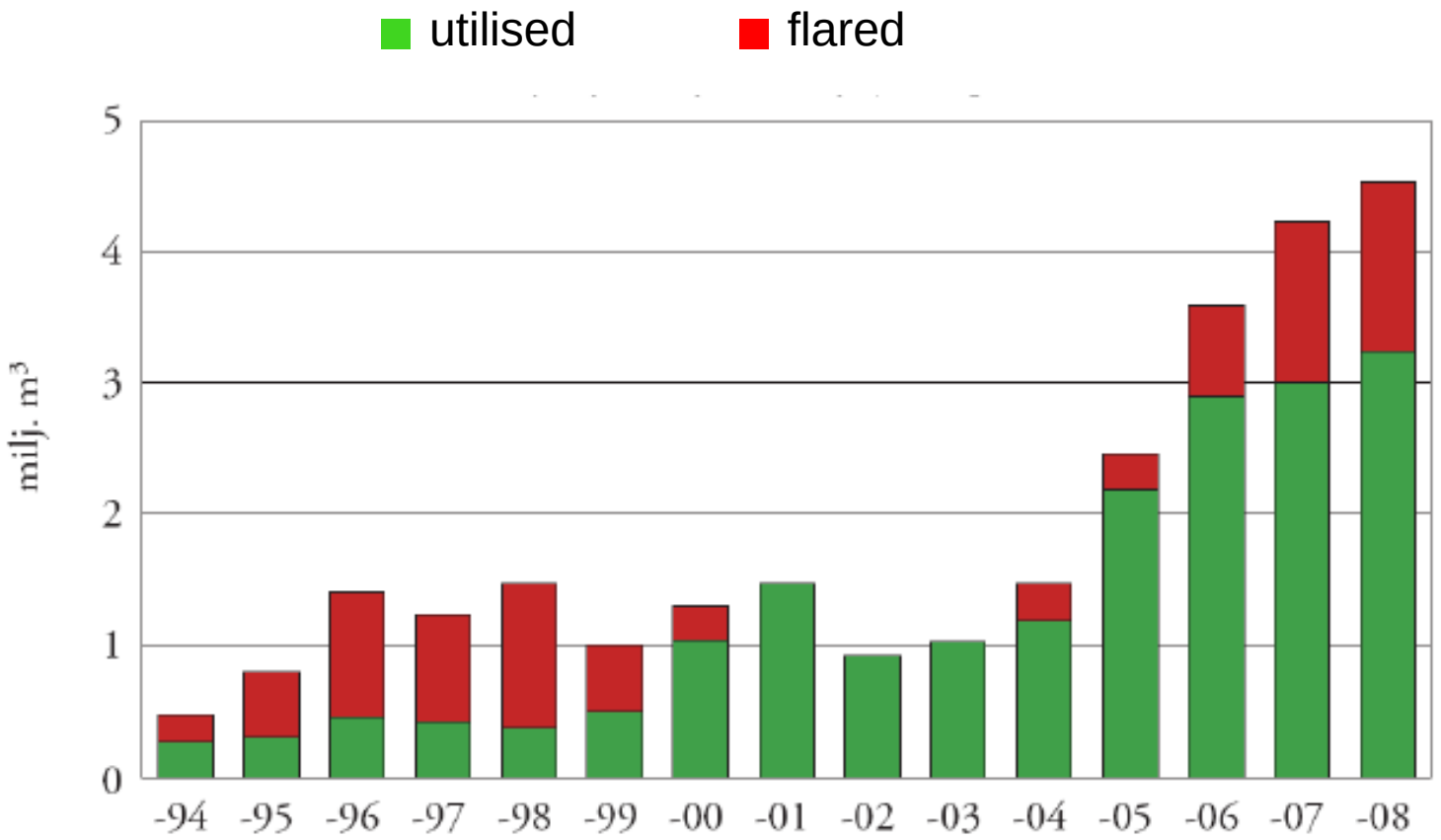


Figure by Kuittinen et. al. 2009


Conversion of Composting into Anaerobig Digestion
700 m3/h (2013 -)
Old bioreactor landfill 50 ha
Landfilled waste ~11 Mm3
220 extraction wells
4 booster stations
7 manifold stations
~ 9 000 m3/h
Gas utilisation
New Bioreactor landfill 13-50 ha
65 extraction wells
3 manifold stations
~ 4 000 m3/h (2015)

