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CanmetENERGY

Leadership in ecoInnovation

Technical Guide to Class 43.1 and 43.2






2019 Edition

Canada

Aussi disponible en français sous le titre :
Catégories 43.1 et 43.2 — Guide Technique, édition 2019

DISCLAIMER

This Guide applies conclusively with respect to engineering and scientific matters only. In this Guide, only the information contained in Section 2.0 refers to engineering and scientific matters. Any information in this Guide that relates to income tax issues is provided for information purposes only. Since the Canada Revenue Agency is responsible for the interpretation and administration of the *Income Tax Act* and the *Income Tax Regulations*, anyone wishing further information concerning the income tax matters described in this Guide should contact the Canada Revenue Agency as described in Section 1.3.

Cat. No. M154-75/2020E-PDF
ISBN 978-0-660-36647-0

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ABBREVIATIONS

AC	Alternating Current
AFC	Alkaline Fuel Cell
ASE	Active Solar Equipment
BGS	Bio Gas System
BOS	Bio-Oil System
BTU	British Thermal Unit
CCA	Capital Cost Allowance
CFCs	Chlorofluorocarbons
CRA	Canada Revenue Agency
CRCE	Canadian Renewable and Conservation Expenses
CSA	Canadian Standards Association
DC	Direct Current
DES	District Energy System
ECG	Electrical Cogeneration
EES	Expansion Engine System
EESE	Electrical Energy Storage Equipment
EV	Electric Vehicle
EVCE	Electric Vehicle Charging Equipment
FCE	Fuel Cell Equipment
GEE	Geothermal Energy Equipment
GEG	Geothermal Electrical Generation
HCFCs	Hydrochlorofluorocarbons
HHV	Higher Heating Value
HPE	Heat Production Equipment
HRE	Heat Recovery Equipment
HRSG	Heat Recovery Steam Generator
HVAC	Heating Ventilating and Air Conditioning
kg	kilogram
kJ	kilojoule
kPa	kilopascal
kW	kilowatt
kWh	kilowatt hour
lb	pound
LDE	Landfill and Digester Gas Equipment
LHV	Lower Heating Value
MCC	Motor Control Centre
MCFC	Molten Carbonate Fuel Cell
MW	megawatt
MWh	megawatt hour
NRCan	Natural Resources Canada
°C	degrees Celsius
°F	degrees Fahrenheit
P.C.	Privy Council
PAFC	Phosphoric Acid Fuel Cell
PEMFC	Proton Exchange Membrane Fuel Cell
PGE	Producer Gas Generating Equipment
PLC	Programmable Logic Controller
psi	pounds per square inch
PVE	Photovoltaic Equipment
S.C.	Statutes of Canada
SCADA	Supervisory Control and Data Acquisition
SHI	Small-Scale Hydro-Electric Installation
SI	International System
SOFC	Solid Oxide Fuel Cell
SOR	Statutory Orders and Regulations
TWE	Thermal Waste Equipment
UCC	Undepreciated Capital Cost
WES	Wind Energy Conversion System
WTE	Water-Current, Tidal or Wave Energy Equipment
yr	year

1.0 Overview

Natural Resources Canada (NRCan) is responsible for advising Finance Canada, the Canada Revenue Agency (CRA) and taxpayers on engineering and scientific issues relating to:

- accelerated Capital Cost Allowance (CCA) for specified clean energy generation and energy conservation equipment that meet the requirements of Classes 43.1 and 43.2 of Schedule II to the *Income Tax Regulations* (the "Regulations"),

and

- certain eligible start-up expenses that qualify as *Canadian renewable and conservation expenses* (CRCE) under section 1219 of the Regulations.

Within NRCan, the responsibility for providing engineering and scientific advice for these tax incentives rests with the Class 43.1 and 43.2 Secretariat of the Innovation Branch in the Strategic Policy and Innovation Sector (SPI). The Class 43.1 and 43.2 Secretariat draws upon the expertise of the engineering and scientific professionals at CanmetENERGY to provide expert advice in many different energy technology areas. As stated in subsection 13(18.1) of the *Income Tax Act*, the Technical Guide to Class 43.1 and 43.2 published by NRCan applies with respect to engineering and scientific matters associated with the determination of whether a property meets the criteria set out in Class 43.1 or 43.2 of Schedule II to the Regulations.

NRCan has prepared this document in co-operation with the CRA and Finance Canada. We welcome your comments.

1.1 About This Guide

This edition of the Guide

- provides information concerning the CCA classes in the Regulations for clean energy generation and energy conservation equipment;
- lists the types of property that are eligible and ineligible for inclusion in Class 43.1 or Class 43.2;
- provides schematic diagrams of the common types of qualifying systems;
- provides tables that list the types of costs that may be incurred for qualifying Class 43.1 or Class 43.2 property;

and

- provides the application forms to be completed by taxpayers to request a technical opinion from NRCan as to which assets in a planned or completed project may qualify for inclusion in Class 43.1 or Class 43.2.

This edition of the Guide supersedes the 2013 edition of the Technical Guide to *Class 43.1 and 43.2* and reflects changes to the Regulations that were enacted as of June 22, 2019.

The Class 43.1 and 43.2 Secretariat also maintains the *Technical Guide to Canadian Renewable and Conservation Expenses (CRCE)* under separate cover. Taxpayers are advised to consult that guide for specific information on CRCE.

This Guide may be amended from time to time to reflect amendments to the Income Tax Act and Regulations with respect to Class 43.1 and 43.2. Taxpayers should consult the latest versions of the *Income Tax Act* and Regulations whenever they are considering a project to ensure that decisions are based on the legislation in force at the time. Proposed changes to Class 43.1 and 43.2 and CRCE are usually announced by the Minister of Finance when legislation is tabled in the House of Commons. For information on proposed changes to the *Income Tax Act* and Regulations, taxpayers are encouraged to visit Finance Canada's website at: https://fin.canada.ca/drleg-apl/index-en.html

1.2 Terms Used in This Guide

Certain terms used in this Guide, including the terms that are defined in sub-section 1104(13) of the Regulations, are summarized in the Glossary of Terms, found in Section 3.0 of this Guide. Throughout this Guide, terms that are defined in the Income Tax Act and the Regulations are italicized in bold the first time they appear and excerpts from the Regulations are shown in italics. Class 43.1 or Class 43.2 of Schedule II to the Regulations is referred to as Class 43.1 or 43.2.

1.3 Services Provided by Finance Canada, the Class 43.1 and 43.2 Secretariat and the CRA

1.3.1 FINANCE CANADA

The legislated conditions for eligibility for Class 43.1 and 43.2 and CRCE are set out in provisions of the Regulations. Those provisions are either adopted by the Governor-in-Council on the recommendation of the Minister of Finance after having been approved by the Treasury Board or implemented through a bill tabled in Parliament. Finance Canada is responsible for developing tax policy, providing advice to the Minister of Finance and for the drafting of tax legislation and regulations. Tax policy concerns that may necessitate amendments to the legislation may be directed to the following address:

Director General, Business Income Tax Division
Finance Canada
90 Elgin Street, 12th Floor,
Ottawa, Ontario K1A 0G5

E-mail: fin.cleanenergy-energiepropre.fin@canada.ca

1.3.2 THE CLASS 43.1 AND 43.2 SECRETARIAT

The Class 43.1 and 43.2 Secretariat is staffed with knowledgeable engineering professionals who are responsible for advising Finance Canada, the CRA and taxpayers on engineering and scientific issues relating to investments in clean energy generation and energy conservation projects. To discuss the engineering and scientific aspects of a project, taxpayers or their authorized representatives are encouraged to contact the Class 43.1 and 43.2 Secretariat at the following address:

Class 43.1 and 43.2 Secretariat
Natural Resources Canada
580 Booth Street, 13th Floor
Ottawa, Ontario K1A 0E4

Phone: (833) 983-1381
E-mail: nrcan.class43-1-categorie43-1.rncan@canada.ca

In response to written applications for technical opinions, the Class 43.1 and 43.2 Secretariat may provide written technical opinions—based on information provided by applicants—as to whether the equipment in a proposed or completed project meets the engineering and scientific requirements of one or more of the qualifying systems or categories of equipment described in Class 43.1 or 43.2. Whereas such opinions are optional and are not binding on the CRA, they do provide technical guidance to taxpayers and the CRA as to whether:

- equipment in a project meets the engineering and scientific requirements of one or more of the qualifying systems or categories of equipment described in Class 43.1 or 43.2;

and

- properties in the project are eligible for inclusion in Class 43.1 or 43.2.

To request a technical opinion, a taxpayer must complete the applicable Class 43.1 or 43.2 forms in Section 2.0 of this Guide and mail them to the above address.

1.3.3 CANADA REVENUE AGENCY

The Income Tax Rulings Directorate (the "Directorate") is part of the Legislative Policy and Regulatory Affairs Branch of the CRA.

The Directorate's role is to interpret Canada's income tax law and publish advance income tax rulings and technical interpretations. In this context, the Directorate provides the following services and publications:

- advance income tax rulings relating to the tax consequences of proposed transactions to taxpayers for a fee;
- technical interpretations (free of charge) of general income tax questions provided to taxpayers, either directly or by assisting other areas of the CRA that deal with taxpayers;

and

- technical publications and newsletters that clarify the CRA's interpretation of income tax law.

The CRA also publishes a folio titled S3-F8-C2, *Tax Incentives for Clean Energy Equipment* that is available on the CRA website at: https://www.canada.ca/en/revenue-agency/services/tax/technical-information/income-tax/income-tax-folios-index/series-3-property-investments-savings-plans/series-3-property-investments-savings-plan-folio-8-resource-properties/income-tax-folio-s3-f8-c2-tax-incentives-clean-energy-equipment.html.

Taxpayers wishing to obtain a binding advance income tax ruling (for which a fee is charged) as to whether certain property to be acquired will be eligible for inclusion in Class 43.1 or 43.2 should refer to the current version of Information Circular IC 70-6, *Advance Income Tax Rulings*, issued by the CRA for the procedure to request an advance income tax ruling. The Circular is available on the CRA website.

Depending on the nature of the advance income tax ruling request, taxpayers may be required to complete the applicable forms and schedules in Section 2.0 of this Guide as discussed above and submit a copy to each of the following offices:

- the Class 43.1 and 43.2 Secretariat at the above address;

and

- the CRA at the address indicated below, along with the request for an advance income tax ruling.

For more information concerning this procedure or for general information regarding Class 43.1 or 43.2, taxpayers may contact the Directorate at the following address:

Income Tax Rulings Directorate
Canada Revenue Agency
112 Kent Street, 9th Floor, Tower A
Ottawa, Ontario K1A 0L5

Phone: (416) 973-3066
E-Mail: itrulingsdirectorate@cra-arc.gc.ca

The Compliance Programs Branch of the CRA, in conjunction with the audit programs administered by the Tax Services Offices, is responsible for ensuring compliance with the provisions of the *Income Tax Act* and the Regulations. For further information relating to the income tax consequences of completed transactions, please contact your local tax services office.

1.4 Background

1.4.1 CLASS 43.1 AND 43.2

The Government of Canada provides an accelerated CCA rate for Class 43.1 and 43.2 properties as an incentive to encourage businesses to invest in specified clean energy generation and energy conservation equipment. Both classes include a variety of stationary equipment that generates or conserves energy by

- using a renewable energy source (e.g., wind, solar, small-scale hydro);
- using fuels from waste (e.g., ***landfill gas, wood waste***, manure);

or

- making efficient use of ***fossil fuels*** (e.g., high efficiency cogeneration systems).

As illustrated in Figure 1.4.1, Class 43.1 was introduced in 1994 and provides an accelerated CCA rate of 30 percent per year on a declining balance basis for properties acquired after February 21, 1994. Class 43.2, which provides an accelerated CCA rate of 50 percent per year on a declining balance basis, was introduced in 2005 and is available for properties acquired after February 22, 2005 and before 2025.

Most systems that are described in Class 43.1 qualify for Class 43.2 when the property is acquired before 2025. The eligibility criteria for these two CCA classes are generally the same, except that the following equipment qualifies for Class 43.1, but not Class 43.2:

- mid-efficiency, cogeneration systems that are fully or partially fuelled with fossil fuels;
- electric vehicle charging stations set up to supply more than 10 kW but less than 90 kW of continuous power; and
- electrical energy storage equipment connected to one of the above systems and stand-alone electrical energy storage systems meeting particular efficiency requirements.

1.4.2 ENHANCED FIRST-YEAR ALLOWANCE FOR PROPERTY INCLUDED IN CLASS 43.1 OR 43.2

As laid out in the previous section, classes 43.1 and 43.2 provide accelerated CCA rates of 30 percent and 50 percent respectively, on a declining-balance basis. In addition, property included in Class 43.1 or 43.2 is generally eligible for an enhanced first-year allowance if it is acquired after November 20, 2018 and becomes available for use before 2028, as illustrated in Figure 1.4.1.

The enhanced allowance initially provides a 100 percent deduction, with a phase out for property that becomes available for use after 2023, as described in the table below:

Table 1.4.1 Enhanced First-Year Allowance for Property Included In Class 43.1 or 43.2

	Current First-Year Allowance (half-year rule)		First-Year Enhanced Allowance
	Class 43.1	Class 43.2	
Implementation -2023	15	25	100
2024	15	25	75
2025	15	_	75
2026	15	_	55
2027	15	_	55
2028 onward	15	_	_

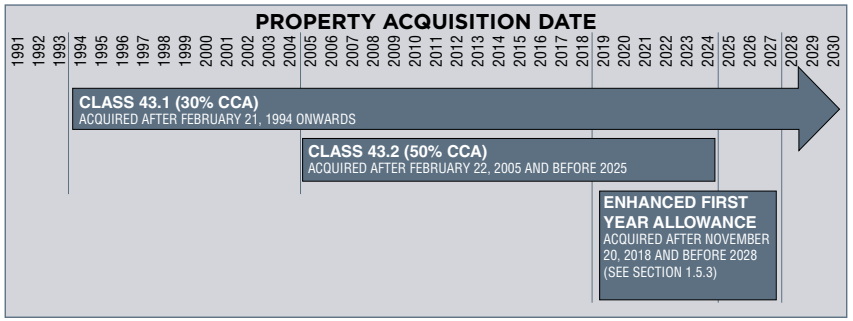


Figure 1.4.1 Eligibility Under Class 43.1 and Class 43.2 and Enhanced First Year Allowance

More information on the enhanced first-year allowance is available at CRA's "Accelerated Investment Incentive" website at: https://www.canada.ca/en/revenue-agency/services/tax/businesses/topics/sole-proprietorships-partnerships/report-business-income-expenses/claiming-capital-cost-allowance/accelerated-investment-incentive.html#FullExpMP.

1.4.3 NON-CAPITAL COSTS INCURRED IN RELATION TO CLASS 43.1 OR 43.2 PROPERTY

In addition to the capital cost of Class 43.1 or 43.2 properties discussed below, the following types of expenditures would generally be incurred in respect of Class 43.1 or 43.2 properties:

- pre-feasibility expenses;
- feasibility study expenses;
- process engineering expenses;

and

- certain financing and administrative expenses.

Generally, the first three types of expenditures—which are discussed in the *Technical Guide to Canadian Renewable and Conservation Expenses (CRCE)* published by NRCan—may be treated as CRCE.

Certain financing and administrative expenses may be deductible when computing income under the *Income Tax Act*.

1.5 Capital Cost of Properties Included in Class 43.1 and 43.2

1.5.1 DETERMINATION OF CAPITAL COST

Class 43.1 and 43.2 generally include the capital cost of eligible energy conservation property and clean energy generation property, as well as all costs associated with the acquisition and installation of the property such as

- the purchase price of the property;
- costs related to the design, engineering and commissioning of the property that would not otherwise qualify as CRCE (see the *Technical Guide to Canadian Renewable Conservation Expenses* (CRCE) for further information);
- the cost of certain modifications made to the property after it was acquired;
- legal, accounting or other expenses related to the acquisition of the property;

and

- costs of other services required to make the property operational.

1.5.2 CAPITAL COST ALLOWANCE

Generally, taxpayers may deduct CCA in respect of the capital cost of depreciable property (less government assistance, see CRA interpretation bulletin IT-273R2 for more information) when computing their business or property income. The CCA claim for a class of depreciable property is based on a prescribed rate that is generally based on the useful life of the property.

Class 43.1 and 43.2 provide a higher CCA rate than would otherwise be available as an incentive to encourage businesses to invest in specified clean energy generation and energy conservation equipment. CCA is a "permissive deduction" in that a taxpayer may choose to claim a smaller amount of CCA in any year than the maximum CCA allowable for the year.

In order for a taxpayer to claim CCA on a Class 43.1 or 43.2 property:

- the taxpayer must own the property;
- the taxpayer must have acquired the property for the purpose of gaining or producing income;
- the property must be "available-for-use" (see below);

and

- the property must meet certain specifications prescribed by regulation (outlined in this Guide).

Property (other than a building) usually becomes available for use on whichever of the following occurs the earliest:

- the date the property is first used to earn income;
- the second tax year after the year the property is acquired;
- the time that is just before the disposition of the property;

or

- the time the property is delivered or made available and is capable of producing a saleable product or service.

The first year property is deemed to be available for use, the amount of CCA that may be claimed is limited to one half of the CCA deductions otherwise available pursuant to the "half-year rule" (see Section 1.5.3 for an example of how the half-year rule is applied). However, special rules apply for properties that are acquired after November 2018 as discussed in paragraph 1.4.2 above.

In addition, as discussed further in Section 1.5.4, the CCA deductions may be further restricted in certain circumstances pursuant to the "specified energy property rules".

1.5.3 EXAMPLES OF CCA CALCULATION FOR PROPERTY INCLUDED IN CLASS 43.1 OR 43.2

Under the enhanced first-year allowance, the allowable first-year CCA for both Class 43.1 and Class 43.2 property is 100%.

For Class 43.1 and 43.2 property available for use in 2024 and future years, the enhanced first-year allowance is reduced. The remaining undepreciated capital cost (UCC) available is claimed using the declining-balance method. This method involves applying the prescribed CCA rate to the UCC of an asset, or group of assets from the same class, at the end of each year. The UCC generally represents the capital cost of property plus additions and less dispositions made in the year, minus all CCA claimed in previous years, if any. In addition, UCC generally excludes the amount of any assistance such as grants, subsidies, forgivable loans, deductions from tax, received or receivable by the taxpayer. The UCC balance continues to decline each year CCA is claimed over the property's useful life.

Example 1: CCA Calculation for Property Included in Class 43.1 and Available for Use in 2020

The example in Table 1.5.1 below shows the maximum CCA that may be deducted each year from the taxpayer's business or property income and the UCC balance each year under Class 43.1. In this example, it is assumed that the taxpayer acquires the equipment in 2020 for $100,000, begins to use the equipment immediately and meets Class 43.1 eligibility requirements each year. The prescribed CCA rate for Class 43.1 is 30 percent, however, since the property is available for use in 2020, the full capital cost of the property can be deducted in 2020 under the enhanced first-year allowance.

Table 1.5.1 Example of CCA for Property Included in Class 43.1 and Available for Use in 2020

Year	UCC ($)	Maximum CCA ($)
2020	100,000	100,000
2021	0	0
2022	0	0
2023	0	0
etc.		

Example 2: CCA Calculation for Property Included in Class 43.2 and Available for Use in 2022

Using the same assumptions as in the example above, the example in Table 1.5.2 below illustrates the maximum CCA that may be deducted each year from the taxpayer's business or property income and the UCC balance each year if the equipment were included in Class 43.2 and was acquired and became available for use in 2022. The prescribed CCA rate for Class 43.2 is 50 percent, however, since the property is available for use in 2022, the full capital cost of the property can be deducted in 2022 under the enhanced first-year allowance.

Table 1.5.2 Example of CCA for Property Included in Class 43.2 and Available for Use in 2022

Year	UCC ($)	Maximum CCA ($)
2022	100,000	100,000
2023	0	0
2024	0	0
2025	0	0
etc.	–	–

Example 3: CCA Calculation for Property Included in Class 43.1 and Available for Use in 2024

Table 1.5.3 below illustrates the maximum CCA that may be deducted each year from the taxpayer's business or property income and the UCC balance each year if the equipment were included in Class 43.1 and acquired and became available for use in 2024. The prescribed CCA rate for Class 43.1 is 30 percent, however, since the property is available for use in 2024, 75 percent of the capital cost of the property can be deducted in 2024 under the enhanced first-year allowance. In the years following 2024, the undepreciated capital cost of the property can be deducted at 30 percent annually.

Table 1.5.3 Example of CCA for Property Included in Class 43.1 and Available for Use in 2024

Year	UCC ($)	Maximum CCA ($)
2024	100,000	75,000
2025	25,000	7,500
2026	17,500	5,250
2027	12,250	3,675
etc.	–	–

For further information on calculating CCA, see "Claiming capital cost allowance (CCA)" on the CRA's website at: https://www.canada.ca/en/revenue-agency/services/tax/businesses/topics/sole-proprietorships-partnerships/report-business-income-expenses/claiming-capital-cost-allowance.html.

1.5.4 SPECIFIED ENERGY PROPERTY RULES

In certain circumstances, the deduction for CCA on Class 43.1 or 43.2 property, as computed in the examples above, may be restricted pursuant to the specified energy property rules contained in subsections 1100(24) to 1100(29) of the Regulations. These rules limit the amount of CCA that may be claimed by passive investors in respect of "specified energy property" (such as Class 43.1 and 43.2 properties) to the income from such property. In other words, CCA cannot be used to create or increase a loss from the specified energy property that can be used to offset other sources of income.

For more information on the application of the Specified Energy Property Rules, refer to the Income Tax Folio S3-F8-C2, *Tax Incentives for Clean Energy Equipment* that is available on the CRA website at: https://www.canada.ca/en/revenue-agency/services/tax/technical-information/income-tax/income-tax-folios-index/series-3-property-investments-savings-plans/series-3-property-investments-savings-plan-folio-8-resource-properties/income-tax-folio-s3-f8-c2-tax-incentives-clean-energy-equipment.html.

1.5.5 ELIGIBLE PROPERTIES

To be eligible for inclusion in Class 43.1 or 43.2, property must be acquired by a taxpayer for the purpose of earning income from a business carried on in Canada or from property situated in Canada. The property must be operational and in compliance with the eligibility requirements on an annual basis.

In addition, the property must generally be new when it is acquired by a taxpayer.

1.5.6 INELIGIBLE PROPERTIES

Property that is not eligible for inclusion in Class 43.1 or 43.2 generally includes the following:

- operating parts, spare parts and components that are used in support of a qualifying system but which do not form an integral part of eligible equipment;
- foundations and support structures, except those specifically described in this Guide;
- buildings or part of a building, except those specifically described in this Guide;
- electrical distribution systems;

and

- electrical transmission systems, except those specifically described in this Guide.

1.5.7 ENVIRONMENTAL COMPLIANCE

Subsection 1104(17) of the Regulations provides that certain property that would otherwise be eligible for inclusion in Class 43.1 or 43.2 will not be eligible under Class 43.1 or 43.2 if the property fails to comply with the applicable environmental laws, by-laws and regulations of Canada or of a province, territory, municipality, or a public or regulatory body performing a function of government in Canada at the time the property becomes available for use. This subsection applies to:

- Cogeneration assets described in section 2.1 acquired after February 10, 2014;
- assets described in sections 2.9, 2.10, 2.12 and 2.14 acquired after March 28, 2012;
- assets described in sections 2.15 and 2.17 acquired after February 10, 2014;
- assets described in section 2.18 after March 22, 2016;

and

- assets described in section 2.8 acquired after March 22, 2017.

1.5.8 MODIFICATIONS AND IMPROVEMENTS

The capital cost of modifications or improvements to existing qualifying systems or to existing equipment may be eligible for inclusion in Class 43.1 or 43.2.

1.5.9 SYSTEMS AND ANCILLARY EQUIPMENT

Property described in Class 43.1 or 43.2 may refer to equipment that is part of a system. The term “system” generally means an integrated whole composed of diverse, yet interacting specialized structures that performs a function not possible with any of the individual parts. Generally, where a system does not meet the conditions in Class 43.1 or 43.2, the equipment that is included in the system will not qualify for Class 43.1 or 43.2. The determination of what constitutes a qualifying system for Class 43.1 or 43.2 purposes is generally an engineering and scientific matter. In this regard, please refer to the schematics of typical qualifying systems contained in Section 2.0 of this Guide or contact the Class 43.1 and 43.2 Secretariat.

In addition, property described in Class 43.1 or 43.2 may refer to certain listed equipment and ancillary equipment. “Ancillary” equipment is generally considered to be equipment that would be subordinate or auxiliary to the listed equipment.

1.5.10 INDUSTRIAL PROCESS

Certain clean energy generation properties described in Class 43.1 and 43.2 refer to energy generated from or used in an “industrial process.” The determination of what constitutes an industrial process is generally a question of fact. In general, for these purposes, an industrial process can include activities such as the manufacture of goods or the processing of materials, the generating and processing of electrical energy and the extraction and processing of natural gas and petroleum. The processing of electrical energy includes processes such as phase synchronization and filtering, in addition to the transformation of electricity which involves changing voltage levels. An industrial process does not include space or domestic water heating or agricultural activities.

2.0 Qualifying Systems and Equipment

This section describes in detail the 19 categories of systems and equipment described in Class 43.1 and 43.2. Subsections are included for each of these 19 categories as follows:

2.1 Cogeneration, Enhanced Combined Cycle and Specified-Waste Fuelled Electrical Generation Systems

2.2 Thermal Waste Electrical Generation Equipment

2.3 Active Solar Heating Equipment and Ground-Source Heat Pump Systems

2.4 Small-Scale Hydro-Electric Installations

2.5 Heat Recovery Equipment

2.6 Wind Energy Conversion Systems

2.7 Photovoltaic Electrical Generation Equipment

2.8 Geothermal Energy Equipment

2.9 Landfill Gas and Digester Gas Collection Equipment

2.10 Specified-Waste Fuelled Heat Production Equipment

2.11 Expansion Engine Systems

2.12 Systems to Convert Biomass into Bio-Oil

2.13 Fixed Location Fuel Cell Equipment

2.14 Systems to Produce Biogas by Anaerobic Digestion

2.15 Water-Current, Tidal or Wave Energy Equipment

2.16 District Energy Systems/Equipment

2.17 Producer Gas Generating Equipment

2.18 Electric Vehicle Charging Equipment

2.19 Electrical Energy Storage Equipment

The categories of properties that are included in subsections 2.1 and 2.2 are described in paragraphs (a) to (c) of Class 43.1. The categories of properties that are included in subsections 2.3 to 2.19 are described in paragraph (d) of Class 43.1.

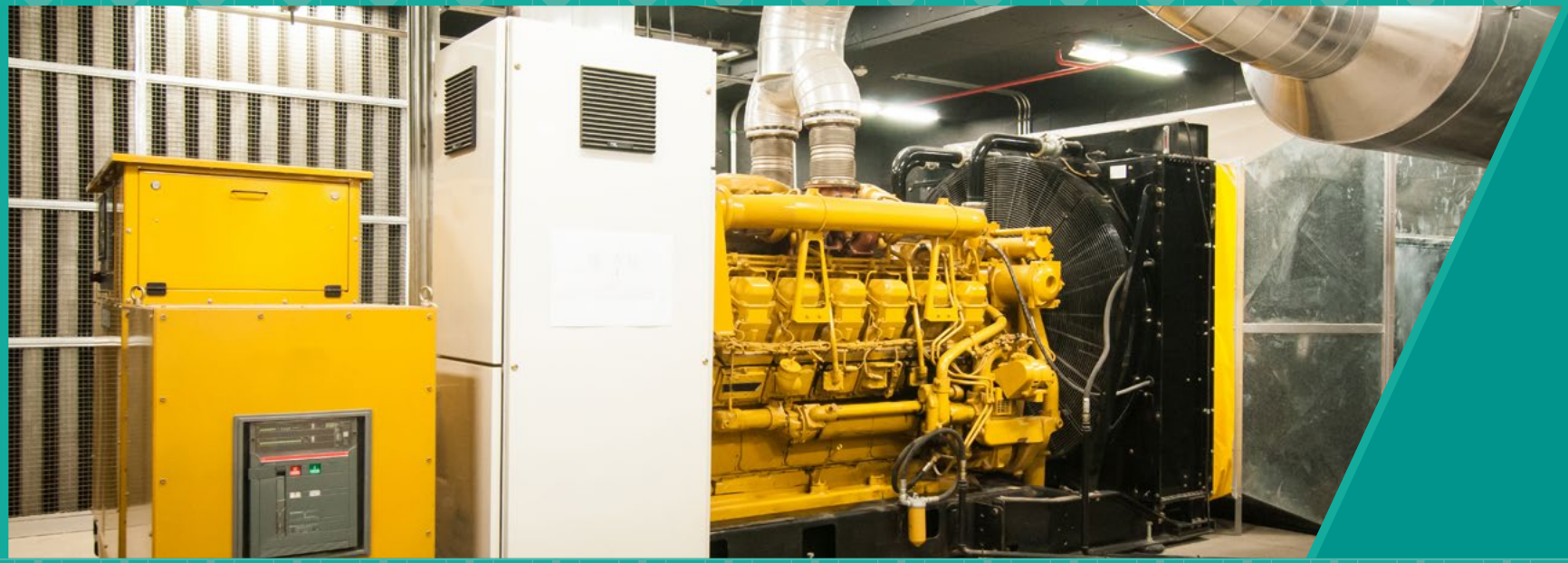
With the exception of cogeneration and specified-waste fuelled electrical generation systems, electric vehicle charging equipment and electrical energy storage equipment, all properties described in the subsections below will generally be included in Class 43.2 provided that they are acquired after February 22, 2005 and before 2025.

Class 43.2 has a higher efficiency standard for cogeneration and specified-waste fuelled electrical generation systems that use fossil fuels than Class 43.1. Cogeneration and specified-waste fuelled electrical generation systems that only meet the lower efficiency standard of Class 43.1 are eligible for inclusion in Class 43.1.

Class 43.2 has a higher power rating requirement for electric vehicle charging stations. Electric vehicle charging stations that only meet the lower power rating requirement of Class 43.1 are eligible for inclusion in Class 43.1.

To be eligible for inclusion in Class 43.2, electrical energy storage equipment must be used to store electrical energy generated by other equipment described in Class 43.2. To be eligible for inclusion in Class 43.1, electrical energy storage equipment must be used to store electrical energy generated by other equipment described in Class 43.1 or meet a minimum round-trip efficiency standard.

For each category of systems or equipment, the subsections that follow provide guidance with respect to certain property or capital costs that may be eligible or ineligible for inclusion in Class 43.1 or 43.2 from an engineering and scientific perspective. The examples provided are for information purposes only. The determination as to whether a particular expenditure will be eligible for inclusion in Class 43.1 or 43.2 requires an examination of the facts of each particular project. Since the CRA is responsible for the interpretation and administration of the *Income Tax Act* and the *Income Tax Regulations*, anyone wishing further information concerning the income tax matters described in this Guide should contact the CRA as described in Section 1.3 of this Guide.



2.1 Cogeneration, Enhanced Combined Cycle and Specified-Waste Fuelled Electrical Generation Systems

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2.1.1 COGENERATION, ENHANCED COMBINED CYCLE AND SPECIFIED-WASTE FUELLED GENERATION SYSTEMS

Cogeneration, enhanced combined cycle and specified-waste fuelled electrical generation systems (described in paragraphs (a) to (c) of Class 43.1 and paragraph (a) of Class 43.2) include certain property where:

- the property is part of a system that is used to generate electricity only or electricity and useful heat (cogeneration);
- the systems use only eligible fuels or ***thermal waste*** (see Section 2.1.4);

and

- the systems meet the designated heat rate for Class 43.1 or 43.2 (see Section 2.1.5).

2.1.2 ELIGIBLE PROPERTIES

Eligible properties for cogeneration, enhanced combined cycle and specified-waste fuelled electrical generation systems include the following:

- electrical generating equipment (e.g., steam turbine generators and expander generators), including any heat-generating equipment used primarily for the purpose of producing heat energy to operate the electrical generating equipment (e.g., steam boilers and duct burners used to produce steam to operate steam turbine generators);
- equipment that generates both electrical and heat energy (e.g., gas turbine generators and reciprocating engine generator sets);
- fixed location fuel cell equipment[1];
- heat recovery equipment (e.g., Heat Recovery Steam Generators [HRSGs], heat recovery boilers [other than those used in pulp and paper processing], heat exchangers, evaporators and recuperators)[2];
- ***district energy equipment*** that uses thermal energy that is primarily supplied by eligible electrical cogeneration equipment[3];
- ancillary equipment (e.g., control, feedwater and condensate return equipment and equipment to contain and circulate working fluids);

and

- an addition to eligible equipment mentioned above (e.g., working platforms, equipment used to upgrade the combustible portion of the fuel such as shredders, dryers or gasifiers).

To clarify, "*heat-generating equipment used primarily for the purpose of producing heat energy to operate the electrical generating equipment*", means heat generating equipment is eligible only if more than 50 percent of the heat output of such equipment is used to operate electrical generating equipment.

Note: Cogeneration, enhanced combined cycle and specified-waste fuelled electrical generation systems included in Class 43.1 or 43.2 are an eligible source of electrical energy for electrical energy storage equipment (see section 2.19) and cogeneration systems are an eligible source of thermal energy for district energy systems/equipment (see section 2.16).

2.1.3 INELIGIBLE PROPERTIES

Ineligible properties for cogeneration, enhanced combined cycle and specified-waste fuelled electrical generation systems include the following:

- buildings or other structures (except working platforms that primarily serve generation or heat production systems);
- permanent brick or concrete stacks;
- heat rejection equipment (e.g., cooling towers, condensers and cooling water systems);

1 See Section 2.13 for more information about eligible fuel cell equipment.

2 See Section 2.5 for more information about eligible heat recovery equipment.

3 See Section 2.16 for more information about eligible district energy equipment.

- electrical ***transmission equipment*** and ***distribution equipment***;
- fuel-handling equipment that does not upgrade the combustible portion of the fuel (e.g., conveyors, wheeled loaders and classifiers);

and

- fuel storage facilities.

Furthermore, auxiliary boilers and backup generators are generally not considered eligible components of any of the systems or equipment in Class 43.1 or 43.2.

2.1.4 ELIGIBLE FUELS AND THERMAL WASTE

The eligible fuels or feedstocks for the systems or equipment described in Class 43.1 and 43.2 are defined in subsection 1104(13) of the Regulations. These definitions are included in the Glossary of Terms found in Section 3.0 of this Guide. For an eligible cogeneration, enhanced combined cycle or specified-waste fuelled electrical generation system, eligible fuels include the following:

- fossil fuels—including petroleum, natural gas or related hydrocarbons, ***basic oxygen furnace gas***, ***blast furnace gas,*** coal, coal gas, coke, coke oven gas, lignite, peat, or ***solution gas***;
- specified-waste fuels—including ***biogas***, ***bio-oil***, ***digester gas***, landfill gas, ***municipal waste***, ***plant residue***, ***pulp and paper waste***, wood waste (collectively defined in the Regulations as eligible waste fuel), ***producer gas*** or ***spent pulping liquor***;

or

- any combination of the above.

Thermal waste is also an eligible input for certain Class 43.1 and 43.2 properties and is defined in subsection 1104(13) of the Regulations.

2.1.5 DESIGNATED HEAT RATE

Heat rate is a common measure in the electrical generation industry of how efficient an electrical generation system is at converting the energy in fuel into electrical energy. In general, heat rate is calculated by dividing the energy content of the fuel consumed for electrical energy generation by the gross electrical energy generated in a given period of time. It is common to express heat rate in kJ/kWh or BTU/kWh. A lower heat rate indicates a higher efficiency of conversion of the energy in fuel into electrical energy and vice versa.

The heat rate calculated for the purposes of Class 43.1 and 43.2 has the same units as the ratio used in industry, however, the quantities used in the numerator and denominator are calculated differently.

The numerator of the Class 43.1 and 43.2 heat rate is based on the Higher Heating Value (HHV) of the fuel as opposed to the Lower Heating Value (LHV) used in heat rate calculations in industry. Unlike LHV, HHV includes the energy that is required to evaporate the water that is formed when a fuel is burned. The numerator of the Class 43.1 and 43.2 heat rate includes only energy derived from fossil fuels other than solution gas. If a system is co-fired with fossil fuels and specified-waste fuels, only the energy content of the fossil fuels consumed (other than solution gas) is considered when calculating the heat rate. If a generation system is fuelled only by a specified-waste fuel or solution gas, the numerator would be zero and as a result, the system will generally meet the designated heat rate. The energy content of the fossil fuels consumed is calculated by multiplying the volume of fuel consumed by the HHV of the fossil fuels.

Unlike the heat rate ratio used in industry, the denominator of the Class 43.1 and 43.2 heat rate ratio includes the net heat exported from the system (net heat exported is divided by a conversion factor to convert heat energy to equivalent electrical energy units) in addition to the gross electrical energy generated. Gross electrical energy is the electrical energy output by the generator or generators in a system without any allowance made for electrical energy that may be required to operate the system. With the inclusion of net heat exported in the denominator, an electrical energy generation system that exports heat for useful purposes can achieve a lower heat rate (i.e., a higher efficiency rating) than a system that generates only electrical energy.

Heat rates can be converted into an efficiency of electrical energy generation in percent by converting the quantity in the denominator of the ratio into the same units as the quantity in the numerator, inverting the ratio, dividing and multiplying by 100. For example, a heat rate of 6000 BTU/kWh corresponds to a ratio of 6000 BTU/3413 BTU given that 1 kWh is equivalent to 3413 BTU. This ratio converts to an efficiency of 57 percent after inverting, dividing and multiplying by 100.

Certain types of systems must meet a designated heat rate to qualify under Class 43.1 or 43.2 (see Table 2.1.1). Once a system has qualified for inclusion in Class 43.1 or 43.2, it must continue to satisfy the heat rate requirement as well as all other eligibility requirements on an annual basis. If these requirements are not satisfied on an annual basis, the UCC balance of the property in that year will need to be transferred to the CCA class in which the asset would otherwise be included. An exception to this rule exists where failure to comply with the annual requirements is beyond the taxpayer's control and the taxpayer makes all reasonable efforts to rectify the problem within a reasonable time.[4]

Table 2.1.1 Designated Heat Rates for Class 43.1 and 43.2

Type of System	Class 43.1			Class 43.2		
	Heat Rate*		Efficiency	Heat Rate*		Efficiency
	kJ/kWh	BTU/kWh	%	kJ/kWh	BTU/kWh	%
Systems that burn a fuel to produce electricity or electricity and heat	≤6330	≤6000	≥57	≤5010	≤4750	≥72
Enhanced combined cycle systems	≤7060	≤6700	≥51	≤7060	≤6700	≥51

* Based on HHV of fuel consumed.

4 Details of the exception to meeting the heat rate may be found in subsection 1104(14) of the Regulations.

2.1.6 CALCULATING HEAT RATES AND THE DEFINING RATIO

The subsections below explain how to determine the energy inputs and outputs and the heat rate of each of the types of systems listed in Table 2.1.1.

2.1.6.1 Systems that burn a fuel to generate electricity or electricity and heat

The energy inputs and outputs of a system that burns fuel to produce electrical energy and useful heat (i.e., a cogeneration system) are shown in Figure 2.1.1.

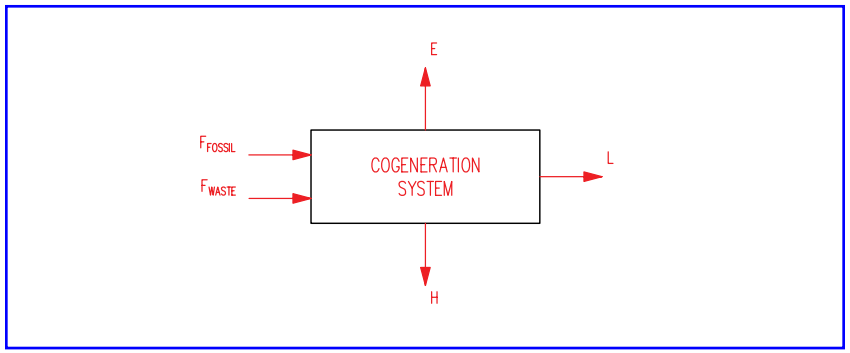


Figure 2.1.1 Cogeneration System Inputs and Outputs

In such systems,

$$F_{FOSSIL} + F_{WASTE} = H + L + (E \times 3600) \quad \textbf{International System (SI) Units [kJ]}$$
$$= H + L + (E \times 3413) \quad \textbf{Imperial Units [BTU]}$$

where

F_{FOSSIL} is the energy content of the fossil fuel consumed by the system in a year in kJ or BTU. **F_{FOSSIL}** is calculated by multiplying the fossil fuel consumption in a year by the HHV of the fossil fuel consumed. The calculation of **F_{FOSSIL}** is based on HHV data from standard tests where the temperature of the fuel and combustion air is brought to 25 °C (77 °F) prior to combustion and the products of combustion are cooled to 25 °C (77 °F) after combustion.

F_{WASTE} is the energy content of the eligible waste fuel or solution gas consumed by the system in a year in kJ or BTU. **F_{WASTE}** is not considered in the calculation of the Class 43.1 or 43.2 heat rate, therefore it is not necessary to determine its value.

H is the net useful energy in the form of heat exported from the system to a thermal host in a year in kJ or BTU. In general, exported heat is considered to be useful if it displaces heat that would otherwise be generated from fossil fuels or electricity. Heat purposely rejected to the environment (e.g., heat rejected in condensers or cooling towers) is not generally considered to be useful heat. The Regulations do not require that exported heat be used in an industrial process or in a greenhouse, nor is it required that heat be exported in the form of steam. For systems involving only electricity generation, **H** = 0 and all thermal waste produced would be viewed as losses (see **L** below). **H** is calculated from outputs and inputs that are metered in cogeneration systems (see below).

E is the gross electrical energy produced by the system in a year in kWh. This quantity is metered in cogeneration systems. Note that a conversion factor of 3600 kJ/kWh is used in the version of the above equation in SI units to convert electrical energy output in kWh to kJ. Similarly, a conversion factor of 3413 BTU/kWh is applied in the version of the equation in Imperial units to convert electrical energy output—which is usually metered in kWh—to BTU.

L is the total loss of energy from the system in a year in the generation of electricity and the production of heat in kJ or BTU. This includes energy lost in combustion exhaust gases, boiler shell losses, blow-down losses and heat discharged to the environment in condensers.

The net useful heat (**H**) exported from a system is calculated from the heat content of the working fluid stream exported from a cogeneration system and the heat content of the working fluid stream after the point in the thermal host's process where useful heat has been extracted as follows:

$$H = Q_{out} - Q_{ex}$$

where

Q_{out} is the gross heat exported from a cogeneration system in working fluid in a year in kJ or BTU,

and

Q_{ex} is the heat content of the working fluid exported in a year after the point in the thermal host's process where useful heat has been extracted in kJ or BTU.

Q_{ex} may or may not be the heat content of the working fluid stream returned to a cogeneration system by a thermal host. In the case where heat is exported from a cogeneration system in a stream of vaporized working fluid (e.g., steam), the working fluid is used to power an expansion turbine, the working fluid leaves the turbine as a low pressure vapour and the vapour is condensed in a condenser before returning to the cogeneration system, Q_{ex} would be evaluated after the expansion turbine and before the condenser. If, on the other hand, the vaporized working fluid were fully condensed in a heating process by the thermal host, Q_{ex} would be evaluated after the heating process.

In the case where heat is exported and a working fluid stream is returned to a cogeneration system, some make-up fluid is usually required to replace fluid lost by the thermal host in the heat export process. The heat that is introduced to the system to heat make-up fluid to the same state as the return fluid stream is generally negligible and therefore can be ignored. However, in the case where no working fluid is returned to a cogeneration system, the calculation of **H** should account for the heat required to heat the supply or "make-up" stream of working fluid to the same state at which the thermal host discharges working fluid after extracting useful heat.

To summarize, heat rate for systems that burn an eligible fuel to generate electricity or electricity and heat is calculated as follows:

$$\text{Heat Rate} = \frac{F_{FOSSIL}}{E + (H \div 3600)} \quad \text{SI Units [kJ/kWh]}$$

$$= \frac{F_{FOSSIL}}{E + (H \div 3413)} \quad \text{Imperial Units [BTU/kWh]}$$

Note: Annual totals of energy inputs and outputs may be used to calculate annual average heat rates for the purpose of Class 43.1 or 43.2. Annual average heat rates can account for seasonal variations in heat and electricity demand that result in a range in operating heat rates over the year.

2.1.6.2 Sample heat rate calculation—systems that burn a fuel to generate electricity or electricity and heat

The heat rate calculation may be applied to systems composed of many different configurations of components, including gas turbine generators, reciprocating engine generators, steam boilers, steam turbines, HRSGs and fuel cells that would qualify as systems that generate electrical energy or electrical energy and useful heat under Class 43.1 or 43.2.

For example, an electrical energy and heat generation system—known as a combined cycle system—that uses a gas turbine generator, a heat recovery boiler and a steam turbine generator to generate electrical energy and export useful heat is shown in Figure 2.1.2. Natural gas is burned in the gas turbine generator to generate electrical energy E_1. Exhaust gases from the gas turbine generator are ducted through a heat recovery boiler (also known as a HRSG) to generate steam. The steam is piped to a steam turbine generator to generate additional electrical energy E_2. Low pressure steam is extracted from an extraction point on the steam turbine to supply heat Q_{out}, in the form of steam to a thermal host. The thermal host condenses the steam and returns the condensate with a heat content of Q_{ex} to the heat recovery boiler. It is assumed the heat required to heat make-up water to the same temperature as that of the condensate returned is negligible.

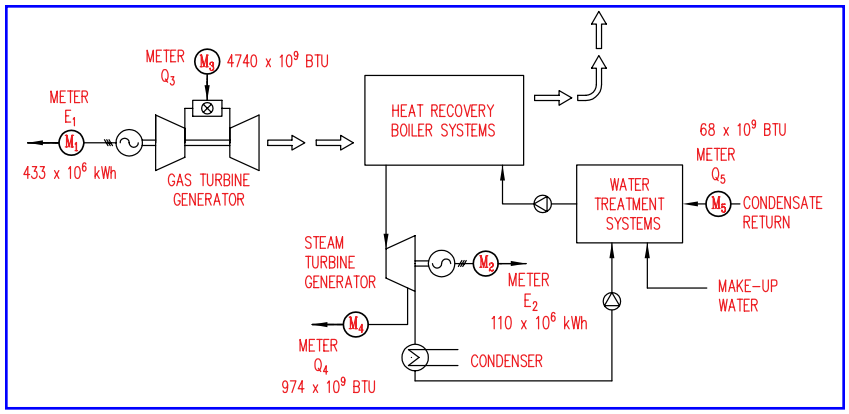


Figure 2.1.2 Natural Gas-Fired Combined Cycle in Cogeneration Mode

In this example the annual values of F_{FOSSIL}, **E** and **H** are determined to be

$$F_{FOSSIL} = Q_3 = 4740 \times 10^9 \text{ BTU}$$

$$E = E_1 + E_2 = 433 \times 10^6 + 110 \times 10^6 = 543 \times 10^6 \text{ kWh}$$

$$H = Q_{out} - Q_{ex} = Q_4 - Q_5 = 974 \times 10^9 - 68 \times 10^9 = 906 \times 10^9 \text{ BTU}$$

Substituting these values into the Class 43.1 or 43.2 heat rate equation in Imperial units yields the following:

$$\text{Heat Rate} = \frac{F_{FOSSIL}}{E + (H \div 3413)} = \frac{4740 \times 10^9}{543 \times 10^6 + (906 \times 10^9 \div 3413)} = 5863 \text{ BTU/kWh}$$

A heat rate of 5863 BTU/kWh is less than the 6000 BTU/kWh upper limit for Class 43.1 but greater than the 4750 BTU/kWh upper limit for Class 43.2, therefore this system would meet the heat rate requirement for Class 43.1 but not that of Class 43.2.

2.1.6.3 Enhanced combined cycle systems

The energy inputs and outputs of an ***enhanced combined cycle system*** that recovers thermal waste from a natural gas compressor station to enhance the electrical energy generation of a combined cycle system is shown in Figure 2.1.3.

