



Incentives & Policies Relevant to Renewable GQCHP

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CHPQA Programme Director

December 2020



Fiscal Measures for GQCHP

- CCL Exemption (on fuel input and electricity output where directly supplied)
- Carbon Price Support (CPS) exemption
- Business Rates Exemption (embedded schemes)
- Hydrocarbon Oil Duty Relief
- ~~Enhanced Capital Allowance (ECA) – scheme now closed~~
- 1 ROC/MWh of electricity from EfW CHP, 2 ROCs/MWh from dedicated biomass CHP (April 2009)
- Specific RHI tariff for biomass fuelled GQCHP
- CHP specific CfDs applicable to biomass and waste fuelled CHP, replaced RO for all new projects from 1/4/2017.



Talk Coverage

Renewable CHP Incentives

- Renewables Obligation (RO) Closed for new schemes from 2015
- Contracts for Difference (CfD) – at Round 4
- Renewable Heat Incentive (RHI) – Open until March 2021, with possible extension??



Renewables Obligation (RO)



The Renewable Obligation (RO) and Banding

- First introduced in 2009 and gave:
- “Banding” concerns the provision of varying levels of support (ROCs/MWh) for different types of generation technology
- New banding regime introduced in April 2013 to run through to March 2017
- **NOW CLOSED TO NEW CAPACITY**
- **But accredited schemes under the RO will need to continue with CHPQA certification to end of the policy period in 2037.**



Banding Regime 2016/17

Generation Type	CHP Qualifying Power Output [ROCs/MWh]	Non-CHP Power Output [ROCs/MWh]
Co-firing of regular bioliquid with CHP	1.0	0.5
Low-range co-firing of relevant energy crops with CHP	1.5	1.0
Dedicated biomass with CHP*	1.8	1.4
High-range co-firing with CHP	1.4	0.9
Mid-range co-firing with CHP	1.1	0.6
Low-range co-firing with CHP	1.0	0.5
Station/unit conversion with CHP [†]	1.5	1.0
Energy from Waste with CHP	1.0	0.0



ROC Eligibility

For GQCHP, the power output eligible for the award of ROCs is determined using:

$$\text{Eligible Power Output} = \text{Net Power Output} \times \text{Biomass Content (\%)} \times \left(\frac{\text{QPO}}{\text{TPO}} \right)$$

From CHPQA
Certificate



ROC eligible CHP Schemes

CHP Schemes Requested GN44 Certificate

No. Schemes	CHTPC (kWe)	CHPQPO (MWh)	CHPTFI (MWh)	CHPQHO (MWh)
61	793,709	2,339,566	21,477,337	3,864,663

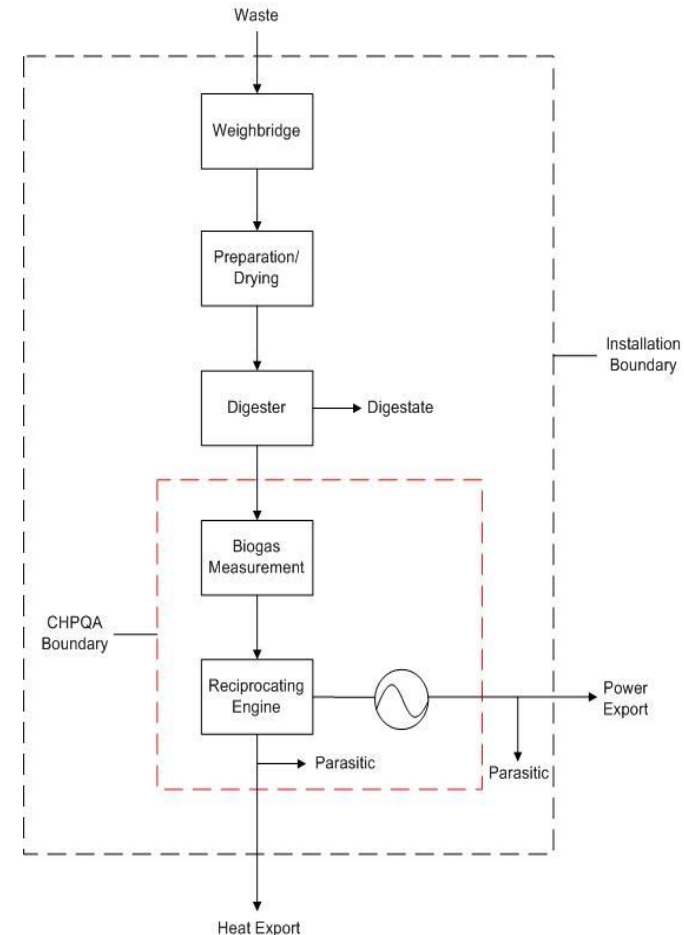
ROC benefit > £50
million (based on
0.5 ROC uplift)



ROC Eligibility – QI Definitions

Advanced Conversion Technologies (ACTs)

- Gasification
 - Pyrolysis
 - Anaerobic Digestion
- For biogas fired schemes, the fuel input boundary should normally be drawn at the gas inlet to RE
 - Should use the Biogas QI formula
 - **This means can't qualify for Biomass CHP uplift tariff.**





