TASK C – SUPPLY CATALOGUE
IEA ANNEX 73

RAMBOLL ENERGY
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STATUS

- Template in excel, draft with a few cases
- Danish team agreed on principles
- Template July 16, with some technologies from Ramboll
- Template September 12, with more technologies and energy prices from Ramboll

- Alexander, proposed some technologies and input-sheet to the model
- Contribution from Austria on PVT
- Contribution from Germany on symbols

- New version October 2

HOW DETAILED INFORMATION IN TASK C ?

- Generate input to our screening model
- Not as detailed as a text book for universities, links can do it.
- But sufficient information to give the energy planner sufficient understanding of
  - Technical information of the technology
  - Economical information of the technology
  - Technical and economical performance of the technology in interaction with others technologies
  - A first understanding of simple solutions, which the screening model shall be able to propose
- Technologies should if possible have link to real cases in task B, which prove that the technology is applicable and cost effective in certain conditions
- Or, at least the technologies could refer to data from other supply catalogues, e.g. the Danish Energy Agency

https://ens.dk/en/our-services/projections-and-models/technology-data

STRUCTURE OF THE TEMPLATE IN THE CATALOQUE

- Sheets in the model:
  - Introduction-sheet: content, unites, calorific values, energy prices, cost of CO2 etc.
  - Energy system-sheet: system combination of technologies
  - Chart including symbols for description of the energy system
  - Technology-sheets, one sheet for each type of technology
    - Storages
    - Boiler plants
    - CHP plants
    - Heat pumps and chillers
    - DH networks
    - ….
    - Non energy..
  - Input-sheet to the model - technology data to be transferred to this sheet

THE SHEETS IN THE MODEL, FROM INTRODUCTION TO INPUT

IEA Annex 73
TASK C Equpiment

Introduction

01-10-2018

Introduction	*Every headline of technology categories in the list of content below refers to a **sheet** in this file.*
List of content	*Every sheet is divided in **sections of 100 rows in two pages** - one section for each technology in the same category*

Introduction
List of content
Introduction and guideline
Units and prices

Energy Storages
Hot water tanks, pressureless
Hot water storage tank, pres.
Hot water storage pit
Cold water storage tank
Cold water storage pit
Gas storage cavern
Aquifer gas storage
Hydro pump storage

Heat Pumps and Chillers
Electric Chiller for cooling
Electric heat pump for combined
Absorption Heat Pump for coolin
Air condition chiller
Available 1
Available 2

DH-Networks
Capacities and losses
System analysis of networks
Preinsulated pipes
Pipes in concrete ducts
Available 1

HVAC
Building heat exchanger stations
Central heating
Ventilation system
Combined ventilation and DH&C
Hot tap water system
Available 1
Available 2

Other Energy
Heat exchanger stations
Pressure sectioning
Pressure reduction
Scada systems

Energy-Systems
Combined Heat and Power in Arctic Climate
District cooling in tropic climate
Combined heating and cooling in mild climate
District heating and wind in mild climate
DH, solar and wind in mild climate island
Available 1

For inspiration and guidance:
The sheets "Input" and "Storage" in the end of the file include information to be transferred into the model.
Therefore each technology shall

Introduction | Energy Systems | Energy Storages | Boiler Plants | CHP Plants | Heat Pumps and Chillers | DH-Networks | DC-Networks | Gas-N ...

Index	Name	Type	Size	(Units)	Capacity/Output
3	Solar PV 10 kW system	Solar PV			100000
4	Solar PV 100 kW system	Solar PV			100000
5	Solar PV 1000 kW system	Solar PV			100000
7	Central plant boiler	Boiler			100
8	Central plant boiler	Boiler			1000
9	Central plant boiler	Boiler			2500
10	Central plant boiler	Boiler			10000
11	Reciprocating engine (natural gas)	Recip. Engine			300
12	Reciprocating engine (natural gas)	Recip. engine			1000
13	Reciprocating engine (natural gas)	Recip. engine			3000
14	Reciprocating engine (natural gas)	Recip. engine			5000
15	Reciprocating engine w/ heat recovery (natural gas)	Recip. engine cogen			100
16	Reciprocating engine w/ heat recovery (natural gas)	Recip. engine cogen			500
17	Reciprocating engine w/ heat recovery (natural gas)	Recip. engine cogen			1000

DH-Networks | DC-Networks | Gas-Networks | Power-Networks | HVAC | Renewable Energy | Resilience | Other Energy | Input | Non Energy ...