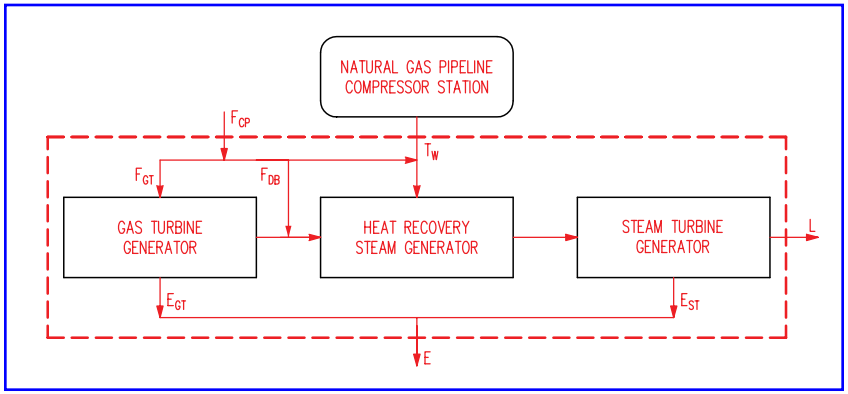


Figure 2.1.3 Enhanced Combined Cycle System Energy Balance

For these systems,

$$F_{CP} + T_W = E \times 3600 + L \quad \text{SI Units [kJ]}$$
$$= E \times 3413 + L \quad \text{Imperial Units [BTU]}$$

where

F_{CP} is the heat content of the fuel (i.e., natural gas) burned in a year that is chargeable to electric power generation in kJ or BTU. **F_{CP}** is calculated by multiplying the volume of natural gas consumed in a year for electric power generation by the HHV of natural gas. This natural gas consumption is in addition to the volume of natural gas that is burned in a year at a natural gas compressor station to compress natural gas flowing through a pipeline.

T_W is the thermal waste recovered in a year from the natural gas pipeline compressor turbine or engine exhaust and supplied to the electrical generating system in kJ or BTU.

E is the electrical energy generated in a year by the enhanced combined cycle system in kWh. This quantity is multiplied by 3600 to convert it to kJ or 3413 to convert it to BTU.

L is the loss of heat in a year from the enhanced combined cycle system in kJ or BTU. This includes energy lost in combustion exhaust gases, HRSG shell losses, blow-down losses and heat discharged to the environment in condensers.

Also, for these systems,

$$F_{CP} = F_{GT} + F_{DB}$$

where

F_{GT} is the heat content of the natural gas burned in a year by the gas turbine generator in the system in kJ or BTU. F_{GT} is calculated by multiplying the volume of natural gas consumed in a year by the gas turbine generator by the HHV of natural gas.

F_{DB} is the heat content of the natural gas burned in a year by the duct burners that may be installed at the inlet of HRSGs to augment power generation. F_{DB} is calculated by multiplying the volume of natural gas consumed in a year by all duct burners in the system by the HHV of natural gas.

The thermal waste recovered from the natural gas pipeline compressor (T_w) in a year can be calculated from the average temperature difference between the air at the air intake of the natural gas compressor turbine and the exhaust gases leaving the natural gas compressor turbine as follows:

$$T_w = m_{exh} \times C_{p\,exh} \times (t_{exh} - t_{air})$$

where

m_{exh} is the mass of exhaust gases recovered in a year from the natural gas compressor turbine or engine exhaust in kg or lb.

$C_{p\,exh}$ is the specific heat at constant pressure of the exhaust gases recovered in a year from the natural gas compressor or engine in kJ/kg °C or BTU/lb °F.

t_{exh} is the average temperature of the exhaust gases leaving the natural gas compressor turbine or engine over a year in °C or °F.

t_{air} is the average temperature of the ambient air over a year in °C or °F.

The total electrical energy generated by an enhanced combined cycle system (**E**) is given by

$$E = E_{GT} + E_{ST}$$

where

E_{GT} is the electrical energy produced in a year by the gas turbine generator in kWh.

E_{ST} is the electrical energy produced in a year by the steam turbine generator in kWh.

To meet the definition of an enhanced combined cycle system, at least 20 percent of the energy input of a combined cycle process must be thermal waste that is recovered from one or more natural gas compressor systems. In terms of the variables defined above, a combined cycle system meets the defining ratio of an enhanced combined cycle system if

$$\text{Defining Ratio Enhanced Combined Cycle} = \frac{T_w}{(F_{CP} + T_w)} \times 100 \geq 20\%$$

The heat rate of enhanced combined cycle systems can be calculated using the equations for systems that burn a fuel to generate electricity or electricity and heat with F_{CP} substituted for F_{FOSSIL}. However, since enhanced combined cycle systems do not usually export useful heat, these equations reduce to the following:

$$\text{Heat Rate Enhanced Combined Cycle} = \frac{F_{CP}}{E}$$

2.1.6.4 Sample heat rate calculation—enhanced combined cycle systems

An enhanced combined cycle system with a gas turbine powering a natural gas compressor at a natural gas compressor station, a gas turbine generator, two heat recovery boilers and a steam turbine generator is shown in Figure 2.1.4. The duct burners shown in the heat recovery boilers are not used.

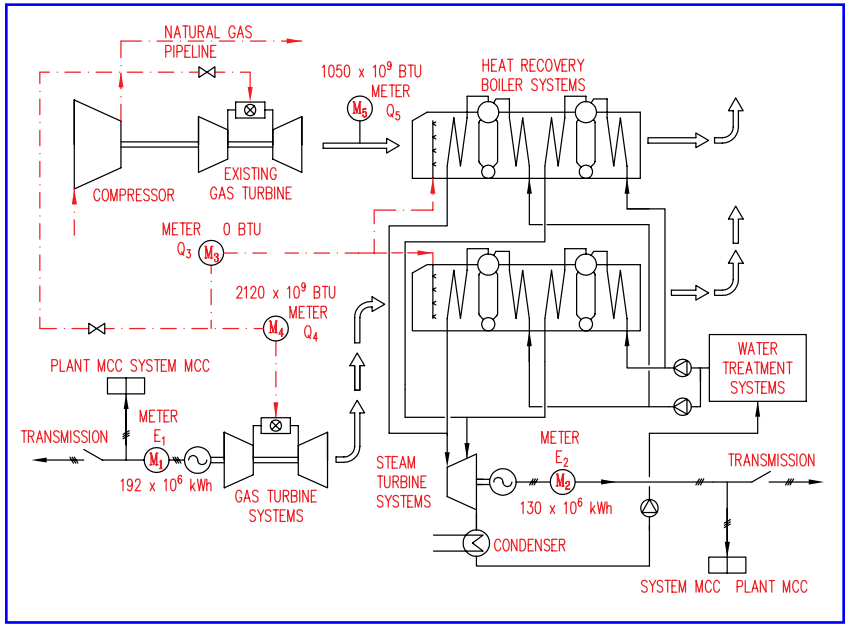


Figure 2.1.4 Enhanced Combined Cycle System at a Natural Gas Compressor Station

In this example, the values for, T_w, F_{CP} and **E** for a year are determined to be

$$T_w = Q_5 = 1050 \times 10^9 \text{ BTU}$$

$$F_{CP} = F_{GT} + F_{DB} = Q_4 + Q_3 = 2120 \times 10^9 + 0 = 2120 \times 10^9 \text{ BTU}$$

$$E = E_{GT} + E_{ST} = E_1 + E_2 = 192 \times 10^6 + 130 \times 10^6 = 322 \times 10^6 \text{ kWh}$$

Substituting T_w and F_{CP} into the defining ratio equation for enhanced combined cycle systems as follows:

$$\text{Defining Ratio} = \frac{T_w}{(F_{CP} + T_w)} \times 100 = \frac{1050 \times 10^9}{(2120 \times 10^9 + 1050 \times 10^9)} \times 100 = 33\%$$

A ratio of 33 percent is greater than 20 percent; therefore this system meets the defining ratio requirement of an enhanced combined cycle system.

Substituting F_{CP} and **E** into the heat rate equation for enhanced combined cycle systems yields the following:

$$\text{Heat Rate} = \frac{F_{CP}}{E} = \frac{2120 \times 10^9}{322 \times 10^6} = 6584 \text{ BTU/kWh}$$

A heat rate of 6584 BTU/kWh is less than 6700 BTU/kWh; therefore this system meets the heat rate requirement for enhanced combined cycle systems in Class 43.1 and 43.2.

2.1.7 APPLICATION FOR TECHNICAL OPINION WITH RESPECT TO CLASS 43.1 OR 43.2 ELIGIBILITY OF A COGENERATION, ENHANCED COMBINED CYCLE OR SPECIFIED-WASTE FUELLED ELECTRICAL GENERATION SYSTEM

FORM 2.1 Details of Cogeneration, Enhanced Combined Cycle or Specified-Waste Fuelled Electrical Generation Project

Company Information

Company Name

Company Address

Class 43.1 or 43.2 Property Address — Activity at this Location

Company Liaison for this Request — Title — Telephone Number

Company Technical Contact — Title — Telephone Number

Status of Project

☐ Installed Equipment or Completed Project ☐ Potential Project

Project Cost and Completion Date

Estimated Total Capitalized Cost of Project: $_____

Estimated Portion of Total Capitalized Cost Eligible Under Class 43.1 or 43.2: $_____

Estimated Project Completion Date (yyyy/mm/dd): _____

Eligible Property Description

For property that is proposed for inclusion in Class 43.1 or 43.2, attach the following information:

- A list including: 1) reference no., 2) item description, 3) name of manufacturer, 4) date of acquisition and 5) notes.
- A simple sketch or process flow diagram of the system or equipment and a process narrative.
- A completed Schedule A as per the following page.

Were any components used previously? Yes ☐ No ☐

If "Yes", provide details on a separate sheet.

Certification

I certify that the information provided in this application is true.

Dated at_____on_____

_____

Signature of owner, partner or authorized officer

_____

Name and title in block letters

Corporate Seal of Applicant

PROTECTED-B
(when completed)

SCHEDULE 2.1–A Configuration and Heat Rate of Proposed Cogeneration, Enhanced Combined Cycle or Specified-Waste Fuelled Electrical Generation System

Type of Cogeneration, Enhanced Combined Cycle or Specified-Waste Fuelled Electrical Generation System

- ☐ Gas Turbine System
- ☐ Steam Turbine System
- ☐ Combined Cycle System
- ☐ Cheng Cycle System
- ☐ Reciprocating Engine System
- ☐ Turbo Expander System
- ☐ Enhanced Combined Cycle System
- ☐ Fuel Cell Equipment
- ☐ Other Specify: _____

System or Equipment Output, Input and Heat Rate

(i) Rated output

Electrical (kW)_____ Useful Heat (kJ/h or BTU/h)_____

(ii) Indicate boiler configuration (if applicable):

- ☐ Direct Fired
- ☐ Heat Exchanger
- ☐ Other (specify) _____

(iii) Type and quantity of fossil fuel consumed in a year (specify units):

Type of Fuel	Annual Consumption	Energy Content (HHV basis)

(iv) Type and quantity of thermal waste or specified-waste fuel used in a year (specify units):

Type of Fuel	Annual Consumption	Energy Content (HHV basis)

(v) Show your calculations and indicate the basis for attaining the heat rate required in Class 43.1 or 43.2—see sections 2.1.5 and 2.1.6 of the 2019 edition of the Technical Guide to Class 43.1 and 43.2 for details of the heat rate requirements and the procedure for calculating heat rates (attach a spreadsheet with calculations if available):

_____

2.1.8 CAPITAL COSTS TYPICALLY INCLUDED IN CLASS 43.1 OR 43.2

Project Cost Table 2.1 Cogeneration, Enhanced Combined Cycle or Specified-Waste Fuelled Electrical Generation Systems

	Typical Capital Cost
1	Construction of working platforms that are not an integral part of a building or other structure.
2	Purchase and installation of compressed air system for equipment controls and instrumentation including compressor, dryer, controls and instrumentation.
3	Purchase and installation of combustion turbine(s) or engine(s) and ancillary equipment such as combustion air supply, fuel compression, control, instrumentation, cooling and lubrication equipment.
4	Purchase and installation of steam boiler(s) and ancillary equipment such as combustion air supply, fuel-handling equipment that upgrades the combustible portion of the fuel, boiler controls, ash elimination equipment, instrumentation and safety equipment.
5	Purchase and installation of steam turbine(s) or expander generator(s) and ancillary equipment such as gland, control, instrumentation and lubrication equipment.
6	Purchase and installation of electrical generator(s) and ancillary equipment such as controls and instrumentation and equipment for the following: electric power control (i.e., phase synchronization, voltage regulation and frequency control), cooling, lubrication, fire protection and acoustic protection.
7	Purchase and installation of power transformer(s).
8	Purchase and installation of HRSG or thermal waste recovery equipment and ancillary equipment such as duct work, controls and instrumentation.
9	Purchase and installation of duct burners and ancillary equipment such as controls and instrumentation.
10	Purchase and installation of boiler feedwater or working fluid systems including chemical treatment, storage tanks and de-aeration facilities.
11	Purchase and installation of steam condensate or working fluid return system.
12	Purchase and installation of eligible fuel or thermal waste piping including meters, instrumentation and controls from utility or thermal waste source to boiler, turbine, engine, duct burners, heat recovery equipment or expander.

2.1.9 SCHEMATICS OF QUALIFYING SYSTEMS

Some of the common types of qualifying systems that can be used to generate electrical energy or electrical energy and heat with fossil fuels or eligible waste fuels are shown in the schematics below.

When determining heat rates, a taxpayer should choose the schematic that best depicts the entire system in which their property is installed. Components of a recognized system cannot be considered in isolation when determining the heat rate because, depending on the treatment of energy inputs and outputs, a component of a system can have a much lower heat rate than the overall system. For example, where a taxpayer owns components of a combined cycle system that is shown in schematic ECG 2.1.10, the taxpayer must use that schematic when determining the heat rate. The taxpayer cannot, for heat rate calculation purposes, subdivide the combined cycle system into its component parts, such as a gas turbine generator as shown in schematic ECG 2.1.1 and a thermal waste to electricity system as shown in schematic TWE 2.2.2.

2.1.9.1 Key to Notes on Schematics of Cogeneration, Enhanced Combined Cycle or Specified-Waste Fuelled Electrical Generation Systems

ECG-1 For eligible properties, see Section 2.1.2 of this Guide.

ECG-2 For ineligible properties, see Section 2.1.3 of this Guide.

ECG-3 The fossil fuel supply line downstream of a main utility shut-off valve of electrical energy or steam generating equipment is eligible property if the supply line is dedicated to a qualifying system. Otherwise, the eligible system boundary for a fossil fuel supply line is considered to be at the point at which fuel enters the energy conversion unit.

ECG-4 Eligible electrical energy generation property includes generators and equipment used at the first level of power transformation. The first level of transformation includes equipment used for phase synchronization and voltage regulation. After the first level of transformation, generation stops, and the electricity is ready for use (e.g., ready to be put on transmission lines). Typically, the eligible system boundary for electrical energy generation equipment is located after the first level of transformation at isolation switches that allow a utility to lock out a generating plant's power production.

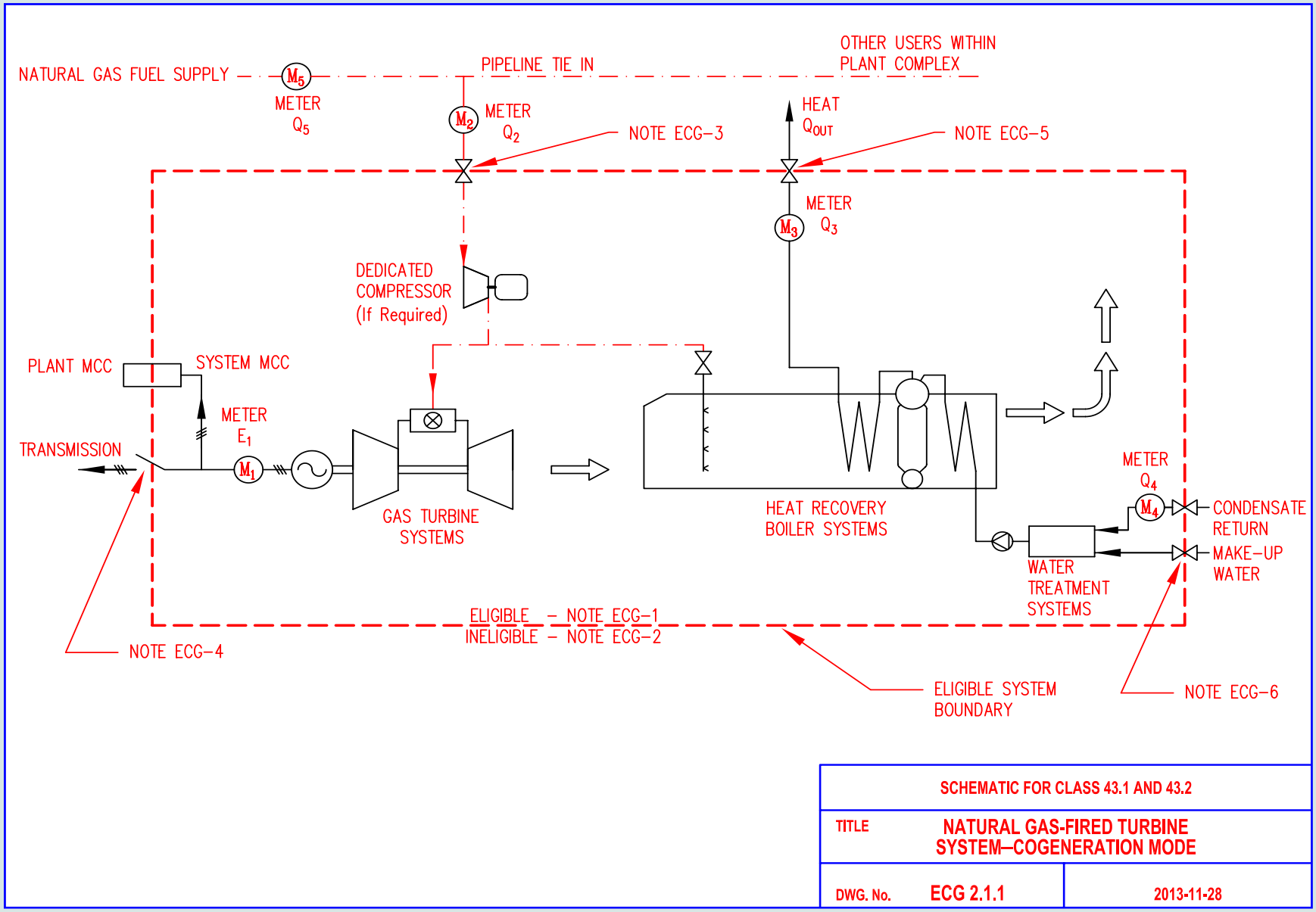
ECG-5 The eligible portion of a heat distribution pipeline system includes piping from the eligible heat generating equipment to the main shut-off valve, interface with the end-use system or change in ownership of the pipeline, whichever is first.

ECG-6 Eligible components of boiler feedwater systems include components that are necessary to treat condensate, return water, or make-up water to the water quality standards required by the boiler as well as components that are necessary to supply feedwater to the boiler at the boiler inlet pressure. The system boundary for the condensate, return water or make-up water piping is located at the main shut-off valves, boiler room walls, or change in ownership of the piping, whichever is first.

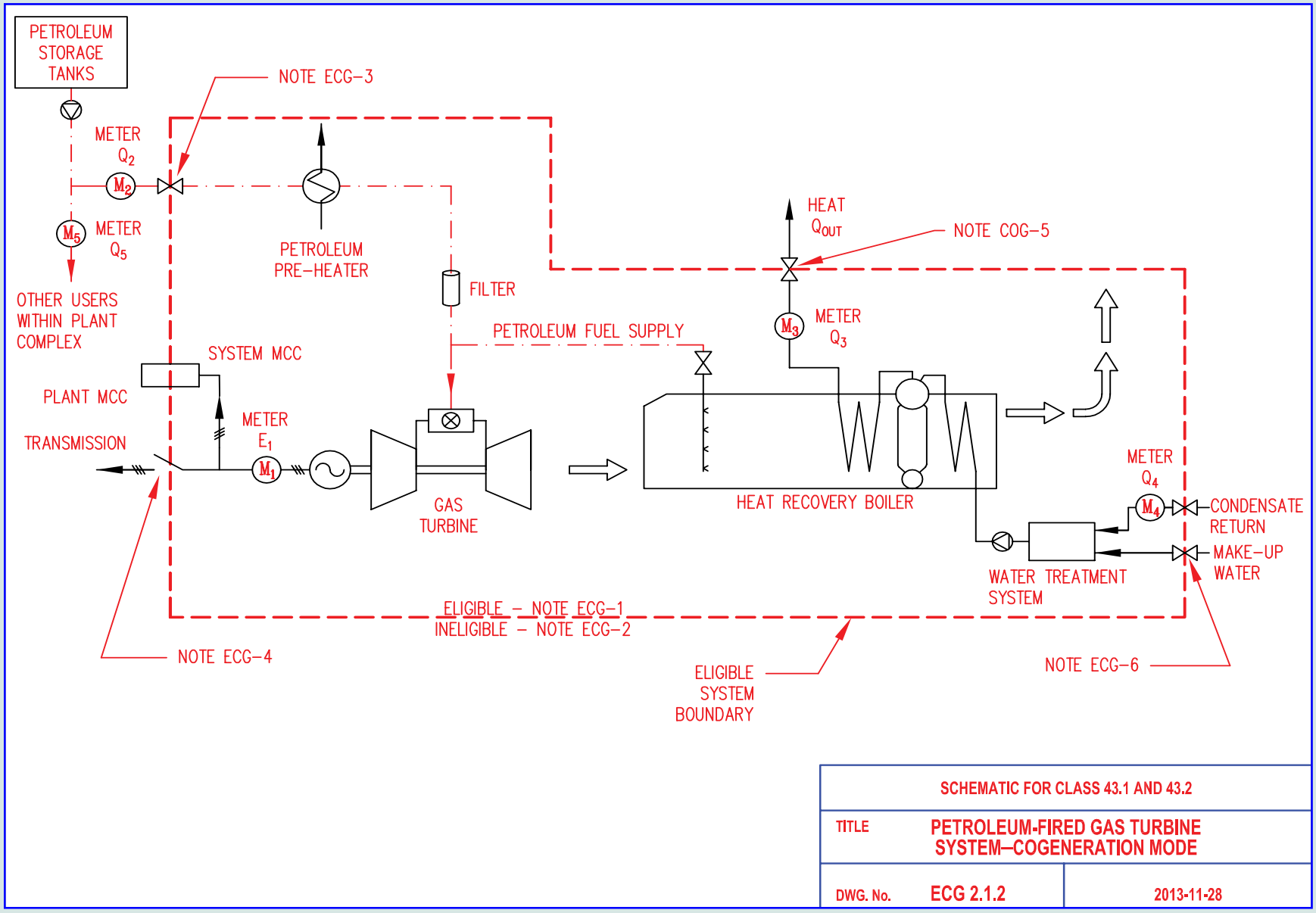
ECG-7 Equipment used primarily to reject heat, such as condensers, cooling towers and similar equipment is ineligible.

ECG-8 In systems that use specified-waste fuels to generate electrical energy or electrical energy and useful heat, the equipment used to pre-process the waste fuel is eligible if the purpose of the equipment is to upgrade the combustible portion of the fuel through processes such as shredding, hogging, compacting, drying or gasifying.

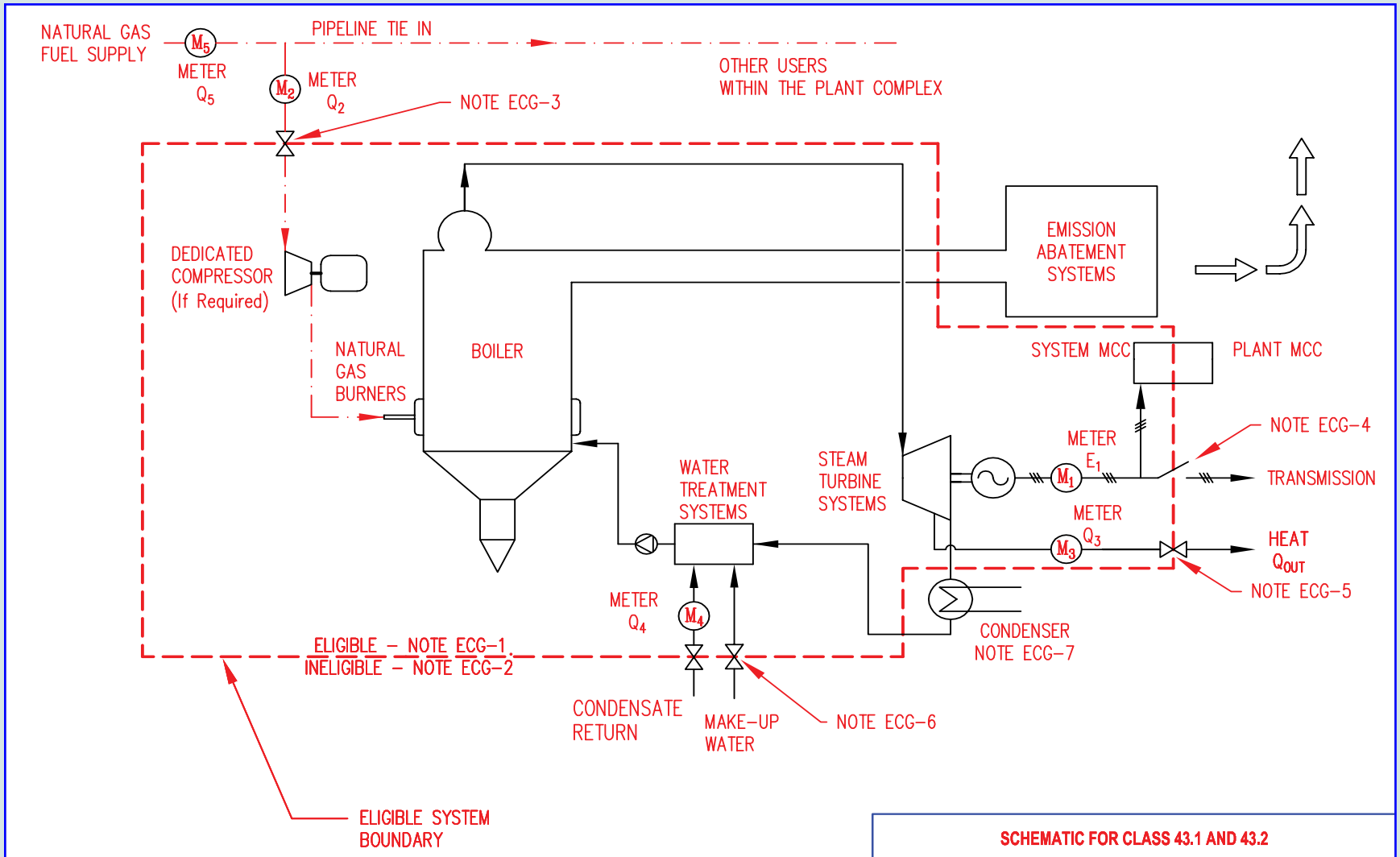
ECG 2.1.1 Natural Gas-Fired Turbine System—Cogeneration Mode



ECG 2.1.2 Petroleum-Fired Gas Turbine System—Cogeneration Mode

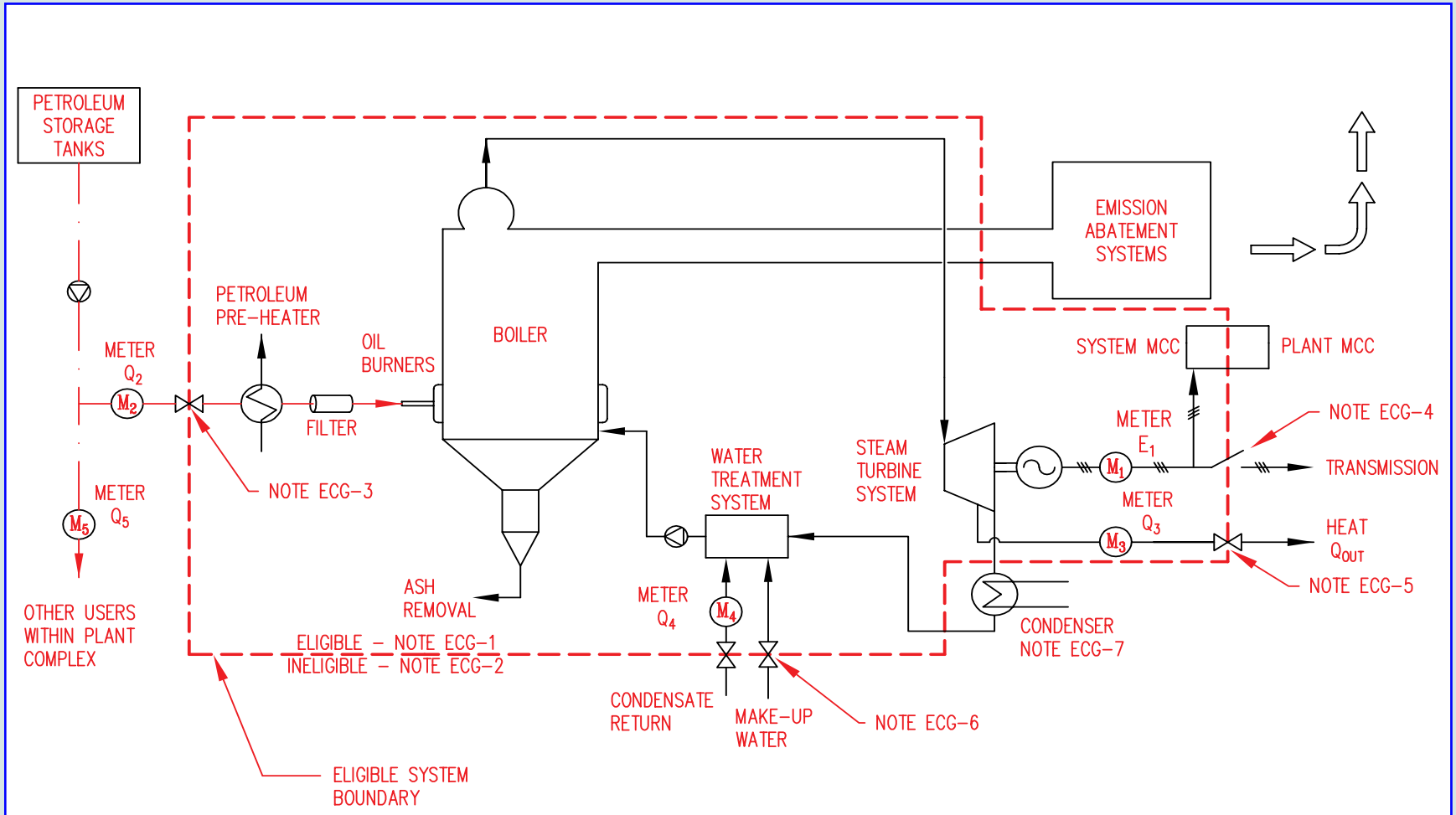


ECG 2.1.3 Natural Gas-Fired Steam Turbine System—Cogeneration Mode



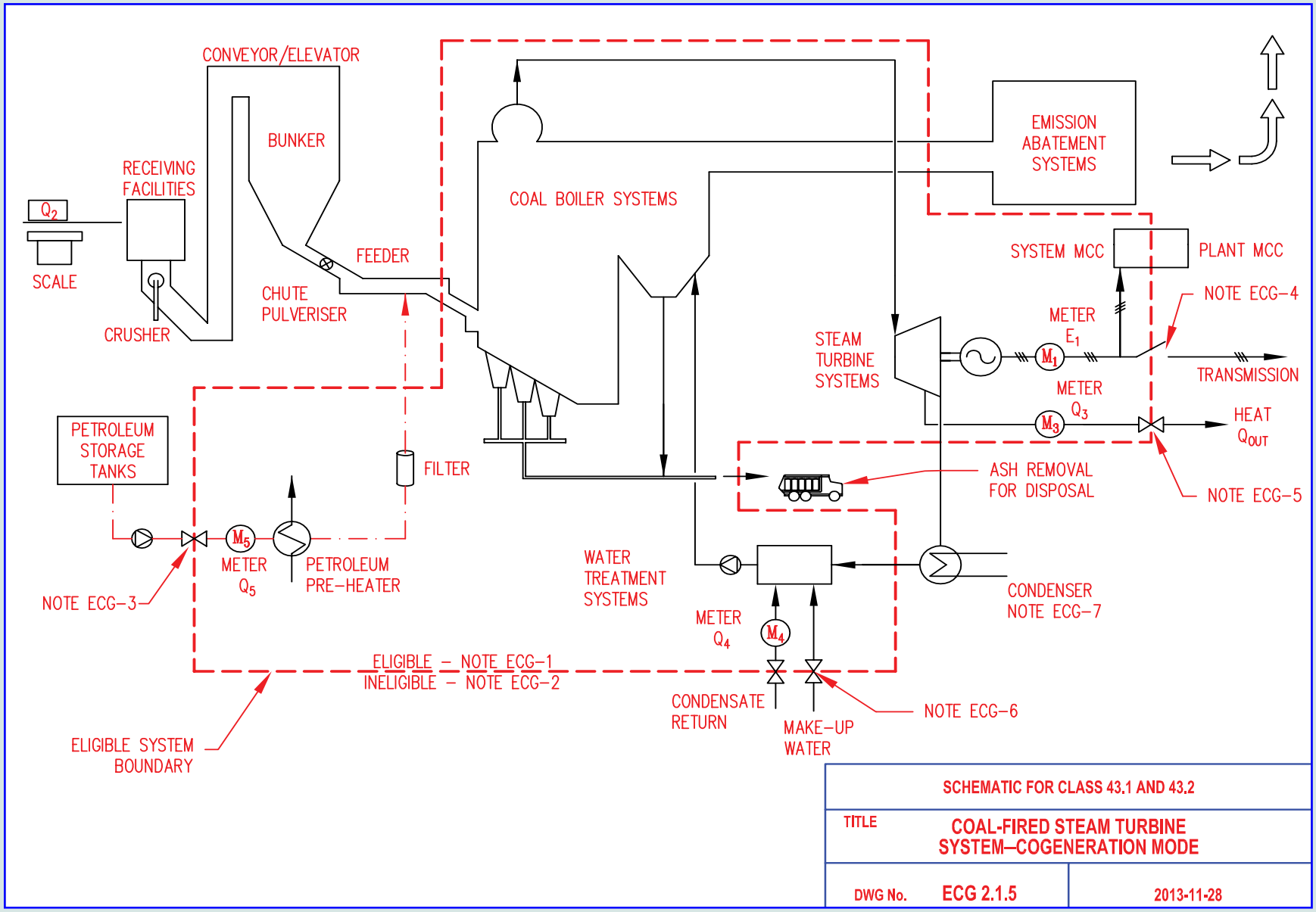
SCHEMATIC FOR CLASS 43.1 AND 43.2	
TITLE	NATURAL GAS-FIRED STEAM TURBINE SYSTEM–COGENERATION MODE
DWG No. ECG 2.1.3	2013-11-28

ECG 2.1.4 Petroleum-Fired Steam Turbine System—Cogeneration Mode

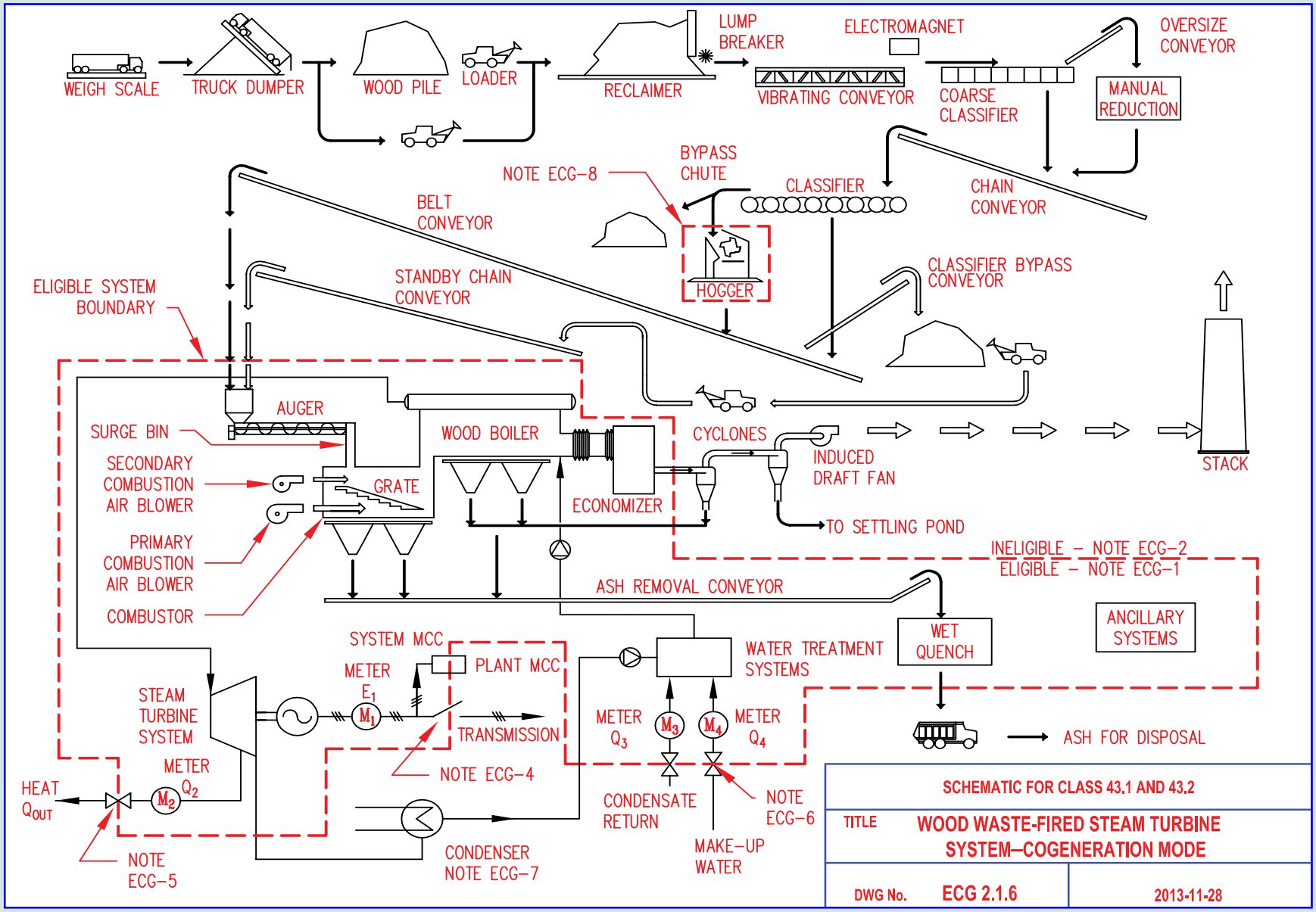


SCHEMATIC FOR CLASS 43.1 AND 43.2	
TITLE	PETROLEUM-FIRED STEAM TURBINE SYSTEM—COGENERATION MODE
DWG No. ECG 2.1.4	2013-11-28

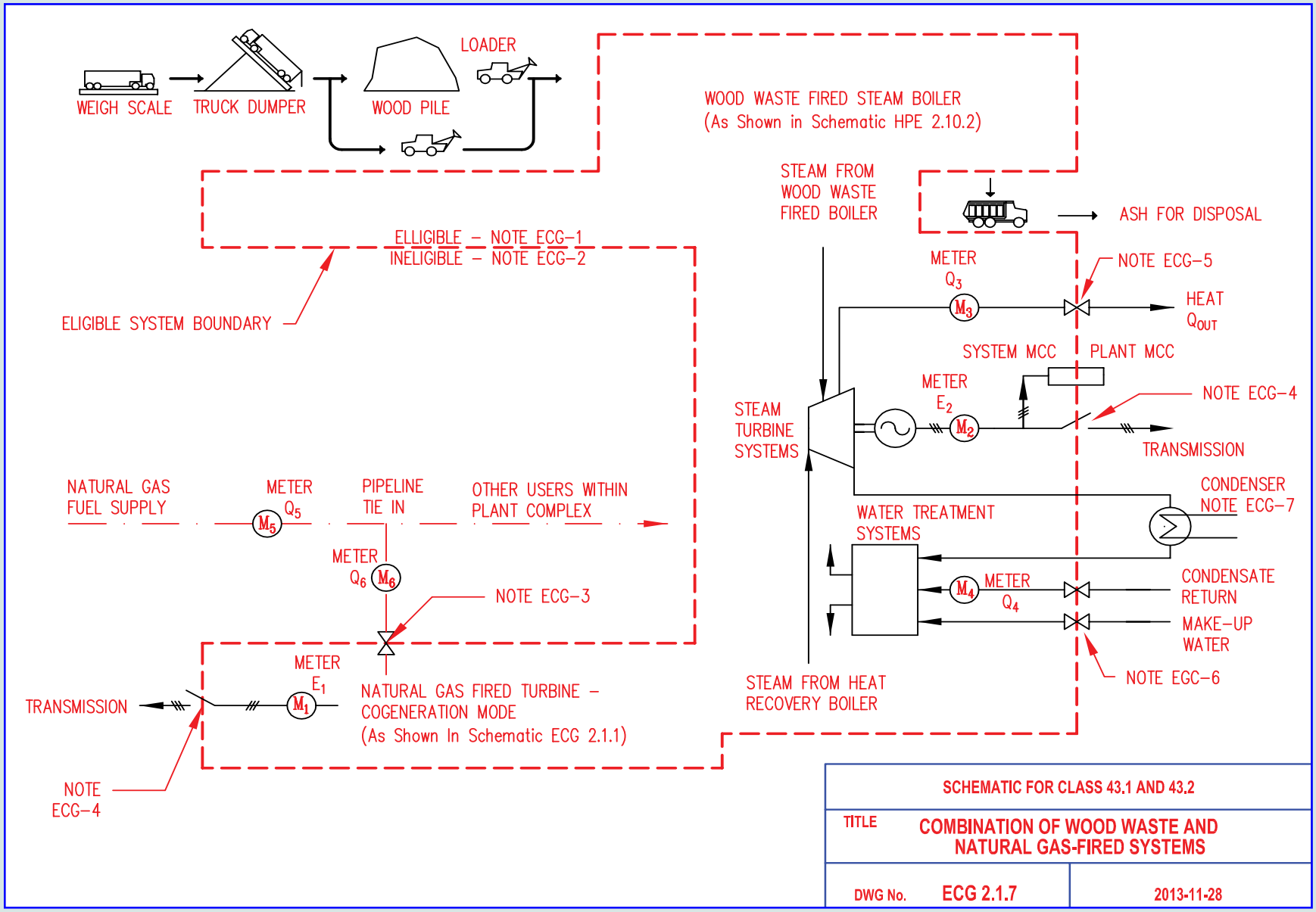
ECG 2.1.5 Coal-Fired Steam Turbine System—Cogeneration Mode



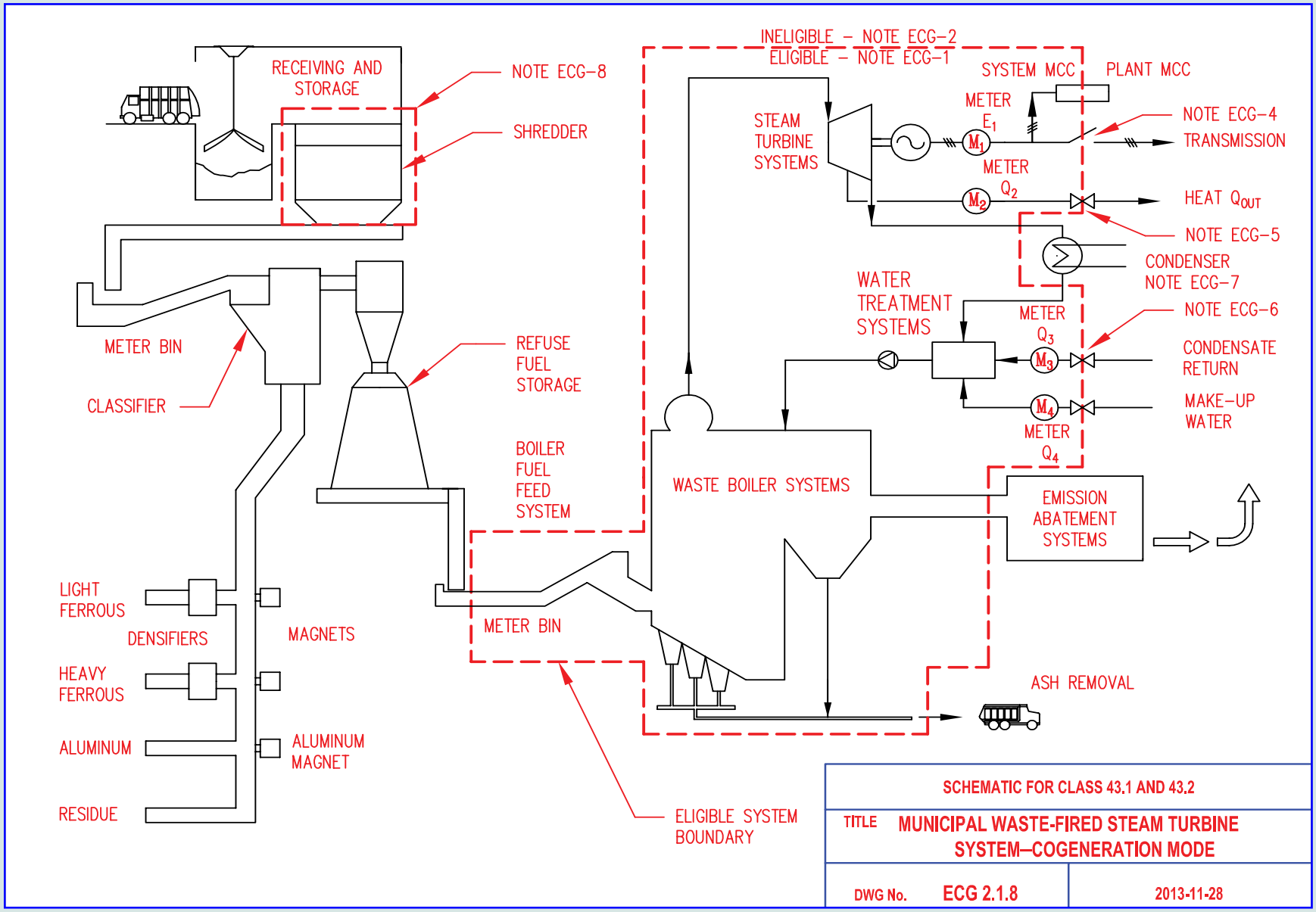
ECG 2.1.6 Wood Waste-Fired Steam Turbine System—Cogeneration Mode