Contract for Difference (CfD)



Contracts for Difference (CfD)

- Regulations for CfDs came into force in Great Britain on 1/8/2014
- CfDs replace the RO for all new projects from 1/4/2017
- Generators are paid the difference between the 'strike price' and the 'reference price' (average market price for electricity in GB market). If 'reference' exceeds 'strike' price, generator must pay difference.
- CfDs are awarded via allocation rounds, which government can tailor to specific technologies
 - ❑ First allocation round was in October 2014: two EfW CHP stations were awarded CfDs
 - ❑ Second allocation round was announced in April 2017. Technologies include:
 - Advanced Conversion technologies (with or without CHP)
 - Anaerobic Digestion (with or without CHP) – **1 Scheme Awarded**
 - Dedicated Biomass with CHP – **2 Schemes Awarded**
 - ❑ Third allocation round was in Sep 2019 – **CHP not included**
 - ❑ Fourth allocation round planned for 2021 – **details not yet released**



Contracts for Difference (CfD)

Round 2, Successful applications:

- 2 Dedicated biomass CHP, total capacity 85.64 MWe
- 1 ACT CHP, capacity of 0.05 MWe

Technology	Capacity (MWe)	Strike Price (£/MWh)	2021/22 Administrative Strike Price (£/MWh)
Advanced Conversion Technologies (with or without CHP)	0.05	74.75	125
Dedicated Biomass CHP	85.0	74.75	115
Dedicated Biomass CHP	0.64	74.75	115



CHP-specific CfD Eligibility

- Dedicated Biomass and Energy from Waste generators are only supported if they are **'with CHP'**.
- Provision for other technologies to be 'with CHP' (ACT, AD and geothermal)
- Support is paid only on the proportion of metered electrical output assessed by CHPQA to be **QPO**.
- Uses the CHP Qualifying Multiplier, **CHPQM = QPO/TPO**.
- Provide evidence of intended "useful heat" load in F3 submission.
- For 'with CHP' technologies, the generator must maintain annual CHPQA certification (full or partial) including **GN44 certification** for the duration of the CfD.
- **Biomass (not EfW) schemes seeking CfDs will also be able to apply for the RHI. This is, however, set for each CfD round.**



GN44 Changes

ISSUE 6

➤ For CHP schemes under 25MWe to have a minimum:

- Primary energy saving of 10%, and
- Heat efficiency of 10% Gross Calorific Value (GCV)

➤ For CHP schemes equal to and over 25MW to have a minimum:

- Primary energy saving of 10%,
- Heat efficiency of 10% GCV, and
- Overall efficiency of at least 35% GCV

ISSUE 7

➤ For CHP schemes of all sizes to have a minimum:

- Primary energy saving of 10%, and
- Heat efficiency of 10% Gross Calorific Value (GCV)
- Overall efficiency of 70% NCV for all sizes.



GN44 Issue 7 – Added Provisions

- Investor Safeguard (para GN44.11)
- Safeguard Provision (para GN44.20)
- Heat Network Flexibility (para GN44.21)



GN44 Issue 7 – Investor Safeguard

- Contract for Difference for Dedicated Biomass with CHP Schemes only
- Protection against risk of loss of heat customers for up to 5 years
- Can be 5 discrete years not necessarily consecutive
- RP may elect to have CHP Qualifying Multiplier (QM) based on most recent F3 Certificate
- Requires written request to CHPQA to invoke

No Schemes have had to utilise this provision



GN44 Issue 7 - Safeguard Provision

- RO and CfD Schemes
- for new Schemes meet relevant policy criteria (heat efficiency, PES and Overall efficiency) but don't achieve $QI=100$
- CHPQA will recalculate the X coefficient specifically against the design of the Scheme on a case-by-case basis
- Based on finding the operating point at which a Scheme just meets all of the relevant policy criteria and an X value is found that gives a $QI=100$
- Revised X value is now used at all operating conditions for Scheme lifetime

About 5 Schemes utilising this provision



GN44 Issue 7 – Heat Network Flexibility

- For renewable Schemes supplying heating/cooling networks
- Adopts a QI threshold of 95 for an initial period of operation of 5 years
- Schemes must demonstrate a heat load development business plan
- That shows build-out will achieve QI=100 in sixth year; or
- QI will increase by at least 5 points by the sixth year
- Business Plan must accompany an F3 submission
- 5 year period starts from first firing and following 5 full calendar years
- Schemes then return to QI=100

2 Schemes using this provision



CfD Consultation

CfD Government response to consultation on proposed amendments to the scheme... November 2020

*The government intended to require all dedicated biomass with CHP, and energy from waste with CHP, projects applying for new support contracts under the Contract for Difference scheme to have a minimum overall efficiency of **70% (net calorific value)** and that government would set a **new GHG threshold of 29 kgCO₂e/MWh**.*