Case study

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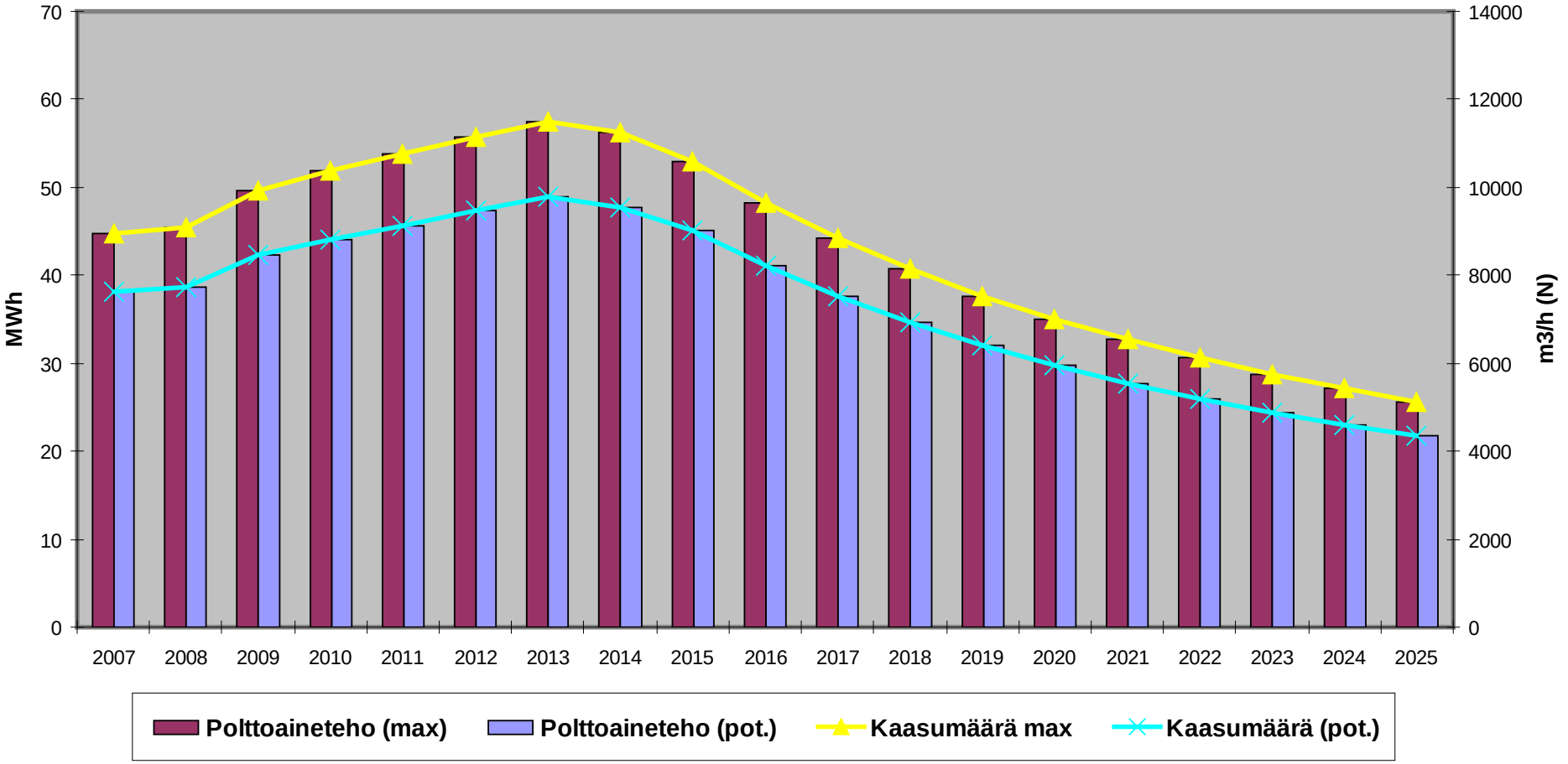
YTV