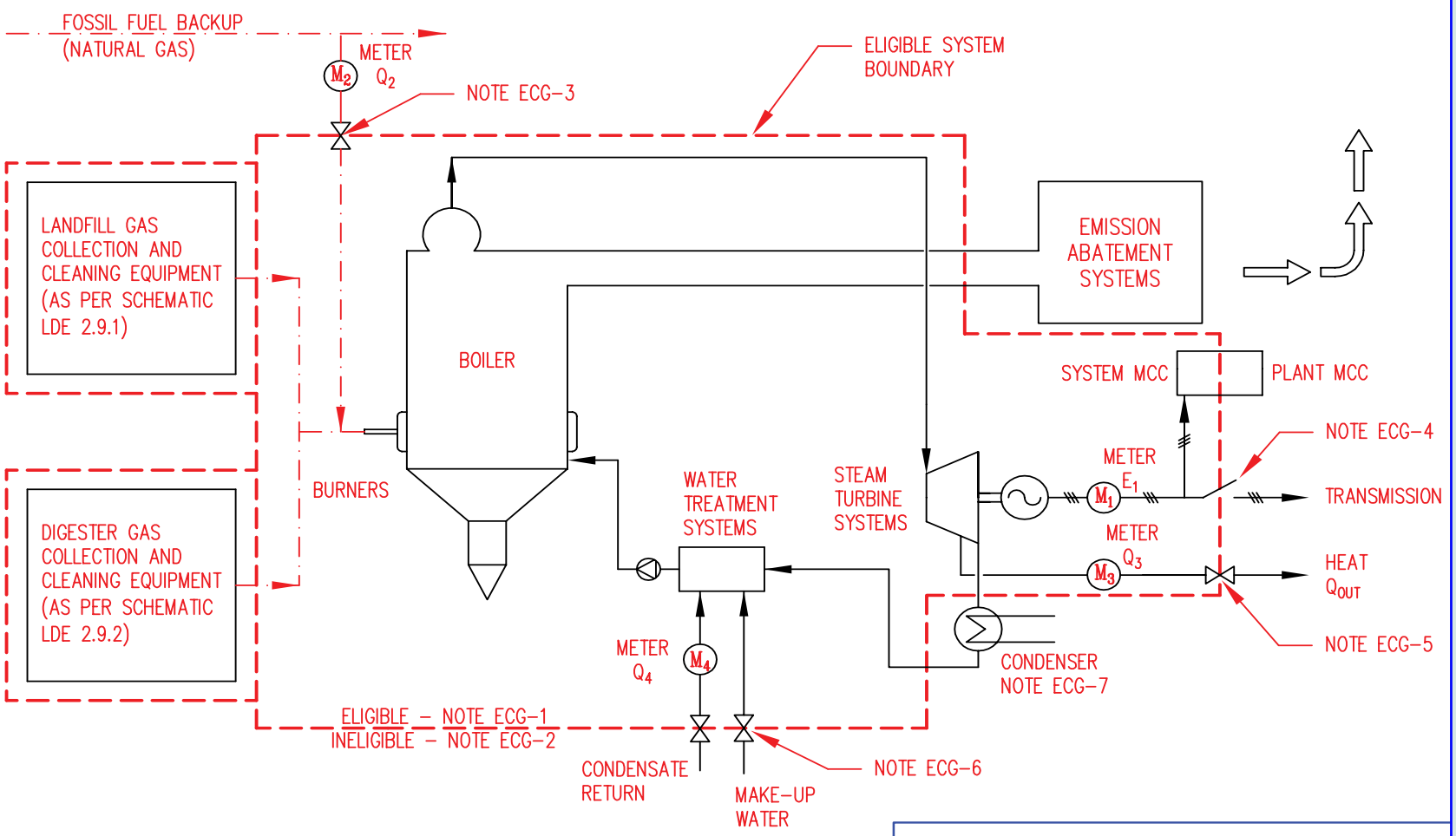
ECG 2.1.7 Combination of Wood Waste and Natural Gas-Fired Systems



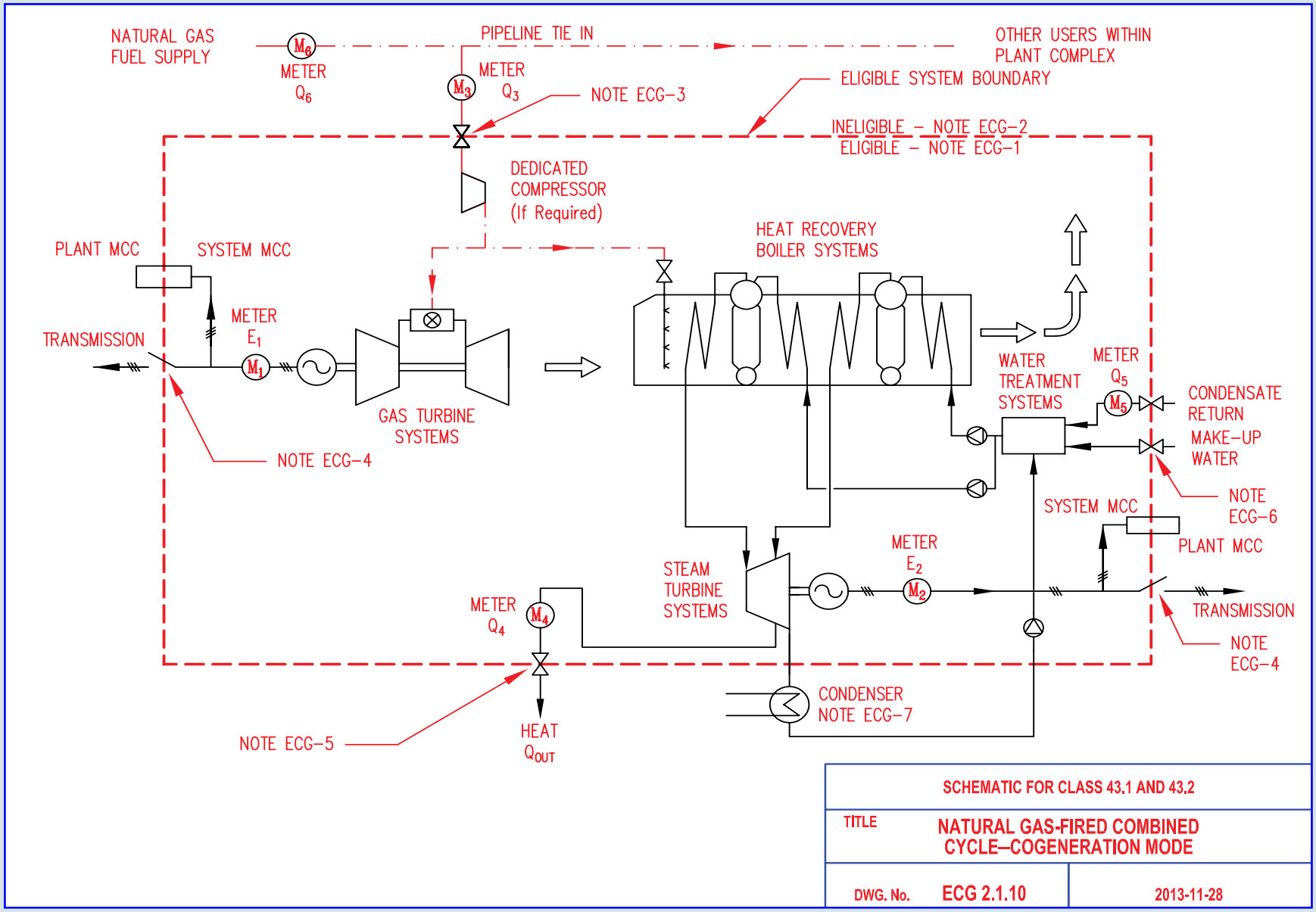
ECG 2.1.8 Municipal Waste-Fired Steam Turbine System—Cogeneration Mode



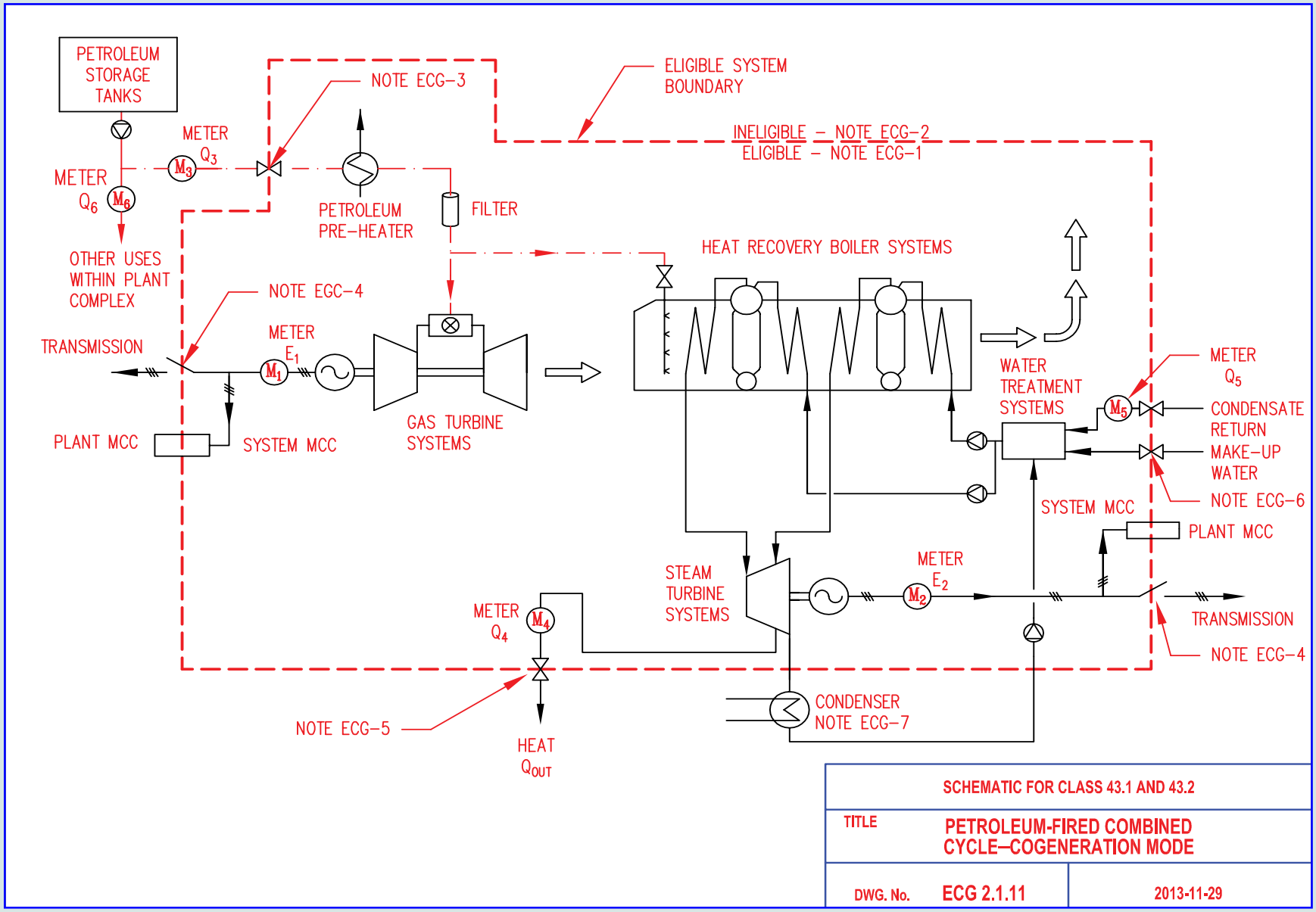
ECG 2.1.9 Landfill Gas or Digester Gas-Fired Steam Turbine System—Cogeneration Mode



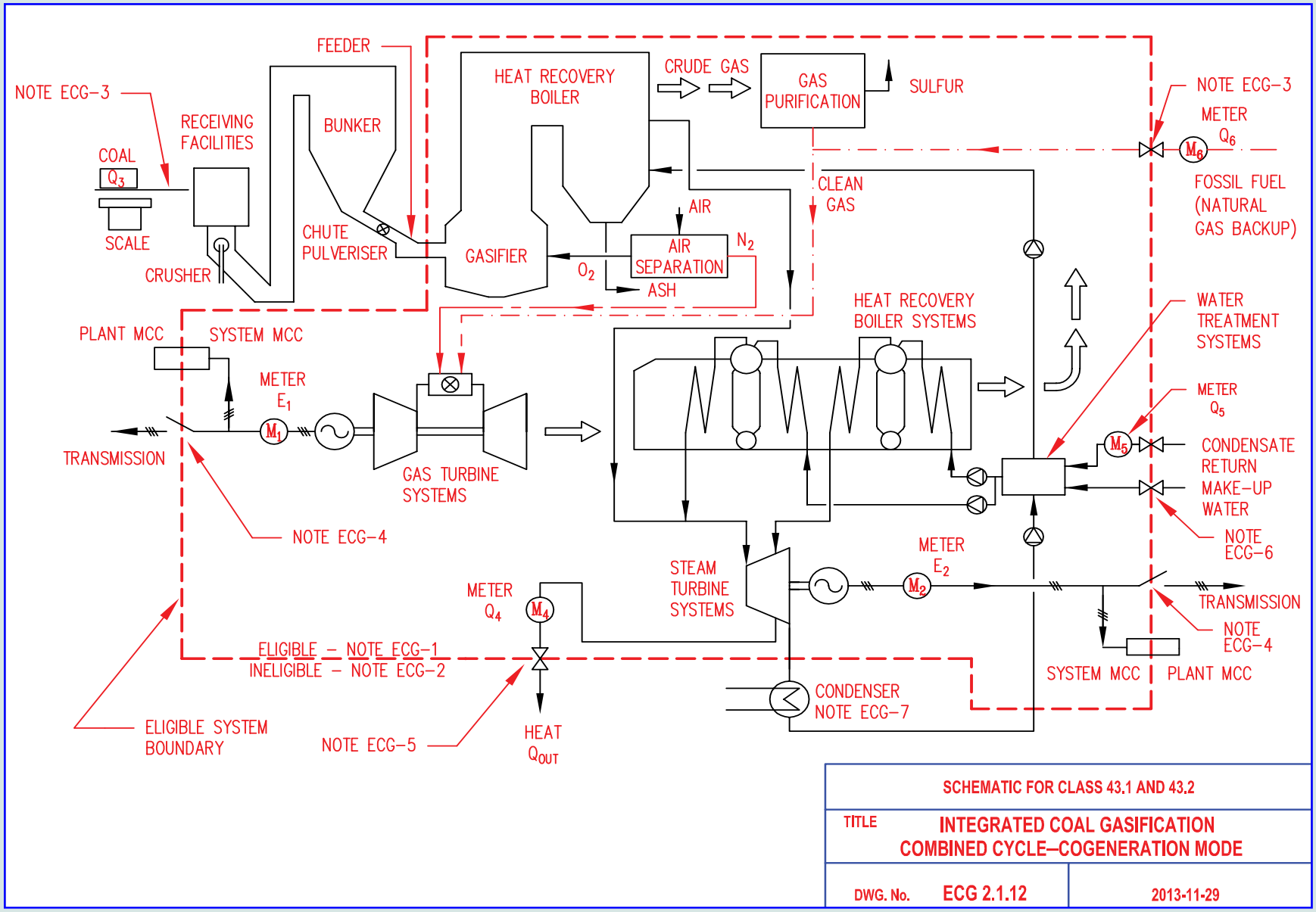
ECG 2.1.10 Natural Gas-Fired Combined Cycle—Cogeneration Mode



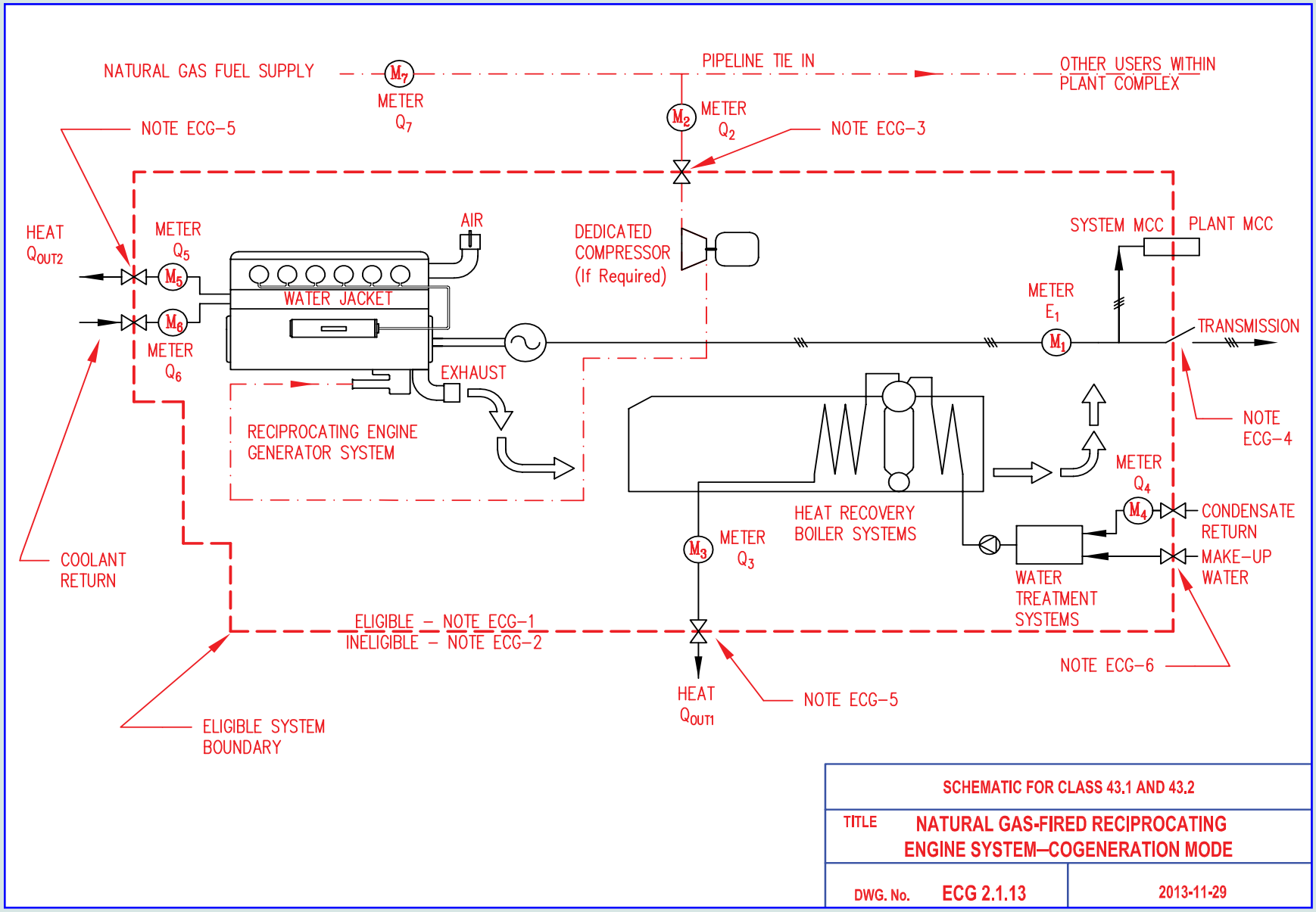
ECG 2.1.11 Petroleum-Fired Combined Cycle—Cogeneration Mode



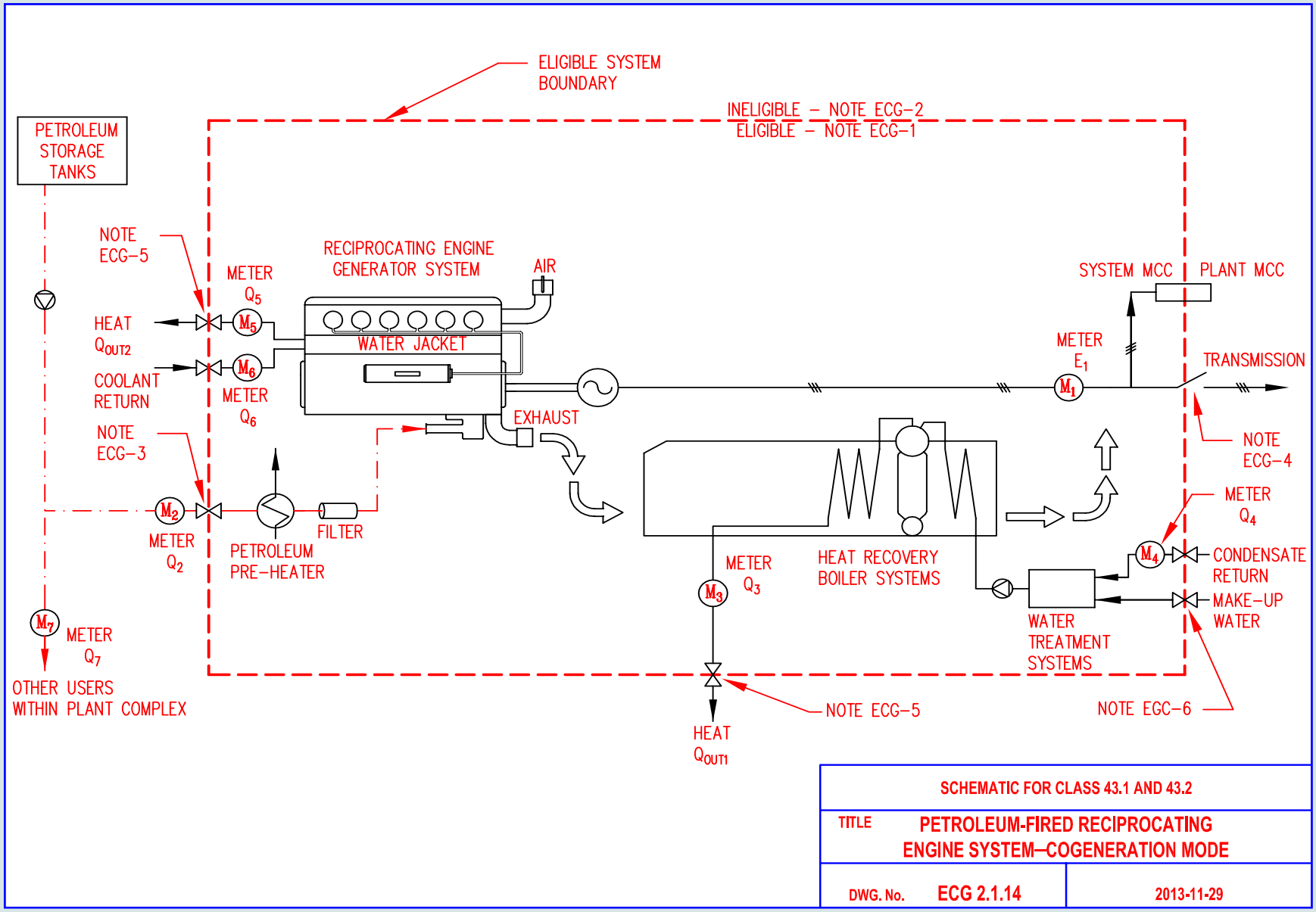
ECG 2.1.12 Integrated Coal Gasification Combined Cycle—Cogeneration Mode



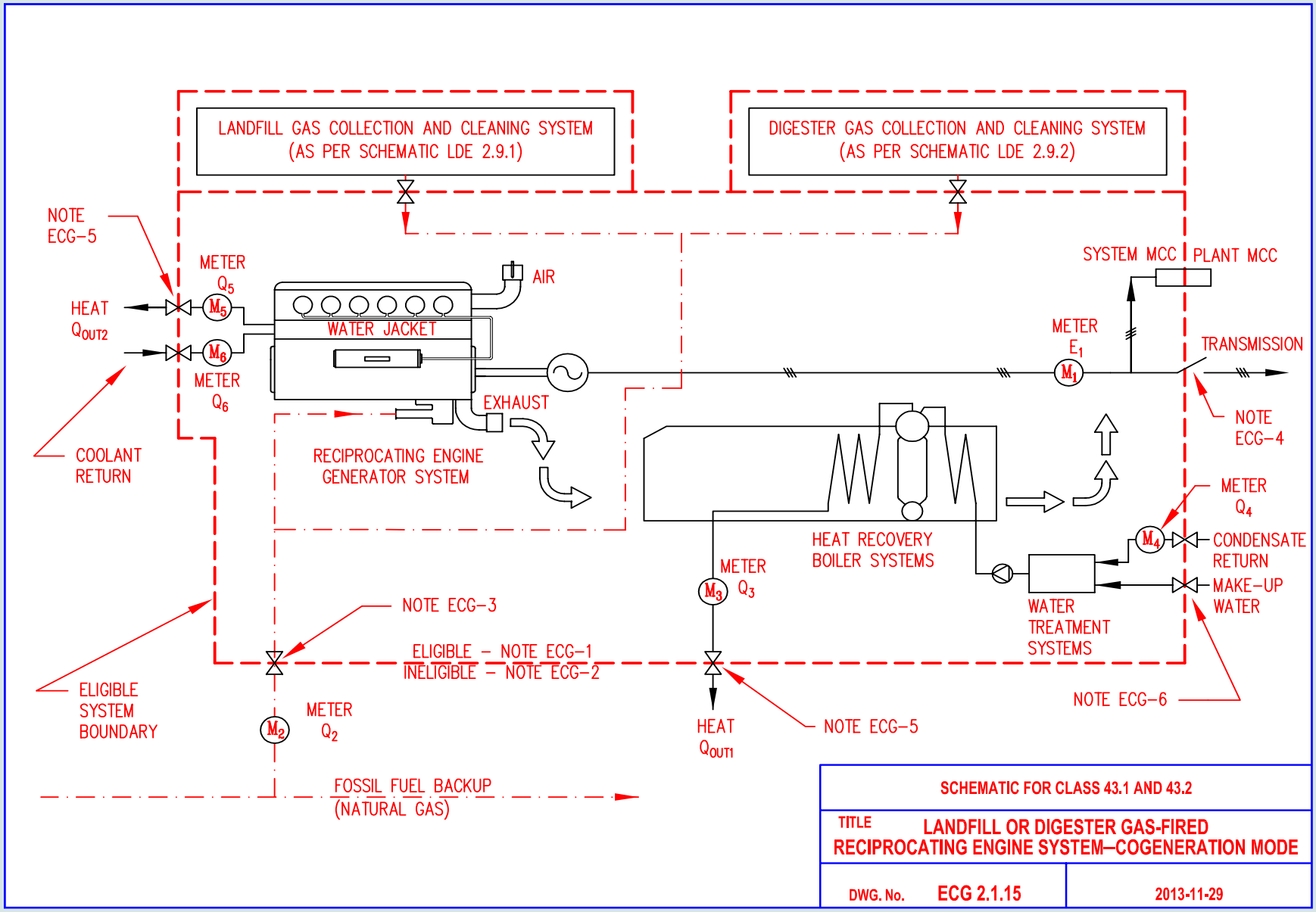
ECG 2.1.13 Natural Gas-Fired Reciprocating Engine System—Cogeneration Mode



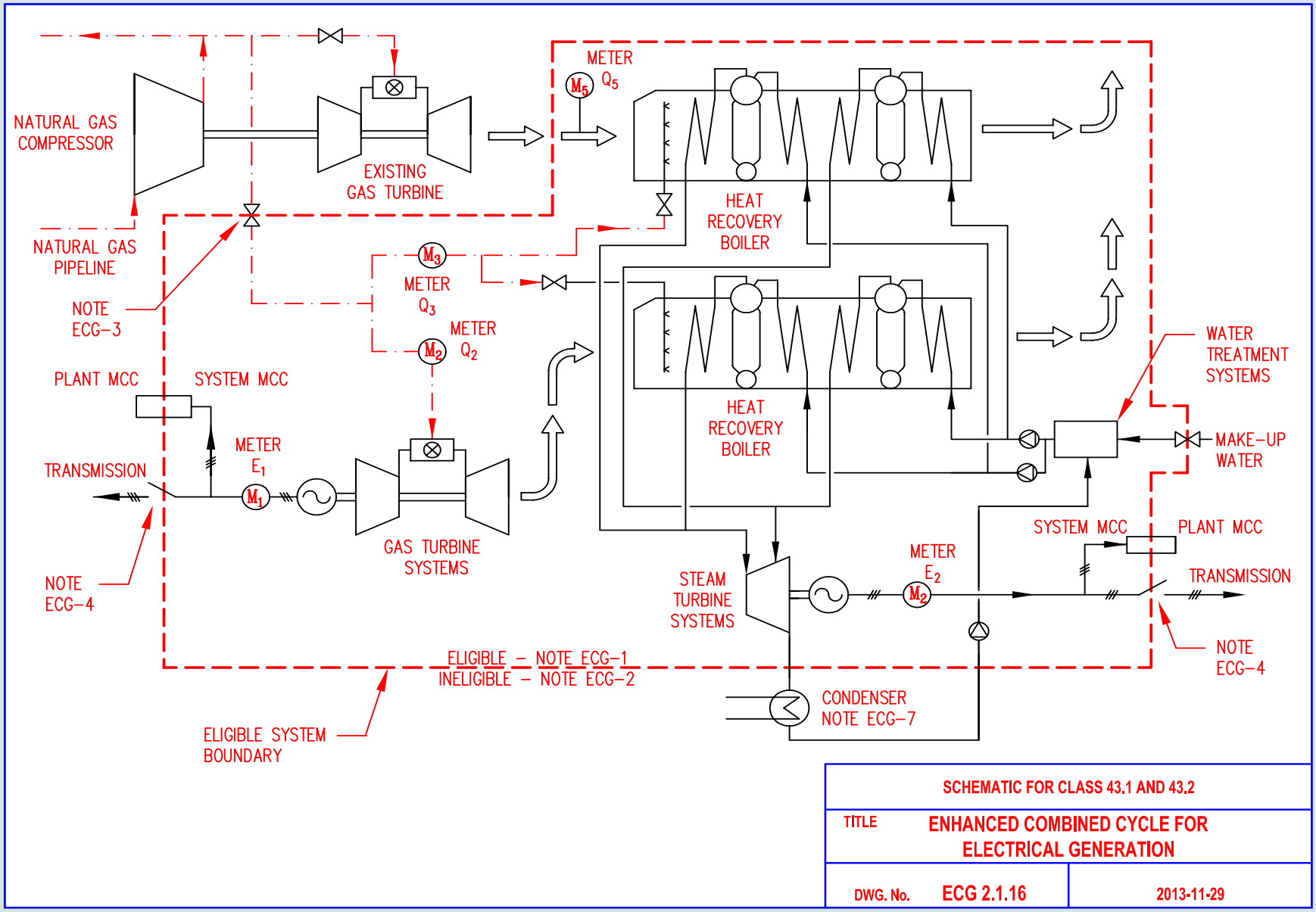
ECG 2.1.14 Petroleum-Fired Reciprocating Engine System—Cogeneration Mode



ECG 2.1.15 Landfill or Digester Gas-Fired Reciprocating Engine System—Cogeneration Mode



ECG 2.1.16 Enhanced Combined Cycle for Electrical Generation



2.2 Thermal Waste Electrical Generation Equipment

CONTENTS

SCHEMATICS

2.2.1 THERMAL WASTE ELECTRICAL GENERATION EQUIPMENT

Thermal waste electrical generation equipment (described in paragraphs (a), (b) and subparagraph (c)(iii) of Class 43.1) includes equipment that is used to generate electrical energy in a process all or substantially all of the energy input of which is thermal waste, other than:

- equipment that uses heat from a gas turbine in the first stage of a combined cycle system;

and

- equipment that, on the date of its acquisition, uses chlorofluorocarbons (CFCs) or hydrochlorofluorocarbons (HCFCs).

2.2.2 ELIGIBLE PROPERTIES

Eligible properties for thermal waste electrical generation equipment include the following:

- heat recovery equipment (see Section 2.5);
- electrical generating equipment (e.g., steam turbine generators, expander generators, Stirling engine generators);
- control, working fluid, feedwater and condensate equipment;

and

- other ancillary equipment.

Note: Thermal waste electrical generation equipment included in Class 43.1 or 43.2 is an eligible source of electrical energy for electrical energy storage equipment (see section 2.19).

2.2.3 INELIGIBLE PROPERTIES

Ineligible properties for thermal waste electrical generation equipment include the following:

- buildings or other structures;
- heat rejection equipment;
- transmission and distribution equipment;

and

- equipment that uses CFCs or HCFCs.

Equipment in the second stage of a combined cycle process that generates electrical energy from heat recovered from the exhaust gases of a gas turbine in the first stage of a combined cycle process is not eligible as thermal waste electrical generation equipment. However, combined cycle systems that use the heat in the gases exhausted by a gas turbine in the first stage of a combined cycle system or a gas turbine in a natural gas compressor system to generate electrical energy can qualify for inclusion in Class 43.1 or 43.2 provided they meet the designated heat rate for such systems as discussed in Section 2.1 of this Guide.

Equipment that on the date of its acquisition uses working fluids that are CFCs or HCFCs (within the meaning assigned by the *Ozone-Depleting Substances Regulations, 1998*, made under the *Canadian Environmental Protection Act, 1999*) is not eligible.

2.2.4 APPLICATION FOR TECHNICAL OPINION WITH RESPECT TO CLASS 43.1 OR 43.2 ELIGIBILITY OF THERMAL WASTE ELECTRICAL GENERATION EQUIPMENT

FORM 2.2 Details of Thermal Waste Electrical Generation Project

Company Information

Company Name

Company Address

Class 43.1 or 43.2 Property Address | Activity at this Location

Company Liaison for this Request | Title | Telephone Number

Company Technical Contact | Title | Telephone Number

Status of Project

☐ Installed Equipment or Completed Project ☐ Potential Project

Project Cost and Completion Date

Estimated Total Capitalized Cost of Project: $_____

Estimated Portion of Total Capitalized Cost Eligible Under Class 43.1 or 43.2: $_____

Estimated Project Completion Date (yyyy/mm/dd): _____

Eligible Property Description

For property that is proposed for inclusion in Class 43.1 or 43.2, attach the following information:

- A list including: 1) reference no., 2) item description, 3) name of manufacturer, 4) date of acquisition and 5) notes.
- A simple sketch or process flow diagram of the system or equipment and a process narrative.
- A completed Schedule A as per the following page.

Were any components used previously? Yes ☐ No ☐

If "Yes", provide details on a separate sheet.

Certification

I certify that the information provided in this application is true.

Dated at_____on_____

_____

Signature of owner, partner or authorized officer

_____

Name and title in block letters

Corporate Seal of Applicant

SCHEDULE 2.2–A Configuration of Proposed Thermal Waste Electrical Generation Equipment

Type of thermal waste electrical energy generation equipment

- ☐ Rankine Cycle (Steam Turbine Cycle)
- ☐ Organic Rankine Cycle
- ☐ Kalina Cycle
- ☐ Stirling Engine
- ☐ Other Specify: _____

Equipment output, thermal waste input and fuels used

(i) Rated output of the electrical energy generator:

_____ kW

(ii) Describe the thermal waste source and estimate the amount used in kJ or BTU on an annual basis: [1]

_____

_____

(iii) Will any fossil fuel be burned to generate heat to supplement the thermal waste used? Yes ☐ No ☐

If "Yes" complete the following indicating the units:

Type of Fossil Fuel	Annual Consumption	Energy Content (HHV basis)

(iv) Will any waste fuel be burned to generate heat to supplement the thermal waste used? Yes ☐ No ☐

If "Yes" complete the following indicating the units:

Type of Waste Fuel	Annual Consumption	Energy Content (HHV basis)

(v) Indicate the working fluid(s) that will be used in the electrical energy generation equipment: [2]

_____

_____

1 To qualify as thermal waste electrical energy generation equipment, substantially all (i.e., typically 90 percent or more) of the thermal energy input must be thermal waste, and less than 10 percent of the energy input may be generated from the direct combustion of fossil or waste fuels. Equipment that uses less than 90 percent thermal waste is subject to the heat rate requirements discussed in Section 2.1 of this Guide.

2 Electrical energy generation equipment that on the date of its acquisition uses working fluids that are CFCs or HCFCs, within the meaning assigned by the Ozone-Depleting Substances Regulations, 1998, made under the Canadian Environmental Protection Act, 1999 is not eligible.

2.2.5 CAPITAL COSTS TYPICALLY INCLUDED IN CLASS 43.1 OR 43.2

Project Cost Table 2.2 Thermal Waste Electrical Generation Equipment

	Typical Capital Cost
1	Construction of working platforms that are not an integral part of a building or other structure.
2	Purchase and installation of compressed air system for equipment controls and instrumentation including compressor, dryer, controls and instrumentation.
3	Purchase and installation of turbine, expander, or heat engine(s) and ancillary equipment such as gland, control, instrumentation and lubrication systems.
4	Purchase and installation of electrical generator(s) and ancillary equipment such as controls and instrumentation and equipment for the following: electric power control (i.e., phase synchronization, voltage regulation and frequency control), cooling, lubrication, fire protection and acoustic protection.
5	Purchase and installation of power transformer(s).
6	Purchase and installation of thermal waste recovery equipment and ancillary equipment such as duct work, working fluid piping, controls and instrumentation.
7	Purchase and installation of feedwater or working fluid systems including chemical treatment, storage tanks and de-aeration facilities.
8	Purchase and installation of condensate or working fluid return system.

2.2.6 SCHEMATICS OF QUALIFYING EQUIPMENT

Some of the common configurations of qualifying equipment that can be used to generate electrical energy from thermal waste are illustrated in the schematics below.

2.2.6.1 Key to Notes on Schematics of Thermal Waste Electrical Generation Equipment

TWE-1 For eligible properties, see Section 2.2.2 of this Guide.

TWE-2 For ineligible properties, see Section 2.2.3 of this Guide.

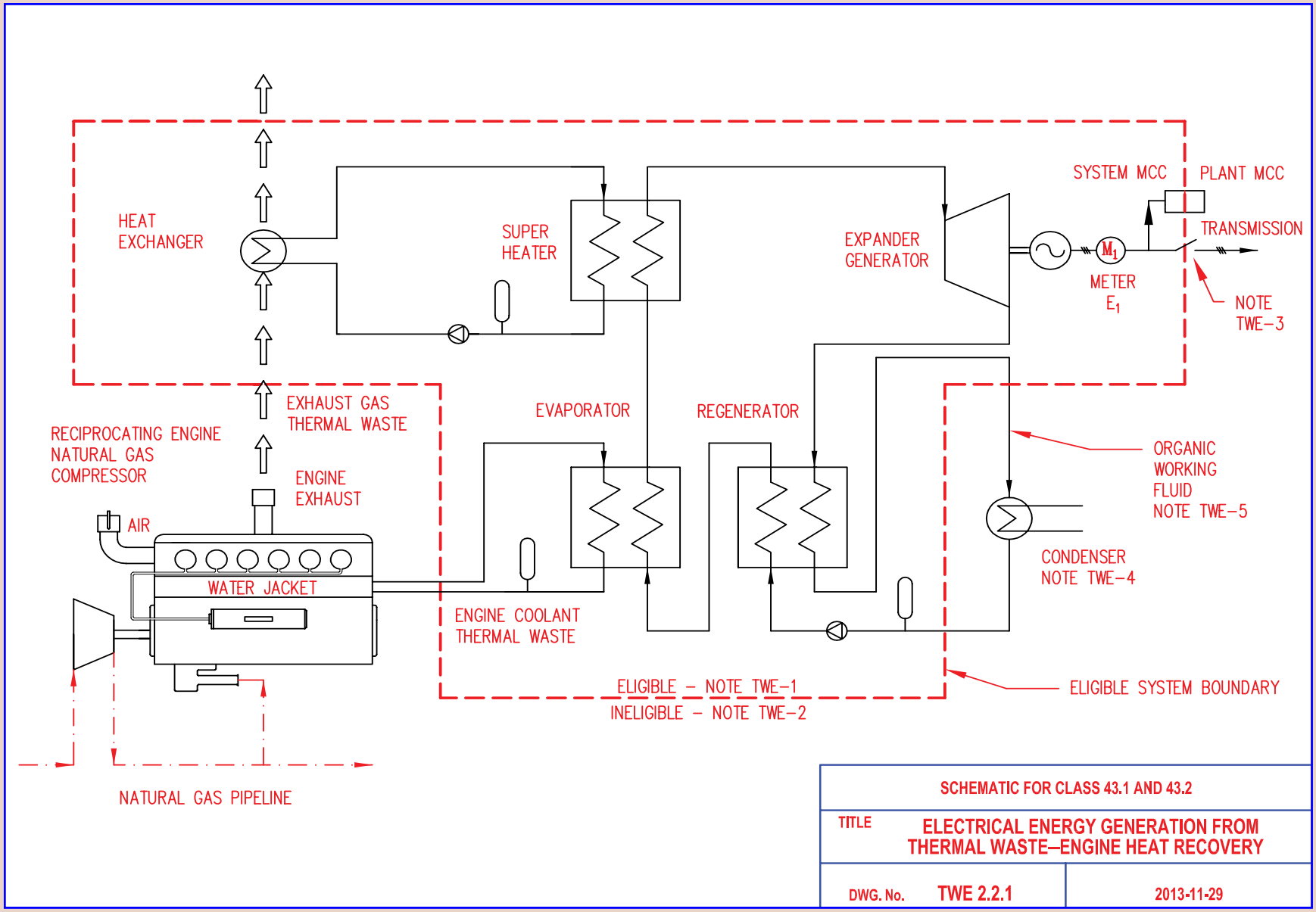
TWE-3 Eligible electrical energy generation property includes generators and equipment used at the first level of power transformation. The first level of transformation includes equipment used for phase synchronization and voltage regulation. After the first level of transformation, generation stops, and the electricity is ready for use (e.g., ready to be put on transmission lines). Typically, the eligible system boundary for electrical energy generation equipment is located after the first level of transformation at isolation switches that allow a utility to lock out a generating plant's power production.

TWE-4 Equipment used primarily to reject heat, such as condensers, cooling towers and similar equipment, is ineligible.

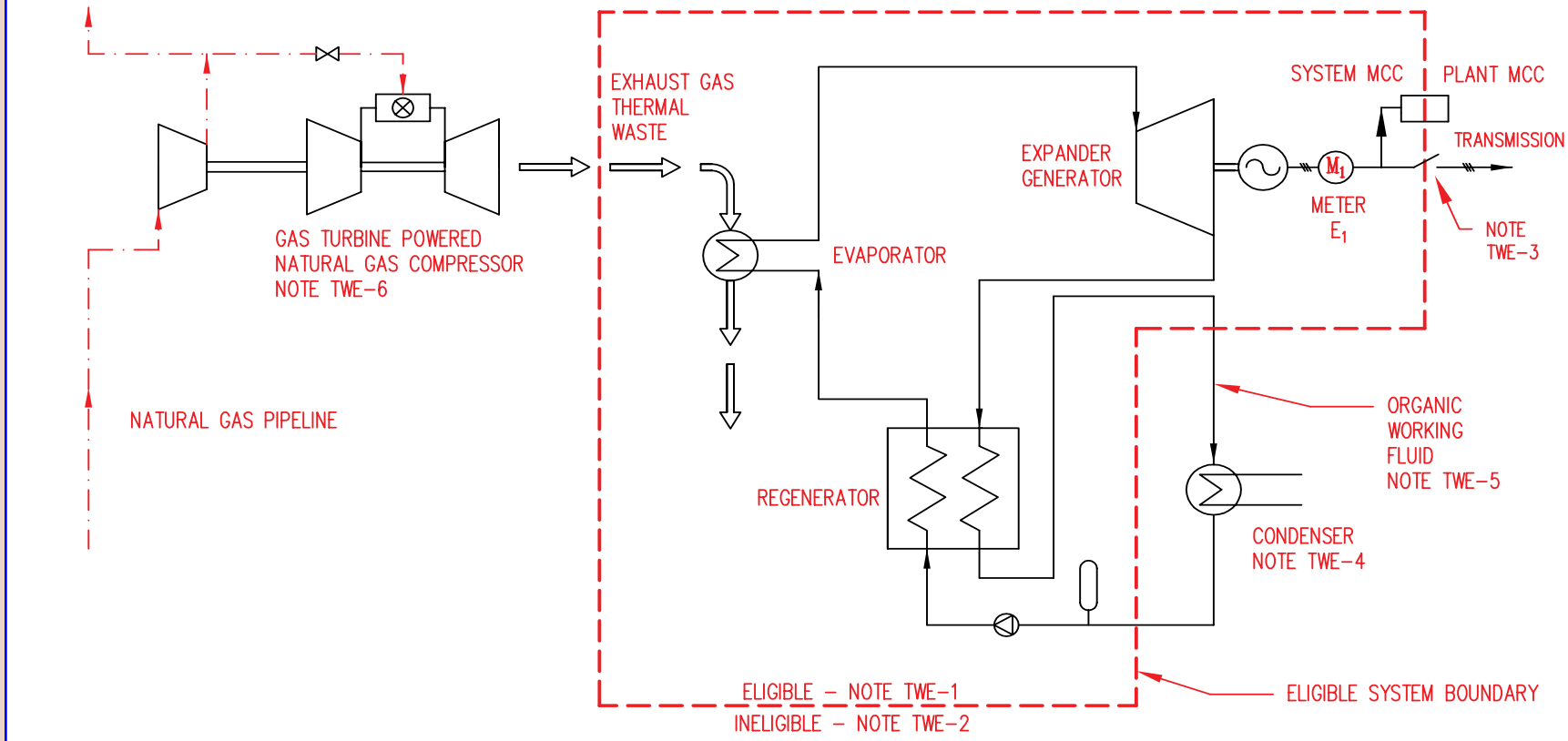
TWE-5 Equipment that, on the date of its acquisition, uses working fluids that are CFCs or HCFCs is not eligible.

TWE-6 Equipment that generates electrical energy from the heat in the exhaust gases of a gas turbine generator that is part of a combined cycle system is not considered to be thermal waste electrical generation equipment. Such equipment may however qualify as cogeneration or specified-waste fuelled electrical generation equipment if it meets the designated heat rates for such equipment.