Dual CHPQA Certification



CHP QA

Department for
Business, Energy
& Industrial Strategy

**Quality Certification for
an existing CHP Scheme**

CHPQA Certificate No: P04231498

Scheme: CHPQA SITE Z
GEMINI BUILDING
HARWELL
OXFORD
OX11 0QR

DRAFT

CHPQA Scheme Reference No: 8760 Z

This is to Certify that the Self-Assessment of the above CHP Scheme undertaken by TEST USER of Scheme performance during the calendar year: 2016 has been Validated under the Combined Heat and Power Quality Assurance programme and that:

1. The Total Power Capacity of this Scheme is: and the Qualifying Power Capacity is:	50,000 MWe 50,000 MWe
2. The threshold Power Efficiency criterion for this Scheme is: and the Power Efficiency of this Scheme is:	20 % 25.85 %
3. The Qualifying Heat Output from this Scheme is: and the Heat Efficiency of this Scheme is:	135,461 MWh 35.46 %
4. The threshold Quality Index criterion for under Annual Operation is: and the Quality Index of this Scheme is:	100 97.75
5. The Total Fuel Input to this Scheme is: and the Qualifying Fuel Input is:	382,033 MWh 382,033 MWh
6. The Percentage of Fuel Input Referable to Electricity Generation is:	56.22 %
7. The Percentage of Conventional Fuel is:	1.51 %
8. The Total Power Output from this Scheme is: and the Qualifying Power Output is:	98,764 MWh 89,049 MWh
9. The fuel supply reference(s) (e.g. TRANSCOMGR gas meter reference nos. and/or other unique ID descriptors) for this Scheme are:	

The CHPQA programme is carried out on behalf of the Department for Business, Energy & Industrial Strategy, the Scottish and Welsh Governments, and the Northern Ireland Department for the Economy.

For the purposes of the Climate Change Levy (General) (Amendment) Regulations 2003 only, the QPO limit shall be equal to the actual output of the station multiplied by the following ratio: the Qualifying Power Output referred to at item 8 above over the Total Power Output referred to at item 8 above.

CHP QA

Department for
Business, Energy
& Industrial Strategy

**Quality Certification for an existing
CHP Scheme for CfD eligibility**

CHPQA Certificate No: F04231498/CID

Scheme: CHPQA SITE Z
GEMINI BUILDING
HARWELL
OXFORD
OX11 0QR

DRAFT

CHPQA Scheme Reference No: 8760 Z

This is to Certify that the Self-Assessment of the above CHP Scheme undertaken by TEST USER of Scheme performance during the calendar year: 2016 has been Validated under the Combined Heat and Power Quality Assurance programme and that:

Information for CfD Eligibility

1. The Total Power Capacity of this Scheme is:	50,000 MWe
2. The Power Efficiency of this Scheme is:	25.85 %
3. The Qualifying Heat Output from this Scheme is: and the Heat Efficiency of this Scheme is:	135,461 MWh 35.46 %
4. The threshold Quality Index criterion for this Scheme under Annual Operation is: and the Quality Index of this Scheme is:	100.00 114.83
5. The Total Fuel Input to this Scheme is:	382,033 MWh
6. The Total Power Output from this Scheme is: and the Qualifying Power Output is:	98,764 MWh 98,764 MWh
7. The CHP Qualifying Multiplier for this Scheme is:	1.00
8. The Technology Type for this Scheme is:	Pass-out condensing steam turbine
9. The Main Fuel Type for this Scheme is:	Wood Fuel
10. The Percentage of Renewable Fuel is:	98.69 %

The CHPQA programme is carried out on behalf of the Department for Business, Energy & Industrial Strategy, the Scottish and Welsh Governments, and the Northern Ireland Department for the Economy.

For the purposes of the Climate Change Levy (General) (Amendment) Regulations 2003 only, the QPO limit shall be equal to the actual output of the station multiplied by the following ratio: the Qualifying Power Output referred to at item 6 above over the Total Power Output referred to at item 6 above.

6. The Total Power Output from this Scheme is:
and the Qualifying Power Output is:

98,764 MWh
98,764 MWh



Renewable Heat Incentive (RHI)



CHP in RHI

- The specific tariff for solid biomass GQCHP of 4.57p/kWh (from 1 April 2016)
- Schemes need to be certified by CHPQA in order to benefit from CHP tariff
- EfW plants are only eligible for the biomass boiler tariff for the biomass percentage contained in the waste
- No special CHP RHI tariffs for EfW or other fuels
- RHI eligible heat from CHP is not the same as QHO
- CHP scheme boundaries for CHPQA certification are not always the same as for RHI eligible installation
- Only heat produced via the engine/turbine can qualify for the CHP tariff
- This needs to be metered separately



The RHI (Amendment) Regulations 2016

- **Effective from the 1 August 2016**, the government introduced a threshold of **20% power efficiency** below which the heat qualifying for the RHI CHP tariff would be scaled back proportionately.
 - For example, if the power efficiency was 15%, the amount of heat that could qualify for the CHP tariff would be reduced by $(20-15)/20 \times 100\% = 25\%$.
This means 25% boiler heat and 75% CHP heat.
- Introduced to address concerns that a number of Schemes with **low power efficiencies** and high heat to power ratios (25:1 up to 90:1) were receiving **disproportionate support** where significant heat was simply passing through the prime-mover
- **However:** given feedback from the industry, the government has reduced the threshold to **10% power efficiency from 1 Jan 2017** for a transitional period to allow for Consultation to be carried out.