Gas & Energy estimation 2007-2025



Case study

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- **Studies on best utilisation method 2001 - 2005**
  - Gas production at highest between 2010-2015
  - Utilisation method has to be readily available!
  - **DH production**:
    - Limited to heating season (Sept. – April)
    - Areal overproduction of DH
    - Low price for the gas
  - **Feed into NG network**:
    - Very high investment & operation cost
    - Building of network connection
    - **Possible shortages in gas generation!**
  - **Upgrading into vehicle fuel**:
    - 1000 trucks / 7000 cars (contract based)

→ OWN ONSITE CHP PRODUCTION!

SITE AT 12.6.2009

SITE AT 21.5.2010

CHP Production (before HR)

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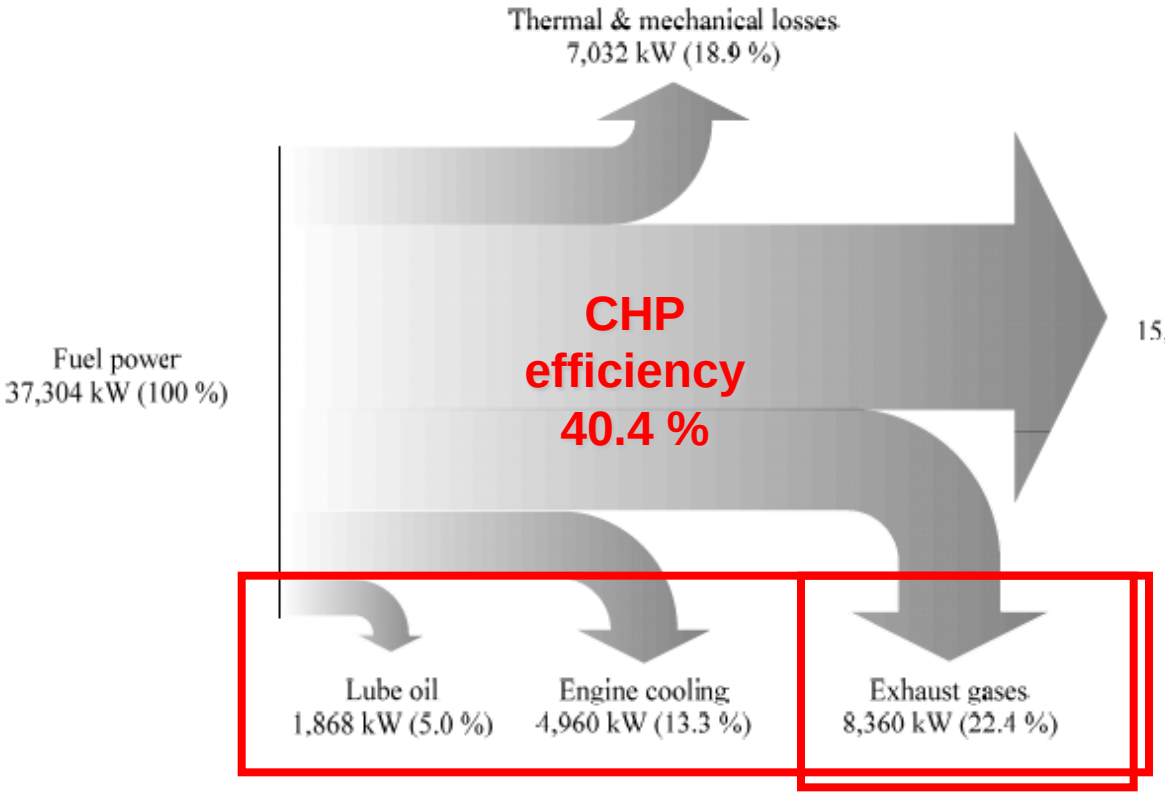
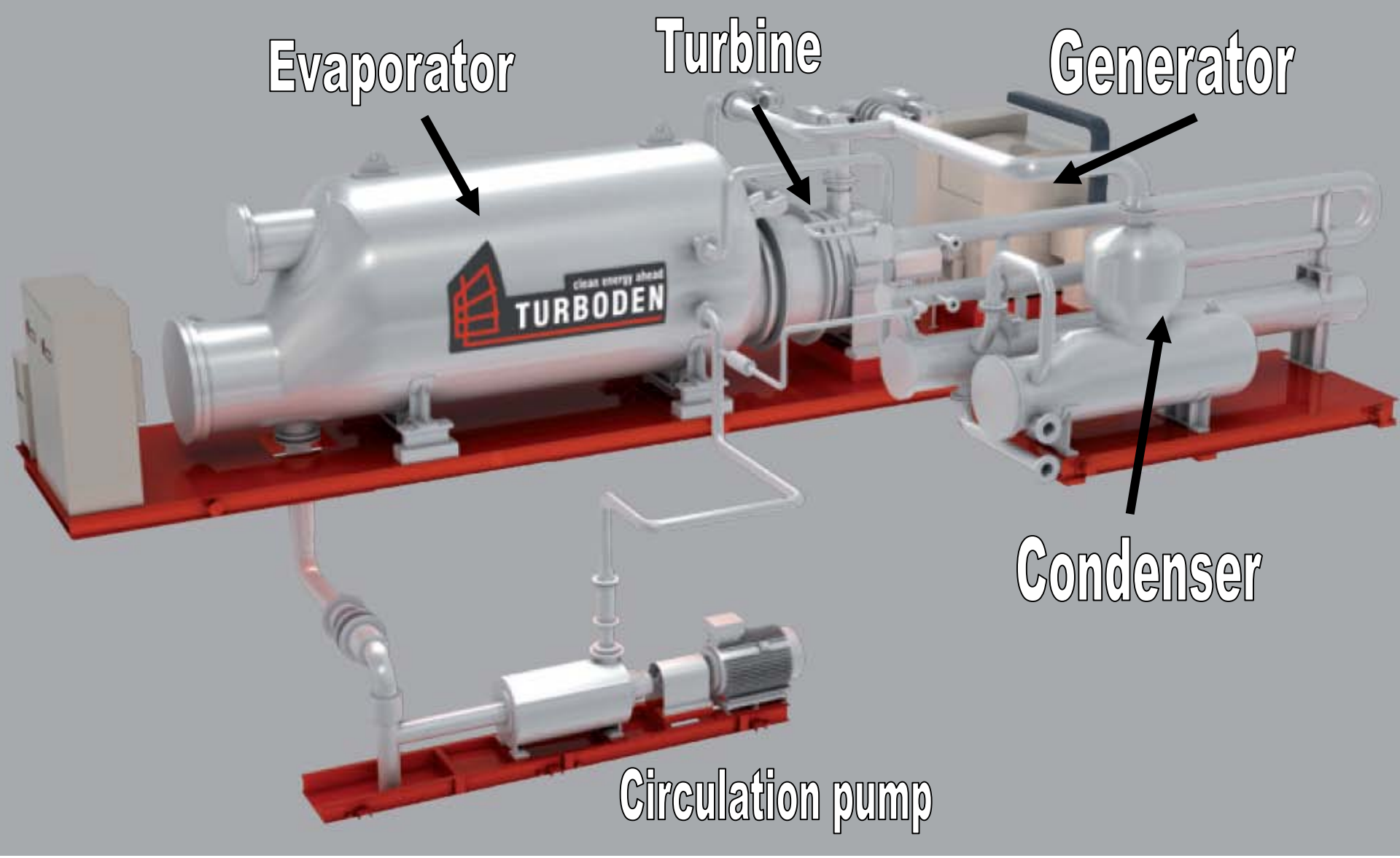
Power production	**MW**	**15.0**
Efficiency (el)	**%**	**42.0**
Efficiency CHP	**%**	**86.1 (theoretical)**
Production 2010	**GWh**	**>100**