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THE STRUCTURE OF THE TECHNOLOGY SHEETS

- Line 1-100, 2 pages: List of content, text box, figures, summary calculations etc
- Line 101-200, 2 pages: Technology type 1, text box, figures, cost calculations etc
- Line 201-300, 2 pages: Technology type 2, text box, figures, cost calculations etc
- Line 301-400, 2 pages: Technology type 3, ……
- Etc.

- In case of many types, it could be divided into two technology types

IEA Annex 73
TASK C Equipment

Energy Storages

01-10-2018

Summary of Energy storages

List of content

Hot water tanks, pressureless	Ramboll
Hot water storage tank, pres.	Ramboll
Hot water storage pit	Ramboll
Cold water storage tank	Ramboll
Cold water storage pit	Ramboll
Gas storage cavern	Ramboll
Aquifer gas storage	Ramboll
Hydro pump storage	?
Electric batteries	?
Aquifer Thermal Energy Storage	Ramboll
Available 1	?

The biggest challenge in developing Net Zero Communities is not to generate renewable energy, but to use it.

The available renewable energy or surplus energy sources, which can contribute to forming Net Zero Communities, are normally not available when needed, and it can even be more expensive to store the energy than to generate it. A good example is that the renewable energy sources wind, solar and hydro can generate electricity, as the wind blows, the sun chines and the rain falls, whereas the power grid it selv can not store the electricity.

Therefore energy storages will play an important role.

In order to identify the most cost effective storage it is necessary to look both at the production , the

Introduction | Energy Systems | Energy Storages | Boiler Plants | CHP Plants | Heat Pumps and Chillers | DH-Networks | DC-Networks | Gas-N ...

IEA Annex 73
TASK C Equipment

Energy Storages

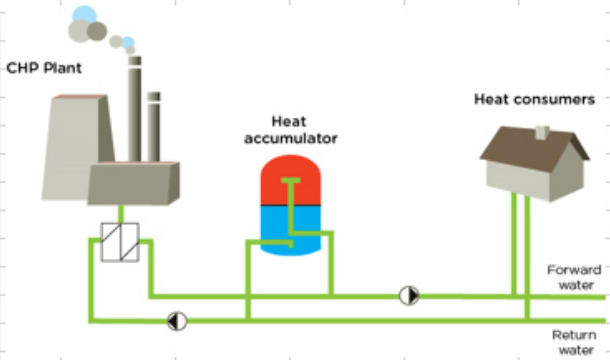
01-10-2018

Hot water tanks, pressureless

Hot water pressure less tanks is the most common energy storage. This is because hot water is the end-use for most heating systems and for hot tap water and because water is a very natural and environmental friendly storage media. The tanks are normally constructed in steel, but it could also be in concrete, fiberglass reinforced plastic. Steel tanks for storage of hot water is a well-established technology, both in small houses and for large DH systems.

Typically, a tank used in district heating is insulated with about 2x150 mm insulation(mineral wool).

In the last decades steel tanks have been used as short term storage in combination with combined heat and power plants, to be able to offset production to a more favorable time. For extraction CHP plants (which can generate power only) the storage allows the plant to stop heat generation and generate maximal power only when electricity is most expensive. For back pressure CHP plants or engines (fixed ratio between heat and power), it allows the plant to



The pressureless directly connected tank operates in a simple way. The tank compensates automatically

Introduction | Energy Systems | Energy Storages | Boiler Plants | CHP Plants | Heat Pumps and Chillers | DH-Networks | DC-Networks | Gas-N ...

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PLAN FOR COMPLETION

- All contributions to be send to Ramboll, urgent
- Ramboll will start to complete missing information
- Danish Technology catalogue will be used in case no better data is available
- New draft February 2019
  - Data for all technologies listed in draft 2nd of October
  - 6-8 energy systems analysed with EnergyPro and prices
  - Example on transfer of data to input-sheet

- More contribution welcome
- New updated edition before each working group meeting

THANK YOU