The RHI Consultation

- In 2017 the Government published a consultation “The Renewable Heat Incentive: Support for Biomass Combined Heat and Power, to gather additional views on power efficiency threshold issue.
 - ❑ This stated that “The Government has decided to implement a 20% power efficiency threshold requirement”
 - ❑ This also stated “Participants with an application effective date between 1 Aug 2016 and the date on which the regulations containing the new 20% power efficiency requirements come into force will continue to have a 10% power efficiency requirement.”

Summary table:

Date of accreditation	CHPQA Power Efficiency Threshold
Prior to 1 st August 2016	No threshold
1 st August 2016 to 31 st December 2016	20% (applies up until 31 st December 2016) 10% (applies from 1 st January 2017 onwards)
1 st January 2017 to 22 nd May 2018	10%
22 nd May 2018 onwards	20%



Tariff rates for RHI accreditation after 1 April 2018

Tariff name	Eligible sizes	Tariff, p/kWh	
Small commercial biomass	< 200 kWth	Tier 1	3.15
		Tier 2	2.21
Medium commercial biomass	200 kWth to \leq 1MWth	Tier 1	3.15
		Tier 2	2.21
Large commercial biomass	>1MWth	Tier 1	3.15
		Tier 2	2.21
Solid biomass CHP systems	All capacities	n/a	4.57

- **No tiers for Solid biomass CHP**
- For boilers Tier 1 rate applied for 3,066 hours (35% load factor).
- Remainder of heat generated in the 12 months paid at Tier 2 rate.



RHI eligible CHP Schemes

RHI CHP Schemes

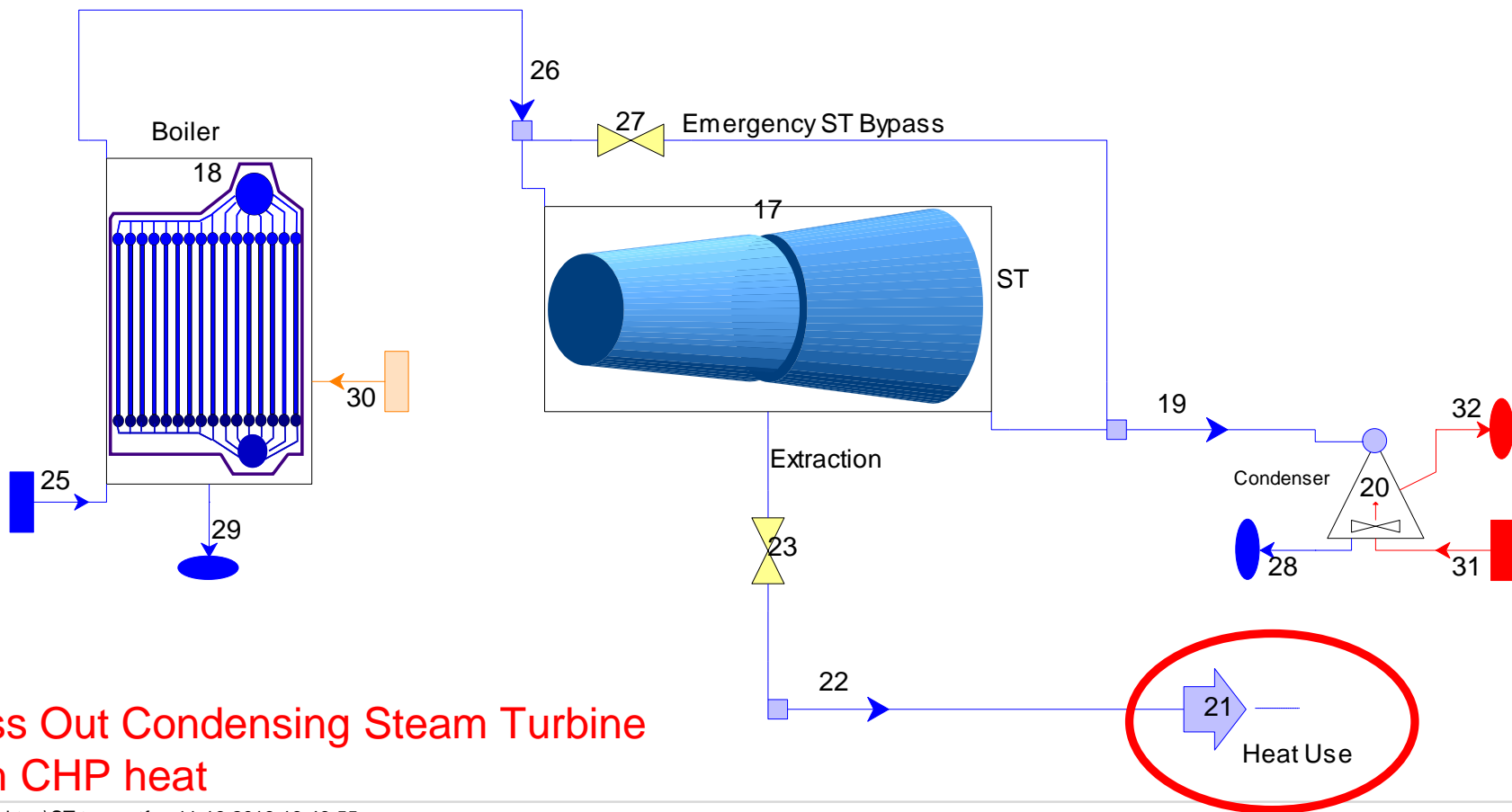
No. Schemes	CHPTPC (kWe)	CHPTPO (MWh)	CHPQPO (MWh)	CHPTFI (MWh)	CHPQHO (MWh)
73	65,713	363,595	118,550	2,038,944	592,310