TWE 2.2.1 Electrical Energy Generation from Thermal Waste—Engine Heat Recovery

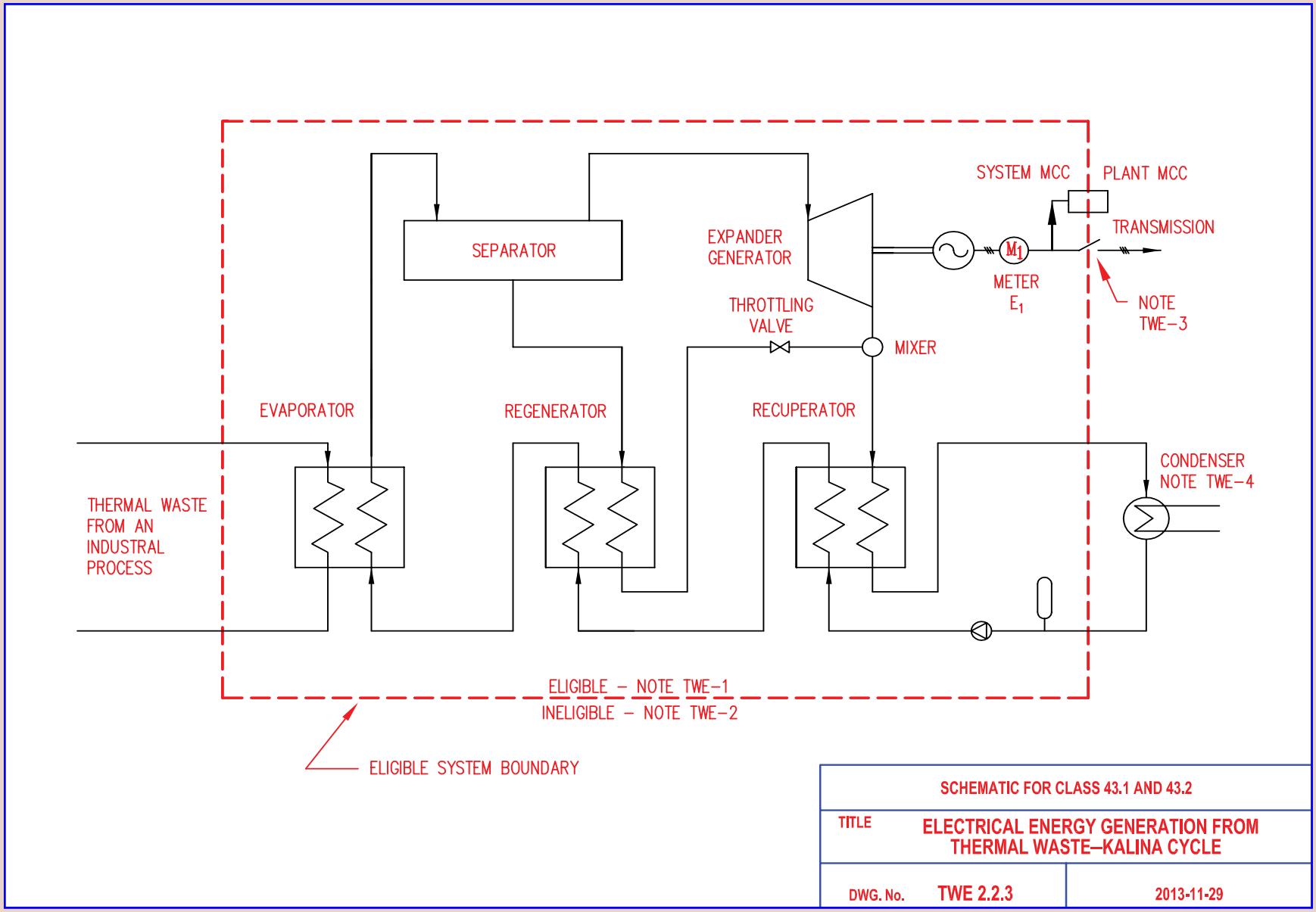


TWE 2.2.2 Electrical Energy Generation from Thermal Waste—Gas Turbine Heat Recovery

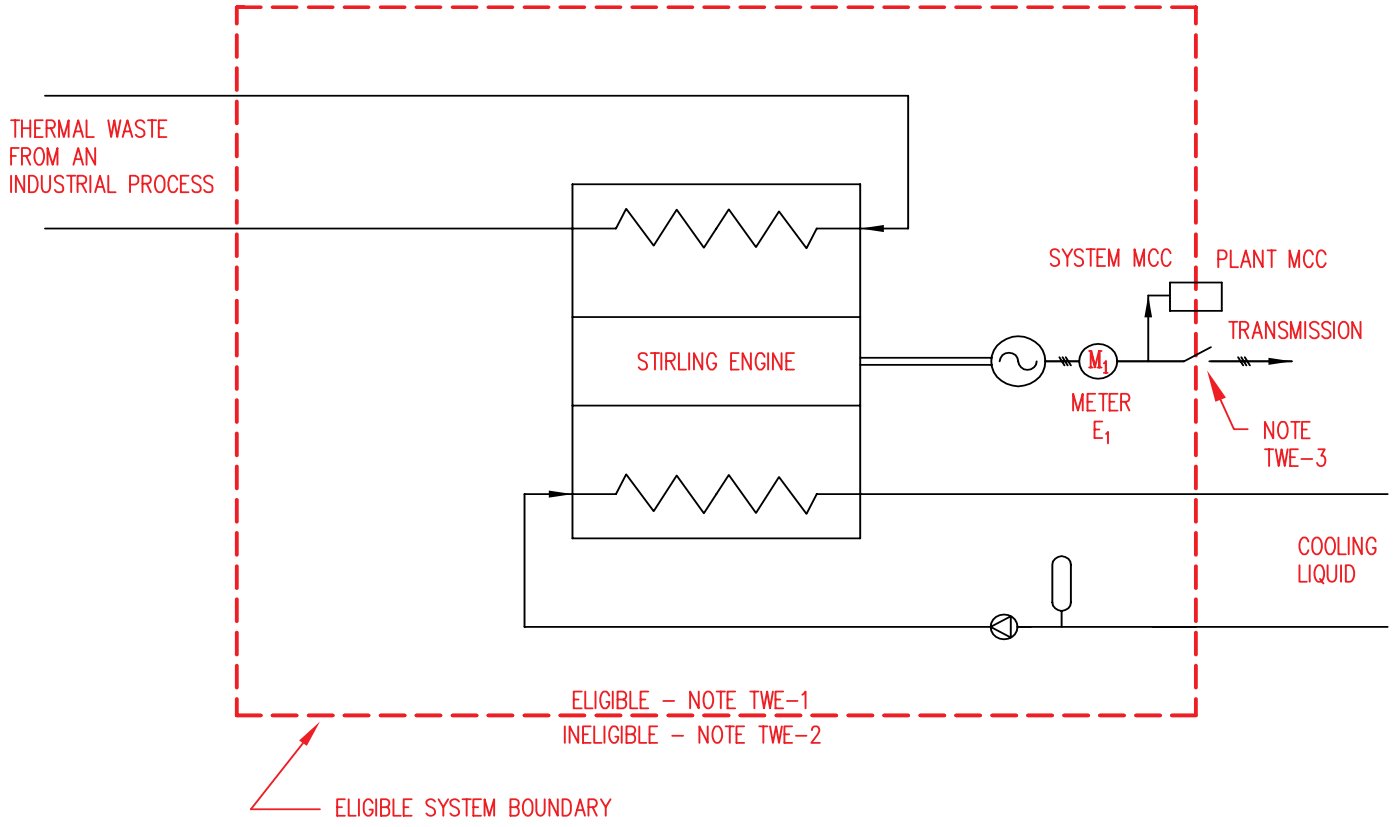


SCHEMATIC FOR CLASS 43.1 AND 43.2	
TITLE ELECTRICAL ENERGY GENERATION FROM THERMAL WASTE–GAS TURBINE HEAT RECOVERY	
DWG. No. TWE 2.2.2	2013-11-29

TWE 2.2.3 Electrical Energy Generation from Thermal Waste—Kalina Cycle



TWE 2.2.4 Electrical Energy Generation from Thermal Waste—Stirling Engine Generator



SCHEMATIC FOR CLASS 43.1 AND 43.2	
TITLE	ELECTRICAL ENERGY GENERATION FROM THERMAL WASTE–STIRLING ENGINE GENERATOR
DWG. No. TWE 2.2.4	2013-11-29

2.3 Active Solar Heating Equipment and Ground-Source Heat Pump Systems

CONTENTS

SCHEMATICS

2.3.1 ACTIVE SOLAR HEATING EQUIPMENT AND GROUND-SOURCE HEAT PUMP SYSTEMS

Active solar heating equipment and ground-source heat pump systems (described in clause (d)(i)(A) of Class 43.1) includes property that is used primarily for the purpose of heating an actively circulated liquid or gas.

This category of equipment includes:

- active solar heating equipment (subclause (d)(i)(A)(I) of Class 43.1);

or

- equipment that is part of a ground-source heat pump system that transfers heat to or from the ground or groundwater and that, at the time of installation, meets the standards set by the Canadian Standards Association for the design and installation of earth energy systems (subclause (d)(i)(A)(II) of Class 43.1).

2.3.2 ELIGIBLE PROPERTIES

Eligible properties for active solar heating and ground-source heat pump systems include the following:

For qualifying active solar heating equipment:

- above-ground solar energy collectors;

and

- solar water heaters.

For qualifying ground-source heat pump systems:

- heat pumps and ancillary equipment;

and

- piping (including above and below-ground piping and the costs of drilling a well or trenching for the purpose of installing that piping).

For both:

- energy conversion equipment;
- thermal energy storage equipment;
- control equipment and ancillary equipment, including valves, meters and pumps;

and

- equipment designed to interface with other heating or cooling equipment.

Note: Active solar heating equipment and ground-source heat pump systems included in Class 43.1 or 43.2 are eligible sources of thermal energy for district energy systems/equipment (see section 2.16).

2.3.3 INELIGIBLE PROPERTIES

Ineligible properties for active solar heating equipment and ground-source heat pump systems include the following:

- equipment that provides back-up for the property described in Section 2.3.2 above;
- a building or part of a building (other than an active solar collector that is integrated into a building);
- equipment that distributes heated or cooled air or water within a building;
- equipment that is part of a system that transfers heat to and from surface water, such as a river, a lake or an ocean;
- equipment that is part of a ground-source heat pump that does not meet the standards set by the Canadian Standards Association for the design and installation of earth-energy systems;

and

- equipment used to heat water for use in a swimming pool.

2.3.4 TYPES OF ACTIVE SOLAR HEATING EQUIPMENT AND GROUND-SOURCE HEAT PUMP SYSTEMS

Further to the description of eligible and ineligible property above, the following explains some of the terminology used in respect of solar heating equipment and ground-source heat pump systems.

Active solar heating equipment, as opposed to passive solar heating equipment, refers to equipment that uses a liquid or gas to transfer heat—collected from solar energy in solar collectors—to solar water-heaters or solar energy conversion equipment. The liquid or gas in active solar heating equipment is actively circulated in process piping or ductwork with a pump or blower. Solar energy conversion equipment, where required, transfers heat from the liquid or gas circulated through solar collectors to a secondary liquid or gas that has characteristics suitable for an end-user's process. In active solar heating equipment, where a liquid is circulated through the collectors, the liquid must be a solution that will not freeze during winter operation.

Solar collectors absorb solar energy, transform the solar energy into heat and transfer the heat to a liquid or gas actively circulated through or over the absorber of the collector. For the purposes of Class 43.1 and 43.2, solar collectors include: flat plate, evacuated tube and air heating (e.g., trombe wall) designs that may or may not be glazed. Solar collectors may be free-standing, mounted on the roofs or walls of buildings, or integrated into roofs or walls of a building; however a building itself or an addition to a building is not viewed as a solar collector.

Passive solar heating equipment (e.g., a masonry wall installed to absorb solar energy) does not use any mechanical equipment to actively transfer solar energy from where it is absorbed to where it is used. Passive solar equipment is generally integrated into building components and is therefore not eligible for inclusion in Class 43.1 or 43.2.

Ground-source heat pump systems (also known as earth energy systems) use the ground as a solar energy collector and a heat pump to extract and convert thermal energy from the ground into useful heat. Ground-source heat pump systems may also be used to transfer excessive solar energy gains to the ground to provide cooling and to store solar energy for reuse during the heating season.

Ground-source heat pump systems are commonly divided into two categories known as open-loop or closed-loop systems:

Open-loop ground-source heat pump systems extract heat from ground-water that is pumped from a supply well. After the groundwater passes through a heat exchanger in a heat pump where the heat is extracted, it is returned to a recharge well. Open-loop systems that extract heat from surface water that is pumped from streams, lakes or oceans are not eligible for inclusion in Class 43.1 or 43.2.

Closed-loop ground-source heat pump systems extract heat from a mixture of water and antifreeze (sometimes referred to as heat transfer thermal fluid) that is circulated through continuous loops of pipe buried in the ground. Closed-loop systems that extract heat from thermal fluid circulated through continuous loops of pipe immersed in bodies of surface water are not eligible for inclusion in Class 43.1 or 43.2.

Depending on the orientation and depth of pipes used to extract thermal energy from the ground, closed-loop ground-source heat pump systems are classified as horizontal- or vertical-loop systems.

Horizontal-loop ground-source heat pump systems use underground pipes that are installed predominantly in a horizontal orientation, typically in trenches that are excavated and backfilled from the soil surface. See drawing ASE 2.3.4 below.

Vertical-loop ground-source heat pump systems use underground pipes that are installed predominantly in a vertical orientation. Typically the pipes are installed and sealed in boreholes that extend more than 10 metres below the soil surface. See drawing ASE 2.3.5 below.

2.3.5 APPLICATION FOR A TECHNICAL OPINION WITH RESPECT TO CLASS 43.1 OR 43.2 ELIGIBILITY OF ACTIVE SOLAR HEATING EQUIPMENT OR A GROUND-SOURCE HEAT PUMP SYSTEM

FORM 2.3 Details of Active Solar Heating or Ground-Source Heat Pump Project

Company Information

Company Name

Company Address

Class 43.1 or 43.2 Property Address Activity at this Location

Company Liaison for this Request Title Telephone Number

Company Technical Contact Title Telephone Number

Status of Project

☐ Installed Equipment or Completed Project ☐ Potential Project

Project Cost and Completion Date

Estimated Total Capitalized Cost of Project: $_____

Estimated Portion of Total Capitalized Cost Eligible Under Class 43.1 or 43.2: $_____

Estimated Project Completion Date (yyyy/mm/dd): _____

Eligible Property Description

For property that is proposed for inclusion in Class 43.1 or 43.2, attach the following information:

- A list including: 1) reference no., 2) item description, 3) name of manufacturer, 4) date of acquisition and 5) notes.
- A simple sketch or process flow diagram of the system or equipment and a process narrative.
- A completed Schedule A or B as per the following pages.

Were any components used previously? Yes ☐ No ☐

If "Yes", provide details on a separate sheet.

Certification

I certify that the information provided in this application is true.

Dated at_____on_____

_____

Signature of owner, partner or authorized officer

_____

Name and title in block letters

Corporate Seal of Applicant

SCHEDULE 2.3-A Configuration of Proposed Active Solar Heating Equipment

Active Solar Heating Equipment

(i) Indicate type of active solar collector:

- ☐ Flat Plate
- ☐ Evacuated Tube
- ☐ Air Heating
- ☐ Other (specify) _____

(ii) Indicate the type of transfer medium:

- ☐ Air
- ☐ Liquid (specify) _____
- ☐ Other (specify) _____

(iii) Indicate how the collected solar energy will be used:

_____

(iv) Indicate the active surface area of collectors:

_____

(v) Provide details of the solar collector mounting:

_____

(vi) Indicate the type of storage equipment (if applicable):

_____

SCHEDULE 2.3-B Configuration of Proposed Ground-Source Heat Pump System

Ground-Source Heat Pump System

(i) Check the appropriate system type:

- ☐ Horizontal Closed-loop
- ☐ Vertical Closed-loop
- ☐ Open-loop
- ☐ Other (specify) _____

(ii) Indicate how the system is to be used:

- ☐ Heating
- ☐ Cooling
- ☐ Heating and Cooling

(iii) If horizontal closed-loop, provide a map showing the layout of loops and indicate:

Depth of loops: _____

Total length of loops: _____

(iv) If vertical closed-loop, provide a map showing the layout of boreholes and indicate:

Depth of boreholes: _____

Total length of boreholes: _____

(v) If closed-loop, indicate the working fluid circulated through the loops:

_____

(vi) If open-loop, provide details of how the groundwater will be extracted and recharged:

_____

_____

(vii) Indicate the type of refrigerant used in the heat pump unit: _____

(viii) Will the installed system meet Canadian Standards Association (CSA) standards for the design and installation of earth-energy systems?

☐ Yes ☐ No

If yes, indicate the CSA No. _____

If no, explain why not. _____

_____

(ix) Are borehole logs available for the wells drilled for the installation?

- ☐ Yes
- ☐ No
- ☐ Not Applicable

2.3.6 CAPITAL COSTS TYPICALLY INCLUDED IN CLASS 43.1 OR 43.2

Project Cost Table 2.3 Active Solar Heating Equipment and Ground-Source Heat Pump Systems

Active Solar Heating Equipment

	Typical Capital Cost
1	Fabrication or purchase and installation of solar collector support structures (e.g., foundations, anchors, mounting supports and other structures).
2	Purchase and installation of solar wall(s) or collectors (e.g., panels, modules and related equipment).
3	Purchase and installation of working fluid ducting or circulation system(s) (e.g., ducts or pipes from solar wall or collector to Heating Ventilating and Air Conditioning [HVAC] equipment or water heating equipment).
4	Purchase and installation of fans, blowers or pumps complete with drives and controls.
5	Purchase and installation of heat exchangers and heat storage system(s).
6	Purchase and installation of controls, safety and freeze protection equipment.
7	Pressure testing of piping and flushing of system.

Ground-source Heat Pump Systems

	Typical Capital Cost
1	Excavation for installation of horizontal collector lines and headers.
2	Purchase and installation of horizontal collector lines and headers.
3	Drilling of vertical borehole(s) and excavation for installation of headers.
4	Purchase and installation of borehole heat exchanger(s) and header lines.
5	Drilling of supply and recharge wells for open-loop systems.
6	Purchase and installation of well points and supply and recharge piping for open-loop systems.
7	Purchase and installation of heat pumps and thermal working fluid pumps complete with controls and drives.
8	Pressure testing and flushing of closed-loop systems.
9	Purchase and installation of working fluid piping, charging and circulation systems.
10	Purchase and installation of heat exchangers and heat storage systems to interface with other heating or cooling equipment.

2.3.7 SCHEMATICS OF QUALIFYING EQUIPMENT AND SYSTEMS

Typical configurations of qualifying active solar heating equipment or ground-source heat pump systems are shown in the schematics below.

2.3.7.1 Key to Notes on Schematics for Active Solar Heating Equipment and Ground-Source Heat Pump Systems

ASE-1 For eligible properties, see Section 2.3.2 of this Guide.

ASE-2 For ineligible properties, see Section 2.3.3 of this Guide.

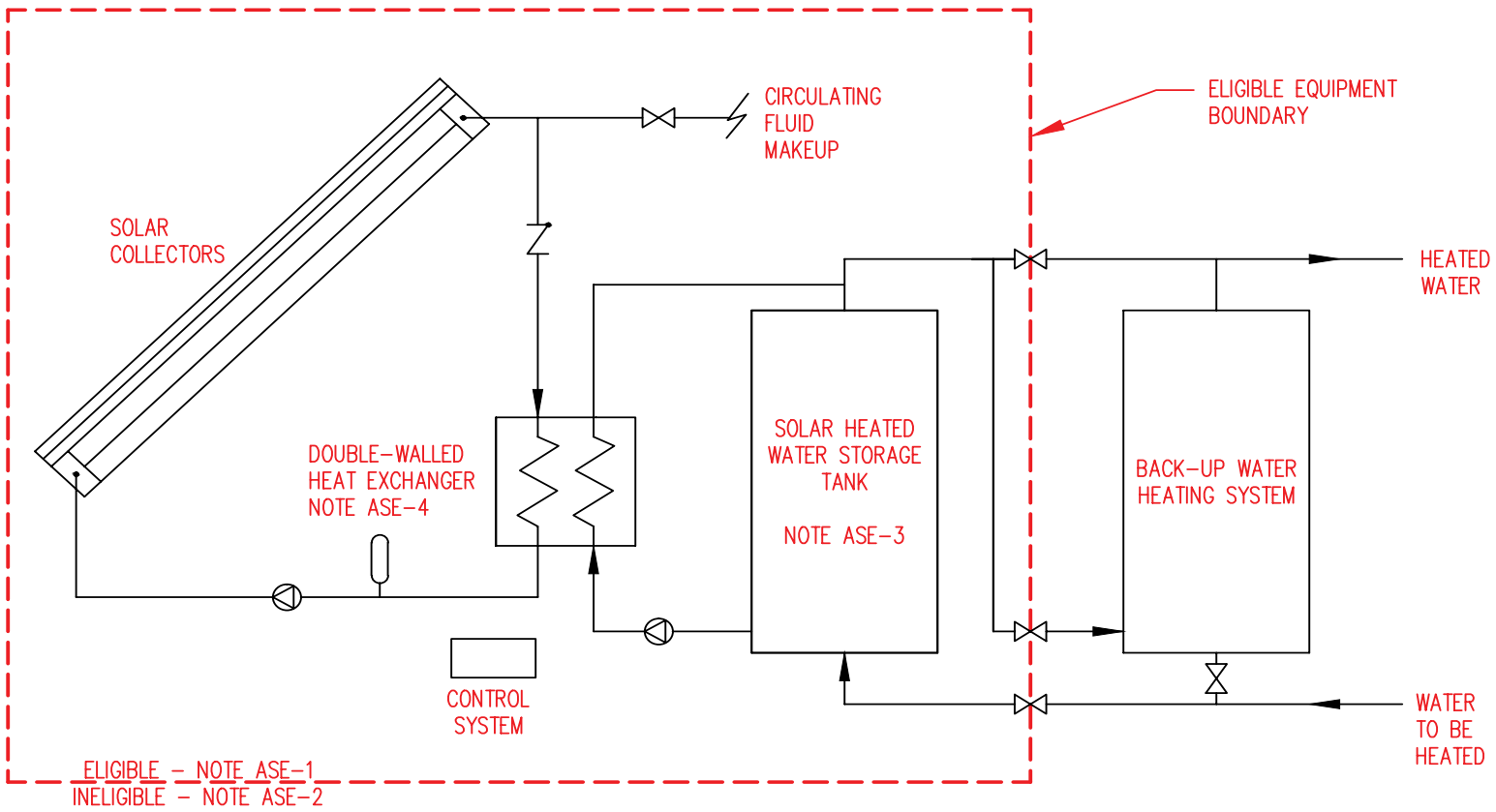
ASE-3 Solar storage tanks may include provision for addition of auxiliary heat in the top part of highly stratified tanks.

ASE-4 Double-walled heat exchangers may be included if they are required for potable water service by local authorities.

ASE-5 Equipment that distributes heated or cooled air or water in a building is not eligible.

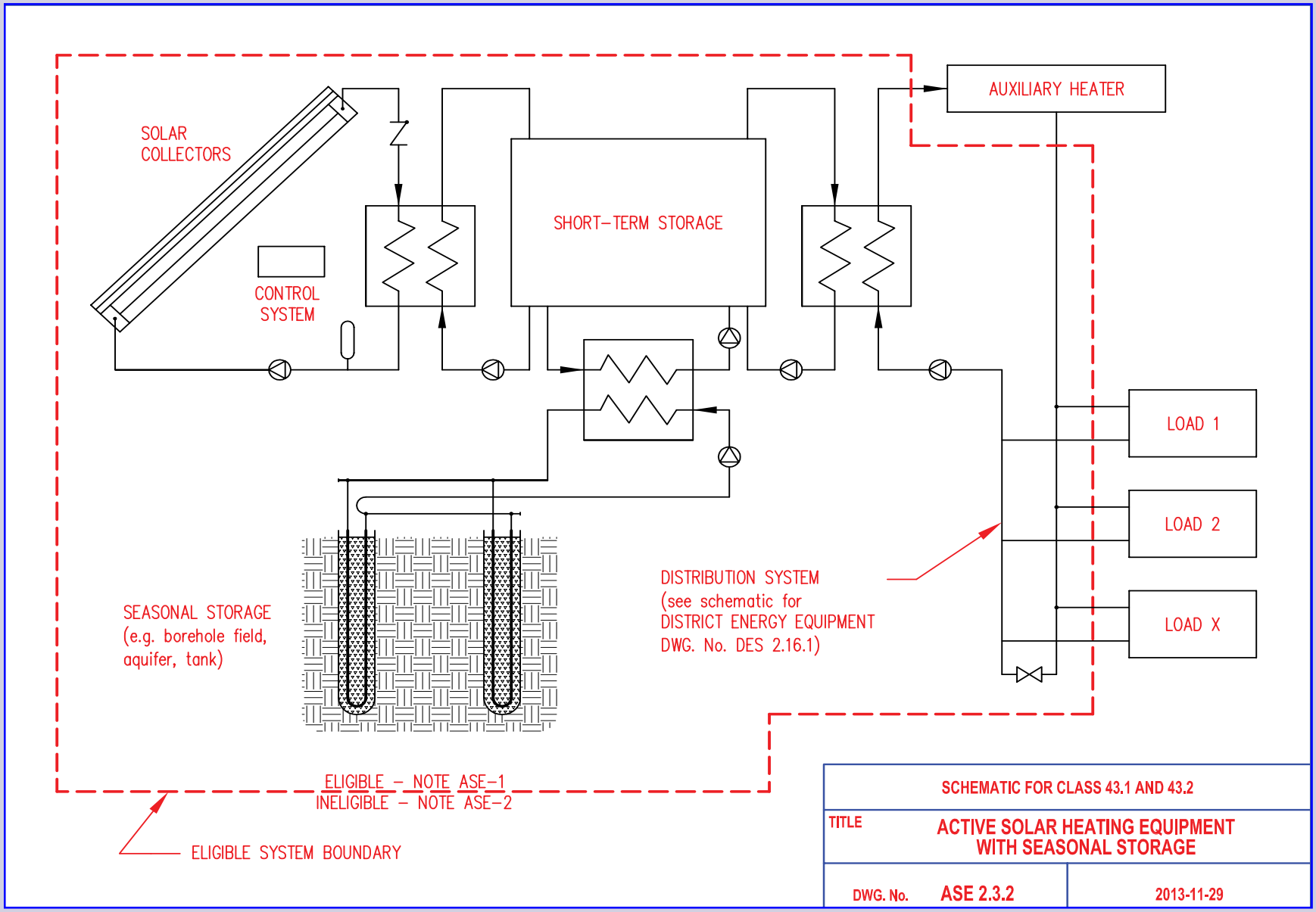
ASE-6 Buildings or parts of buildings (other than a solar collector that is not a window and that is integrated into a building) are not eligible.

ASE 2.3.1 Active Solar Heating Equipment—Solar Water Heating

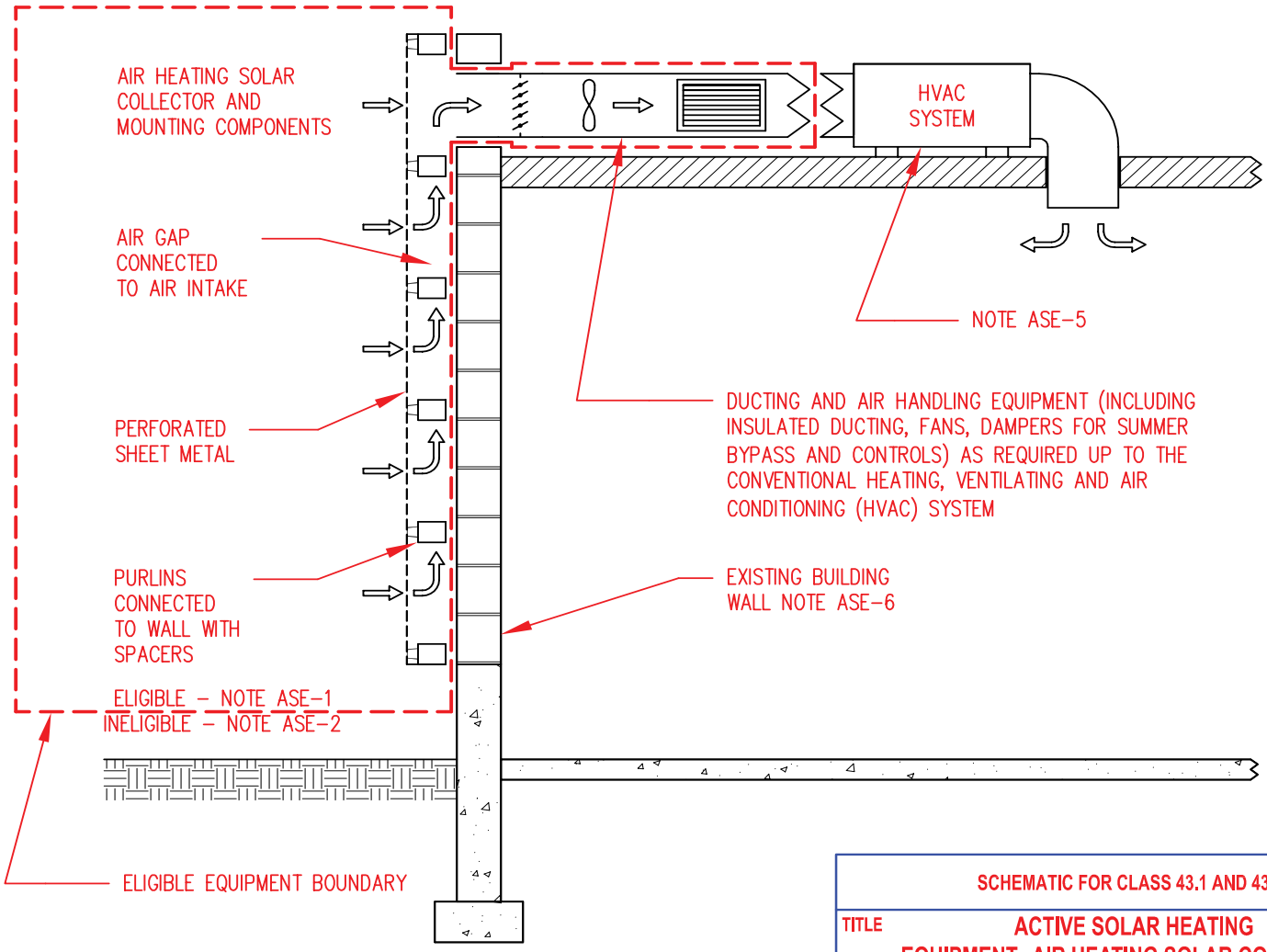


SCHEMATIC FOR CLASS 43.1 AND 43.2	
TITLE	ACTIVE SOLAR HEATING EQUIPMENT–SOLAR WATER HEATING
DWG. No. ASE 2.3.1	2013-11-29

ASE 2.3.2 Active Solar Heating Equipment with Seasonal Storage

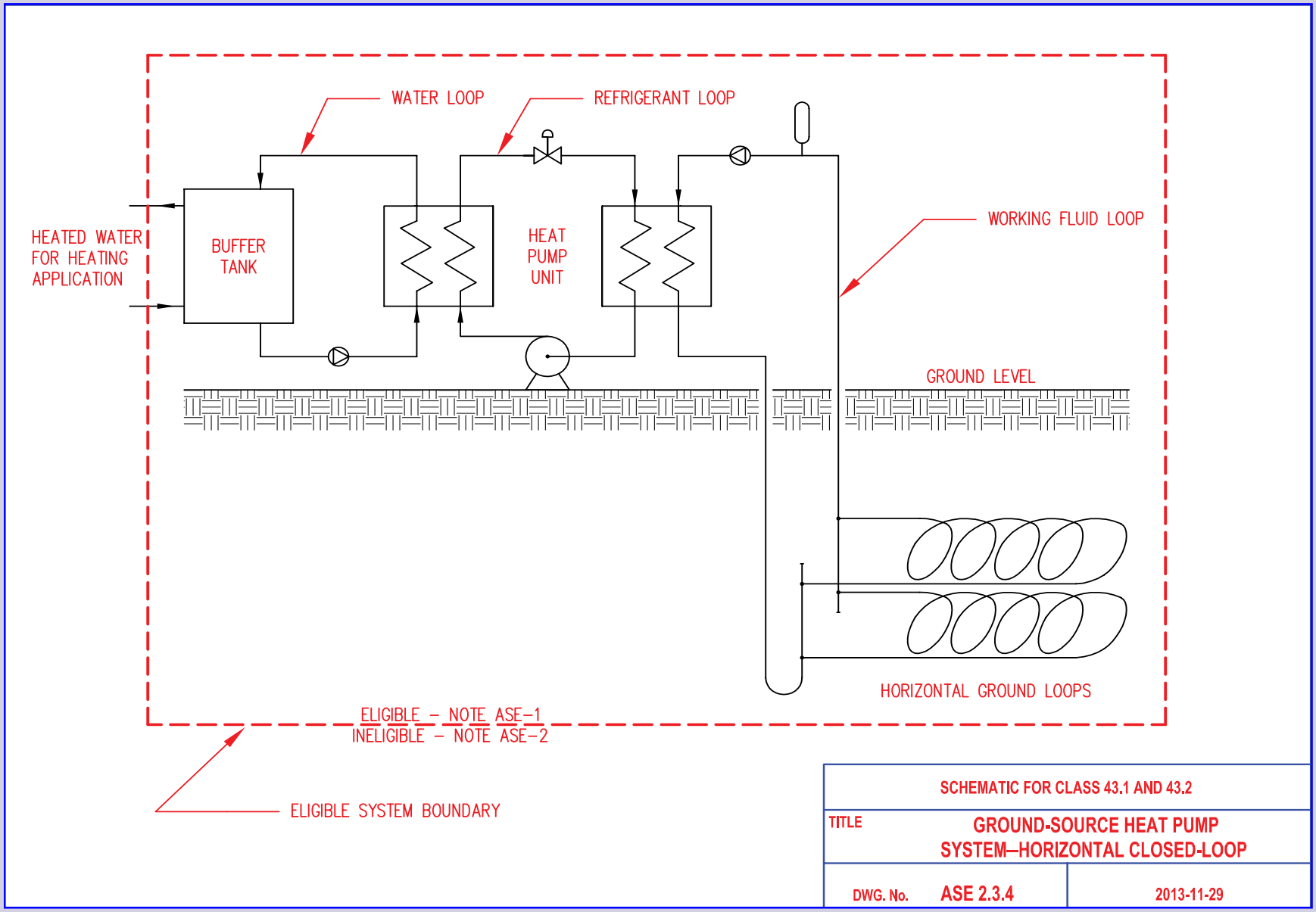


ASE 2.3.3 Active Solar Heating Equipment—Air Heating Solar Collector

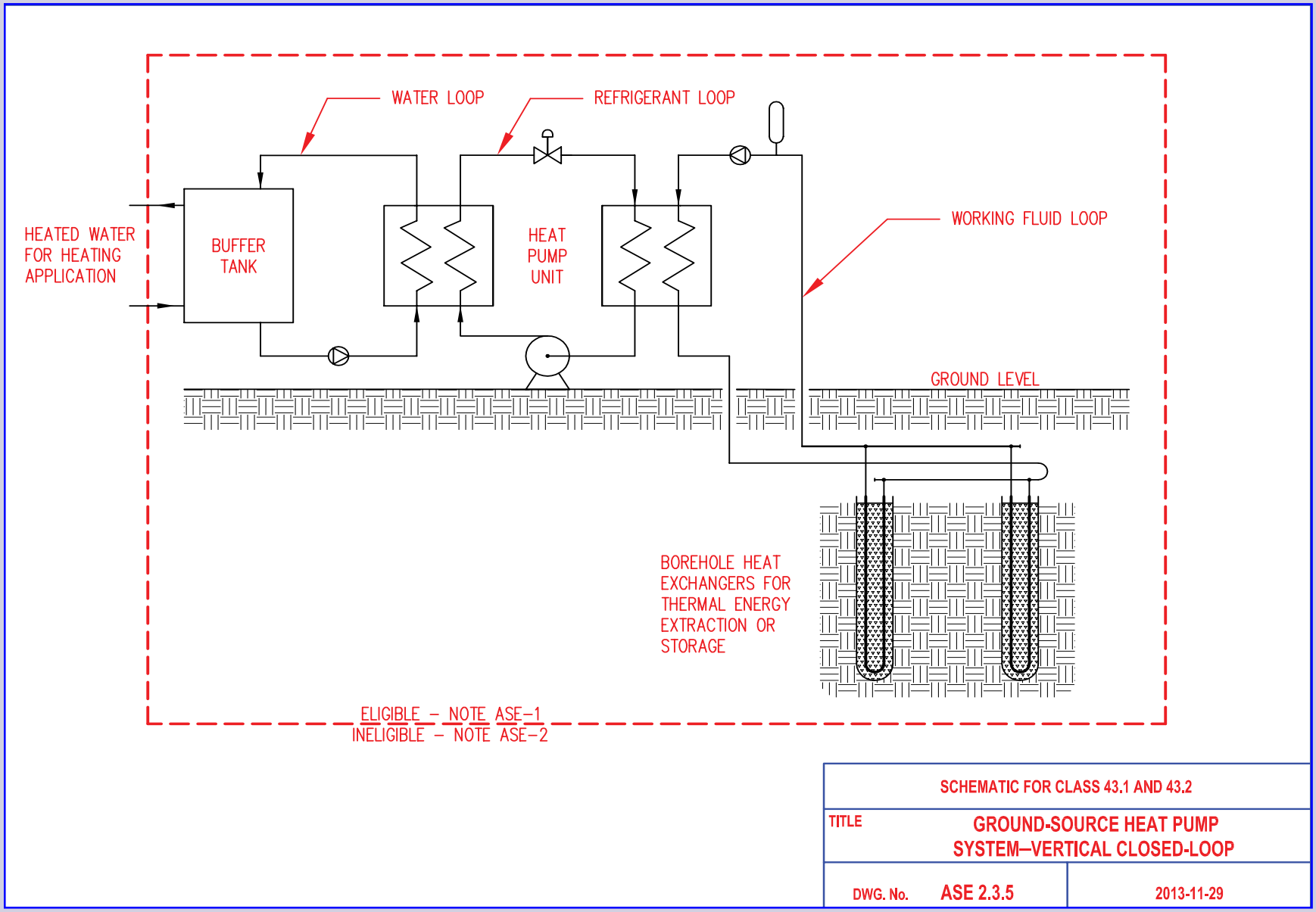


SCHEMATIC FOR CLASS 43.1 AND 43.2	
TITLE	ACTIVE SOLAR HEATING EQUIPMENT–AIR HEATING SOLAR COLLECTOR
DWG. No. ASE 2.3.3	2013-11-29

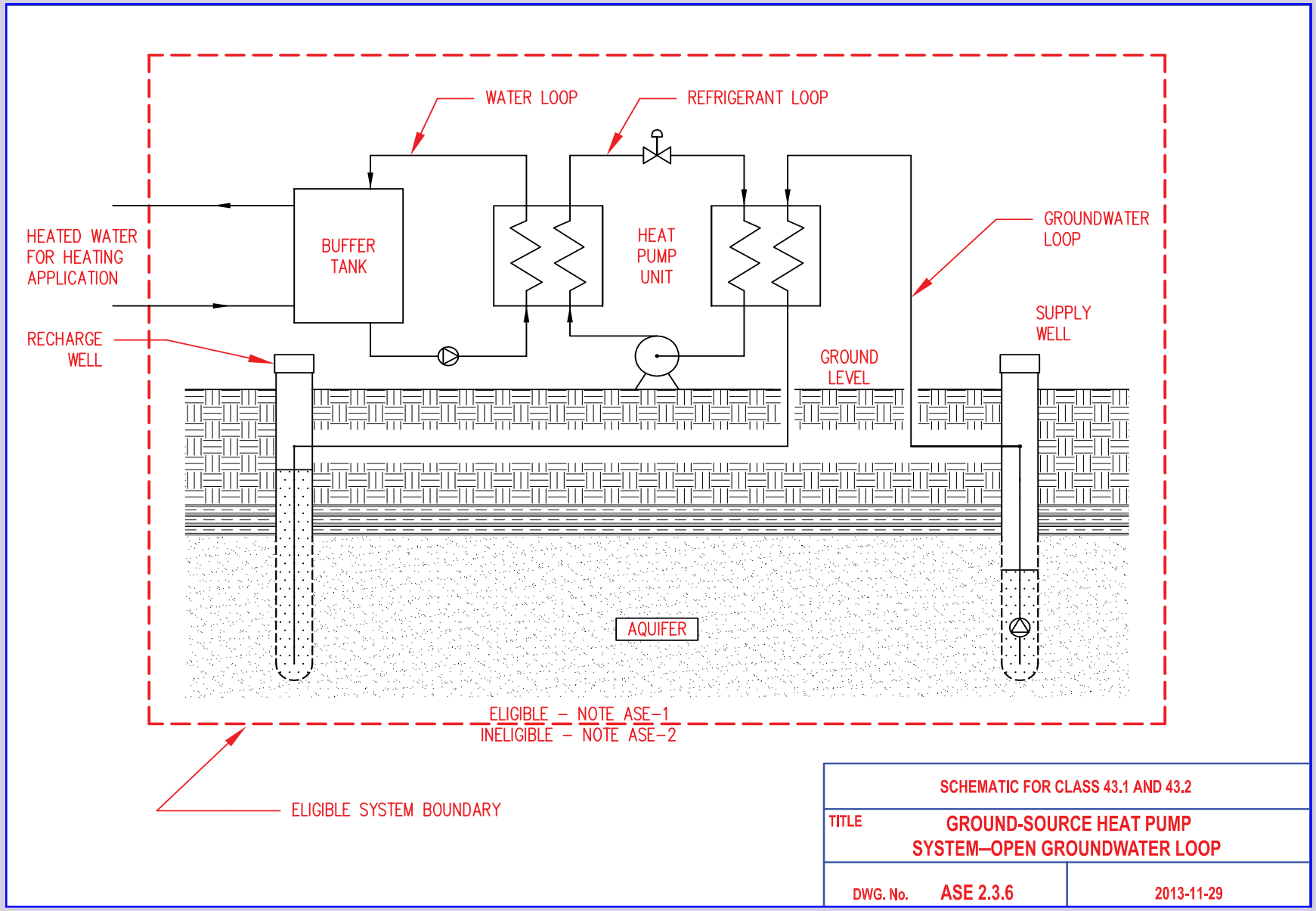
ASE 2.3.4 Ground-Source Heat Pump System—Horizontal Closed-Loop



ASE 2.3.5 Ground-Source Heat Pump System—Vertical Closed-Loop



ASE 2.3.6 Ground-Source Heat Pump System—Open Groundwater Loop



2.4 Small-Scale Hydro-Electric Installations

CONTENTS

SCHEMATICS

2.4.1 SMALL-SCALE HYDRO-ELECTRIC INSTALLATIONS

Small-scale hydro-electric installations (described in subparagraphs (d)(ii) and d(iii.1) of Class 43.1) include installations with a rated capacity at the installation site not exceeding 50 megawatts (MW).

The capital cost of additions or alterations to an existing small-scale hydro-electric installation may be included in Class 43.1 or 43.2 provided the additions or alterations increase the generating capacity of the installation, the additions or alterations involve eligible property for this category (see Section 2.4.2 below) and the resulting rated capacity of the electrical generator or generators at the installation site does not exceed 50 MW.

Note:

Where the capacity of a site is developed in stages, the individual stages may be eligible provided that the total capacity of the completed installation does not exceed a rated capacity of 50 MW.

Hydro-electric generation is generally considered to be generation from falling water. For equipment that generates electrical energy from water-current, tidal, or wave energy see Section 2.15 of this Guide.

2.4.2 ELIGIBLE PROPERTIES

Eligible properties for qualifying small-scale hydro-electric installations include the following:

- the electrical energy generating equipment and plant, including generators, water turbines, step-up transformers and structures;
- the related canal, dam, dyke, overflow spillway and penstock;
- fishways and fish bypasses;
- a powerhouse complete with electrical generating equipment and related ancillary equipment;
- control equipment, including devices for phase synchronization and voltage regulation;

and

- transmission lines and related equipment from the electrical energy generating equipment up to the interface with the electrical grid or the isolation switch of the local electrical utility, or up to the point where, on an annual basis, more than 75 percent of the electrical energy transmitted by the ***transmission equipment*** is electrical energy generated by the small-scale hydro-electric generating equipment.

Note: Small-scale hydroelectric installations included in Class 43.1 or 43.2 are an eligible source of electrical energy for electrical energy storage equipment (see section 2.19).

2.4.3 INELIGIBLE PROPERTIES

Properties that may be part of a qualifying small-scale hydro-electric system, but are ineligible under this category include the following:

- electrical distribution systems;
- vehicles;
- telephone and related equipment;

and

- access roads, sidewalks, parking areas and other similar surface construction.

2.4.4 APPLICATION FOR A TECHNICAL OPINION WITH RESPECT TO CLASS 43.1 OR 43.2 ELIGIBILITY OF A SMALL-SCALE HYDRO-ELECTRIC INSTALLATION

FORM 2.4 Details of Small-Scale Hydro-Electric Project

Company Information

Company Name

Company Address

Class 43.1 or 43.2 Property Address — Activity at this Location

Company Liaison for this Request — Title — Telephone Number

Company Technical Contact — Title — Telephone Number

Status of Project

☐ Installed Equipment or Completed Project ☐ Potential Project

Project Cost and Completion Date

Estimated Total Capitalized Cost of Project: $_____

Estimated Portion of Total Capitalized Cost Eligible Under Class 43.1 or 43.2: $_____

Estimated Project Completion Date (yyyy/mm/dd): _____

Eligible Property Description

For property that is proposed for inclusion in Class 43.1 or 43.2, attach the following information:

- A list including: 1) reference no., 2) item description, 3) name of manufacturer, 4) date of acquisition and 5) notes.
- A simple sketch or process flow diagram of the system or equipment and a process narrative.
- A completed Schedule A as per the following page.

Were any components used previously? Yes ☐ No ☐

If "Yes", provide details on a separate sheet.

Certification

I certify that the information provided in this application is true.

Dated at_____on_____

_____

Signature of owner, partner or authorized officer

_____

Name and title in block letters

Corporate Seal of Applicant

SCHEDULE 2.4-A Configuration of Proposed Small-Scale Hydro-Electric Installation

(i) Check appropriate description of the project.

☐ New installation

☐ Expansion of existing installation

Annual output of existing site: _____ MWh

☐ Upgrade of existing installation

Annual output of existing site: _____ MWh

(ii) Date construction is to begin/began:

_____

(iii) Planned maximum generating capacity upon completion of site development:

_____ MWh

(iv) Rated output in MW of all electrical energy generators at the site[1]:
(Include those presently in place, if any, as well as those planned.
Use an additional sheet if necessary.)

Generator 1: _____

Generator 2: _____

Generator 3: _____

(v) Annual electrical energy generation <u>expected</u> from the site: _____ MWh

(vi) Describe the point of grid interconnection for the project including the voltage and any special grid connection requirements that must be met.

_____

_____

_____

(vii) Describe briefly the configuration of equipment from the generator(s) to the point of grid interconnection and state the capacity of the equipment to transmit the power to the point of interconnection[2].

_____

_____

_____

(viii) For projects where an existing small-scale hydro-electric installation will be upgraded, provide a narrative on separate pages describing the existing small-scale hydro-electric installation and the components to be upgraded. Also provide data and calculations to estimate the increase in generation capacity that can be expected from each upgrade.

_____

_____

_____

1 Rated generating capacity of all generators at the installation site must not exceed 50 MW.

2 To be eligible, on an annual basis, more than 75 percent of the electrical energy transmitted by the transmission equipment must be electrical energy generated by the small-scale hydro-electric generating equipment.

2.4.5 CAPITAL COSTS TYPICALLY INCLUDED IN CLASS 43.1 OR 43.2

Project Cost Table 2.4 Small-Scale Hydro-Electric Installations

	Typical Capital Cost
1	Construction of a dam with the following: level control facilities, overflow spillway, facilities for maintaining minimum river flow requirements and mitigating environmental impact (e.g., fishways), trash racks, penstock and discharge canal.
2	Construction of a powerhouse with working platforms and installation of water flow control facilities (e.g., main control valve).
3	Purchase and installation of turbine(s) and ancillary equipment such as vane control system, controls and instrumentation, cooling and lubrication systems.
4	Purchase and installation of equipment for instrumentation and control of the small-scale hydro-electric installation including hydraulic power unit, governor, Programmable Logic Controller (PLC) and Supervisory Control and Data Acquisition (SCADA) systems.
5	Purchase and installation of electrical generating equipment and ancillary equipment such as controls and instrumentation and, systems for the following: electric power control (i.e., phase synchronization, voltage regulation and frequency control), cooling, lubrication, over or reverse current protection, over and under voltage protection, over and under frequency protection, lightning protection, fire protection and acoustic protection.
6	Purchase and installation of power transformer(s).
7	Purchase and installation of electrical transmission line including switches and meters.

2.4.6 SCHEMATIC OF QUALIFYING INSTALLATIONS

Typical equipment in a qualifying small-scale hydro-electric installation is shown in the schematic below.

2.4.6.1 Key to Notes on Schematic of Small-Scale Hydro-Electric Installations

SHI-1 For eligible properties, see Section 2.4.2 of this Guide.

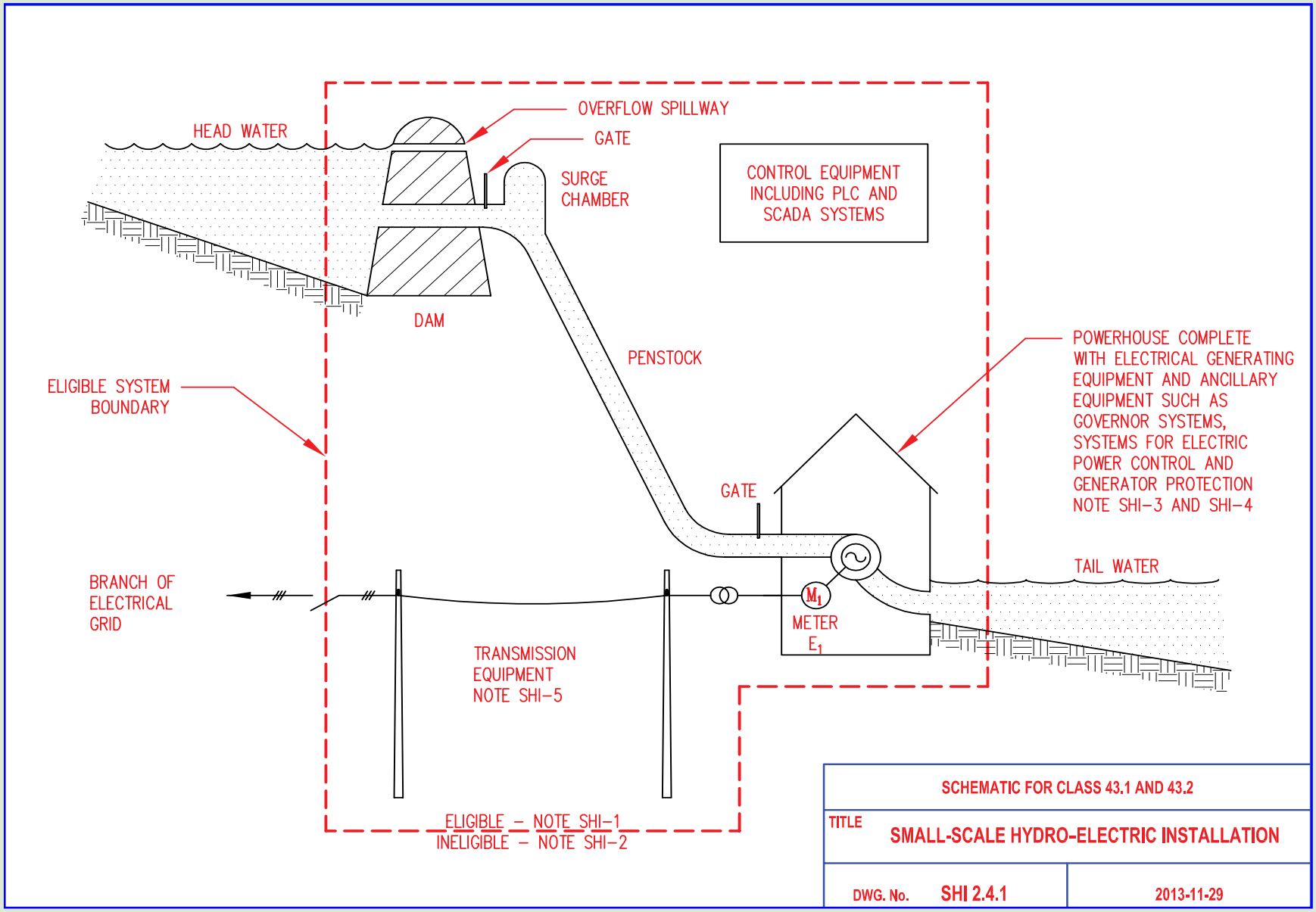
SHI-2 For ineligible properties, see Section 2.4.3 of this Guide.