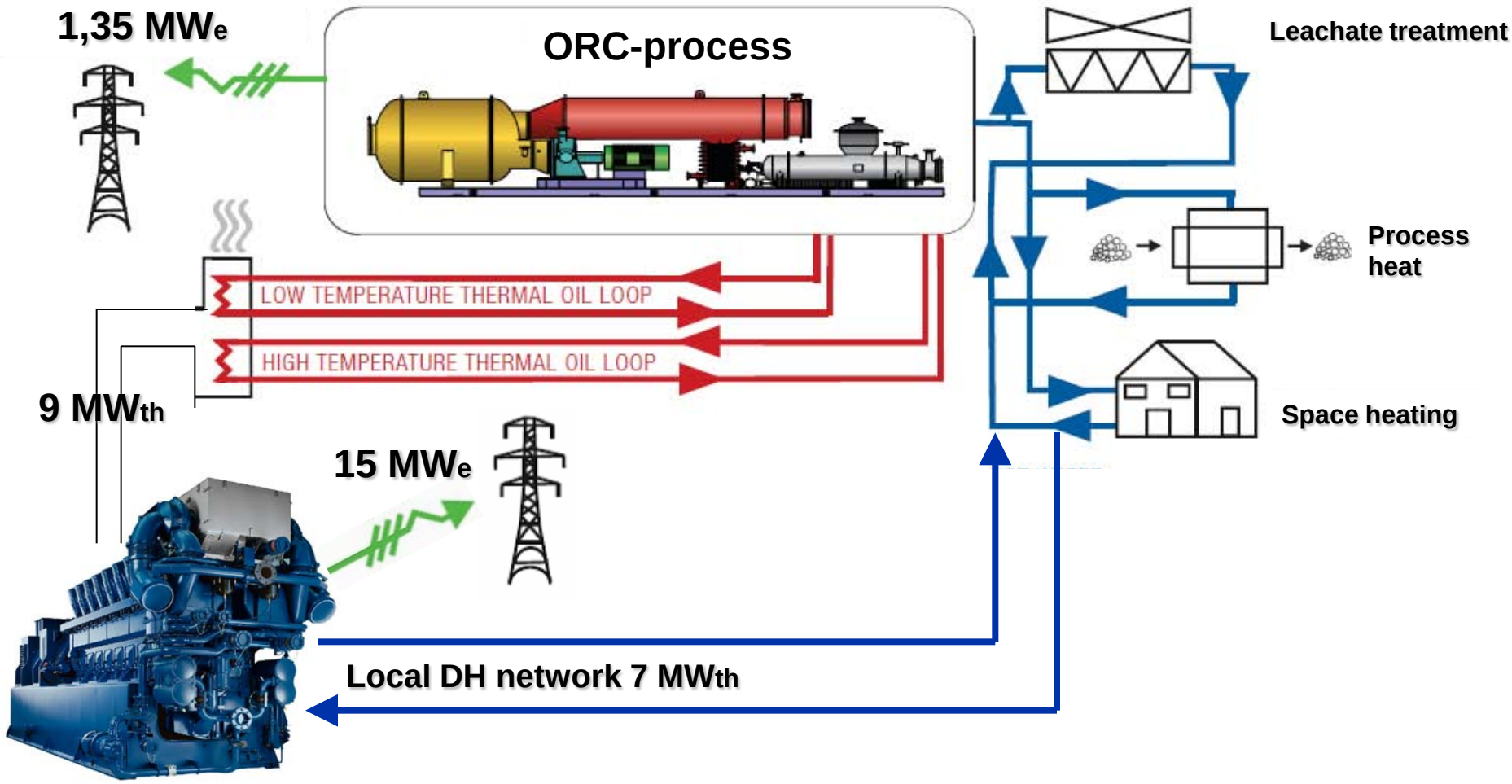
Suitable for recovery using ORC



ORC-process (1,35 MW_e)

Expected start-up 11 / 2011

CHP Production (after HR)



Energy conversion (after HR)