RHI benefit > £1.2 million (based on RHI tariff difference of £2.03/MWh)



ST Example CHP

Version 23.0 Demonstration Thermoflow, Inc.



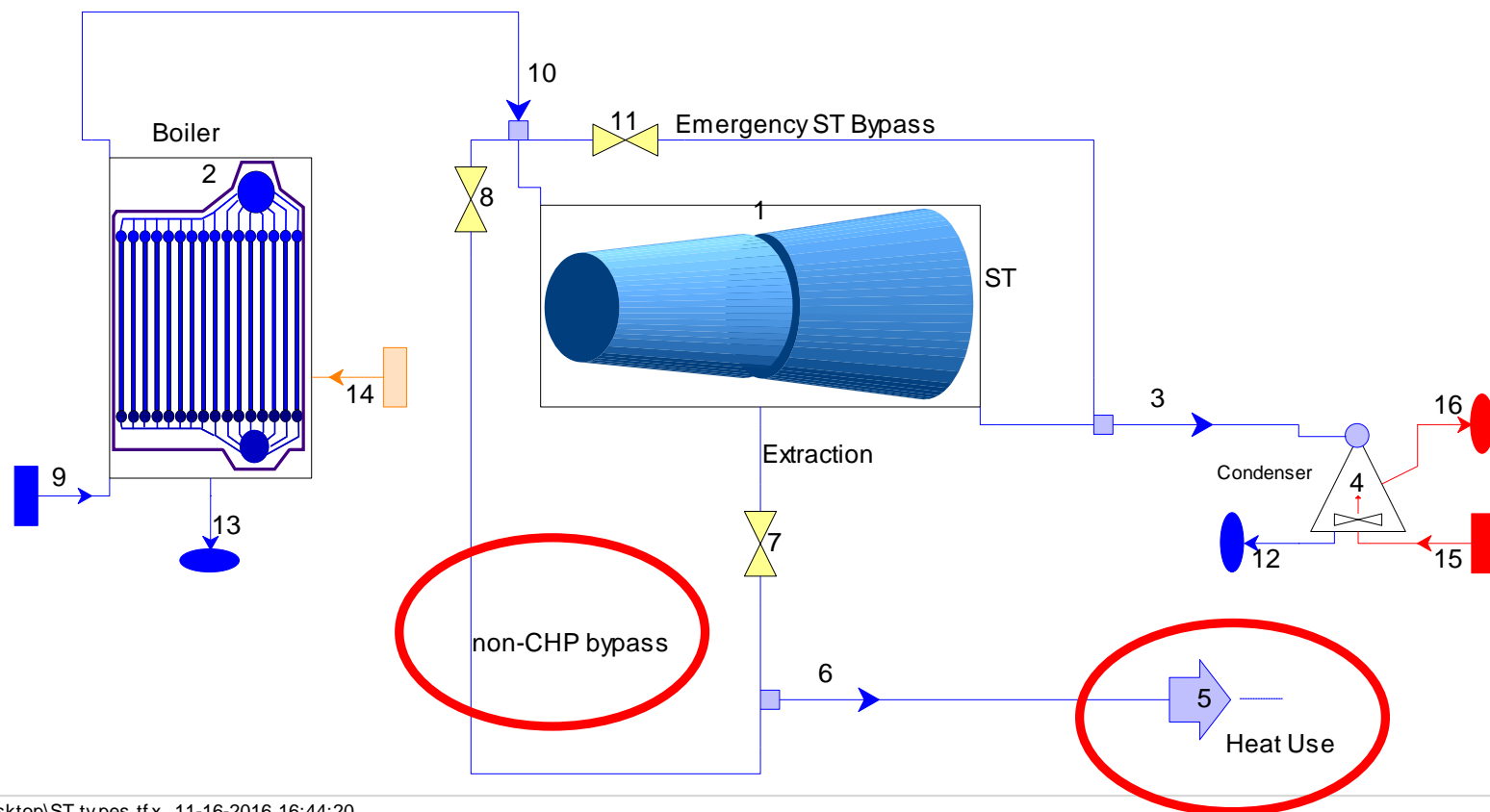
Pass Out Condensing Steam Turbine
with CHP heat



ST Example with non-CHP Heat

LEX Version 23.0 Demonstration Thermoflow, Inc.