SHI-3 Eligible electrical energy generation property includes generators and equipment used at the first level of power transformation. The first level of transformation includes equipment used for phase synchronization and voltage regulation. After the first level of transformation, generation stops, and the electricity is ready for use (e.g., ready to be put on transmission lines). Typically, the eligible system boundary for electrical energy generation equipment is located after the first level of transformation at isolation switches that allow a utility to lock out a generating plant's power production.

SHI-4 Eligible small-scale hydro-electric installations are installations with a rated generation capacity of the electrical energy generator or generators at the site not exceeding 50 MW if the installation is acquired after December 10, 2001.

SHI-5 Eligible transmission equipment is site specific and is dependent on the electrical grid configuration near the site. In general, it includes transmission lines (and related equipment) from the electrical energy generating equipment up to the interface with the electrical grid or the isolation switch of the local electrical utility, or up to the point where, on an annual basis, more than 75 percent of the electrical energy transmitted by the transmission equipment is electrical energy generated by the small-scale hydro-electric generating equipment, whichever point comes first.

SHI 2.4.1 Small-Scale Hydro-Electric Installation



2.5 Heat Recovery Equipment

CONTENTS

SCHEMATICS

2.5.1 HEAT RECOVERY EQUIPMENT

Heat recovery equipment includes equipment that is used primarily for the purpose of conserving energy or reducing the requirement to acquire energy, and, that recovers thermal waste generated by:

- an electrical generation or cogeneration system (subparagraph (a)(iii) of Class 43.1);

or

- an industrial process, other than an industrial process that generates or processes electrical energy (subparagraph (d)(iv) of Class 43.1).

Note:

Thermal waste is defined in subsection 1104(13) of the Regulations and in the Glossary of Terms found in Section 3.0 of this Guide.

Heat recovery equipment described under this category may be part of a cogeneration and specified-waste fuelled electrical generation system (see Section 2.1), part of thermal waste electrical generation equipment (see Section 2.2) or equipment on its own.

The thermal waste recovered by heat recovery equipment must be reused for productive purposes such as heating or cooling a plant or nearby buildings, or for electrical energy generation.

Equipment for standard heat recycling and heat recovery in industrial processes such as boiler economizers, combustion air pre-heaters and steam turbine condensers is ineligible under this category.

Heat lost from building heating, ventilation or air conditioning processes is not considered to be eligible thermal waste.

2.5.2 ELIGIBLE PROPERTIES

Eligible properties for heat recovery equipment include the following:

- heat exchangers and other heat extraction devices;
- the portion of the heat transfer system (including piping, ducting and other equipment) between the point of heat extraction and the interface with the end-use system, the first shut-off valve, or the boundary of ownership, whichever occurs first;
- compressors used to upgrade low pressure steam, vapour or gas;
- waste heat boilers (sometimes referred to as HRSGs);

and

- ancillary equipment such as pumps, valves, fans, instruments and control panels.

Note: Heat recovery equipment included in Class 43.1 or 43.2 is an eligible source of thermal energy for district energy systems/equipment (see section 2.16).

2.5.3 INELIGIBLE PROPERTIES

Ineligible properties for heat recovery equipment include the following:

- property employed in reusing the recovered heat such as property that is part of the internal heating or cooling system of a building or electrical generating equipment[1];
- buildings;

and

- equipment that recovers heat primarily to heat water for use in a swimming pool.

1 Whereas electrical generating equipment that uses heat recovered by the heat recovery equipment described in subparagraph (d)(iv) of Class 43.1 is ineligible under subparagraph (d)(iv) of Class 43.1, such equipment may be eligible under paragraphs (a) to (c) of Class 43.1.

2.5.4 APPLICATION FOR A TECHNICAL OPINION WITH RESPECT TO CLASS 43.1 OR 43.2 ELIGIBILITY OF HEAT RECOVERY EQUIPMENT

FORM 2.5 Details of Heat Recovery Project

Company Information

Company Name

Company Address

Class 43.1 or 43.2 Property Address — Activity at this Location

Company Liaison for this Request — Title — Telephone Number

Company Technical Contact — Title — Telephone Number

Status of Project

☐ Installed Equipment or Completed Project ☐ Potential Project

Project Cost and Completion Date

Estimated Total Capitalized Cost of Project: $_____

Estimated Portion of Total Capitalized Cost Eligible Under Class 43.1 or 43.2: $_____

Estimated Project Completion Date (yyyy/mm/dd): _____

Eligible Property Description

For property that is proposed for inclusion in Class 43.1 or 43.2, attach the following information:

- A list including: 1) reference no., 2) item description, 3) name of manufacturer, 4) date of acquisition and 5) notes.
- A simple sketch or process flow diagram of the system or equipment and a process narrative.
- A completed Schedule A as per the following page.

Were any components used previously? Yes ☐ No ☐

If "Yes", provide details on a separate sheet.

Certification

I certify that the information provided in this application is true.

Dated at_____on_____

_____

Signature of owner, partner or authorized officer

_____

Name and title in block letters

Corporate Seal of Applicant

SCHEDULE 2.5-A Configuration of Proposed Heat Recovery Equipment

(i) Describe the process or system involved and the present method of rejection of thermal waste:

_____

_____

(ii) Indicate if the thermal waste is available:

☐ Continuously _____

☐ Intermittently _____

(iii) Estimate the quantity of thermal waste available per year and indicate the base used for estimation (e.g., ambient temperature of 20°C):

Quantity:_____

Base:_____

(iv) Estimate the proportion of (iii) that can be recovered by the equipment and that will be used for the purpose described in (vi): _____%

(v) Describe the method of recovering thermal waste and the equipment used:

_____

_____

(vi) Indicate the process in which the recovered heat will be used:

_____

_____

(vii) Estimate the quantity of energy that will be input per year to recover the thermal waste and indicate the form of the energy input:

Quantity of Energy _____

Form of Energy _____

(viii) Estimate the quantity of useful heat that will be output by the system per year:

_____

_____

2.5.5 CAPITAL COSTS TYPICALLY INCLUDED IN CLASS 43.1 OR 43.2

Project Cost Table 2.5 Heat Recovery Equipment

	Typical Capital Cost
1	Construction of working platforms that are not an integral part of a building or other structure.
2	Purchase and installation of equipment to extract thermal waste (e.g., heat exchangers, waste heat recovery boilers and ancillary equipment such as controls and instrumentation) from an industrial process other than an industrial process that generates or processes electrical energy.
3	Purchase and installation of equipment to upgrade thermal waste extracted from an industrial process (e.g., steam or vapour compressors and heat pumps).
4	Purchase and installation of equipment to deliver recovered thermal waste (e.g., steam, hot water, air, chilled water and thermal fluid) to an end-user, including piping, pumps or blowers, drives, controls and instrumentation.

2.5.6 SCHEMATICS OF QUALIFYING EQUIPMENT

Typical configurations of equipment that would qualify as heat recovery equipment are shown in the schematics below.

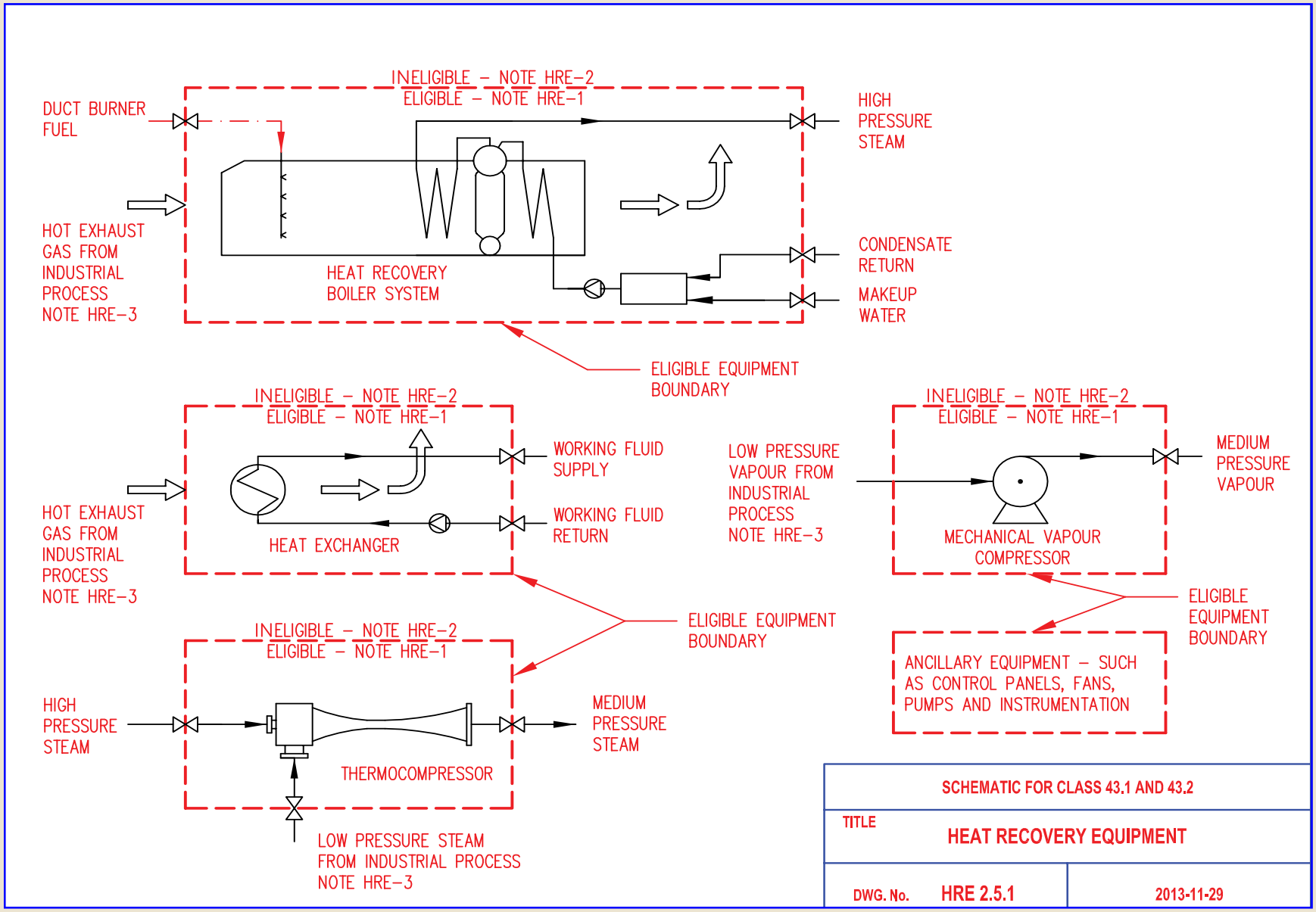
2.5.6.1 Key to Notes on Schematics of Heat Recovery Equipment

HRE-1 For eligible properties, see Section 2.5.2 of this Guide.

HRE-2 For ineligible properties, see Section 2.5.3 of this Guide.

HRE-3 Qualifying heat recovery equipment must be designed primarily to conserve energy or reduce the requirement to acquire energy by extracting thermal waste from an industrial process and upgrading the thermal waste or transforming it such that it can be reused.

HRE 2.5.1 Heat Recovery Equipment



2.6 Wind Energy Conversion Systems

CONTENTS

SCHEMATICS

2.6.1 WIND ENERGY CONVERSION SYSTEMS

Wind energy conversion systems (described in subparagraph (d)(v) of Class 43.1) include a fixed location device that is used primarily for the purpose of converting wind energy into electrical energy.

Note:

Under subsection 1219(1) of the Regulations, expenses incurred for a "test wind turbine" that is a wind energy conversion system may qualify as CRCE if the test wind turbine meets the criteria set out in subsection 1219(3). For further information on test wind turbines, refer to the *Technical Guide to Canadian Renewable and Conservation Expenses (CRCE)*.

2.6.2 ELIGIBLE PROPERTIES

Eligible properties for wind energy conversion systems include the following:

- wind-driven turbines;
- electrical generating and related equipment, including control and power conditioning equipment;
- support structures (e.g., foundations and towers);
- powerhouse (e.g., tower-mounted nacelle of wind turbine generators and collector substation enclosures), complete with related ancillary equipment;

and

- transmission equipment.

Note: Wind energy conversion systems included in Class 43.1 or 43.2 are an eligible source of electrical energy for electrical energy storage equipment (see section 2.19).

2.6.3 INELIGIBLE PROPERTIES

Ineligible properties for wind energy conversion systems include the following:

- distribution equipment;
- auxiliary electrical generating equipment (e.g., diesel engine-powered generator sets, main electrical transfer switches or power bars);
- vehicles;
- telephone and related equipment;

and

- access roads, sidewalks, parking areas and other similar surface construction.

2.6.4 APPLICATION FOR A TECHNICAL OPINION WITH RESPECT TO CLASS 43.1 OR 43.2 ELIGIBILITY OF A WIND ENERGY CONVERSION SYSTEM

FORM 2.6 Details of Wind Energy Conversion Project

Company Information

Company Name

Company Address

Class 43.1 or 43.2 Property Address | Activity at this Location

Company Liaison for this Request | Title | Telephone Number

Company Technical Contact | Title | Telephone Number

Status of Project

☐ Installed Equipment or Completed Project ☐ Potential Project

Project Cost and Completion Date

Estimated Total Capitalized Cost of Project: $_____

Estimated Portion of Total Capitalized Cost Eligible Under Class 43.1 or 43.2: $_____

Estimated Project Completion Date (yyyy/mm/dd): _____

Eligible Property Description

For property that is proposed for inclusion in Class 43.1 or 43.2, attach the following information:

- A list including: 1) reference no., 2) item description, 3) name of manufacturer, 4) date of acquisition and 5) notes.
- A simple sketch or process flow diagram of the system or equipment and a process narrative.
- A completed Schedule A as per the following page.

Were any components used previously? Yes ☐ No ☐

If "Yes", provide details on a separate sheet.

Certification

I certify that the information provided in this application is true.

Dated at_____on_____

_____

Signature of owner, partner or authorized officer

_____

Name and title in block letters

Corporate Seal of Applicant

SCHEDULE 2.6-A Configuration of Proposed Wind Energy Conversion System

(i) Date construction is to begin/began:_____

(ii) Planned maximum generating capacity upon completion of site development:

_____MWh

(iii) Rated output in MW of all wind-powered electrical generators at the site:

Turbine 1 _____

Turbine 2 _____

Turbine 3 _____

Turbine 4 _____

Turbine 5 _____

(Use additional sheet if necessary.)

(iv) Annual electrical energy output expected from the site: _____MWh

(v) Describe briefly the configuration of the system, the ancillary equipment and the power transmission to the local grid.

_____

_____

_____

_____

(vi) If battery storage equipment is to be used, explain the charging and AC/DC conversion systems that will be used and indicate the capacity of the batteries.

_____

_____

_____

_____

2.6.5 CAPITAL COSTS TYPICALLY INCLUDED IN CLASS 43.1 OR 43.2

Project Cost Table 2.6 Wind Energy Conversion Systems

	Typical Capital Cost
1	Excavation for foundations and underground electrical collector and control wiring.
2	Installation of support structures (e.g., concrete foundations, guy wire supports, anchors and concrete platforms).
3	Purchase and installation of wind-driven turbine generator(s) with tower and nacelle and ancillary equipment, including the following: blade pitch and yaw control system, lubrication system, cooling system, icing control system, power regulation equipment, transformer to step up voltage to collector voltage levels, controls and instrumentation.
4	Purchase and installation of powerhouse (i.e., electrical collector substation) complete with fencing, equipment enclosures, switches, central Supervisory Control and Data Acquisition (SCADA) system and ancillary equipment.
5	Purchase and installation of underground collector and control wiring.
6	Purchase and installation of power transformer(s) and central power control system for phase synchronization, voltage regulation and frequency control.
7	Purchase and installation of electrical transmission line including switches and meters.

2.6.6 SCHEMATICS OF QUALIFYING SYSTEMS

A typical configuration of wind turbine generators and related equipment that would qualify as a wind energy conversion system is shown in the schematic below.

2.6.6.1 Key to Notes on Schematic for a Wind Energy Conversion System

WES-1 For eligible properties, see Section 2.6.2 of this Guide.

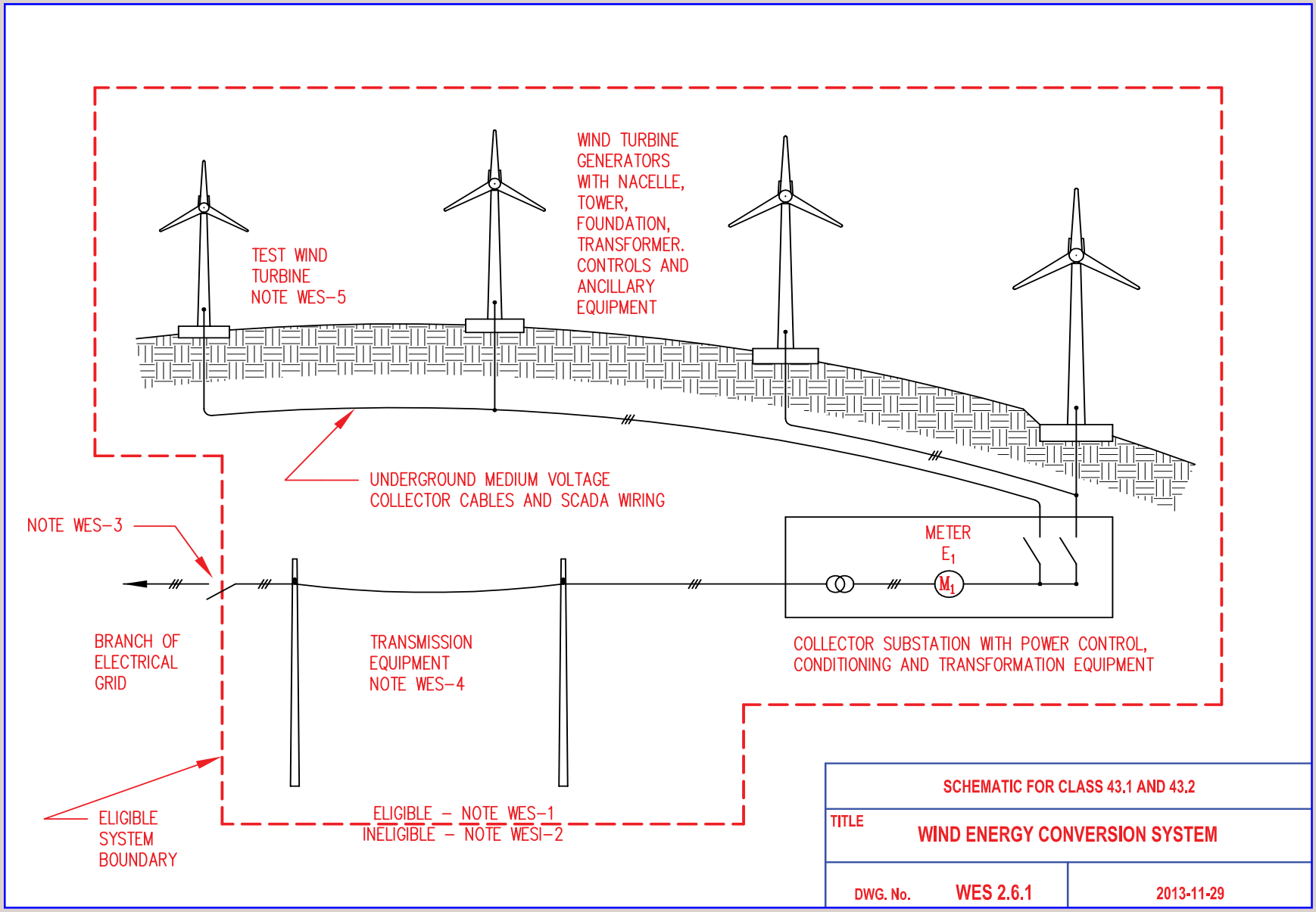
WES-2 For ineligible properties, see Section 2.6.3 of this Guide.

WES-3 Eligible electrical energy generation property for a wind energy conversion system includes one or more wind turbine generators complete with turbine support structures and equipment to collect, condition and transform the electrical energy produced by all wind turbine generators in the system such that it may be placed on the electrical grid through a single point of connection. Typically, the eligible system boundary for a wind energy conversion system is located at the isolation switch that allows a utility to lock out a wind energy conversion system's electrical energy production.

WES-4 Eligible transmission equipment is site specific and is dependent on the electrical grid configuration near the site. In general it includes transmission lines (and related equipment) from the electrical energy generating equipment up to the interface with the electrical grid or the isolation switch of the local electrical utility, or up to the point where, on an annual basis, more than 75 percent of the electrical energy transmitted by the transmission equipment is electrical energy generated by the wind energy conversion system, whichever point comes first.

WES-5 The cost of certain wind turbine generators installed at the site of a planned wind energy conversion system project for the purpose of testing the wind regime prior to the full build-out of the project may qualify as CRCE. See the *Technical Guide to Canadian Renewable and Conservation Expenses (CRCE)* for additional information.

WES 2.6.1 Wind Energy Conversion System



2.7 Photovoltaic Electrical Generation Equipment

CONTENTS

SCHEMATICS

2.7.1 PHOTOVOLTAIC ELECTRICAL GENERATION EQUIPMENT

Photovoltaic electrical generation equipment (described in subparagraph (d)(vi) of Class 43.1) includes fixed location photovoltaic equipment that is used primarily for the purpose of generating electrical energy from solar energy.

2.7.2 ELIGIBLE PROPERTIES

Eligible properties for photovoltaic electrical generation equipment include the following:

- solar cells or modules, including a solar cell or module that is integrated into a building;
- related equipment, including inverters, control and power conditioning equipment;
- support structures for the solar array;

and

- transmission equipment.

Note: Photovoltaic electrical generation equipment included in Class 43.1 or 43.2 is an eligible source of electrical energy for electrical energy storage equipment (see section 2.19).

2.7.3 INELIGIBLE PROPERTIES

Ineligible properties for photovoltaic electrical generation equipment include the following:

- distribution equipment;
- a building or part of a building other than a solar cell or module that is integrated into a building;
- auxiliary electrical generating equipment (e.g., diesel engine-powered generator sets, main electrical transfer switches or power bars);
- vehicles;
- telephone and related equipment;

and

- access roads, sidewalks, parking areas and other similar surface construction.

2.7.4 APPLICATION FOR A TECHNICAL OPINION WITH RESPECT TO CLASS 43.1 OR 43.2 ELIGIBILITY OF PHOTOVOLTAIC ELECTRICAL GENERATION EQUIPMENT

FORM 2.7 Details of Photovoltaic Electrical Generation Project

Company Information

Company Name

Company Address

Class 43.1 or 43.2 Property Address | Activity at this Location

Company Liaison for this Request | Title | Telephone Number

Company Technical Contact | Title | Telephone Number

Status of Project

☐ Installed Equipment or Completed Project ☐ Potential Project

Project Cost and Completion Date

Estimated Total Capitalized Cost of Project: $_____

Estimated Portion of Total Capitalized Cost Eligible Under Class 43.1 or 43.2: $_____

Estimated Project Completion Date (yyyy/mm/dd): _____

Eligible Property Description

For property that is proposed for inclusion in Class 43.1 or 43.2, attach the following information:

- A list including: 1) reference no., 2) item description, 3) name of manufacturer, 4) date of acquisition and 5) notes.
- A simple sketch or process flow diagram of the system or equipment and a process narrative.
- A completed Schedule A as per the following page.

Were any components used previously? Yes ☐ No ☐

If "Yes", provide details on a separate sheet.

Certification

I certify that the information provided in this application is true.

Dated at_____on_____

_____

Signature of owner, partner or authorized officer

_____

Name and title in block letters

Corporate Seal of Applicant

SCHEDULE 2.7-A Configuration of Proposed Photovoltaic Electrical Generation Equipment

(i) Indicate peak capacity of the equipment:_____kW

(ii) Indicate active surface area of solar cells or modules:

_____

(iii) Describe the cell or module mounting arrangements:

_____

_____

(iv) Indicate the type of storage equipment used (if applicable):

_____

(v) Indicate where appropriate:

Type of fuel displaced _____

Unit value of fuel displaced _____

Amount of fuel displaced per year _____

Estimated annual savings _____

Percentage of annual energy requirements supplied by solar system _____

(vi) Include any other relevant data:

_____

_____

_____

_____

2.7.5 CAPITAL COSTS TYPICALLY INCLUDED IN CLASS 43.1 OR 43.2.2

Project Cost Table 2.7 Photovoltaic Electrical Generation Equipment

	Typical Capital Cost
1	Construction of working platforms that are not an integral part of a building or other structure.
2	Installation of support structures for photovoltaic modules (e.g., foundations, anchors, mounting frames for systems mounted on the ground or mounting brackets and rails for systems mounted on a roof or wall).
3	Purchase and installation of solar photovoltaic array (e.g., cells, modules, panels and related equipment).
4	Purchase and installation of controls, power inverters, and power-conditioning equipment.
5	Purchase and installation of power transformer(s).
6	Purchase and installation of electrical transmission line, including switches and meters.

2.7.6 SCHEMATICS OF QUALIFYING EQUIPMENT

A typical configuration of solar cells or modules and related equipment that would qualify as photovoltaic equipment is shown in the schematic below.

2.7.6.1 Key to Notes on Photovoltaic Electrical Generation Equipment Schematic

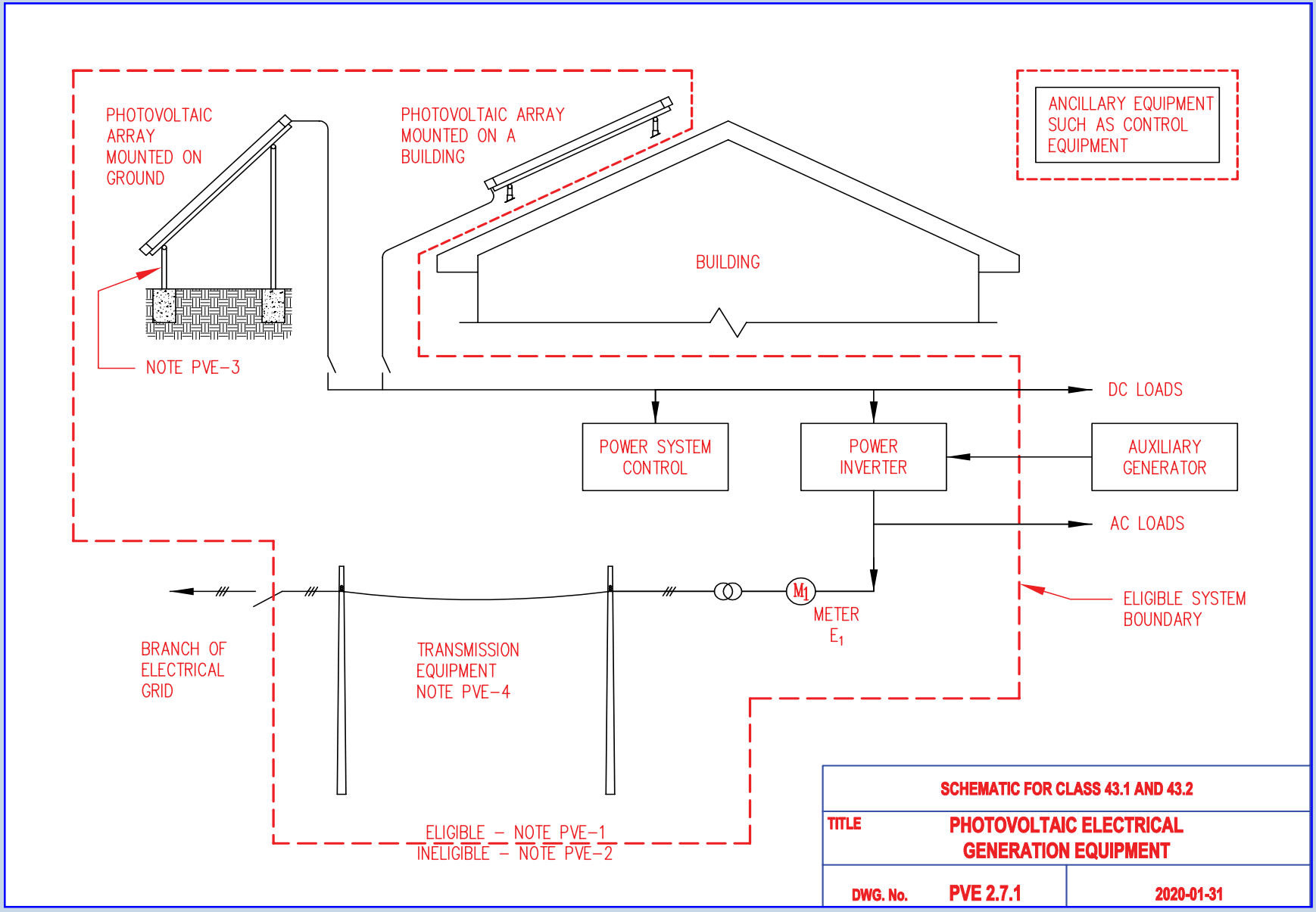
PVE-1 For eligible properties, see Section 2.7.2 of this Guide.

PVE-2 For ineligible properties, see Section 2.7.3 of this Guide.

PVE-3 Support structures and equipment to automatically orient photovoltaic panels toward the sun are eligible. Structures to mount and orient photovoltaic panels on buildings are eligible but buildings and modifications to buildings to support photovoltaic panels are ineligible.

PVE-4 Eligible transmission equipment is site specific and is dependent on the electrical grid configuration near the site. In general, it includes transmission lines (and related equipment) from the electrical energy generating equipment up to the interface with the electrical grid or the isolation switch of the local electrical utility, or up to the point where, on an annual basis, more than 75 percent of the electrical energy transmitted by the transmission equipment is electrical energy generated by the photovoltaic electrical generation equipment, whichever point comes first.

PVE 2.7.1 Photovoltaic Electrical Generation Equipment



2.8 Geothermal Energy Equipment

CONTENTS

SCHEMATICS

2.8.1 GEOTHERMAL ENERGY EQUIPMENT

Geothermal energy equipment (described in subparagraph (d)(vii) of Class 43.1) includes equipment used primarily for the purpose of generating electrical energy or heat energy, or both electrical and heat energy, solely from geothermal energy.

Note:

Under subsection 1219(1) of the Regulations, expenses incurred for the drilling of a geothermal well or solely for the purpose of determining the extent and quality of a geothermal well may qualify as CRCE if at least 50% of the depreciable property to be used in the project, determined by reference to its capital cost, is eligible geothermal energy equipment.

2.8.2 ELIGIBLE PROPERTIES

Eligible properties for geothermal energy equipment include the following:

- piping (including above- or below-ground piping and the cost of completing a production well (including wellhead and production string), or trenching, for the purpose of installing that piping);
- pumps, heat exchangers, steam separators and ancillary equipment used to collect geothermal energy;
- electrical generating equipment;
- transmission equipment;

and

- working platforms that primarily serve eligible equipment.

Note: Geothermal energy equipment included in Class 43.1 or 43.2 is an eligible source of thermal energy for district energy systems/equipment (see section 2.16) and an eligible source of electrical energy for electrical energy storage equipment (see section 2.19).

2.8.3 INELIGIBLE PROPERTIES

Ineligible properties for geothermal electrical generation equipment include the following:

- buildings and structures or portions thereof, with the exception of working platforms that primarily serve the eligible equipment;
- distribution equipment;
- back-up generating equipment (e.g., diesel engine-powered generator sets, main electrical transfer switches or power bars);
- vehicles;
- telephone and related equipment;
- equipment used to heat water for use in a swimming pool;

and

- access roads, sidewalks, parking areas and other similar surface construction.

2.8.4 APPLICATION FOR TECHNICAL OPINION WITH RESPECT TO CLASS 43.1 OR 43.2 ELIGIBILITY OF GEOTHERMAL ENERGY EQUIPMENT

FORM 2.8 Details of Geothermal Energy Project

Company Information

Company Name

Company Address

Class 43.1 or 43.2 Property Address Activity at this Location

Company Liaison for this Request Title Telephone Number

Company Technical Contact Title Telephone Number

Status of Project

☐ Installed Equipment or Completed Project ☐ Potential Project

Project Cost and Completion Date

Estimated Total Capitalized Cost of Project: $

Estimated Portion of Total Capitalized Cost Eligible Under Class 43.1 or 43.2: $

Estimated Project Completion Date (yyyy/mm/dd):

Eligible Property Description

For property that is proposed for inclusion in Class 43.1 or 43.2, attach the following information:

- A list including: 1) reference no., 2) item description, 3) name of manufacturer, 4) date of acquisition and 5) notes.
- A simple sketch or process flow diagram of the system or equipment and a process narrative.
- A completed Schedule A as per the following page.

Were any components used previously? Yes ☐ No ☐

If "Yes", provide details on a separate sheet.

Certification

I certify that the information provided in this application is true.

Dated at_____on_____

Signature of owner, partner or authorized officer

Name and title in block letters

Corporate Seal of Applicant

SCHEDULE 2.8-A Configuration of Proposed Geothermal Energy Equipment

(i) Indicate the depth of the geothermal aquifer, the temperature and pressure of the aquifer, the number of wells for production and reinjection, the diameter of wells and the quality of the steam or water in the aquifer: _____

_____

_____

(ii) Indicate the total geothermal energy resource capacity: _____ MW

Electrical Energy Generation

(iii) Indicate electrical energy generation equipment configuration:

- ☐ Flash Steam with Steam Turbine Generator
- ☐ Binary with Expander Generator
- ☐ Other (specify) _____

(iv) Rated electrical output of the equipment: _____ MW

(v) Planned annual electrical energy generation: _____ MWh

(vi) For a flash steam system, indicate the annual steam flow and energy content of steam delivered to the turbine(s):

Steam Flow _____ kg/yr or lb/yr

Enthalpy of Steam _____ kJ/kg or BTU/lb

(vii) For a binary system, indicate the annual flow and energy content of the expansion fluid:

Working Fluid _____

Fluid Flow _____ kg/yr or lb/yr

Enthalpy of Fluid _____ kJ/kg or BTU/lb

Heat Energy Generation

(viii) Indicate heat energy generation equipment configuration:

_____

_____

(ix) Rated heat output of the equipment: _____ MW

(x) Planned annual heat energy generation: _____ MWh

(xi) Indicate how the heat will be used:

_____

_____

2.8.5 CAPITAL COSTS TYPICALLY INCLUDED IN CLASS 43.1 OR 43.2

Project Cost Table 2.8 Geothermal Energy Equipment

	Typical Capital Cost
1	Installation of production string in completion of geothermal energy wells (the cost of drilling geothermal wells is eligible as CRCE).
2	Purchase and installation of wellhead equipment including separators, piping, silencers and controls.
3	Purchase and installation of geothermal energy gathering system including steam and water piping and controls.
4	Purchase and installation of heat cascading equipment including heat exchangers, binary unit and ancillary equipment used to collect geothermal heat.
5	Construction of an emergency water pond.
6	Construction of working platforms that are not an integral part of a building or other structure.
7	Purchase and installation of compressed air system for equipment controls and instrumentation including compressor, dryer, controls and instrumentation.
8	Purchase and installation of turbine(s) and ancillary controls and instrumentation, and cooling and lubrication equipment.
9	Purchase and installation of a heat exchanger for the transfer of geothermal energy to a secondary heating medium used to deliver heat to end users.
10	Purchase and installation of steam treatment and condensate return system including ejector and vacuum system for non-condensable gas ejection, hot well pumps, piping and associated controls.
11	Purchase and installation of generator(s) and ancillary equipment such as controls and instrumentation, systems for the following: electric power control (e.g., phase synchronization, voltage regulation and frequency control), cooling, lubrication, fire protection and acoustic protection.
12	Purchase and installation of power transformer(s).
13	Purchase and installation of electrical transmission line including switches and meters.

2.8.6 SCHEMATICS OF QUALIFYING SYSTEMS

Typical components of geothermal systems that would qualify as geothermal electrical generation equipment are shown in the schematics below.

2.8.6.1 Key to Notes on Schematics of Geothermal Energy Equipment

GEE-1 For eligible properties, see Section 2.8.2 of this Guide.

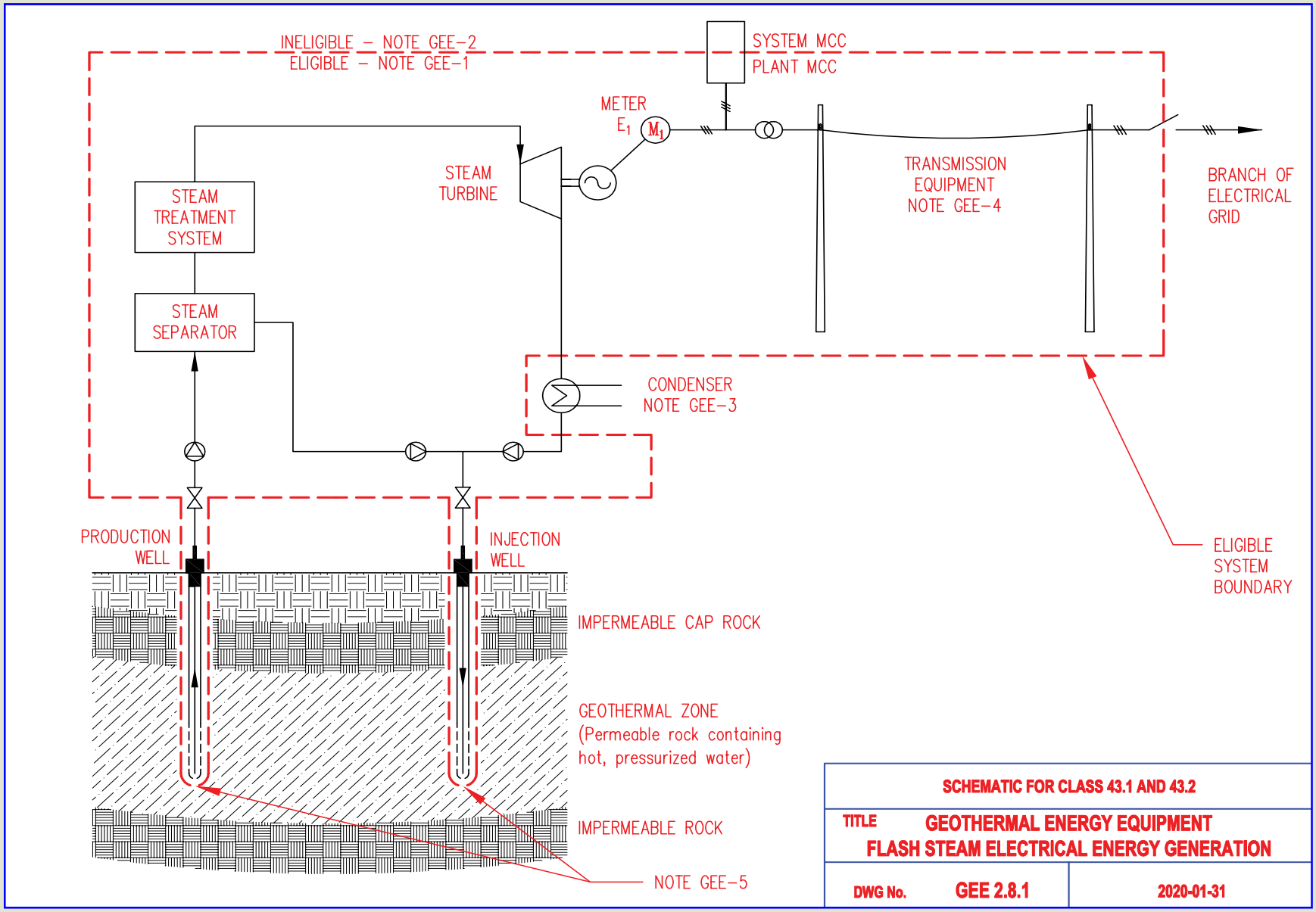
GEE-2 For ineligible properties, see Section 2.8.3 of this Guide.

GEE-3 Equipment used primarily to reject heat, such as condensers, cooling towers and similar equipment, is ineligible.

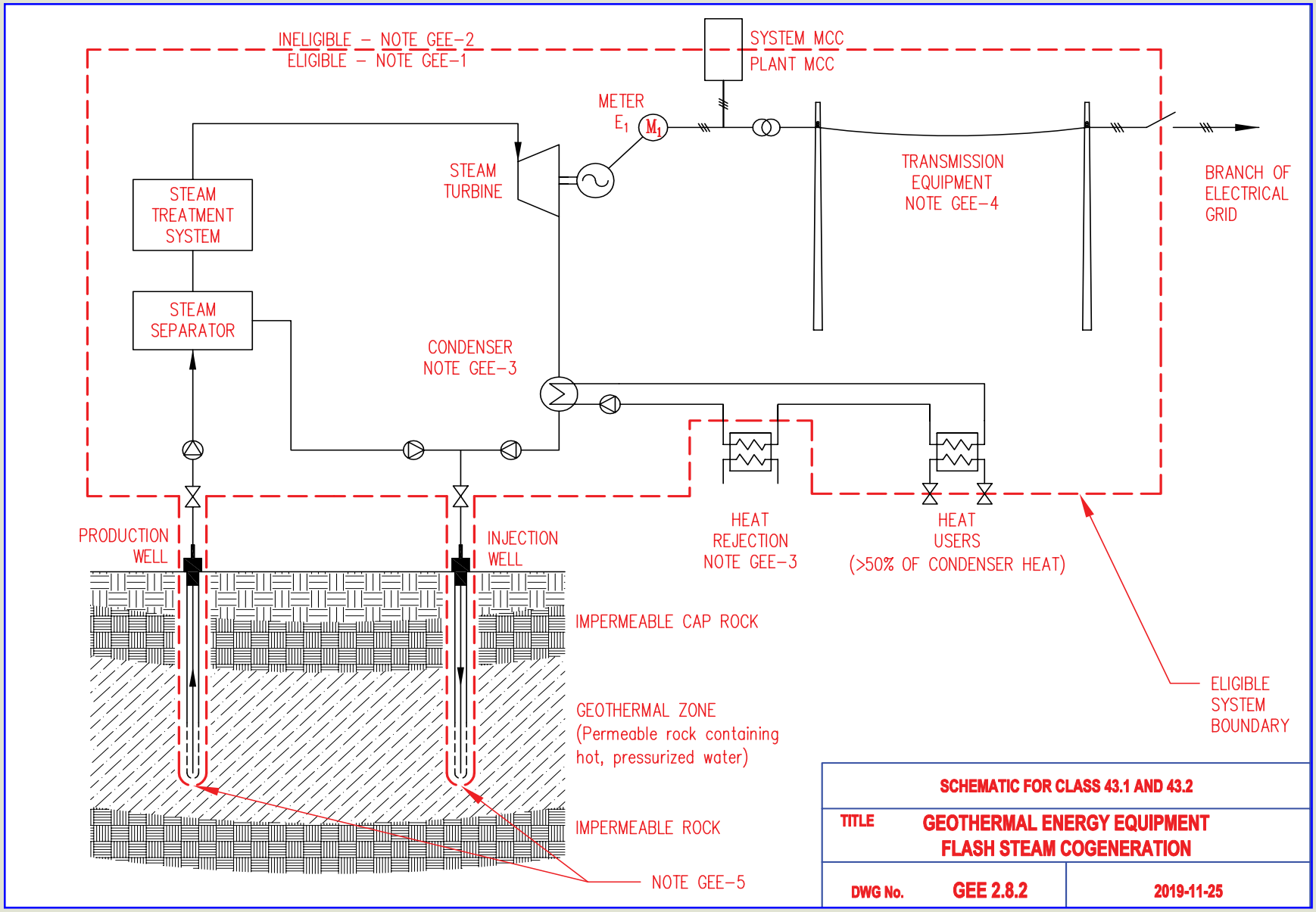
GEE-4 Eligible transmission equipment is site specific and is dependent on the electrical grid configuration near the site. In general, it includes transmission lines (and related equipment) from the electrical energy generating equipment up to the interface with the electrical grid or the isolation switch of the local electrical utility, or up to the point where, on an annual basis, more than 75 percent of the electrical energy transmitted by the transmission equipment is electrical energy generated by the geothermal electrical generation equipment, whichever point comes first.

GEE-5 The cost of drilling geothermal wells is eligible as CRCE but the cost of completing geothermal production wells (production string and wellhead equipment) is included in Class 43.1 or 43.2.

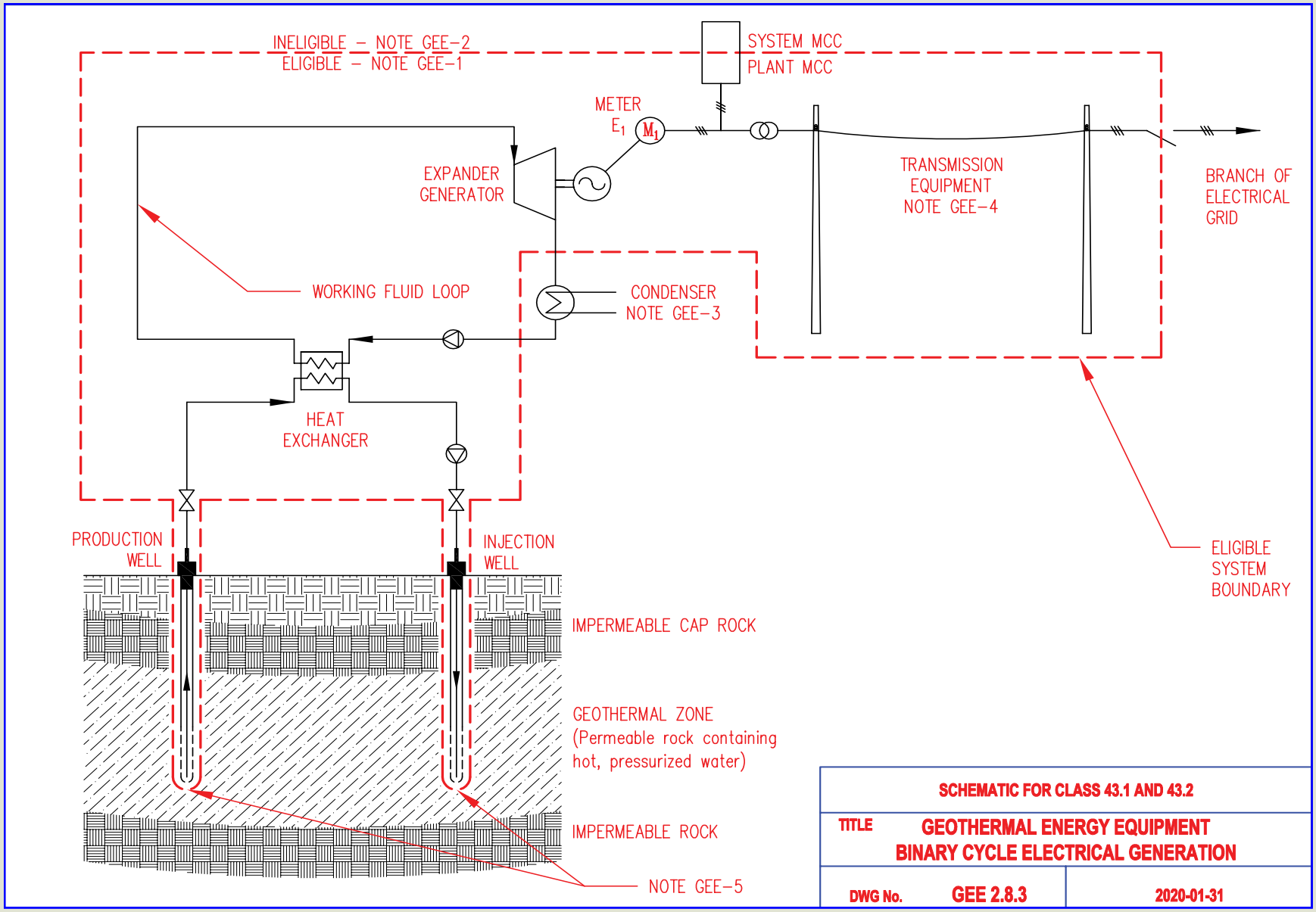
GEE 2.8.1 Geothermal Energy System —Flash Steam Electrical Generation



GEE 2.8.2 Geothermal Energy System—Flash Steam Cogeneration



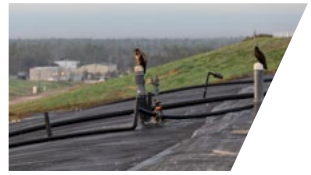
GEE 2.8.3 Geothermal Energy System—Binary Cycle Electrical Generation



2.9 Landfill Gas and Digester Gas Collection Equipment

CONTENTS

SCHEMATICS



2.9.1 LANDFILL GAS AND DIGESTER GAS COLLECTION EQUIPMENT

Landfill gas and digester gas collection equipment (described in subparagraph (d)(viii) of Class 43.1), includes equipment used primarily for the purpose of collecting landfill gas or digester gas.