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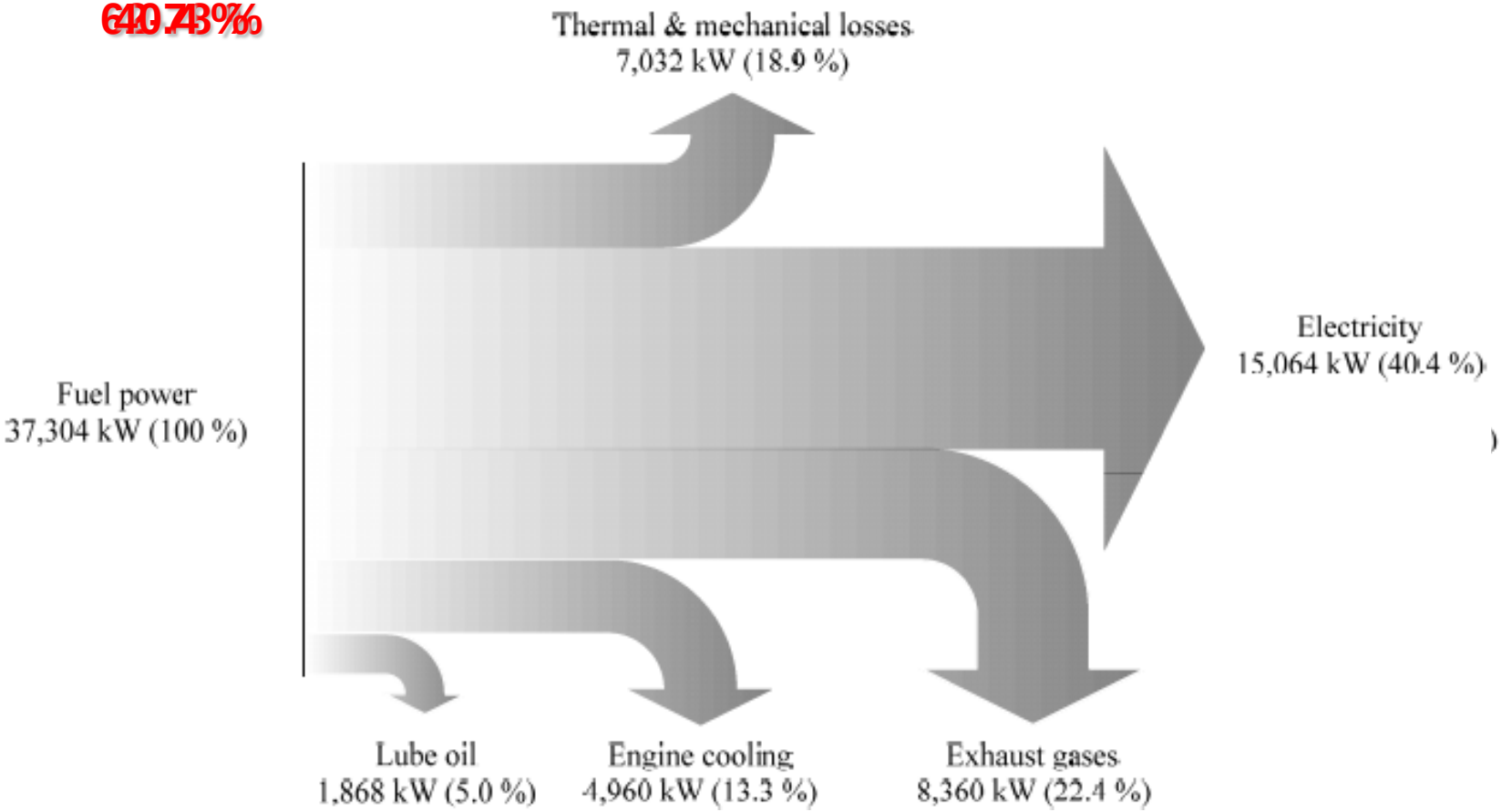
CHP efficiency 40.4%



Case summary

- Waste heat utilisation can potentially produce annually > 10 000 MWh electricity, hence covering the total electricity consumption within the studied site.

- If this ~ 10 GWh power production would replace similar production in a traditional condensing coal fired power plant, this would result an annual CO_2 reduction of nearly 8 500 tons.

- A brief economical analysis also gives positive result for the investment.
  - Estimated total investement 2 130 000 € (vat. 0%)
  - Average O&M cost of 0,007 €/MWh
  - Estimated plant availability 90 %
  - IRR 10 %
  - Payback time with electricity market price is 5,8 years
  - Payback time with feed-in tariff scheme is only 3,3 years

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THANK YOU FOR YOUR ATTENTION !