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t/h



C:\Users\PE5\Desktop\ST types.tfx 11-16-2016 16:44:20

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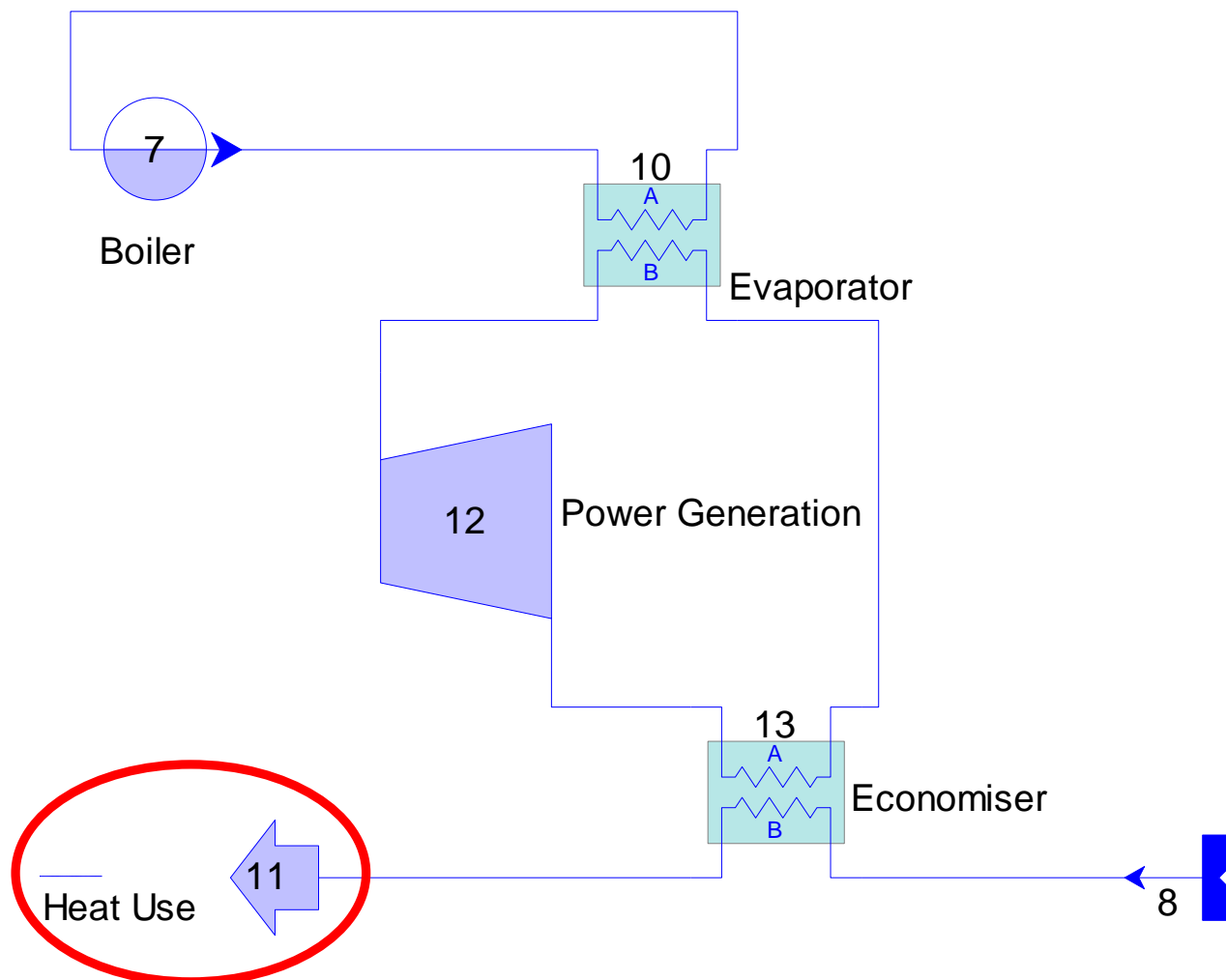
Pass Out Condensing Steam Turbine
with non-CHP heat in bypass



CHP Heat

THERMOFLEX Version 23.0 Demonstration Thermoflow, Inc.