Note:

Landfill gas must be extracted from an ***eligible landfill site.***

Digester gas must be extracted from an ***eligible sewage treatment facility***.

Landfill gas, digester gas, eligible landfill site and eligible sewage treatment facility are defined in subsection 1104(13) of the Regulations and in the Glossary of Terms found in Section 3.0 of this Guide.

Budget 2013 expanded eligibility under Class 43.1 and 43.2 by including all types of cleaning and upgrading equipment that can be used to treat eligible gases from waste.

2.9.2 ELIGIBLE PROPERTIES

Eligible properties for landfill gas and digester gas collection equipment include the following:

- piping (including above or below ground piping and the cost of drilling a well or trenching, for the purpose of installing that piping);
- fans, compressors, storage tanks, heat exchangers;
- related equipment used to:
  - collect the gas;
  - remove non-combustibles and contaminants from the gas;

  or
  - store the gas;

and

- working platforms that primarily serve the eligible equipment.

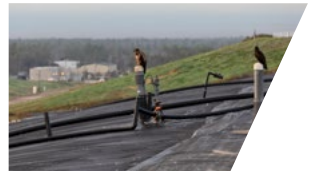
2.9.3 INELIGIBLE PROPERTIES

Ineligible properties for landfill gas and digester gas collection equipment include the following:

- buildings and structures or portions thereof, with the exception of working platforms that primarily serve the eligible equipment;
- vehicles;
- telephone and related equipment;

and

- access roads, sidewalks, parking areas and other similar surface construction.



2.9.4 APPLICATION FOR TECHNICAL OPINION WITH RESPECT TO CLASS 43.1 OR 43.2 ELIGIBILITY OF LANDFILL GAS OR DIGESTER GAS COLLECTION EQUIPMENT

FORM 2.9 Details of Landfill Gas and Digester Gas Project

Company Information

Company Name

Company Address

Class 43.1 or 43.2 Property Address Activity at this Location

Company Liaison for this Request Title Telephone Number

Company Technical Contact Title Telephone Number

Status of Project

☐ Installed Equipment or Completed Project ☐ Potential Project

Project Cost and Completion Date

Estimated Total Capitalized Cost of Project: $

Estimated Portion of Total Capitalized Cost Eligible Under Class 43.1 or 43.2: $

Estimated Project Completion Date (yyyy/mm/dd):

Eligible Property Description

For property that is proposed for inclusion in Class 43.1 or 43.2, attach the following information:

- A list including: 1) reference no., 2) item description, 3) name of manufacturer, 4) date of acquisition and 5) notes.
- A simple sketch or process flow diagram of the system or equipment and a process narrative.
- A completed Schedule A as per the following page.

Were any components used previously? Yes ☐ No ☐

If "Yes", provide details on a separate sheet.

Certification

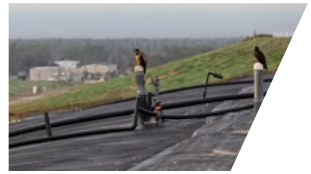
I certify that the information provided in this application is true.

Dated at_____on_____

Signature of owner, partner or authorized officer

Name and title in block letters

Corporate Seal of Applicant



SCHEDULE 2.9-A Configuration of Proposed Landfill Gas or Digester Gas Collection Equipment

(i) Indicate the source of the gas:

- ☐ Eligible landfill
- ☐ Digester at an eligible sewage treatment facility
- ☐ Other (specify) _____

(ii) Describe the gas collection system employed:

_____

_____

_____

(iii) Describe the process used to treat the gas and remove contaminants and non-combustibles.

_____

_____

_____

(iv) If the gas cannot be used as it is produced it will be:

- ☐ Flared
- ☐ Stored (indicate storage method and capacity) _____

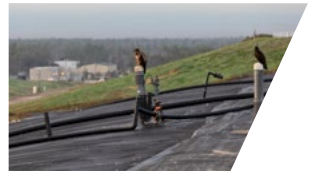
(v) Describe how the gas will be used:

_____

_____

_____

_____



2.9.5 CAPITAL COSTS TYPICALLY INCLUDED IN CLASS 43.1 OR 43.2

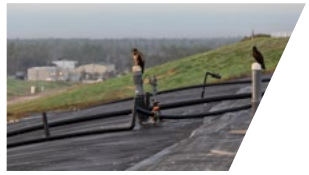
Project Cost Table 2.9 Landfill Gas and Digester Gas Collection Equipment

Landfill Gas Collection Equipment

	Typical Capital Cost
1	Drilling of landfill gas collection wells in an eligible landfill site and installation of casings and well heads.
2	Purchase and installation of underground collector piping.
3	Purchase and installation of gas blowers to extract landfill gas from landfill gas collection wells.
4	Purchase and installation of primary moisture and particulate removal equipment (e.g., knockout pot).
5	Construction of working platforms that are not an integral part of a building or other structure.
6	Purchase and installation of compressed air system for equipment controls and instrumentation including compressor, dryer, controls and instrumentation.
7	Purchase and installation of equipment to remove non-combustibles and contaminants (e.g., heat exchangers, scrubbing, stripping, pressure swing absorption, gas compression, gas cooling, moisture separation and particulate filtration equipment).
8	Purchase and installation of clean gas compression equipment.
9	Purchase and installation of gas storage equipment.

Digester Gas Equipment

	Typical Capital Cost
1	Purchase and installation of piping and gas blower(s) to extract digester gas from anaerobic digesters at an eligible sewage treatment facility.
2	Purchase and installation of primary moisture and particulate removal equipment (e.g., knockout pot).
3	Construction of working platforms that are not an integral part of a building or other structure.
4	Purchase and installation of compressed air system for equipment controls and instrumentation including compressor, dryer, controls and instrumentation.
5	Purchase and installation of equipment to remove non-combustibles and contaminants (e.g., heat exchangers, scrubbing, stripping, pressure swing absorption, gas compression, gas cooling, moisture separation and particulate filtration equipment).
6	Purchase and installation of clean gas compression equipment.
7	Purchase and installation of gas storage equipment.



2.9.6 SCHEMATICS OF QUALIFYING EQUIPMENT

Typical configurations of components that would qualify as landfill gas or digester gas equipment are shown in the schematics below.

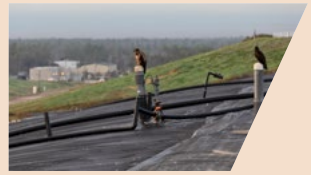
2.9.6.1 Key to Notes on Schematics of Landfill Gas and Digester Gas Collection Equipment

LDE-1 For eligible properties, see Section 2.9.2 of this Guide.

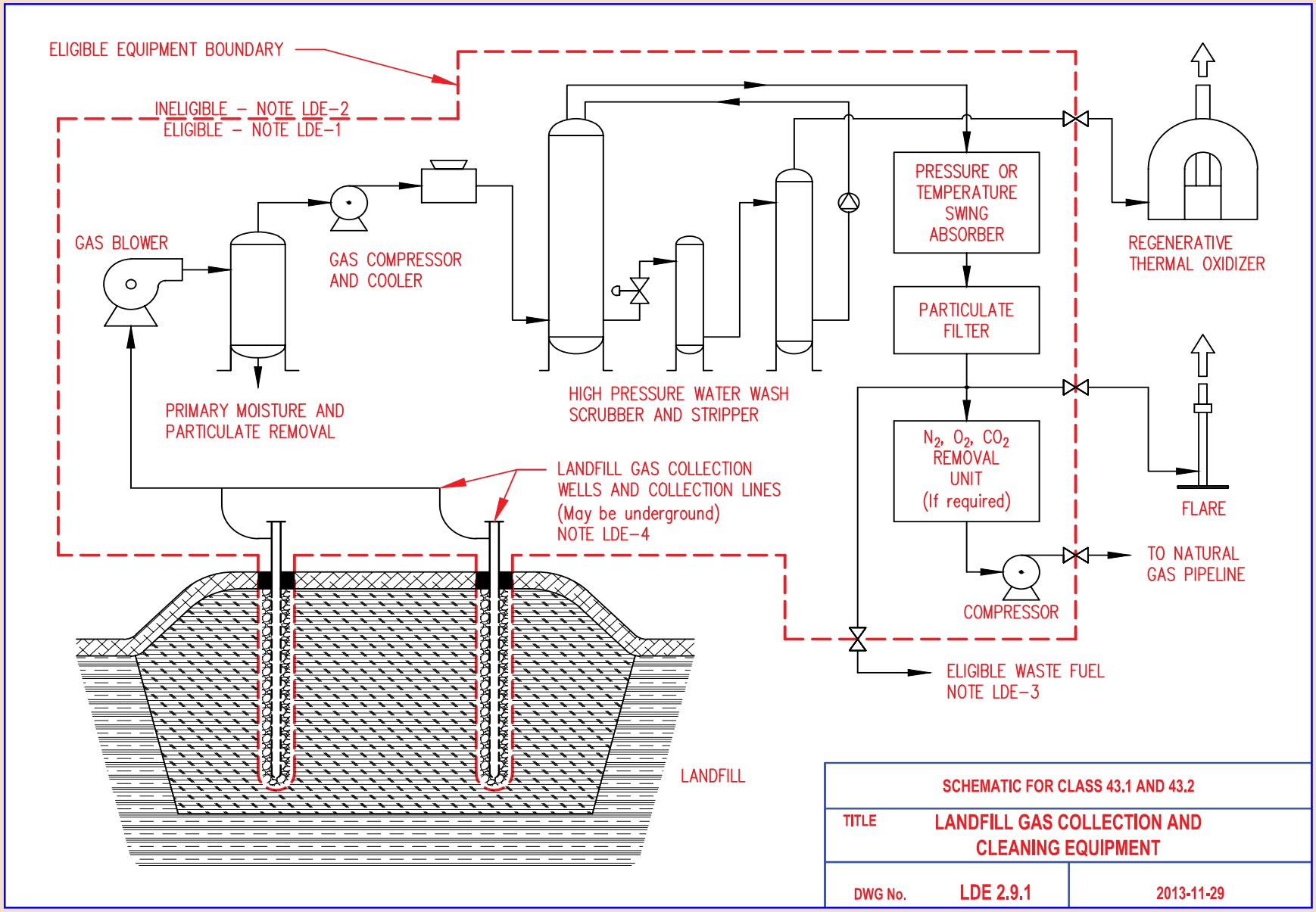
LDE-2 For ineligible properties, see Section 2.9.3 of this Guide.

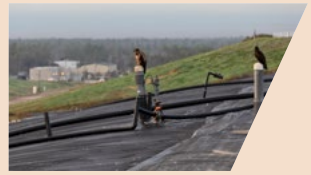
LDE-3 Landfill or digester gas cleaned such that it may be burned in an engine or gas turbine qualifies as an eligible waste fuel.

LDE-4 Underground landfill gas wells and piping to collect and deliver the gas to landfill gas cleaning equipment are eligible.

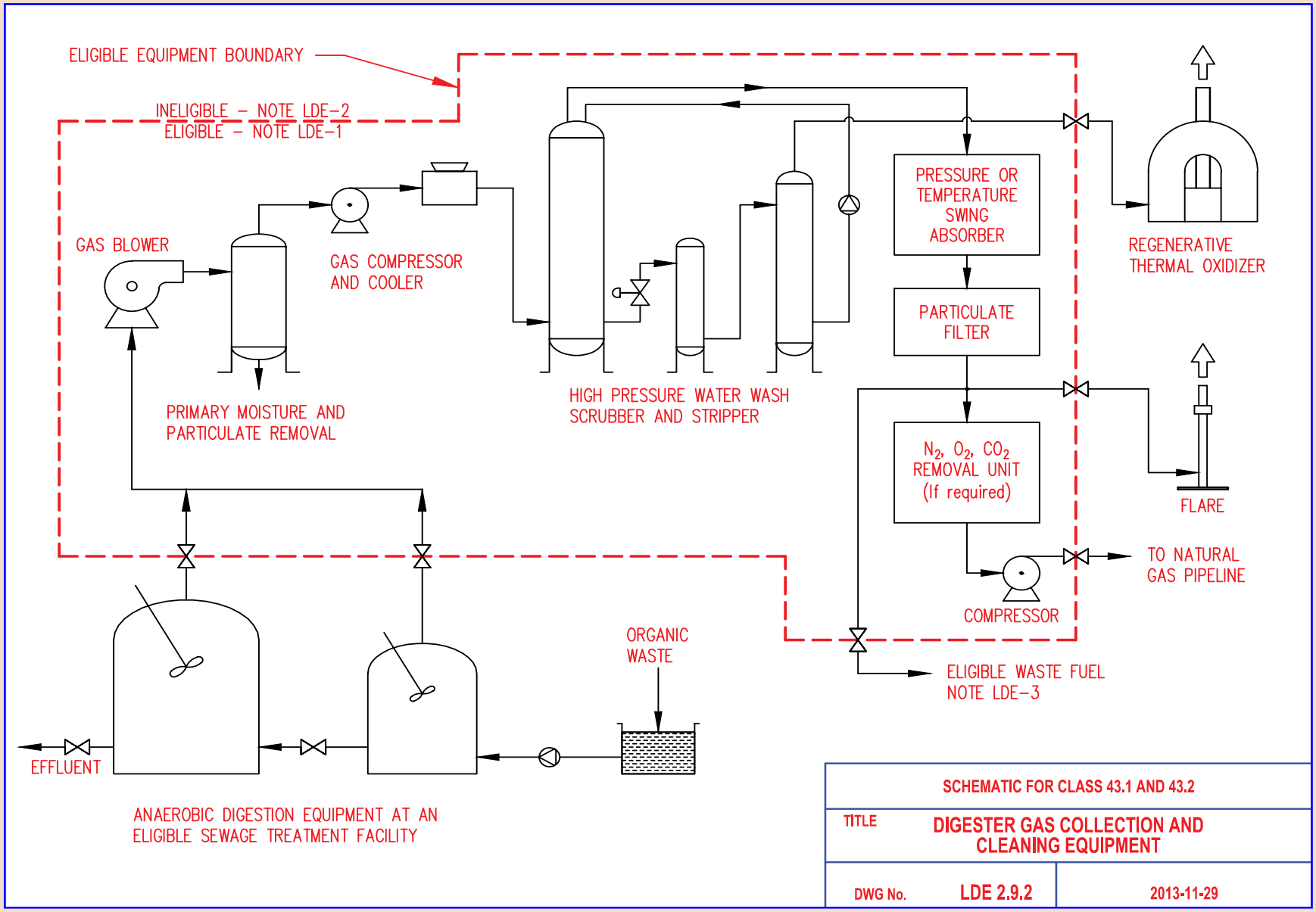


LDE 2.9.1 Landfill Gas Collection and Cleaning Equipment





LDE 2.9.2 Digester Gas Collection and Cleaning Equipment



2.10 Specified-Waste Fuelled Heat Production Equipment

CONTENTS

SCHEMATICS

2.10.1 SPECIFIED-WASTE FUELLED HEAT PRODUCTION EQUIPMENT

Specified-waste fuelled heat production equipment (described in subparagraph (d)(ix) of Class 43.1) includes equipment used for the sole purpose of generating heat energy from the consumption of eligible waste fuel or producer gas.

Note:

Although fossil fuel can be combined with eligible waste fuel and producer gas for use as a fuel source, the heat energy must be generated primarily from the use of eligible waste fuel or producer gas.

Eligible waste fuel means biogas, bio-oil, digester gas, landfill gas, municipal waste, plant residue, pulp and paper waste and wood waste. These terms are defined in subsection 1104(13) of the Regulations and in the Glossary of Terms in Section 3.0 of this Guide.

2.10.2 ELIGIBLE PROPERTIES

Eligible properties for specified-waste fuelled heat production equipment include the following:

- heat energy generating equipment including waste-fuelled burners and boilers, combustion air-handling equipment, boiler feedwater and condensate systems, controls and instrumentation and other ancillary equipment;
- components of the fuel-handling equipment whose primary purpose is to upgrade the combustible portion of the fuel by grinding, shredding, compacting, gasifying or drying;
- working platforms, including catwalks, access ladders and walkways that are an integral part of the heat production equipment (platforms that serve the surrounding structure are ineligible);

and

- metal exhaust stacks that are an integral part of the heat production equipment.

Note: Specified-waste fuelled heat production equipment included in Class 43.1 or 43.2 is an eligible source of thermal energy for district energy systems/equipment (see section 2.16).

2.10.3 INELIGIBLE PROPERTIES

Ineligible properties for specified-waste fuelled heat production equipment include the following:

- buildings and structures (with the exception of working platforms that primarily serve the heat-producing equipment);
- permanent brick or concrete stacks;
- fuel storage facilities and components of the fuel-handling equipment that do not upgrade the combustible portion of the fuel (e.g., front-end loaders and conveyor belts);
- heat rejection equipment (e.g., condensers and cooling water equipment);
- effluent treatment and emission abatement (e.g., pollution control) equipment;
- electrical generating equipment;
- vehicles;
- telephone and related equipment;

and

- access roads, sidewalks, parking areas and other similar surface construction.

2.10.4 APPLICATION FOR TECHNICAL OPINION WITH RESPECT TO CLASS 43.1 OR 43.2 ELIGIBILITY OF SPECIFIED-WASTE FUELLED HEAT PRODUCTION EQUIPMENT

FORM 2.10 Details of Specified-Waste Fuelled Heat Production Project

Company Information

_____
Company Name

_____
Company Address

_____
Class 43.1 or 43.2 Property Address Activity at this Location

_____
Company Liaison for this Request Title Telephone Number

_____
Company Technical Contact Title Telephone Number

Status of Project

☐ Installed Equipment or Completed Project ☐ Potential Project

Project Cost and Completion Date

Estimated Total Capitalized Cost of Project: $_____

Estimated Portion of Total Capitalized Cost Eligible Under Class 43.1 or 43.2: $_____

Estimated Project Completion Date (yyyy/mm/dd): _____

Eligible Property Description

For property that is proposed for inclusion in Class 43.1 or 43.2, attach the following information:

- A list including: 1) reference no., 2) item description, 3) name of manufacturer, 4) date of acquisition and 5) notes.
- A simple sketch or process flow diagram of the system or equipment and a process narrative.
- A completed Schedule A as per the following page.

Were any components used previously? Yes ☐ No ☐

If "Yes", provide details on a separate sheet.

Certification

I certify that the information provided in this application is true.

Dated at_____on_____

_____
Signature of owner, partner or authorized officer

_____
Name and title in block letters

Corporate Seal of Applicant

SCHEDULE 2.10–A Configuration of Proposed Specified-Waste Fuelled Heat Production Equipment

(i) Check appropriate description of project.

- ☐ New installation or equipment
- ☐ Retrofit of existing installation or equipment
- ☐ Expansion of existing installation or equipment

(ii) For a retrofit or expansion, please indicate:

Output of existing installation per year: _____

Type(s) of fuel used by existing installation: _____

Quantity of fuel(s) used by existing installation per year: _____

(iii) Heat will be produced from consumption of (please indicate units):

Source	% of Total	Annual Consumption	Energy Content (HHV basis)
☐ Wood Waste			
☐ Municipal Waste			
☐ Landfill Gas			
☐ Digester Gas			
☐ Bio-Oil			
☐ Biogas			
☐ Plant Residue			
☐ Pulp and Paper Waste			
☐ Producer Gas			
☐ Other (specify) _____			

(iv) Quantity of heat to be generated annually (on average): _____

(v) State the type of furnace, boiler, etc., which is to be used for converting fuel to heat energy:

_____

_____

(vi) Indicate how the heat will be used:

_____

_____

(vii) Indicate what fuel-handling equipment is used to upgrade the combustible portion of the fuel:

_____

_____

2.10.5 CAPITAL COSTS TYPICALLY INCLUDED IN CLASS 43.1 OR 43.2

Project Cost Table 2.10 Specified-Waste Fuelled Heat Production Equipment

	Typical Capital Cost
1	Construction of working platforms that are not an integral part of a building or other structure.
2	Purchase and installation of compressed air system for equipment controls and instrumentation including compressor, dryer, controls and instrumentation.
3	Purchase and installation of equipment to upgrade the combustible portion of eligible waste fuels (e.g., dryers, shredders, hoggers and gasifiers) and ancillary equipment such as controls and instrumentation.
4	Purchase and installation of eligible waste fuelled heat generating equipment and ancillary equipment (e.g., burner, boiler, fuel feeder, combustion air supply, duct work, integrated metal exhaust stacks, ash eliminator, controls and instrumentation).
5	Purchase and installation of boiler feedwater or working fluid systems, including chemical treatment, storage tanks, de-aeration facilities and ancillary equipment.
6	Purchase and installation of steam condensate or working fluid return system.

2.10.6 SCHEMATICS OF QUALIFYING EQUIPMENT

Typical configurations of equipment used to produce heat from waste fuels that would qualify as specified-waste fuelled heat production equipment are shown in the schematics below.

2.10.6.1 Key to Notes on Schematics of Specified-Waste Fuelled Heat Production Equipment

HPE-1 For eligible properties, see Section 2.10.2 of this Guide.

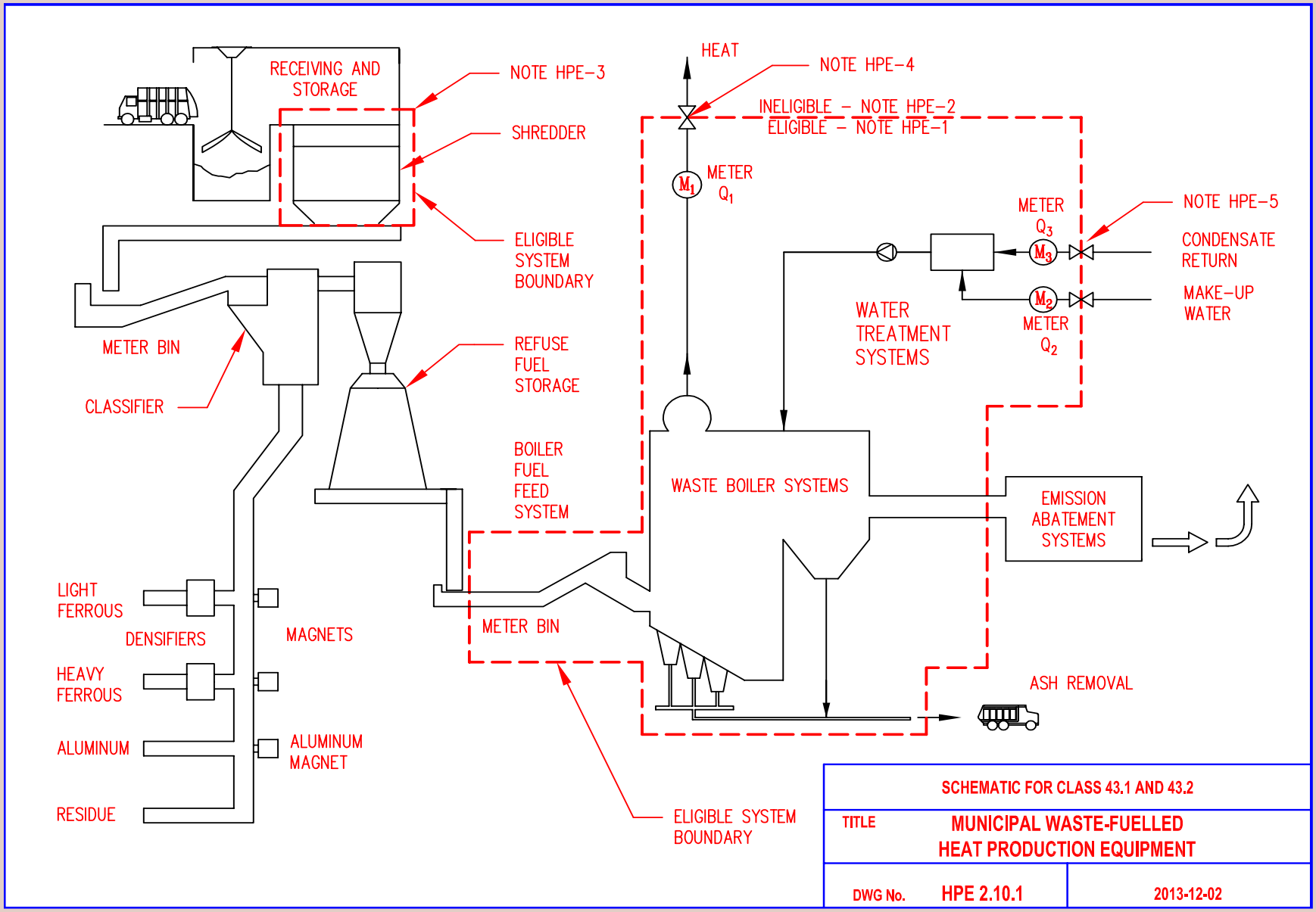
HPE-2 For ineligible properties, see Section 2.10.3 of this Guide.

HPE-3 In specified-waste fuelled heat production equipment, equipment used to upgrade the combustible portion of the fuel by processes such as shredding, drying, hogging, compacting, gasifying or compressing is eligible.

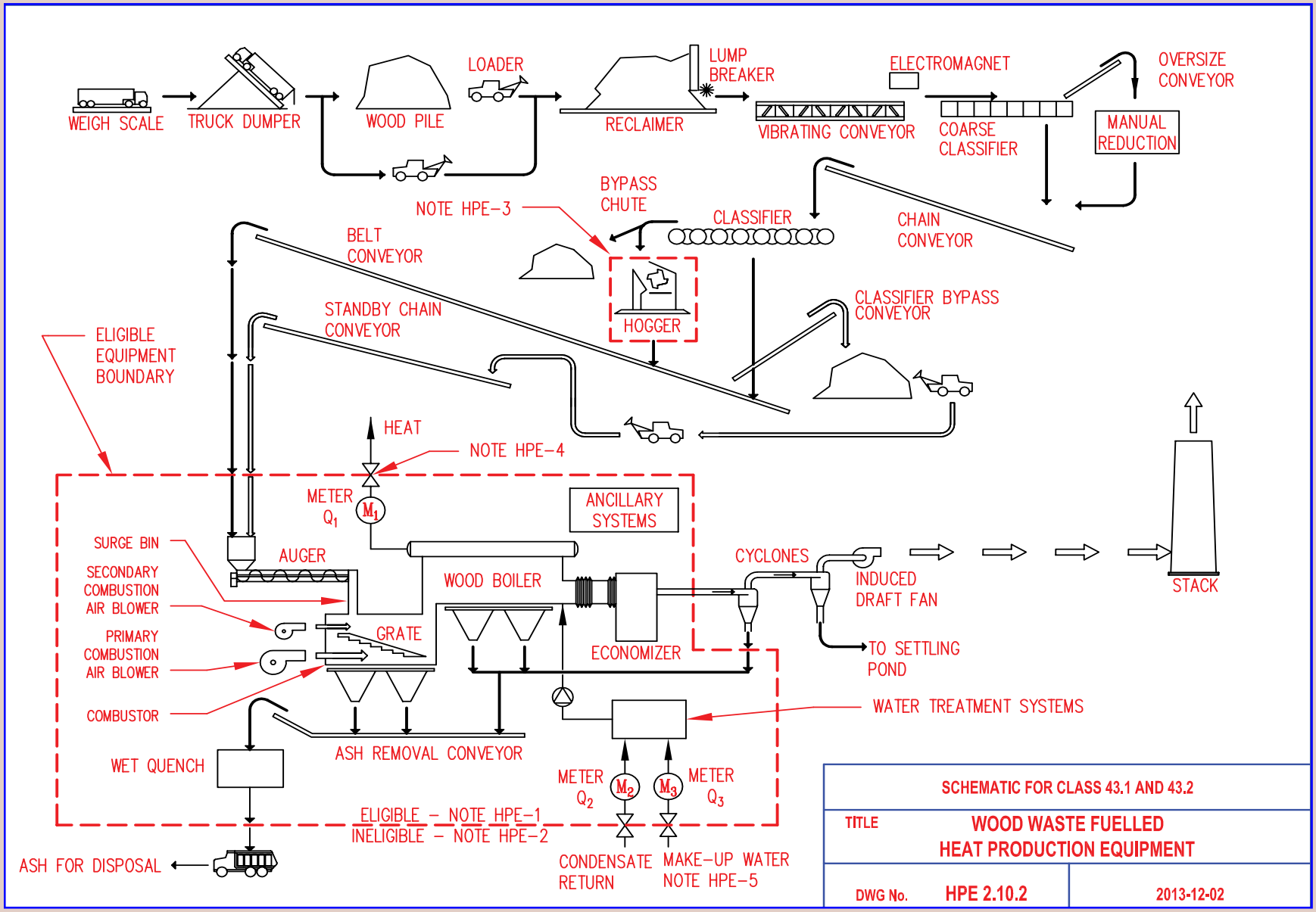
HPE-4 The eligible portion of the heat distribution pipeline extends to whichever is first among the main shut-off valve, the interface with the end-use system or a change in ownership of components.

HPE-5 Boiler feedwater treatment systems that are necessary to protect and prevent fouling of high-temperature and pressure steam generation systems are eligible.

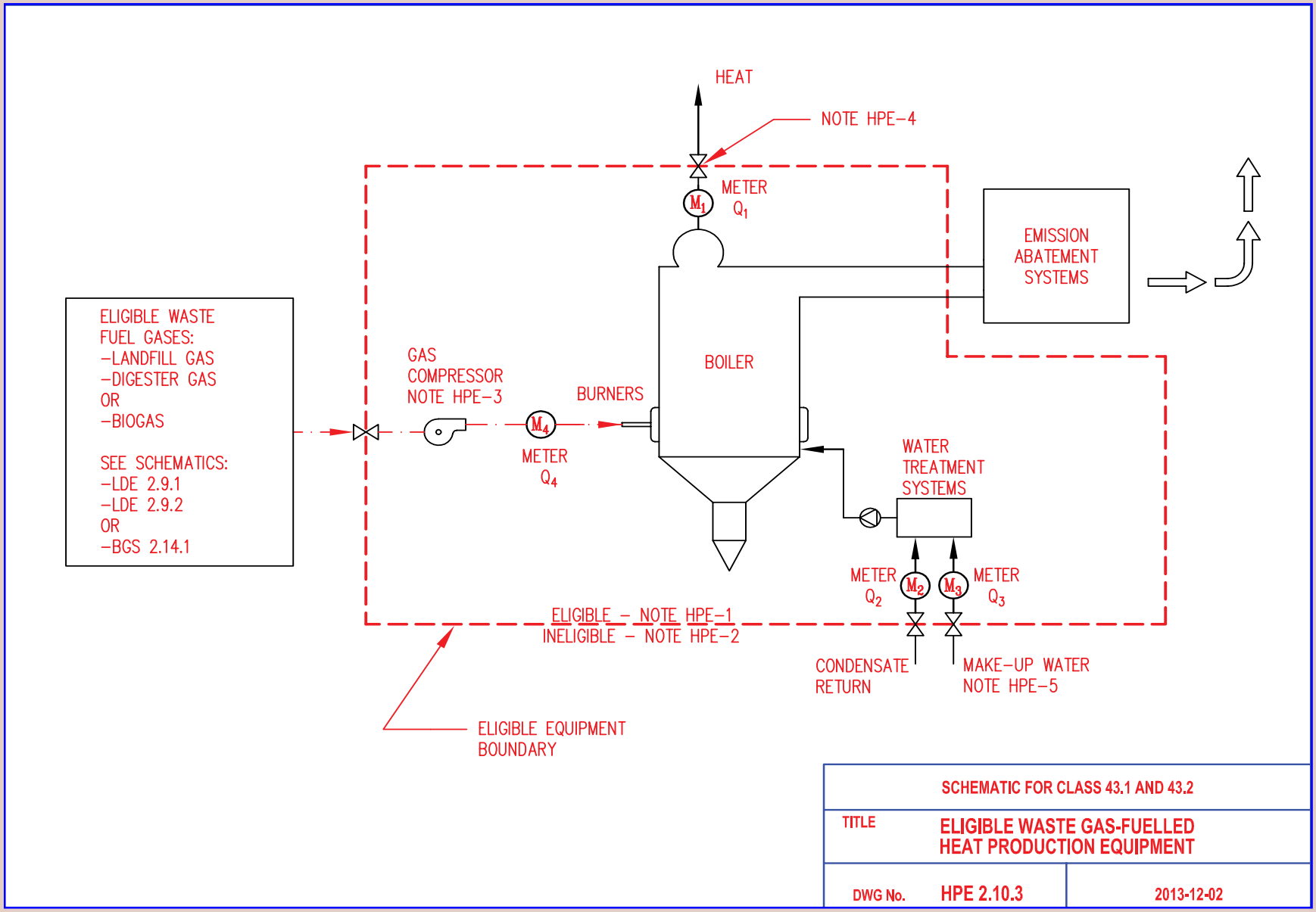
HPE 2.10.1 Municipal Waste-Fuelled Heat Production Equipment

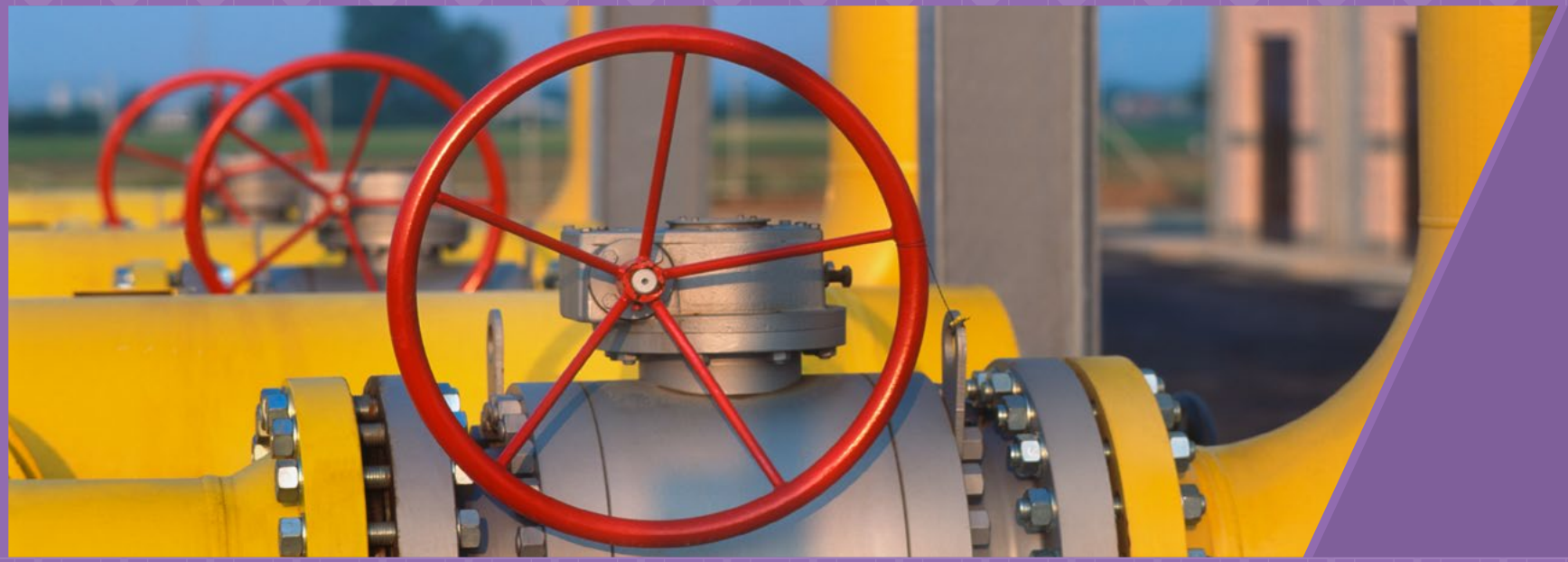


HPE 2.10.2 Wood Waste-Fuelled Heat Production Equipment



HPE 2.10.3 Eligible Waste Gas-Fuelled Heat Production Equipment





2.11 Expansion Engine Systems

CONTENTS

SCHEMATICS

2.11.1 EXPANSION ENGINE SYSTEMS

Expansion engine systems (described in subparagraph (d)(x) of Class 43.1) include certain expansion engines, with one or more turbines, or cylinders, that are used to convert the compression energy in pressurized natural gas into shaft power that generates electricity.

To qualify, the expansion engine:

- must be used instead of a pressure-reducing valve;

and

- must be part of a system installed on:
  - a distribution line of a natural gas distributor,

  or
  - a branch distribution line of a taxpayer that is primarily engaged in the manufacturing or processing of goods for sale or lease if the branch line is used to deliver natural gas directly to the taxpayer's manufacturing or processing facility.

2.11.2 ELIGIBLE PROPERTIES

Eligible properties for expansion engine systems include the following:

- an expansion engine with one or more turbines or cylinders;

and

- related electrical generating equipment such as generators, transformers and electric power control equipment (e.g., phase synchronization, voltage regulation and frequency control equipment) and ancillary controls.

Note: Expansion engine systems included in Class 43.1 or 43.2 are an eligible source of electrical energy for electrical energy storage equipment (see section 2.19).

2.11.3 INELIGIBLE PROPERTIES

Ineligible properties for expansion engine systems include the following:

- distribution equipment and facilities;
- buildings and structures;

and

- auxiliary electrical generating equipment (e.g., diesel engine powered generator sets, main electrical transfer switches or power bars).

2.11.4 APPLICATION FOR TECHNICAL OPINION WITH RESPECT TO CLASS 43.1 OR 43.2 ELIGIBILITY OF AN EXPANSION ENGINE SYSTEM

FORM 2.11 Details of Expansion Engine Project

Company Information

_____
Company Name

_____
Company Address

_____
Class 43.1 or 43.2 Property Address Activity at this Location

_____
Company Liaison for this Request Title Telephone Number

_____
Company Technical Contact Title Telephone Number

Status of Project

☐ Installed Equipment or Completed Project ☐ Potential Project

Project Cost and Completion Date

Estimated Total Capitalized Cost of Project: $_____

Estimated Portion of Total Capitalized Cost Eligible Under Class 43.1 or 43.2: $_____

Estimated Project Completion Date (yyyy/mm/dd): _____

Eligible Property Description

For property that is proposed for inclusion in Class 43.1 or 43.2, attach the following information:

- A list including: 1) reference no., 2) item description, 3) name of manufacturer, 4) date of acquisition and 5) notes.
- A simple sketch or process flow diagram of the system or equipment and a process narrative.
- A completed Schedule A as per the following page.

Were any components used previously? Yes ☐ No ☐

If "Yes", provide details on a separate sheet.

Certification

I certify that the information provided in this application is true.

Dated at_____on_____

_____
Signature of owner, partner or authorized officer

_____
Name and title in block letters

Corporate Seal of Applicant

SCHEDULE 2.11-A Configuration of Proposed Expansion Engine System

(i) Indicate the planned electrical energy generating capacity: _____ MW

(ii) Indicate the type of expansion engine:

☐ Expander Turbine

Number of Units:_____

☐ Cylinder

Number of Units:_____

(iii) Indicate how the expansion engine is installed/used:

☐ On a distribution line of a distributor of natural gas.

☐ On a branch distribution line of a taxpayer that delivers natural gas directly to the taxpayer's manufacturing or processing facility.

☐ Other (specify): _____

_____

(iv) Indicate the pressure let down available for the expansion engine:

_____ kPa or psi

(v) Describe briefly the configuration of the system, the related electrical generating equipment and ancillary controls.

_____

_____

_____

(vi) Indicate how the electrical energy generated will be used and how it will be transmitted to the end-user.

_____

_____

_____

2.11.5 CAPITAL COSTS TYPICALLY INCLUDED IN CLASS 43.1 OR 43.2

Project Cost Table 2.11 Expansion Engine Systems

	Typical Capital Cost
1	Purchase and installation of expansion engine or expander turbine, gas pre-heater at a natural gas pressure-reducing station and ancillary controls and instrumentation.
2	Purchase and installation of related electrical generating equipment and controls (e.g., phase synchronization, voltage regulation and frequency control equipment) and equipment for cooling, lubrication, fire protection and acoustic protection.
3	Purchase and installation of power transformer(s).

2.11.6 SCHEMATICS OF QUALIFYING SYSTEMS

A typical system to generate electricity from the let-down of pressure in a natural gas pipeline that would qualify as an expansion engine system is shown in the schematic below.

2.11.6.1 Key to Notes on Schematic of an Expansion Engine System

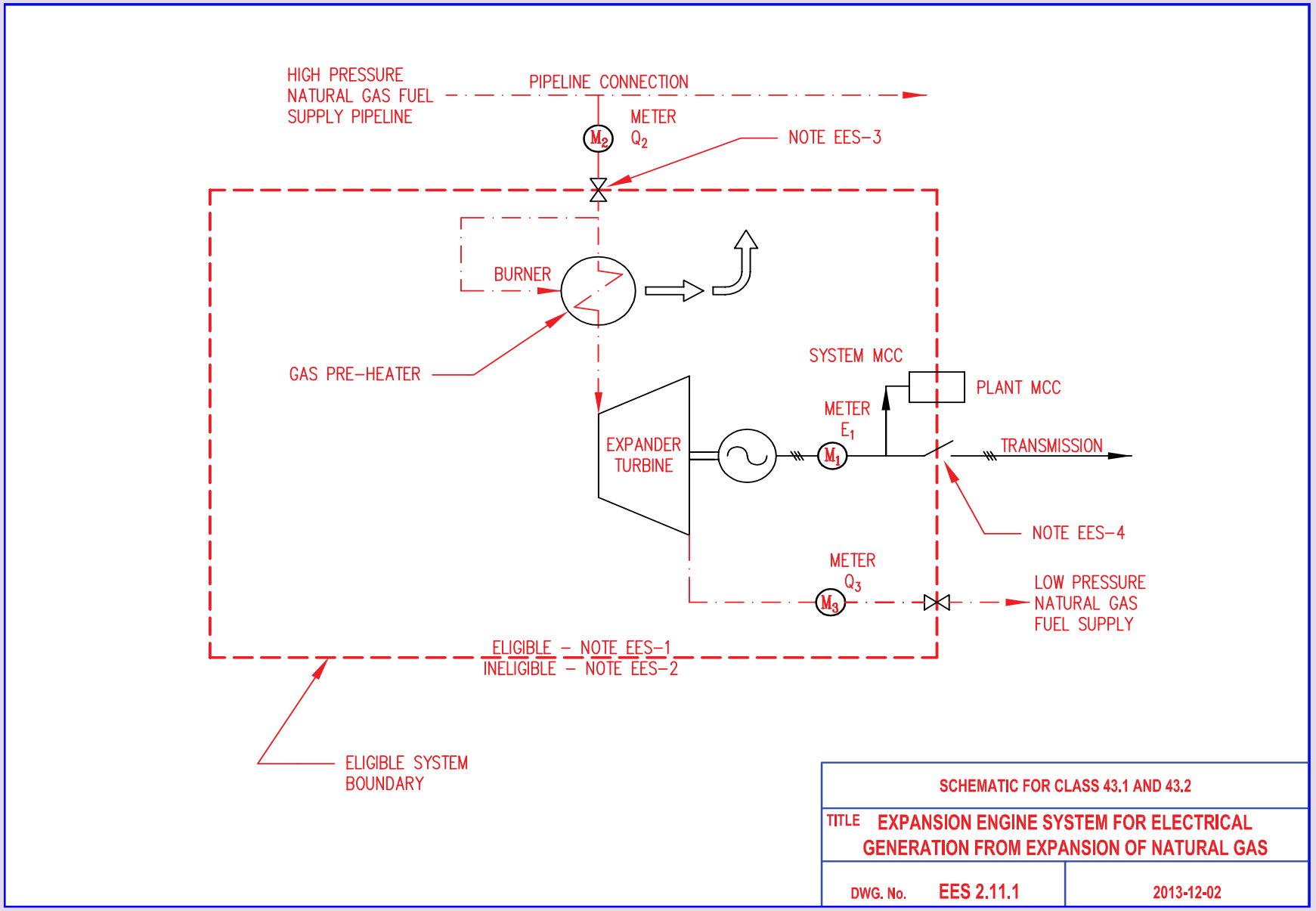
EES-1 For eligible properties, see Section 2.11.2 of this Guide.

EES-2 For ineligible properties, see Section 2.11.3 of this Guide.

EES-3 The gaseous fuel supply line downstream of the main utility shut-off valve is eligible if the supply line is dedicated to the eligible system.

EES-4 Eligible electrical equipment includes equipment used at the first level of power transformation. The first level of transformation includes phase synchronization and voltage regulation. At this boundary generation stops, and the electricity is ready for use or to be put on transmission lines. Typically this boundary is at the isolation switches that allow the utility to lock out the plant's power production.

EES 2.11.1 Expansion Engine System for Electrical Generation from Expansion of Natural Gas



2.12 Systems to Convert Biomass into Bio-Oil

CONTENTS

SCHEMATICS

2.12.1 SYSTEMS TO CONVERT BIOMASS INTO BIO-OIL

Systems to convert biomass into bio-oil (described in subparagraph (d)(xi) of Class 43.1) includes equipment that converts wood waste or plant residue into bio-oil by a thermo-chemical conversion process that takes place in the absence of oxygen. The equipment is eligible only if the bio-oil is used primarily for the following purposes:

- generating heat that is used directly in an industrial process or a greenhouse;
- generating electricity;

or

- generating electricity and heat.

Note:

The thermo-chemical conversion process to produce bio-oil that takes place in the absence of oxygen is generally referred to as pyrolysis.

Equipment that produces bio-oil remains eligible if the bio-oil is sold to another person who uses it for the designated purposes.

The terms bio-oil, wood waste and plant residue are defined in subsection 1104(13) of the Regulations and in the Glossary of Terms found in Section 3.0 of this Guide.

2.12.2 ELIGIBLE PROPERTIES

Eligible properties for systems that convert biomass into bio-oil include the following:

- feedstock pre-processing equipment (e.g., shredders, hoggers);
- pyrolysis reactor;
- recycled gas or char burners to provide heat to a pyrolysis reactor or a fluidizing medium;
- pyrolysis gas cleaning equipment (e.g., cyclones, char collectors);
- pyrolysis gas quench system;
- bio-oil storage tank;

and

- related equipment (e.g., controls, instrumentation, pumps, blowers, process piping, ash removal piping and metal exhaust stacks).

2.12.3 INELIGIBLE PROPERTIES

Ineligible properties for systems that convert biomass into bio-oil include the following:

- buildings and other structures;
- equipment used for the collection, storage or transportation of wood waste or plant residue;
- vehicles;
- telephone and related equipment;
- condensers or heat rejection equipment;

and

- access roads, sidewalks, parking areas and similar surface construction.

PROTECTED-B
(when completed)

2.12.4 APPLICATION FOR TECHNICAL OPINION WITH RESPECT TO CLASS 43.1 OR 43.2 ELIGIBILITY OF A SYSTEM TO CONVERT BIOMASS INTO BIO-OIL

FORM 2.12 Details of Project to Convert Biomass to Bio-Oil

Company Information

Company Name

Company Address

Class 43.1 or 43.2 Property Address | Activity at this Location

Company Liaison for this Request | Title | Telephone Number

Company Technical Contact | Title | Telephone Number

Status of Project

☐ Installed Equipment or Completed Project ☐ Potential Project

Project Cost and Completion Date

Estimated Total Capitalized Cost of Project: $_____

Estimated Portion of Total Capitalized Cost Eligible Under Class 43.1 or 43.2: $_____

Estimated Project Completion Date (yyyy/mm/dd): _____

Eligible Property Description

For property that is proposed for inclusion in Class 43.1 or 43.2, attach the following information:

- A list including: 1) reference no., 2) item description, 3) name of manufacturer, 4) date of acquisition and 5) notes.
- A simple sketch or process flow diagram of the system or equipment and a process narrative.
- A completed Schedule A as per the following page.