Organic Rankine
Cycle Turbine as
CHP mode

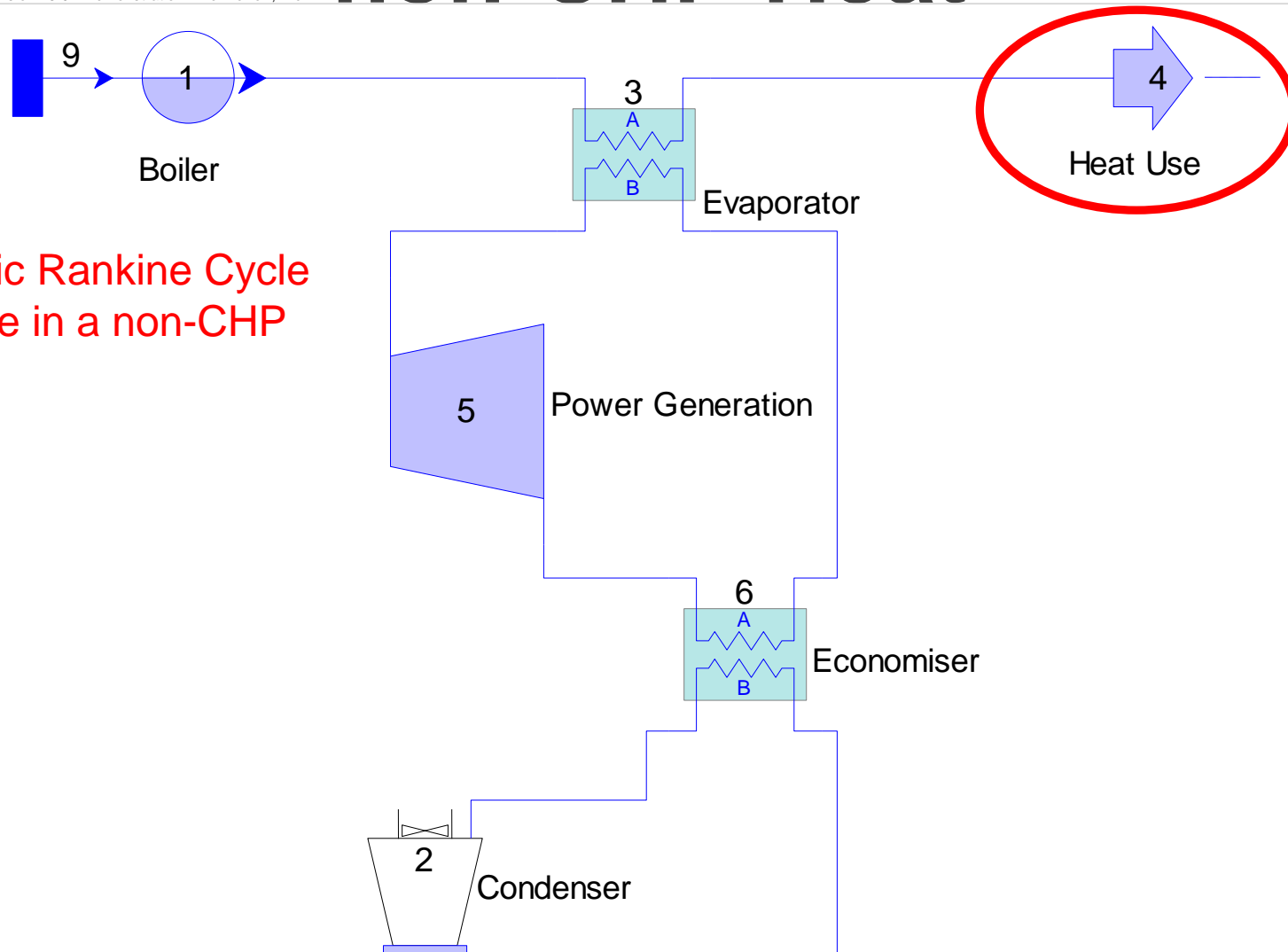




non-CHP Heat

THERMOFLEX Version 23.0 Demonstration Thermoflow, Inc.

ata C
t/h kcal/kg



Organic Rankine Cycle
Turbine in a non-CHP
mode



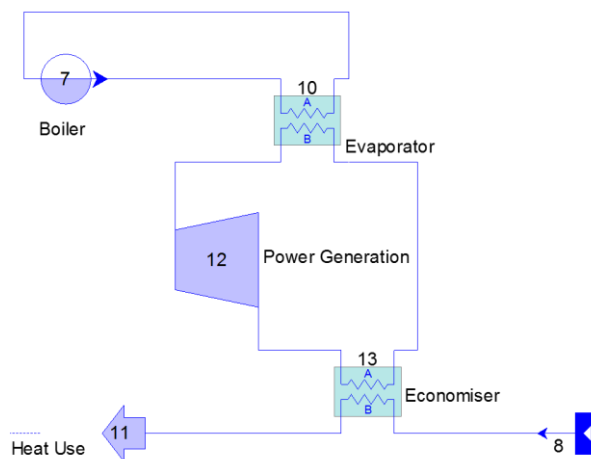
Example of Biomass CHP

TPC = 200 KWe

Thermal Capacity = 1 MWth

Power efficiency = 12%

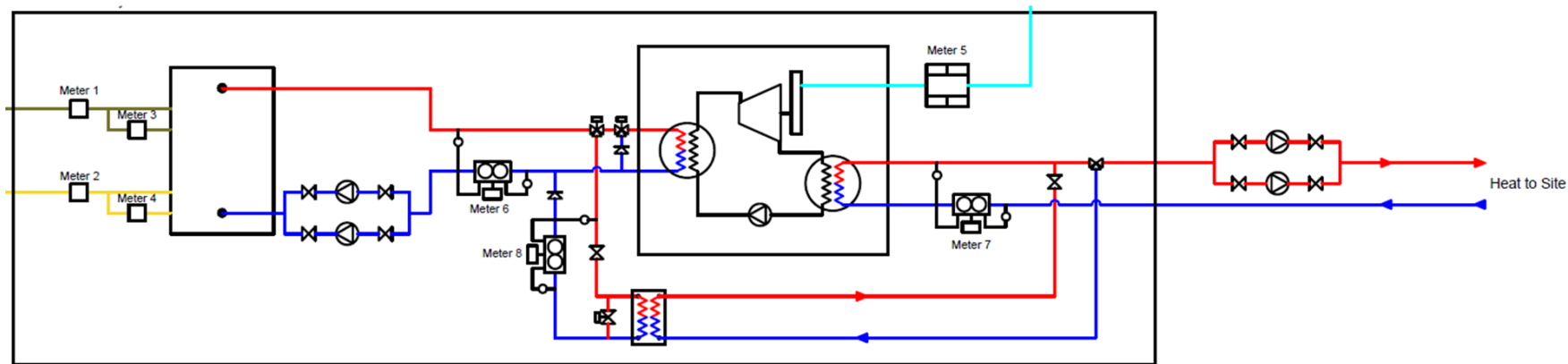
QHO = 6,000 MWh



- CHP tariff will apply to $6,000 * (12/20) = 3,600$ MWh
- The remaining 2,400 MWh (40% of total heat) will be supported under Biomass Boiler tariff:
 - Tier 1 will apply to, $1 \text{ MW} * 8760 * 35% * 40% = 1,226.4$ MWh
 - Tier 2 will apply to, $2,400 - 1,226.4 = 1,173.6$ MWh
- CHP RHI payment $= 3,600 * 45.7 = \text{£}164,520$
- Biomass boiler Tier 1 payment $= 1,226.4 * 31.5 = \text{£}38,632$
- Biomass boiler Tier 2 payment $= 1,173.6 * 22.1 = \text{£}25,936$
- Total RHI payment = $\text{£}229,088$



Typical ORC CHP Arrangement



Which boundary should you select?



Interactions

- 1. CHP ROC uplift only**
- 2. Standard ROC (no uplift) and RHI**
- 3. From 2017 can only apply for CfD & RHI**



Quality Certification for an existing CHP Scheme

CHPQA Certificate No: P01234567

Scheme: **Energy Centre**
ENERGY LTD
DUNNALONG ROAD
TOWN
COUNTRYSHIRE
AB12 3CD

CHPQA Scheme Reference No: **8760X**

This is to Certify that the Self-Assessment of the above CHP Scheme undertaken by **RESPONSIBLE PERSON** of Scheme performance during the calendar year: **2018** has been Validated under the Combined Heat and Power Quality Assurance programme and that:

- | | |
|---|--------------------|
| 1. The Total Power Capacity of this Scheme is: | 3.605 MWe |
| and the Qualifying Power Capacity is: | 3.605 MWe |
| 2. The threshold Power Efficiency criterion for this Scheme is: | 20 % |
| and the Power Efficiency of this Scheme is: | 24.25 % |
| 3. The Qualifying Heat Output from this Scheme is: | 55,046 MWh |
| and the Heat Efficiency of this Scheme is: | 43.77 % |
| 4. The threshold Quality Index criterion for under Annual Operation is: | 100 |
| and the Quality Index of this Scheme is: | 97.62 |
| 5. The Total Fuel Input to this Scheme is: | 125,183 MWh |
| and the Qualifying Fuel Input is: | 125,183 MWh |
| 6. The Percentage of Fuel Input Referable to Electricity Generation is: | 45.71 % |
| 7. The Percentage of Conventional Fuel is: | 100.00 % |
| 8. The Total Power Output from this Scheme is: | 30,353 MWh |
| and the Qualifying Power Output is: | 28,896 MWh |
| 7. The fuel supply reference(s) (e.g. TRANSCO/MPR gas meter reference nos. and/or other unique ID descriptors) for this Scheme are: | |
| [01234567890] | |

ECA & Stat

ECA & RHI

CPS

Full, Partial

CCL

CPS

CCL & CPS

This certificate is a statement of Scheme performance over the period 01/01/2018 to 31/12/2018 and is valid until 31/12/2019.

Approved by the CHPQA Administrator on behalf of BEIS. Date: 31 March 2019

The CHPQA programme is carried out on behalf of the Department for Business, Energy & Industrial Strategy, the Scottish and Welsh Governments, and the Northern Ireland Department for the Economy.

For the purposes of the Climate Change Levy (General) (Amendment) Regulations 2003 only, the QPO limit shall be equal to the actual output of the station multiplied by the following ratio: the Qualifying Power Output referred to at item 8 above over the Total Power Output referred to at item 8 above.



To summarise...

To obtain any of the fiscal benefits available for GQCHP the Scheme must be certified by CHPQA and must have a valid Certificate

Submission any time from 1 Jan 2021

Thank You