Were any components used previously? Yes ☐ No ☐

If "Yes", provide details on a separate sheet.

Certification

I certify that the information provided in this application is true.

Dated at_____on_____

_____

Signature of owner, partner or authorized officer

_____

Name and title in block letters

Corporate Seal of Applicant

SCHEDULE 2.12–A Configuration of Proposed System to Convert Biomass to Bio-Oil

(i) Material (biomass) used for the production of bio-oil:

Material	% of Total	Annual Consumption
☐ Wood Waste		
☐ Plant Residue		

(ii) Indicate the source of the biomass used for bio-oil production:

(iii) Indicate how the biomass will be received, stored and handled:

(iv) Indicate how the feedstock will be prepared for bio-oil production:

(v) Estimate the annual production of bio-oil:

(vi) Indicate if the bio-oil will be used by the producer of the bio-oil or if it will be sold to a third party:

(vii) Indicate which of the following the bio-oil will be used to produce:

- ☐ Heat
- ☐ Electricity
- ☐ Electricity and heat

(viii) Indicate the planned electrical generating capacity (if applicable): _____ MW

(ix) Indicate how the heat (if applicable) will be produced and whether it will be used in a greenhouse or in an industrial process. If it will be used in an industrial process, indicate the nature of the process:

2.12.5 CAPITAL COSTS TYPICALLY INCLUDED IN CLASS 43.1 OR 43.2

Project Cost Table 2.12 Systems to Convert Biomass into Bio-Oil

	Typical Capital Cost
1	Construction of working platforms that are not an integral part of a building or other structure.
2	Purchase and installation of compressed air system for equipment controls and instrumentation including compressor, dryer, controls and instrumentation.
3	Purchase and installation of biomass (i.e., wood waste or plant residue) feedstock pre-processing equipment (e.g., shredders and hoggers).
4	Purchase and installation of bio-oil reactor vessel (e.g., fluidized bed reactor for pyrolysis) with wood waste or plant residue feed system.
5	Purchase and installation of recycle gas or char burner to supply heat to bio-oil reactor or a fluidizing medium.
6	Purchase and installation of pyrolysis gas cleaning equipment (e.g., cyclones and char collectors)
7	Purchase and installation of pyrolysis gas quenching system.
8	Purchase and installation of bio-oil storage equipment.
9	Purchase and installation of related equipment (e.g., controls, instrumentation, pumps, blowers, heat exchangers and process piping).

2.12.6 SCHEMATICS OF QUALIFYING SYSTEMS

A typical configuration of components to produce bio-oil that would qualify as a system to convert biomass into bio-oil is shown in the schematic below.

2.12.6.1 Key to Notes on Schematic of Systems to Convert Biomass into Bio-Oil

BOS-1 For eligible properties, see Section 2.12.2 of this Guide.

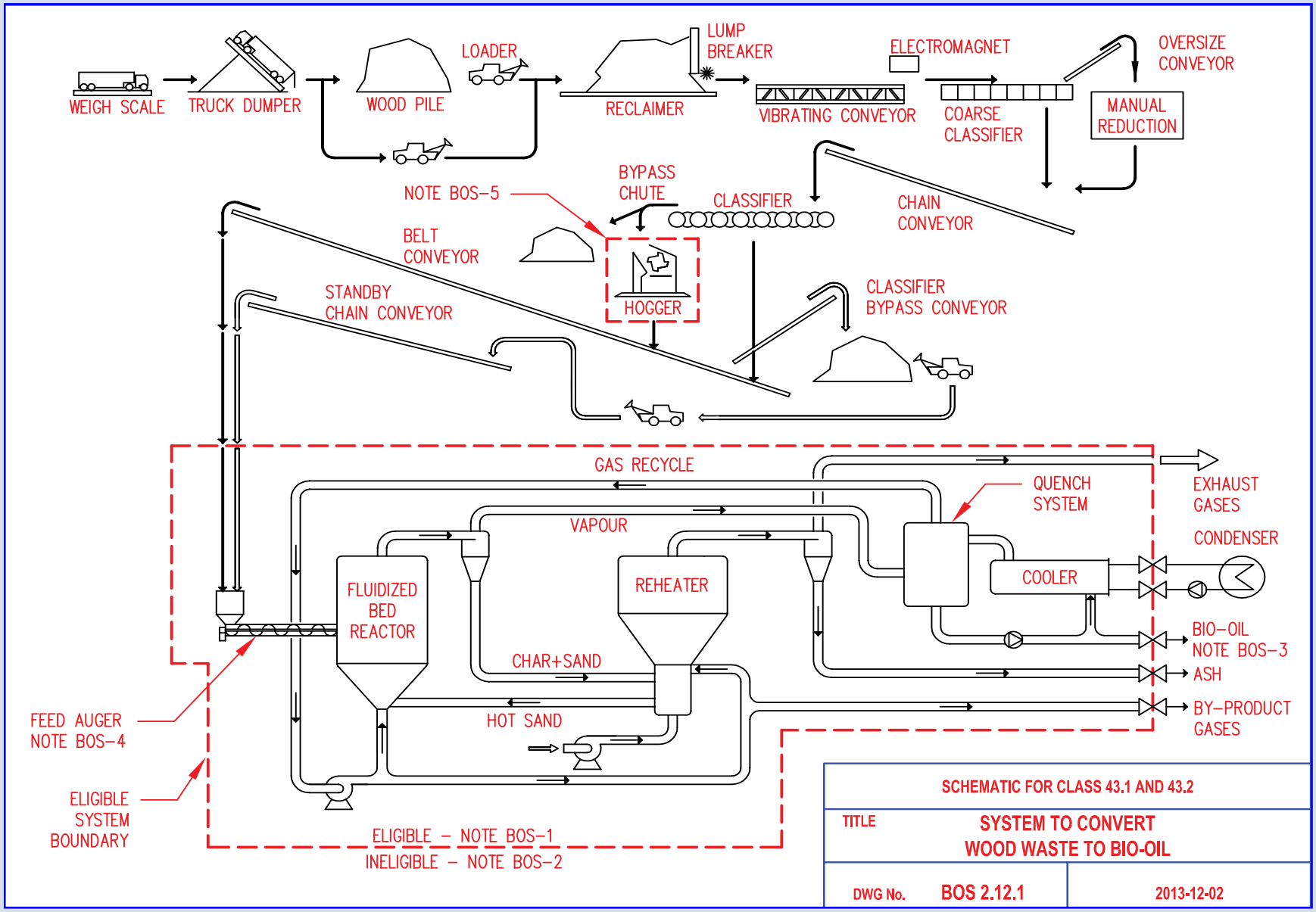
BOS-2 For ineligible properties, see Section 2.12.3 of this Guide.

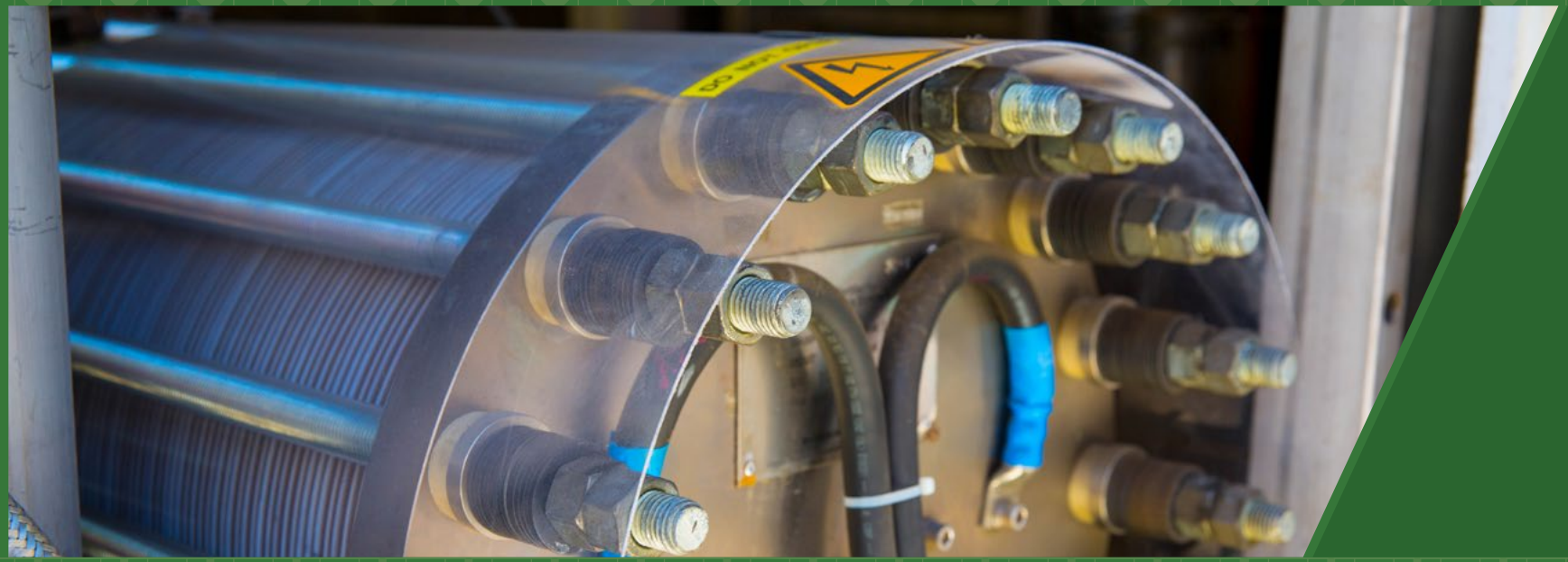
BOS-3 Equipment used in a system to convert biomass to bio-oil is eligible only if the bio-oil produced is used primarily for the purpose of generating heat that is used directly in an industrial process or a greenhouse, generating electricity or generating electricity and heat.

BOS-4 The equipment used in a system to produce bio-oil is eligible only if it converts wood waste or plant residues, both of which are defined in subsection 1104(13) of the Regulations, into bio-oil in a thermo-chemical conversion process that takes place in the absence of oxygen. Equipment used for the collection, storage or transportation of wood waste or plant residue is not an eligible component of such systems.

BOS-5 Equipment (e.g., shredders or hoggers) used in a system to produce bio-oil that pre-processes the feedstock (wood waste or plant residue) by reducing particle size is eligible.

BOS 2.12.1 System to Convert Wood Waste to Bio-Oil





2.13 Fixed Location Fuel Cell Equipment

CONTENTS

SCHEMATICS

2.13.1 FIXED LOCATION FUEL CELL EQUIPMENT

Fixed location fuel cell equipment includes property used to generate electrical energy or electrical energy and heat from hydrogen by the electrochemical reaction of hydrogen and oxygen. Eligible fuel cell equipment uses oxygen in air and hydrogen generated from

- fossil fuels or eligible waste fuels by internal or ancillary fuel reformation equipment that is part of an electrical energy generation or cogeneration system (subparagraph (a)(ii.1) of Class 43.1);

or

- water by ancillary electrolysis equipment (or the fuel cell itself if the fuel cell is reversible) that uses electrical energy, all or substantially all of which is generated from photovoltaic, wind energy conversion, geothermal or hydro-electric equipment (subparagraph (d)(xii) of Class 43.1).

Note:

Fixed location fuel cell equipment that uses hydrogen generated from fossil fuels must meet the heat rate requirements of Class 43.1 or 43.2 as explained in Section 2.1.5 of this Guide.

2.13.2 ELIGIBLE PROPERTIES

Eligible properties for fixed location fuel cell equipment include the following:

- fuel cells;
- fuel reformation equipment (internal or ancillary) or ancillary electrolysis equipment, as the case may be;
- hydrogen storage equipment for hydrogen generated by electrolysis using electrical energy generated by photovoltaic, wind energy conversion, geothermal or hydro-electric equipment;
- inverters and electric power conditioning equipment;

and

- ancillary controls and instrumentation, water treatment equipment, water conditioning equipment and equipment used to supply air to the fuel cell.

Note: Fixed location fuel cell equipment included in Class 43.1 or 43.2 is an eligible source of electrical energy for electrical energy storage equipment (see section 2.19).

2.13.3 INELIGIBLE PROPERTIES

Ineligible properties for fixed location fuel cell equipment include the following:

- buildings or other structures (e.g., platforms that do not primarily serve eligible properties and are not an integral part of a qualifying system);
- transmission and distribution equipment;

and

- in the case of fuel cell systems fuelled by fossil fuels or eligible waste fuels;
  - heat rejection equipment (e.g. condensers and cooling water systems);
  - fuel storage facilities;

  and
  - fuel-handling equipment that does not upgrade the combustible portion of fuel;

or

- in the case of fuel cell systems that use hydrogen generated from renewable electricity sources (e.g., electrical energy generated by photovoltaic, wind energy conversion, geothermal or hydro-electric equipment),
  - auxiliary electrical generating equipment;
  - vehicles;
  - telephone and related equipment;

  and
  - access roads, sidewalks, parking areas and other similar surface construction.

2.13.4 APPLICATION FOR TECHNICAL OPINION WITH RESPECT TO CLASS 43.1 OR 43.2 ELIGIBILITY OF FIXED LOCATION FUEL CELL EQUIPMENT

FORM 2.13 Details of Fixed Location Fuel Cell Project

Company Information

Company Name

Company Address

Class 43.1 or 43.2 Property Address | Activity at this Location

Company Liaison for this Request | Title | Telephone Number

Company Technical Contact | Title | Telephone Number

Status of Project

☐ Installed Equipment or Completed Project ☐ Potential Project

Project Cost and Completion Date

Estimated Total Capitalized Cost of Project: $_____

Estimated Portion of Total Capitalized Cost Eligible Under Class 43.1 or 43.2: $_____

Estimated Project Completion Date (yyyy/mm/dd): _____

Eligible Property Description

For property that is proposed for inclusion in Class 43.1 or 43.2, attach the following information:

- A list including: 1) reference no., 2) item description, 3) name of manufacturer, 4) date of acquisition and 5) notes.
- A simple sketch or process flow diagram of the system or equipment and a process narrative.
- A completed Schedule A as per the following page.

Were any components used previously? Yes ☐ No ☐

If "Yes", provide details on a separate sheet.

Certification

I certify that the information provided in this application is true.

Dated at_____on_____

_____

Signature of owner, partner or authorized officer

_____

Name and title in block letters

Corporate Seal of Applicant

SCHEDULE 2.13-A Configuration of Proposed Fixed Location Fuel Cell Equipment

(i) Indicate the peak electrical generation capacity of the system: _____kW

(ii) Indicate type of fuel cell:

- ☐ Molten Carbonate (MCFC)
- ☐ Proton Exchange Membrane (PEMFC)
- ☐ Alkaline (AFC)
- ☐ Phosphoric Acid (PAFC)
- ☐ Solid Oxide (SOFC)
- ☐ Other (specify) _____

(iii) If the fuel cell uses hydrogen, indicate how the hydrogen is generated:

- ☐ Fuel reformation equipment
- ☐ Electrolysis equipment
- ☐ Fuel cell itself (i.e., Reversible fuel cell)
- ☐ Other (specify) _____

(iv) If a reformer is used, indicate the following:

a) Location of reformer relative to the fuel cell:

- ☐ Internal
- ☐ External and connected (ancillary)
- ☐ Remote (explain) _____

b) Type of reforming used:

- ☐ Steam Reforming
- ☐ Partial Oxidation Reforming
- ☐ Auto-Thermal Reforming
- ☐ Other (specify) _____

(v) If ancillary electrolysis equipment is used, indicate the following:

a) Type of electrolysis equipment:

- ☐ Conventional electrolysis
- ☐ Pressurized electrolysis
- ☐ High-temperature electrolysis
- ☐ Other (specify) _____

b) Type of equipment used to generate electrical energy for electrolysis:

- ☐ Photovoltaic
- ☐ Wind energy conversion
- ☐ Geothermal
- ☐ Hydro-electric
- ☐ Other (specify) _____

c) Is the electrical generation equipment indicated in paragraph (v)(b) above owned by the applicant or a lessee of the applicant?

- ☐ Yes
- ☐ No

(vi) If the fuel cell system consumes fossil fuel, indicate the following:

a) Type and quantity of fossil fuel consumed per year (specify units):

Type of Fossil Fuel	Annual Consumption	Energy Content (HHV basis)

b) Type and quantity of other fuel used per year (specify units);

Type of Other Fuel	Annual Consumption	Energy Content (HHV basis)

(vii) Show your calculations and explain the basis for meeting the heat rate[1] required in Class 43.1 or Class 43.2 (the total fossil energy consumed for the generation of electricity on an annual basis must not exceed 6330 kJ/kWh [6,000 BTU/kWh] for Class 43.1 or 5010 kJ/kWh [4,750 BTU/kWh] for Class 43.2):

(Attach additional pages if necessary.)

1 The heat rate requirements for cogeneration systems in the Class 43.1 and 43.2 do not apply to fuel cell systems that use only hydrogen produced by ancillary electrolysis equipment (or the fuel cell itself, if the fuel cell is reversible) if the electrolysis equipment is powered by electricity that is generated from photovoltaic, wind energy conversion or hydro-electric equipment owned by the applicant or a lessee of the applicant.

2.13.5 CAPITAL COSTS TYPICALLY INCLUDED IN CLASS 43.1 OR 43.2

Project Cost Table 2.13 Fixed Location Fuel Cell Equipment

Fuel Cell Equipment that Consumes Fossil Fuel or Eligible Waste Fuel

	Typical Capital Cost
1	Purchase and installation of fuel gasification equipment if required.
2	Purchase and installation of equipment to upgrade the combustible portion of the fuel (i.e., to remove contaminants and components that cannot be reformed to hydrogen and carbon dioxide).
3	Purchase and installation of fuel compression equipment.
4	Purchase and installation of fuel reformation equipment.
5	Purchase and installation of related water treatment and water conditioning equipment.
6	Purchase and installation of fuel cell equipment (with or without internal fuel reformation equipment) and ancillary equipment such as controls and instrumentation.
7	Purchase and installation of air compression equipment to supply air to the fuel cell.
8	Purchase and installation of pre-heaters to preheat fuel and air entering the fuel cell with heat in the fuel cell exhaust.
9	Purchase and installation of inverters and electric power conditioning equipment.
10	Purchase and installation of electric power transformer(s).

Fuel Cell Equipment that Consumes only Hydrogen Produced by Electrolysis of Water with Electricity Generated by Wind Energy Conversion, Photovoltaic or Hydro-Electric Equipment

	Typical Capital Cost
1	Purchase and installation of electrolysis equipment to produce hydrogen from water using only electricity generated by wind energy conversion, photovoltaic or hydro-electric equipment.
2	Purchase and installation of related water treatment and water conditioning equipment.
3	Purchase and installation of hydrogen compression equipment.
4	Purchase and installation of pressurized hydrogen storage equipment.
5	Purchase and installation of air compression equipment to supply air to the fuel cell.
6	Purchase and installation of a hydrogen decompressor if required.
7	Purchase and installation of fuel cell module or reversible fuel cell module and ancillary equipment such as controls and instrumentation.
8	Purchase and installation of inverters and electric power conditioning equipment.
9	Purchase and installation of electric power transformer(s).

2.13.6 SCHEMATICS OF QUALIFYING EQUIPMENT

Typical configurations of fuel cell systems that would qualify as fixed location fuel cell equipment are shown in the schematics below.

2.13.6.1 Key to Notes on Schematics of Fixed Location Fuel Cell Equipment

FCE-1 For eligible properties, see Section 2.13.2 of this Guide.

FCE-2 For ineligible properties, see Section 2.13.3 of this Guide.

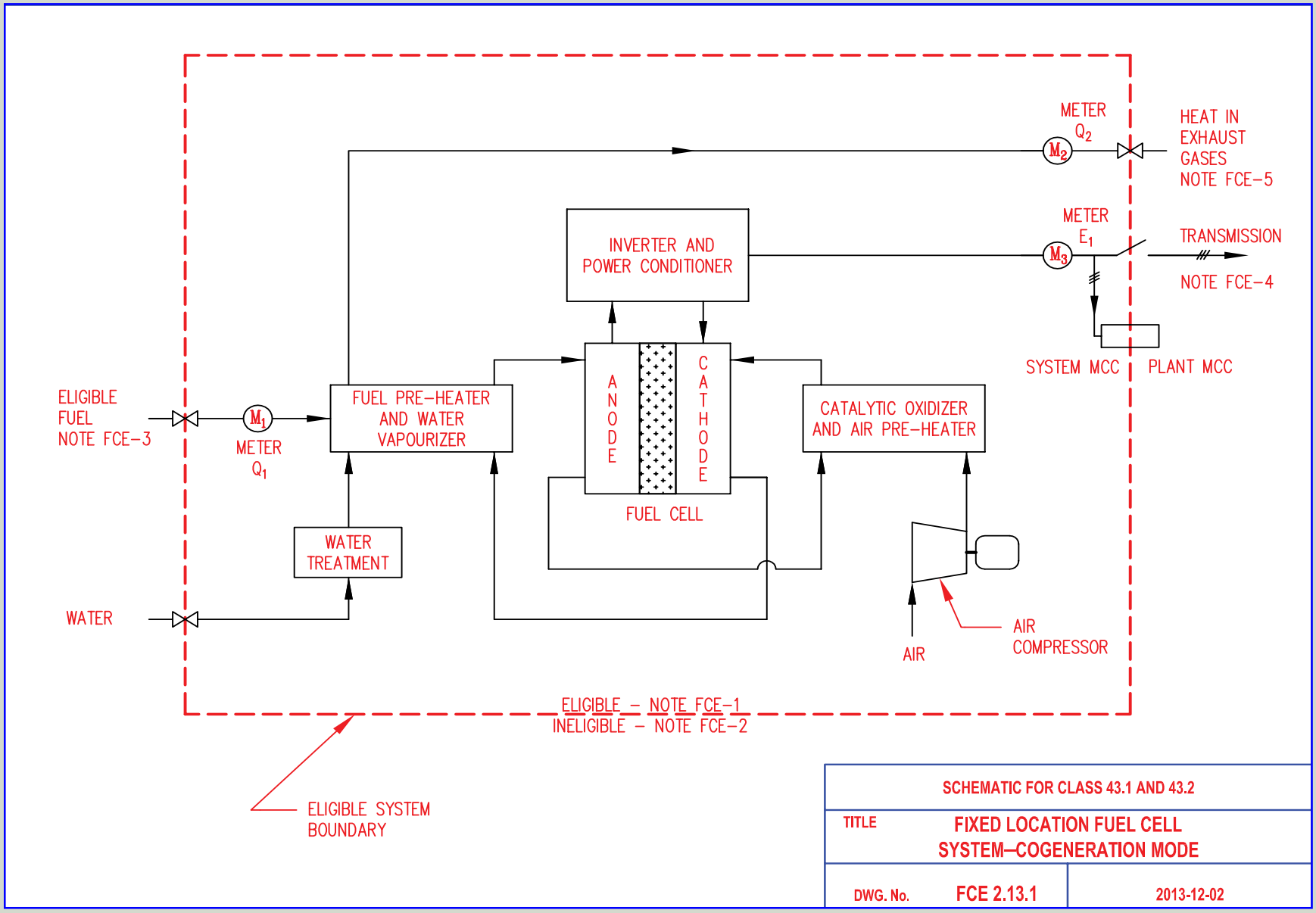
FCE-3 Eligible fuels for fuel cell systems include fossil fuels and eligible waste fuels as defined in subsection 1104(13) in the Regulations (see Section 3.0 of this Guide). Fuel cell systems that consume hydrogen derived from eligible fuels are considered to be cogeneration systems. The equipment in a cogeneration system must meet the heat rate requirements of Class 43.1 or 43.2 for the cost of the equipment to be included in Class 43.1 or 43.2. See Section 2.1.5 of this Guide for information on the heat rate requirements for Class 43.1 or 43.2 and the method for calculating heat rate.

FCE-4 Eligible electrical energy generation property includes generators and equipment used at the first level of power transformation. The first level of transformation includes equipment used for phase synchronization and voltage regulation. After the first level of transformation, generation stops, and the electricity is ready for use (e.g., ready to be put on transmission lines). Typically, the eligible system boundary for electrical energy generation equipment is located after the first level of transformation at isolation switches that allow a utility to lock out a generating plant's power production.

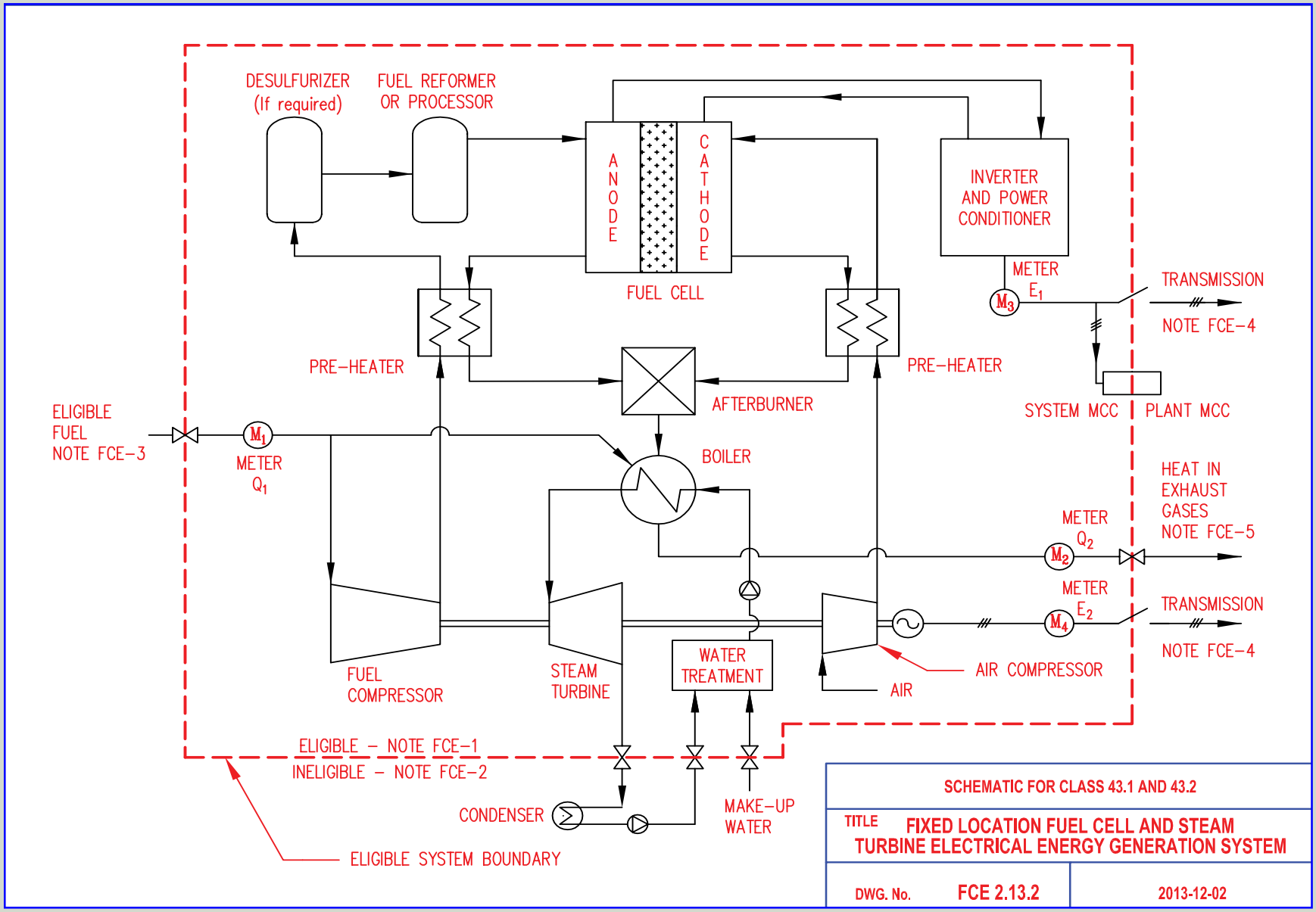
FCE-5 The eligible portion of a heat distribution pipeline system includes piping from the eligible heat generating equipment to the main shut-off valve, interface with the end-use system or change in ownership of the pipeline, whichever is first.

FCE-6 Fixed location fuel cell equipment that uses hydrogen generated only by ancillary electrolysis equipment using electricity that is generated by photovoltaic, wind energy conversion, geothermal or hydro-electric equipment does not have to meet the heat rate requirements as explained in Section 2.1.5 of this Guide for the cost of the equipment to be eligible for inclusion in Class 43.1 or 43.2.

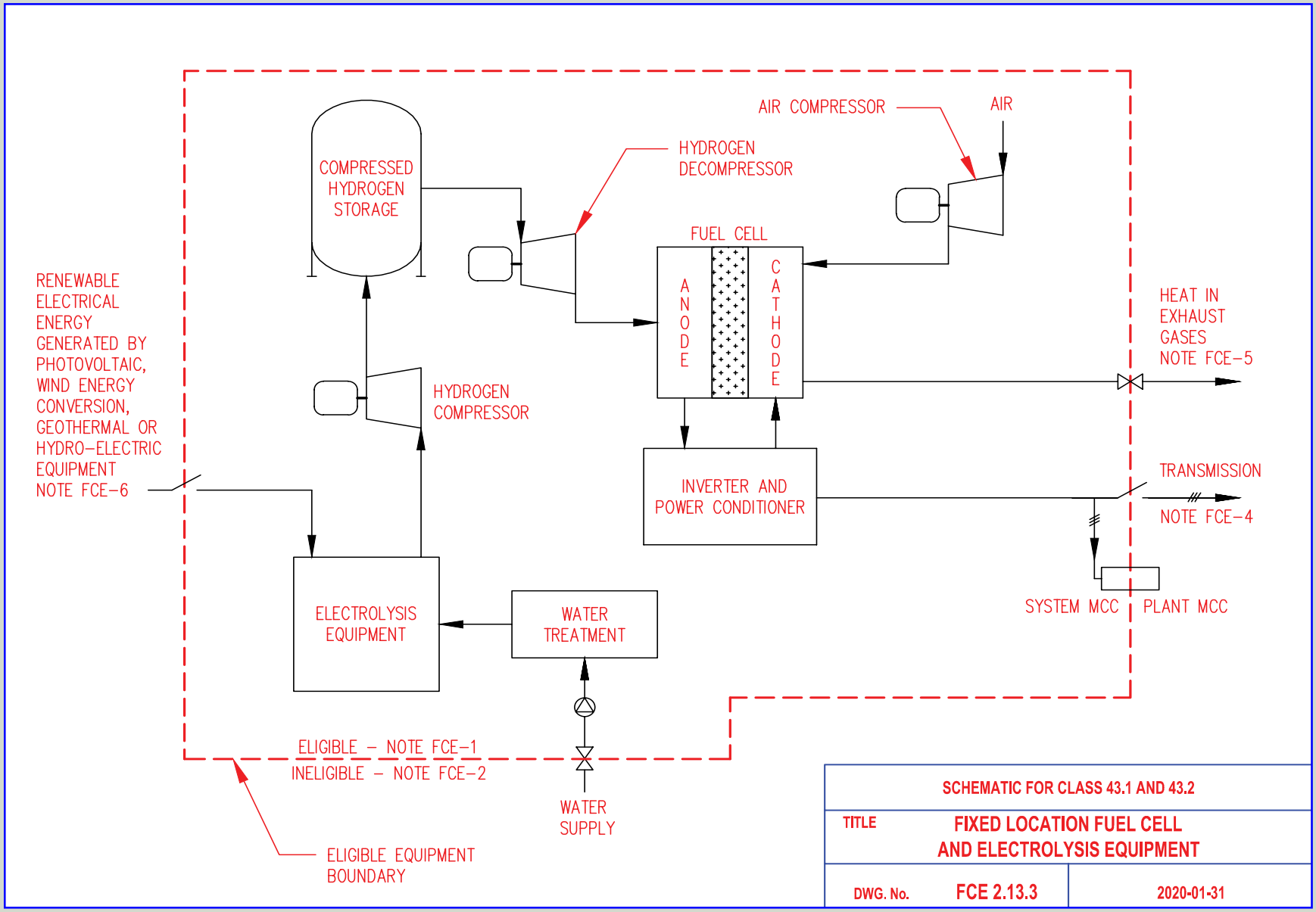
FCE 2.13.1 Fixed Location Fuel Cell System—Cogeneration Mode



FCE 2.13.2 Fixed Location Fuel Cell System and Steam Turbine Electrical Energy Generation System



FCE 2.13.3 Fixed Location Fuel Cell and Electrolysis Equipment



2.14 Systems to Produce Biogas by Anaerobic Digestion

CONTENTS

SCHEMATICS

2.14.1 SYSTEMS TO PRODUCE BIOGAS BY ANAEROBIC DIGESTION

Systems that produce biogas by anaerobic digestion (described in subparagraph (d)(xiii) of Class 43.1) include equipment that is part of a system that is used primarily to produce and store biogas.

Note:

Eligible substrates for biogas production include organic waste that is food and animal waste, manure, plant residue, pulp and paper by-product, separated organics, wood waste or sludge from an eligible sewage treatment facility.

Biogas and what constitutes the eligible substrates for biogas production are defined in subsection 1104(13) of the Regulations and in the Glossary of Terms found in Section 3.0 of this Guide.

2.14.2 ELIGIBLE PROPERTIES

Eligible properties for a system that produces biogas by anaerobic digestion include the following:

- anaerobic digester reactors;
- buffer tanks;
- pre-treatment tanks and equipment;
- biogas piping;
- fans, compressors and heat exchangers;
- biogas storage tanks;

and

- equipment used to remove contaminants and non-combustibles from the gas

2.14.3 INELIGIBLE PROPERTIES

Ineligible properties for a system that produces biogas by anaerobic digestion include the following:

- buildings or other structures;
- property (other than a buffer tank) used to collect, store or move organic waste to the system;
- equipment used to process the residue after digestion or to treat recovered liquids;
- biogas flares;
- equipment for odour management;
- vehicles;
- telephone and related equipment;

and

- access roads, sidewalks, parking areas and other similar surface construction.

2.14.4 APPLICATION FOR TECHNICAL OPINION WITH RESPECT TO CLASS 43.1 OR 43.2 ELIGIBILITY OF A SYSTEM TO PRODUCE BIOGAS BY ANAEROBIC DIGESTION

FORM 2.14 Details of Project to Produce Biogas by Anaerobic Digestion

Company Information

Company Name

Company Address

Class 43.1 or 43.2 Property Address Activity at this Location

Company Liaison for this Request Title Telephone Number

Company Technical Contact Title Telephone Number

Status of Project

☐ Installed Equipment or Completed Project ☐ Potential Project

Project Cost and Completion Date

Estimated Total Capitalized Cost of Project: $_____

Estimated Portion of Total Capitalized Cost Eligible Under Class 43.1 or 43.2: $_____

Estimated Project Completion Date (yyyy/mm/dd): _____

Eligible Property Description

For property that is proposed for inclusion in Class 43.1 or 43.2, attach the following information:

- A list including: 1) reference no., 2) item description, 3) name of manufacturer, 4) date of acquisition and 5) notes.
- A simple sketch or process flow diagram of the system or equipment and a process narrative.
- A completed Schedule A as per the following page.

Were any components used previously? Yes ☐ No ☐

If "Yes", provide details on a separate sheet.

Certification

I certify that the information provided in this application is true.

Dated at_____on_____

_____

Signature of owner, partner or authorized officer

_____

Name and title in block letters

Corporate Seal of Applicant

SCHEDULE 2.14–A Configuration of Proposed System to Produce Biogas by Anaerobic Digestion

(i) Indicate the type of anaerobic digestion system:

- ☐ Completely Mixed
- ☐ Plug Flow
- ☐ Other (specify) _____

(ii) Indicate the temperature range for the anaerobic digestion system:

- ☐ Thermophylic (50 to 60 °C [122 to 140 °F])
- ☐ Mesophylic (30 to 38 °C [86 to 100 °F])
- ☐ Psychrophylic (15 to 25 °C [59 to 77 °F])

(iii) Indicate the type and quantity (specify units) of each substrate processed per year and the days of storage capacity of the buffer tank(s) for each substrate:

Type of Substrate	Annual Consumption	Buffer Tank Capacity (days)

(iv) Indicate what pre-treatment will be done prior to adding the substrates to the anaerobic digester reactor:

_____

_____

(v) Describe the type of biogas scrubbing equipment that will be used to clean the biogas:

_____

_____

(vi) Describe the equipment that will be used to process the residue after digestion or to treat the recovered liquids:

_____

_____

(vii) Describe the equipment that will be used to control odours:

_____

_____

(viii) Indicate how the biogas will be used:

_____

_____

2.14.5 CAPITAL COSTS TYPICALLY INCLUDED IN CLASS 43.1 OR 43.2

Project Cost Table 2.14 Systems to Produce Biogas by Anaerobic Digestion

	Typical Capital Cost
1	Purchase and installation of buffer tank(s) for short-term storage of substrates prior to anaerobic digestion.
2	Purchase and installation of tanks for mixing and pre-treatment (e.g., thermal, chemical, mechanical, ultrasonic, electron beam or biological pre-treatment) of substrates prior to anaerobic digestion.
3	Purchase and installation of an anaerobic digester reactor.
4	Purchase and installation of equipment to remove non-combustibles and contaminants (e.g., heat exchangers, scrubbing, stripping, pressure swing absorption, gas compression, gas cooling, moisture separation and particulate filtration equipment).
5	Purchase and installation of clean gas compression equipment.
6	Purchase and installation of biogas storage equipment.
7	Purchase and installation of biogas piping.

2.14.6 SCHEMATICS OF QUALIFYING SYSTEMS

A typical configuration of components to produce biogas that would qualify as a system to produce biogas by anaerobic digestion is shown in the schematic below.

2.14.6.1 Key to Notes on Schematic for Systems to Produce Biogas by Anaerobic Digestion

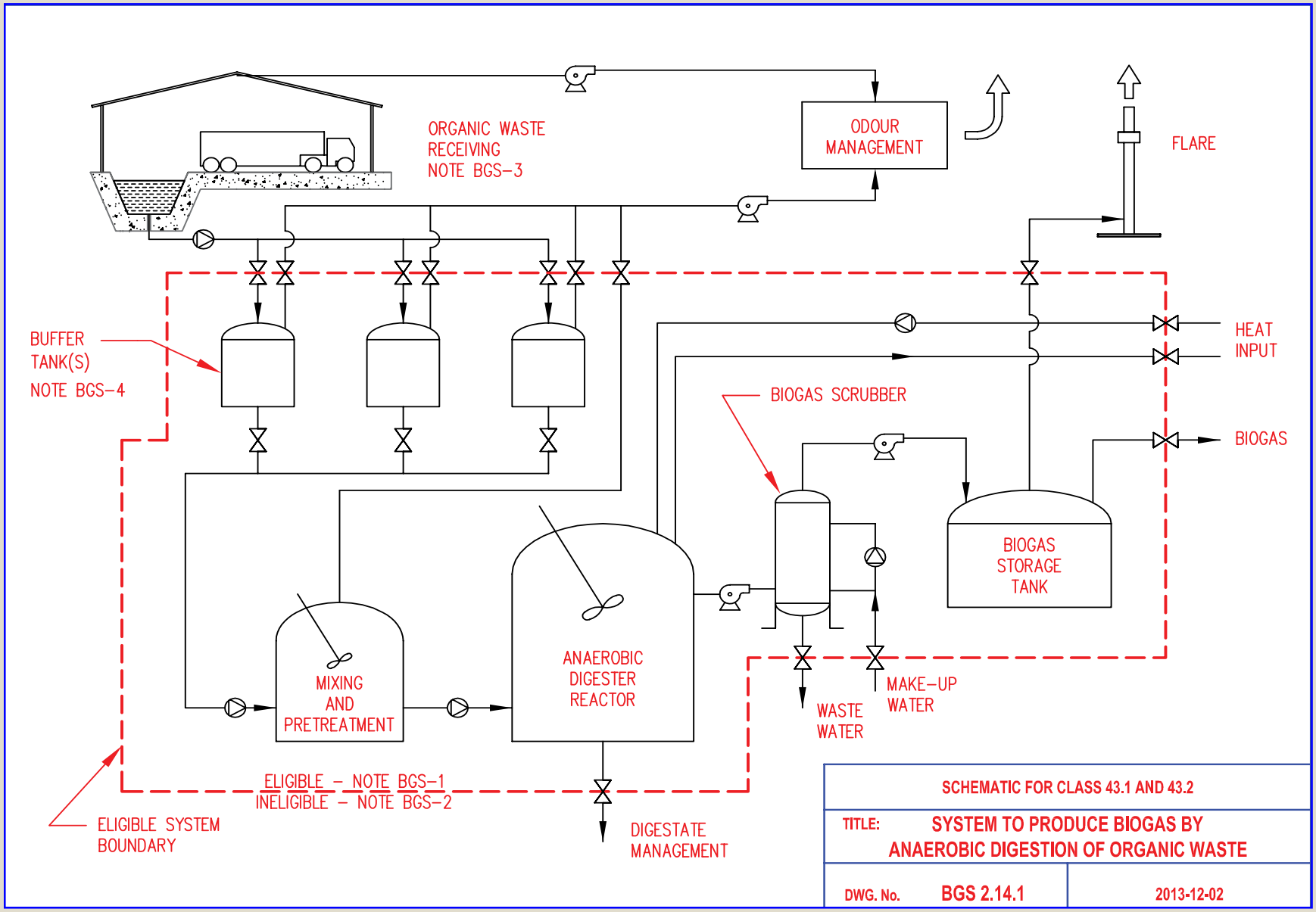
BGS-1 For eligible properties, see Section 2.14.2 of this Guide.

BGS-2 For ineligible properties, see Section 2.14.3 of this Guide.

BGS-3 Biogas production systems are eligible only if they use the organic waste materials that are set out in the definition of biogas in subsection 1104(13) of the Regulations (see Section 3.0 of this Guide).

BGS-4 Organic waste holding tanks qualify as buffer tanks if they are designed and used for short-term storage (e.g., less than two weeks) of organic waste prior to digestion. Storage tanks designed and used to store organic waste for more than two weeks (e.g., liquid manure storage tanks on farms) are not considered to be buffer tanks.

BGS 2.14.1 System to Produce Biogas by Anaerobic Digestion of Organic Waste



2.15 Water-Current, Tidal or Wave Energy Equipment

CONTENTS

SCHEMATICS

2.15.1 WATER-CURRENT, TIDAL OR WAVE ENERGY EQUIPMENT

Water-current, tidal or wave energy equipment (described in subparagraph (d)(xiv) of Class 43.1) includes equipment that is used primarily for the purpose of generating electrical energy from the kinetic energy of flowing water, tidal currents or wave energy (otherwise than by diverting or impeding the natural flow of the water or using physical barriers or dam-like structures).

2.15.2 ELIGIBLE PROPERTIES

Eligible properties for water-current, tidal or wave energy equipment include the following:

- support structures (e.g., mooring equipment, anchors, foundations and cable supports);
- water-current, tidal or wave energy conversion equipment;
- electrical energy generation equipment;
- electric power conditioning equipment (e.g., AC/DC converters, DC/DC step-up and step-down converters and inverters);
- control equipment (e.g., conversion equipment control, power control and SCADA equipment);
- submerged cables and undersea collector hubs;

and

- transmission equipment.

Note: Water-current, tidal or wave energy equipment included in Class 43.1 or 43.2 is an eligible source of electrical energy for electrical energy storage equipment (see section 2.19).

2.15.3 INELIGIBLE PROPERTIES

Ineligible properties for water-current, tidal or wave energy equipment include the following:

- equipment that generates electrical energy by diverting or impeding the natural flow of the water or using physical barriers (e.g., barrages) or dam-like structures;
- buildings;
- distribution equipment;
- auxiliary electricity generating equipment;
- vehicles;
- telephone and related equipment;

and

- access roads, sidewalks, parking areas and other similar surface construction.

2.15.4 APPLICATION FOR TECHNICAL OPINION WITH RESPECT TO CLASS 43.1 OR 43.2 ELIGIBILITY OF WATER-CURRENT, TIDAL OR WAVE ENERGY EQUIPMENT

FORM 2.15 Details of Water-Current, Tidal or Wave Energy Project

Company Information

Company Name

Company Address

Class 43.1 or 43.2 Property Address | Activity at this Location

Company Liaison for this Request | Title | Telephone Number

Company Technical Contact | Title | Telephone Number

Status of Project

☐ Installed Equipment or Completed Project ☐ Potential Project

Project Cost and Completion Date

Estimated Total Capitalized Cost of Project: $_____

Estimated Portion of Total Capitalized Cost Eligible Under Class 43.1 or 43.2: $_____

Estimated Project Completion Date (yyyy/mm/dd): _____

Eligible Property Description

For property that is proposed for inclusion in Class 43.1 or 43.2, attach the following information:

- A list including: 1) reference no., 2) item description, 3) name of manufacturer, 4) date of acquisition and 5) notes.
- A simple sketch or process flow diagram of the system or equipment and a process narrative.
- A completed Schedule A or B as per the following pages as appropriate.

Were any components used previously? Yes ☐ No ☐

If "Yes", provide details on a separate sheet.

Certification

I certify that the information provided in this application is true.

Dated at_____on_____

_____

Signature of owner, partner or authorized officer

_____

Name and title in block letters

Corporate Seal of Applicant

SCHEDULE 2.15–A Configuration of Proposed Water-Current or Tidal Energy Equipment

(i) Indicate type of water-current or tidal energy conversion equipment and describe where it is situated and how it is supported (e.g., floating, submerged, anchored to bottom, anchored to shore, on foundations, etc.)

☐ Horizontal axis turbine _____

☐ Vertical axis turbine _____

☐ Other (specify) _____

(ii) Indicate the number of water-current or tidal energy conversion devices in the project and the sum of the rated generation capacity of all devices in the project:

Number of Devices: _____

Sum of Rated Capacity of all Devices in Project: _____

(iii) Indicate the coordinates of each water-current or tidal energy conversion device in the project (add sheets if necessary):

No.	Name of Device	Latitude	Longitude

(iv) Indicate type of electrical energy generator that is used by the water-current or tidal energy conversion device(s):

_____

_____

_____

(v) Indicate how the electrical energy is transmitted to shore (if applicable):

_____

_____

_____

(vi) Indicate the configuration of power conditioning and battery storage equipment (if applicable) used on shore:

_____

_____

_____

(vii) Indicate how the project is interconnected to an electrical grid or an end-user of the electricity:

_____

_____

SCHEDULE 2.15–B Configuration of Proposed Wave Energy Equipment

(i) Indicate type of tidal energy conversion equipment and describe where it is situated and how it is supported (e.g., onshore, offshore, floating, submerged, anchored to bottom, anchored to shore, on foundations, etc.)

☐ Oscillating Water Column _____

☐ Oscillating Body _____

☐ Overtopping Device _____

☐ Other (specify) _____

(ii) Indicate the number of tidal energy conversion devices in the project and the sum of the rated generation capacity of all devices in the project:

Number of Devices _____

Sum of Rated Capacity of all Devices in Project _____ kW

(iii) Indicate the coordinates of each tidal energy conversion device in the project (add sheets if necessary):

No.	Name of Device	Latitude	Longitude

(iv) Indicate type of electrical energy generator that is used by the tidal energy conversion device(s):

_____

_____

_____

(v) Indicate how the electrical energy is transmitted to shore (if applicable):

_____

_____

_____

(vi) Indicate the configuration of power conditioning and battery storage equipment (if applicable) used on shore:

_____

_____

_____

(vii) Indicate how the project is interconnected to an electrical grid or an end-user of the electrical energy:

_____

_____

2.15.5 CAPITAL COSTS TYPICALLY INCLUDED IN CLASS 43.1 OR 43.2

Project Cost Table 2.15 Water-Current, Wave or Tidal Energy Equipment

	Typical Capital Cost
Water-Current, Tidal or Wave Energy Equipment	
1	Purchase and installation of water-current, tidal or wave energy conversion equipment including support structures or mooring as required.
2	Purchase and installation of electrical energy generation and conversion equipment.
3	Purchase and installation of underwater collector hubs and step-up converters.
4	Purchase and installation of submerged cables.
5	Purchase and installation of onshore power conditioning equipment.
6	Purchase and installation of control equipment (e.g., water-current, tidal or wave energy conversion equipment controls, electric power controls and Supervisory Control and Data Acquisition [SCADA] equipment).
7	Purchase and installation of electrical transmission equipment to transmit electrical energy generated by water-current, tidal or wave energy equipment to a branch of a local electrical grid.

2.15.6 SCHEMATICS OF QUALIFYING EQUIPMENT

Typical configurations of water-current, tidal or wave electrical energy generation equipment that would qualify as water-current, tidal or wave energy equipment are shown in the schematics below.

2.15.6.1 Key to Notes on Schematics for Water-Current, Tidal or Wave Energy Equipment

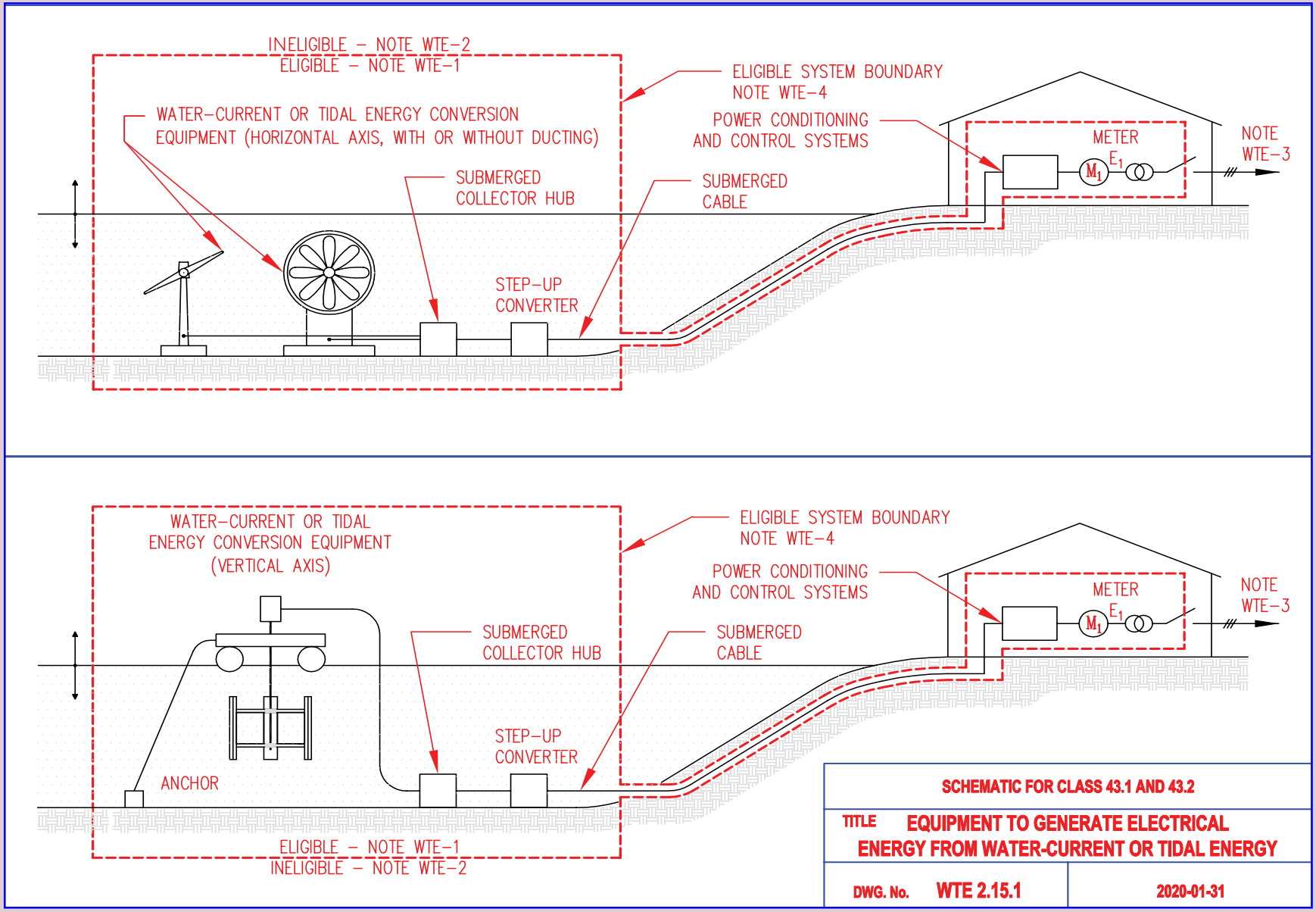
WTE-1 For eligible properties, see Section 2.15.2 of this Guide.

WTE-2 For ineligible properties, see Section 2.15.3 of this Guide.

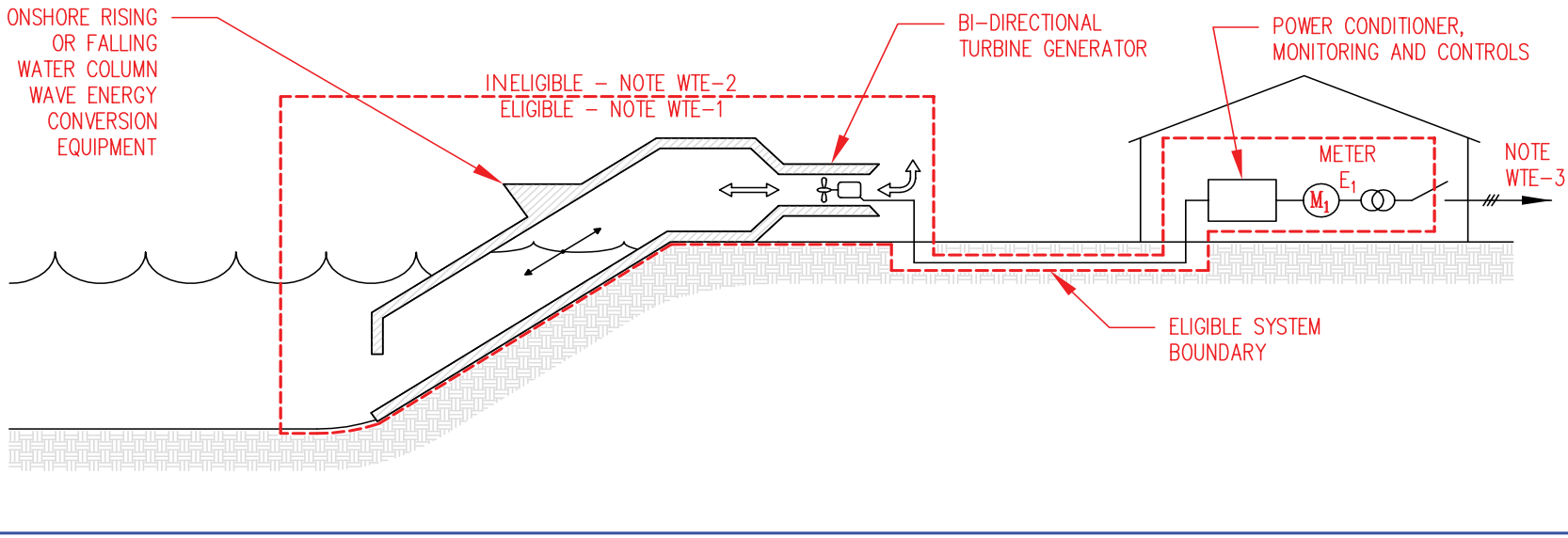
WTE-3 Eligible electrical energy generation property includes generators and equipment used at the first level of power transformation. The first level of transformation includes equipment used for phase synchronization and voltage regulation. After the first level of transformation, generation stops, and the electricity is ready for use (e.g., ready to be put on transmission lines). Typically, the eligible system boundary for electrical energy generation equipment is located after the first level of transformation at isolation switches that allow a utility to lock out a generating plant's power production.

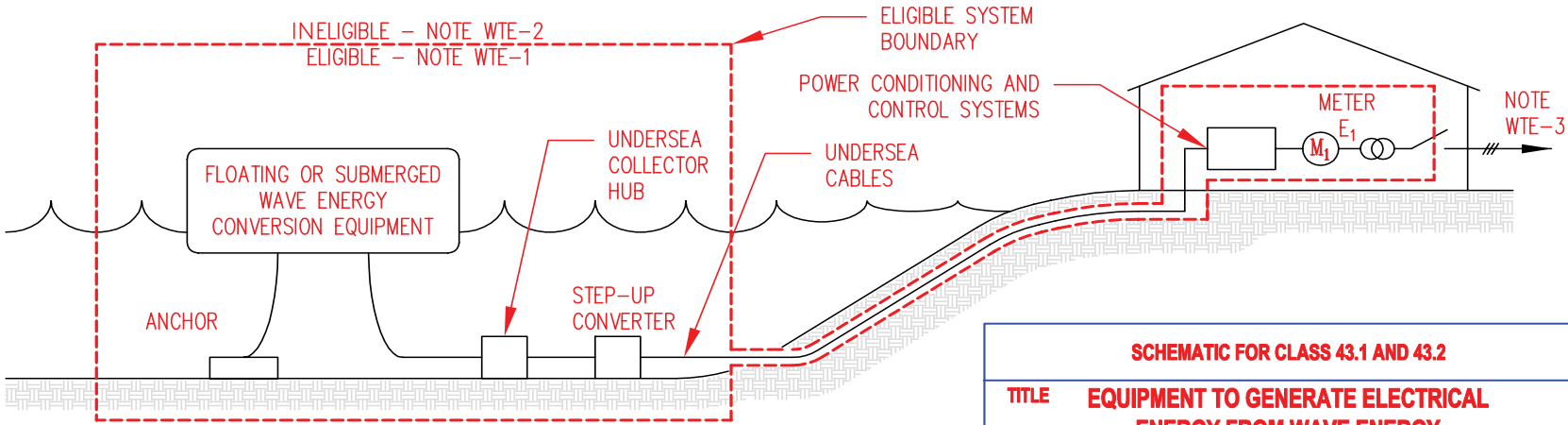
WTE-4 Equipment that generates electricity from water-current, tidal or wave energy by diverting or impeding the natural flow of the water or by using physical barriers or dam-like structures is not eligible.

WTE 2.15.1 Equipment to Generate Electrical Energy from Water-Current or Tidal Energy



WTE 2.15.2 Equipment to Generate Electrical Energy from Wave Energy





SCHEMATIC FOR CLASS 43.1 AND 43.2	
TITLE **EQUIPMENT TO GENERATE ELECTRICAL ENERGY FROM WAVE ENERGY**	
DWG. No. **WTE 2.15.2**	**2020-01-31**

2.16 District Energy Systems/Equipment

CONTENTS

SCHEMATICS

2.16.1 DISTRICT ENERGY SYSTEMS/EQUIPMENT

District energy equipment (described in subparagraphs (a)(iii.1) and (d)(xv) of Class 43.1) includes equipment that is part of a ***district energy system*** that is used primarily to provide heating or cooling from a central thermal energy generation unit to one or more buildings where the thermal energy is primarily generated by the following:

- an eligible cogeneration system (described in subparagraph (c)(i) of Class 43.1);
- active solar heating equipment (described in subclause (d)(i)(A)(I) of Class 43.1);
- a ground-source heat pump system (described in subclause (d)(i)(A)(II) of Class 43.1);
- heat recovery equipment (described in subparagraph (d)(iv) of Class 43.1);
- geothermal energy equipment (described in subparagraph (d)(vii) of Class 43.1);

or

- specified-waste fuelled heat production equipment (described in subparagraph (d)(ix) of Class 43.1).

Note:

A district energy system provides heating or cooling to one or more buildings by continuously circulating, through a system of interconnected pipes, a thermal medium (e.g., water or steam) that is heated or cooled by thermal energy generated at a central generation unit.

District energy system and district energy equipment are defined in subsection 1104(13) of the Regulations and in the Glossary of Terms found in Section 3.0 of this Guide.

2.16.2 ELIGIBLE PROPERTIES

Eligible properties of a qualifying district energy system include the following:

- pipes and pumps used to collect and distribute an energy transfer medium;
- meters;
- control equipment;
- chillers;

and

- heat exchangers (i.e., as part of energy transfer stations) that are attached to the main distribution lines of a qualifying district energy system.

2.16.3 INELIGIBLE PROPERTIES

Properties that may be part of a district energy system but are ineligible under this category include the following:

- buildings or other structures;
- property used to distribute water that is for consumption, disposal or treatment (i.e., wastewater treatment);

and

- property that is part of the internal heating or cooling system of a building.

2.16.4 APPLICATION FOR TECHNICAL OPINION WITH RESPECT TO CLASS 43.1 OR 43.2 ELIGIBILITY OF DISTRICT ENERGY SYSTEMS/EQUIPMENT

FORM 2.16 Details of District Energy Project

Company Information

Company Name

Company Address

Class 43.1 or 43.2 Property Address Activity at this Location

Company Liaison for this Request Title Telephone Number

Company Technical Contact Title Telephone Number

Status of Project

☐ Installed Equipment or Completed Project ☐ Potential Project

Project Cost and Completion Date

Estimated Total Capitalized Cost of Project: $_____

Estimated Portion of Total Capitalized Cost Eligible Under Class 43.1 or 43.2: $_____

Estimated Project Completion Date (yyyy/mm/dd): _____

Eligible Property Description

For property that is proposed for inclusion in Class 43.1 or 43.2, attach the following information:

- A list including: 1) reference no., 2) item description, 3) name of manufacturer, 4) date of acquisition and 5) notes.
- A simple sketch or process flow diagram of the system or equipment and a process narrative.
- A completed Schedule A as per the following page.

Were any components used previously? Yes ☐ No ☐

If "Yes", provide details on a separate sheet.

Certification

I certify that the information provided in this application is true.

Dated at_____on_____

Signature of owner, partner or authorized officer

Name and title in block letters

Corporate Seal of Applicant

SCHEDULE 2.16–A Configuration of Proposed District Energy System

(i) Indicate the type of District Energy System:

- ☐ Direct (connection to customer heating loop)
- ☐ Indirect (connection to customer through an energy transfer heat exchanger)
- ☐ Other (specify) _____

(ii) Indicate the source of energy for the District Energy System:

- ☐ Cogeneration and specified-waste fuelled electrical generation system
- ☐ Active solar heating equipment
- ☐ Ground-source heat pump system
- ☐ Heat recovery equipment
- ☐ Geothermal energy equipment
- ☐ Specified-waste fuelled heat production equipment
- ☐ Other (specify) _____

(iii) Indicate the form of thermal energy distributed:

- ☐ Steam
  - Pressure (leaving central generation unit) _____
  - Temperature (leaving central generation unit) _____
- ☐ Hot Water
  - Supply temperature (at design conditions) _____
  - Return temperature (at design conditions) _____
- ☐ Chilled Water
  - Supply temperature (at design conditions) _____
  - Return temperature (at design conditions) _____
- ☐ Other (specify) _____

(iv) Indicate the type of technology used to recover or generate cool energy (if applicable) for distribution:

- ☐ Absorption chillers (use waste heat as an input energy)
- ☐ Electrically driven chillers
- ☐ Ground-source heat pumps operated in reverse
- ☐ Other (specify) _____

(v) Describe the end-use of the distributed energy (for example: space heating and domestic hot water for large office buildings or steam supply for process heat used in industrial process) including heat loads:

_____

_____

2.16.5 CAPITAL COSTS TYPICALLY INCLUDED IN CLASS 43.1 OR 43.2

Project Cost Table 2.16 District Energy Systems/Equipment

	Typical Capital Cost
1	Purchase and installation of a piping connection with a central energy supply unit for a district energy system.
2	Purchase and installation of a central heat exchanger or water chiller if required to supply a heating or cooling medium to a district energy system.
3	Excavation or trenching for the installation of insulated underground supply and return header piping to distribute an energy transfer medium from the main energy supply connection to one or more buildings.
4	Purchase and installation of insulated underground supply and return header piping including supply and return pumps, chemical injection system, expansion tank, central energy metering and control equipment as well as header connections and shut-off valves for each building connected to the district energy system.
5	Purchase and installation of a heat exchanger for the energy transfer station at each building to transfer heating or cooling energy from the district energy heating medium to the building or industrial process heating or cooling medium.
6	Purchase and installation of piping, energy metering equipment, pressure and temperature indicators, freeze protection equipment and controls at each building or industrial process heat exchanger to connect it to the district energy system and the building or industrial process heating and cooling equipment.

2.16.6 SCHEMATICS OF QUALIFYING SYSTEMS

A typical arrangement of district energy equipment that would qualify as a district energy system is shown in the schematic below.

2.16.6.1 Key to Notes on Schematics for District Energy Systems/Equipment

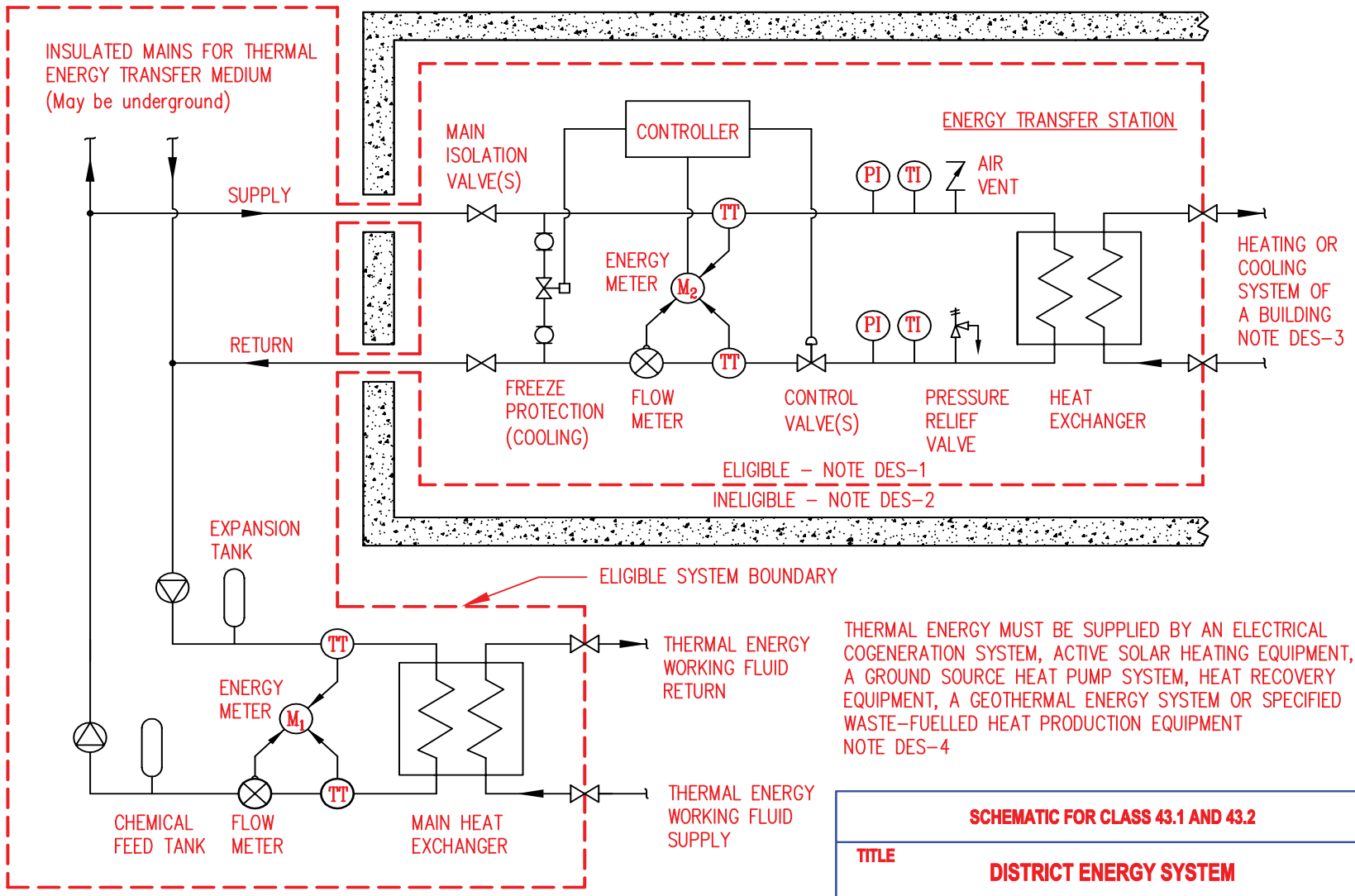
DES-1 For eligible properties, see Section 2.16.2 of this Guide.

DES-2 For ineligible properties, see Section 2.16.3 of this Guide.

DES-3 Property that is part of the internal heating or cooling systems of a building is not considered to be part of a district energy system. Buildings or parts of buildings are not eligible.

DES-4 The energy transfer medium must be heated or cooled using thermal energy that is primarily produced by an electrical cogeneration system, active solar heating equipment, a ground-source heat pump system, heat recovery equipment, geothermal energy equipment or specified-waste fuelled heat production equipment. See Sections 2.1, 2.3, 2.5, 2.8 and 2.10 of this Guide.

DES 2.16.1 District Energy System



2.17 Producer Gas Generating Equipment

CONTENTS

SCHEMATICS

2.17.1 PRODUCER GAS GENERATING EQUIPMENT

Producer gas generating equipment (described in subparagraph (d)(xvi) of Class 43.1) includes equipment that is part of a system that generates ***producer gas*** (other than producer gas that is to be converted into liquid biofuels or chemicals) primarily from ***eligible waste fuel*** using a thermo-chemical conversion process.

Note:

The thermo-chemical conversion process to generate producer gas is generally referred to as gasification.

Eligible feedstocks for producer gas generating equipment include biogas, bio-oil, digester gas, landfill gas, municipal waste, plant residue, pulp and paper waste, wood waste and fossil fuel.

Producer gas and what constitutes eligible feedstock for its production are defined in subsection 1104(13) of the Regulations and in the Glossary of Terms found in Section 3.0 of the Guide.

2.17.2 ELIGIBLE PROPERTIES

Eligible properties for producer gas generating equipment include the following:

- related piping (including fans and compressors);
- air separation equipment;
- storage equipment;
- equipment used for drying or shredding eligible waste fuel;
- ash-handling equipment;
- equipment used to upgrade the producer gas into biomethane

and

- equipment used to remove non-combustibles and contaminants from the producer gas

2.17.3 INELIGIBLE PROPERTIES

Ineligible properties for producer gas generating equipment include the following:

- buildings or other structures;
- heat rejection equipment (such as condensers and cooling water systems);

and

- equipment used to convert producer gas into liquid biofuels or chemicals.

2.17.4 APPLICATION FOR TECHNICAL OPINION WITH RESPECT TO CLASS 43.1 OR 43.2 ELIGIBILITY OF PRODUCER GAS GENERATING EQUIPMENT

FORM 2.17 Details of Producer Gas Generating Project

Company Information

Company Name

Company Address

Class 43.1 or 43.2 Property Address — Activity at this Location

Company Liaison for this Request — Title — Telephone Number

Company Technical Contact — Title — Telephone Number

Status of Project

☐ Installed Equipment or Completed Project ☐ Potential Project

Project Cost and Completion Date

Estimated Total Capitalized Cost of Project: $_____

Estimated Portion of Total Capitalized Cost Eligible Under Class 43.1 or 43.2: $_____

Estimated Project Completion Date (yyyy/mm/dd): _____

Eligible Property Description

For property that is proposed for inclusion in Class 43.1 or 43.2, attach the following information:

- A list including: 1) reference no., 2) item description, 3) name of manufacturer, 4) date of acquisition and 5) notes.
- A simple sketch or process flow diagram of the system or equipment and a process narrative.
- A completed Schedule A as per the following page.

Were any components used previously? Yes ☐ No ☐

If "Yes", provide details on a separate sheet.

Certification

I certify that the information provided in this application is true.

Dated at_____on_____

_____

Signature of owner, partner or authorized officer

_____

Name and title in block letters

Corporate Seal of Applicant

SCHEDULE 2.17–A Configuration of Proposed Producer Gas Generating Equipment

(i) Indicate the type of Producer Gas Generating Equipment:

- ☐ Counter-current fixed bed ("up draft") gasifier
- ☐ Co-current fixed bed ("down draft") gasifier
- ☐ Fluidized bed reactor
- ☐ Entrained flow gasifier
- ☐ Heat pipe reformer
- ☐ Other (specify) _____

(ii) The producer gas will be generated from (please indicate units):

Source	% of Total	Annual Consumption	Energy Content (HHV basis)
☐ Wood Waste			
☐ Municipal Waste			
☐ Landfill Gas			
☐ Digester Gas			
☐ Bio-Oil			
☐ Biogas			
☐ Plant Residue			
☐ Pulp and Paper Waste			
☐ Coal			
☐ Coke			
☐ Petroleum			
☐ Natural Gas			
☐ Other (specify) _____			

(iii) Describe the equipment and/or processes employed to refine or upgrade the producer gas:

_____

_____

_____

(iv) Describe the end-use of the producer gas (for example: electrical energy generation or natural gas pipeline injection):

_____

_____

_____

2.17.5 CAPITAL COSTS TYPICALLY INCLUDED IN CLASS 43.1 OR 43.2

Project Cost Table 2.17 Producer Gas Generating Equipment

	Typical Capital Cost
1	Construction of working platforms that are not an integral part of a building or other structure.
2	Purchase and installation of feedstock-handling components used to shred or dry the material (e.g., hoggers, drum or belt dryers).
3	Purchase and installation of thermo-chemical reactor vessels and related equipment (e.g. material infeed and ash-handling equipment).
4	Purchase and installation of recycle gas or char burner to supply heat to reactor or a fluidizing medium.
5	Purchase and installation of equipment used primarily to supply oxidant to the reactor (e.g. dedicated air separation or steam generation equipment).
6	Purchase and installation of HRSG or thermal waste recovery equipment and ancillary equipment such as duct work, piping, controls and instrumentation.
7	Purchase and installation of equipment to remove non-combustibles and contaminants from the producer gas (e.g., heat exchangers, scrubbing, stripping, pressure swing absorption, gas compression, gas cooling, moisture separation and particulate filtration equipment).
8	Purchase and installation of catalytic methanization reactors and related equipment.
9	Purchase and installation of producer gas or biomethane storage equipment.
10	Purchase and installation of related equipment (e.g., controls, instrumentation, pumps, blowers, heat exchangers and process piping).

2.17.6 SCHEMATICS OF QUALIFYING SYSTEMS

Typical configurations of components that would qualify as producer gas generating equipment are shown in the schematics below.

2.17.6.1 Key to Notes on Schematics for Gasification Equipment

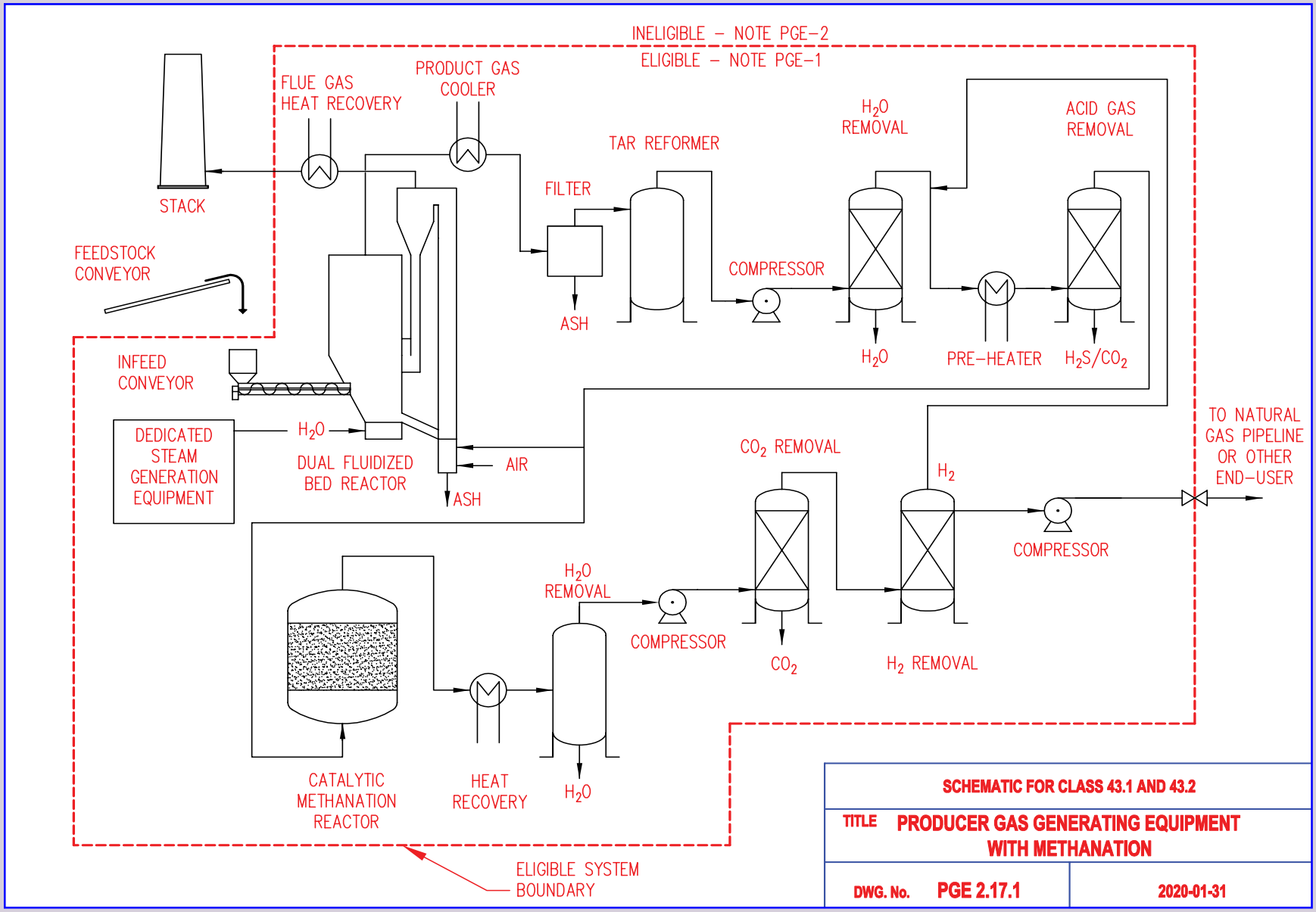
PGE-1 For eligible properties, see Section 2.17.2 of this Guide.

PGE-2 For ineligible properties, see Section 2.17.3 of this Guide.

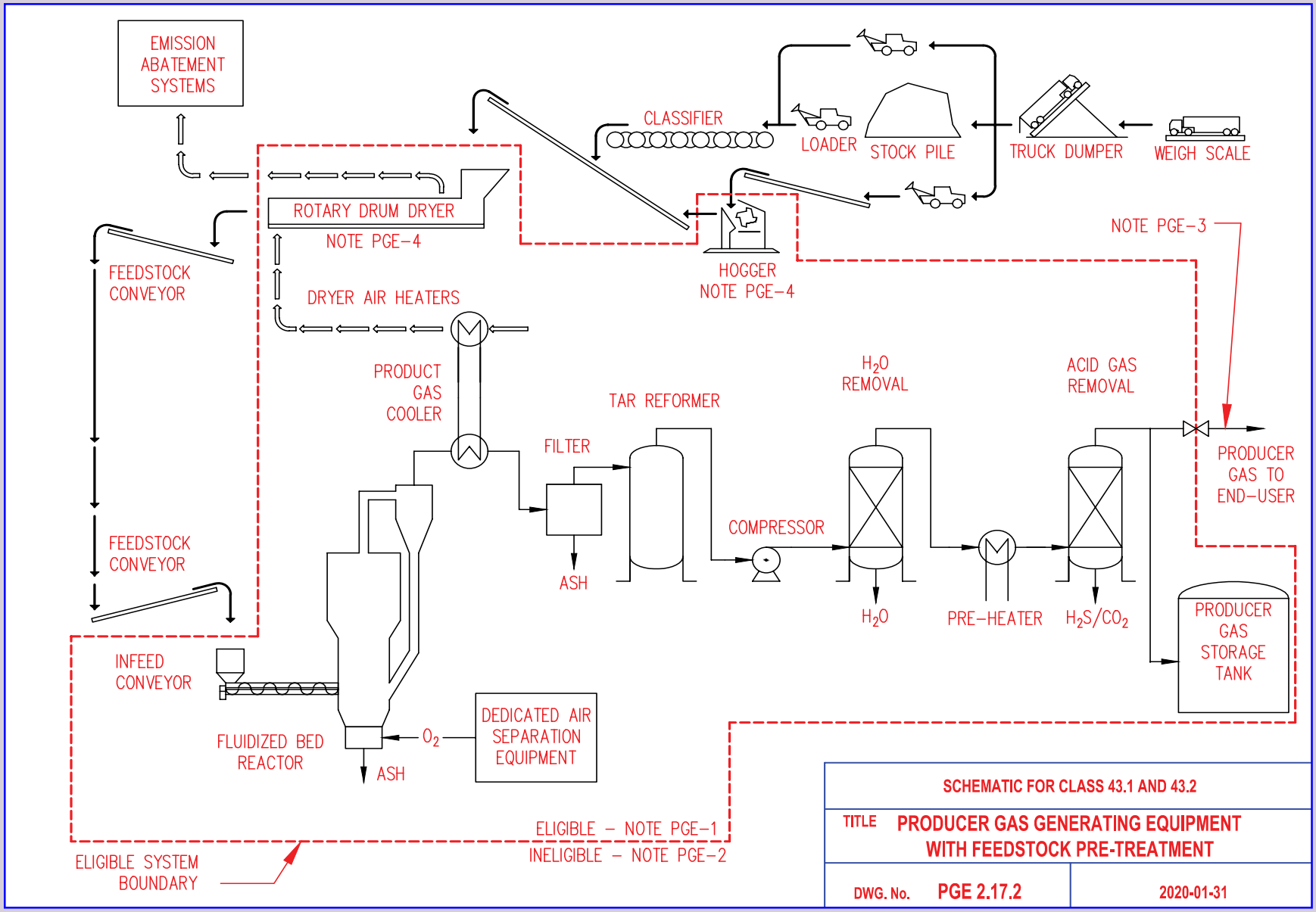
PGE-3 Producer gas generating equipment used to generate producer gas that is to be converted into liquid biofuels or chemicals is ineligible.

PGE-4 In systems to generate producer gas, equipment used for drying or shredding eligible waste fuel is eligible.

PGE 2.17.1 Producer Gas Generating Equipment with Methanization



PGE 2.17.2 Producer Gas Generating Equipment with Feedstock Pre-Treatment



2.18 Electric Vehicle Charging Equipment

CONTENTS

SCHEMATICS

2.18.1 ELECTRIC VEHICLE CHARGING EQUIPMENT

Electric vehicle (EV) charging equipment (described in subparagraph (d)(xvii) of Class 43.1) includes EV charging stations that meet certain power capacity thresholds and other electrical equipment used to supply power to those EV charging stations provided that:

- more than 75% of the equipment's electrical capacity is dedicated to charging electric vehicles;

and

- the equipment is located on the load side of an electricity meter used for billing purposes by a power utility or on the generator side of an electricity meter used to measure electricity generated by the owner of the EV charging equipment.

EV Charging Stations: EV charging stations that supply more than 10 kilowatts of power are eligible for inclusion in Class 43.1. EV charging stations that supply at least 90 kilowatts of power are eligible for inclusion in Class 43.2.

Other Electrical Equipment: Other electrical equipment used in connection with EV charging stations that supply more than 10 kilowatts of power is eligible for inclusion in Class 43.1. Other electrical equipment used in connection with EV charging stations that supply at least 90 kilowatts of power is eligible for inclusion in Class 43.2 even if that other electrical equipment also supplies power to other EV charging stations that supply more than 10 kilowatts of power.

2.18.2 ELIGIBLE PROPERTIES

Eligible properties of an EV charging system include the following:

- electric vehicle charging stations;
- transformers;
- distribution and control panels;
- circuit breakers;

and

- conduits and related wiring.

2.18.3 INELIGIBLE PROPERTIES

Properties that may be part of an electric vehicle charging system but are ineligible under this category include the following:

- buildings or other structures;

and

- access roads, sidewalks, parking areas and other similar surface construction.

2.18.4 ELECTRICAL CAPACITY

For the purpose of determining eligibility, the electrical capacity of other electrical equipment used in connection with EV charging stations is generally measured in terms of its current-carrying capacity (or ampacity).

For example, an 11.5 kW EV charging station might draw up to 48 amps from a single-phase 240 V circuit protected by a 60 amp over-current protection device. The circuit itself (the associated cabling, circuit breaker, local disconnect etc.) would meet the capacity test since 100% of its capacity is dedicated to charging electric vehicles.

However, if the distribution panel housing that 60 amp over-current protection device also houses other dedicated circuits (that are not necessary for EV charging equipment), and those circuits have a collective current carrying capacity of 20 amps or more, then the distribution panel and any 'upstream' equipment supplying power to that panel would not meet the capacity test since not more than 75% of its total current-carrying capacity would be dedicated to charging electric vehicles.

2.18.5 APPLICATION FOR TECHNICAL OPINION WITH RESPECT TO CLASS 43.1 OR 43.2 ELIGIBILITY OF ELECTRIC VEHICLE CHARGING EQUIPMENT

FORM 2.18 Details of Electric Vehicle Charging Project

Company Information

Company Name

Company Address

Class 43.1 or 43.2 Property Address Activity at this Location

Company Liaison for this Request Title Telephone Number

Company Technical Contact Title Telephone Number

Status of Project

☐ Installed Equipment or Completed Project ☐ Potential Project

Project Cost and Completion Date

Estimated Total Capitalized Cost of Project: $_____

Estimated Portion of Total Capitalized Cost Eligible Under Class 43.1 or 43.2: $_____

Estimated Project Completion Date (yyyy/mm/dd): _____

Eligible Property Description

For property that is proposed for inclusion in Class 43.1 or 43.2, attach the following information:

- A list including: 1) reference no., 2) item description, 3) name of manufacturer, 4) date of acquisition and 5) notes.
- A simple sketch or process flow diagram of the system or equipment and a process narrative.
- A completed Schedule A as per the following page.

Were any components used previously? Yes ☐ No ☐

If "Yes", provide details on a separate sheet.

Certification

I certify that the information provided in this application is true.

Dated at_____on_____

_____

Signature of owner, partner or authorized officer

_____

Name and title in block letters

Corporate Seal of Applicant

SCHEDULE 2.18 A Configuration of Electric Vehicle Charging Equipment

(i) Indicate the quantity model number and type of EV charger(s) to be installed:

Quantity	Manufacturer	Model Number	Rating (kW)

(ii) Provide manufacturer's specification sheet for the EV charging station(s)

(iii) Provide a site plan indicating the layout of existing parking space(s) and proposed location of EV parking space(s) with respect to existing buildings and structures.

(iv) Provide single line diagram of the distribution system showing all proposed components clearly differentiated from existing components and which identifies:

a) Conductor types and ratings

b) Overcurrent device types and ratings

c) Distribution equipment types and ratings (transformer, panel board, etc.)

d) Calculated fault current levels at all distribution points

2.18.6 CAPITAL COSTS TYPICALLY INCLUDED IN CLASS 43.1 OR 43.2

Project Cost Table 2.18 Electric Vehicle Charging Equipment

	Typical Capital Cost
1	Purchase and installation of EV charging stations.
2	Purchase and installation of electrical equipment used to deliver power to EV charging stations (power distribution panels, fuses, transformers, disconnects, cabling and related conduit or cable troughs).
3	Trenching and concrete repair for buried cable dedicated to EV charging equipment.
4	Concrete pads or posts required for mounting the EV charging equipment.
5	Purchase and installation of data network infrastructure equipment and systems software used to control and direct data on EV station usage, availability and billing information.
6	Barriers required to prevent vehicles from damaging EV charging equipment (e.g. bollards).
7	Dedicated signage and lighting.

2.18.7 SCHEMATICS OF QUALIFYING SYSTEMS

Typical configurations of components that would qualify as electric vehicle charging equipment are shown in the schematics below.

2.18.7.1 Key to Notes on Schematics for Electric Vehicle Charging Stations

EVCE-1 For eligible properties, see Section 2.18.2 of this Guide.

EVCE-2 For ineligible properties, see Section 2.18.3 of this Guide.

EVCE-3 Other electrical equipment used to supply power to EV charging stations is eligible provided that more than 75% of the equipment's electrical capacity is dedicated to charging electric vehicles.

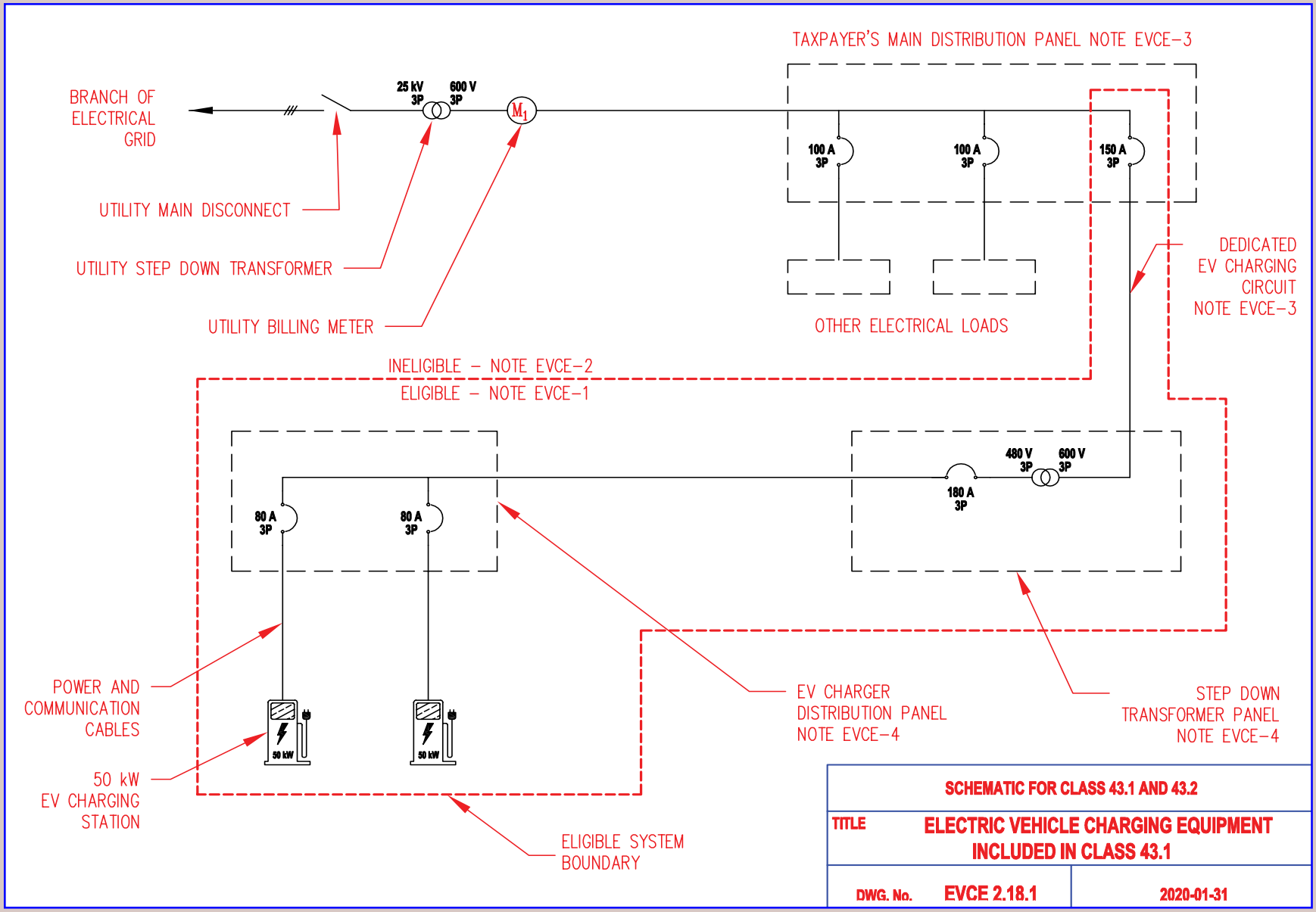
EVCE-4 Other electrical equipment used to supply power to EV charging stations that supply more than 10 kilowatts and less than 90 kilowatts of power is eligible for inclusion in Class 43.1.

EVCE-5 Other electrical equipment used to supply power to EV charging stations that supply at least 90 kilowatts of power is eligible for inclusion in Class 43.2 even if that other electrical equipment also supplies power to EV charging stations that supply more than 10 kilowatts of power.

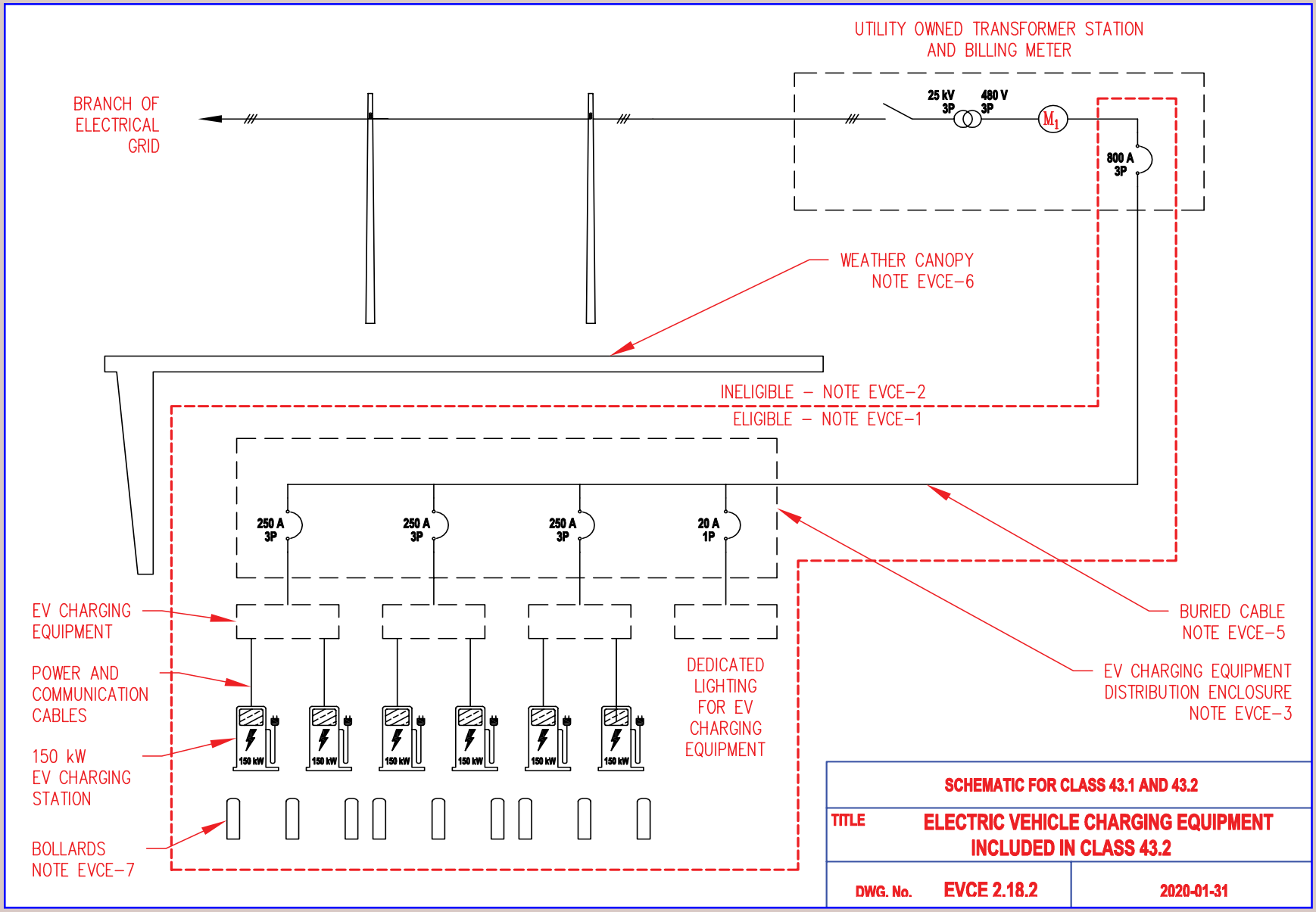
EVCE-6 Buildings or other structures are ineligible.

EVCE-7 Barriers required to prevent vehicles from damaging EV charging equipment are eligible.

EVCE 2.18.1 Electric Vehicle Charging Equipment Included in Class 43.1



EVCE 2.18.2 Electric Vehicle Charging Equipment Included in Class 43.2



2.19 Electrical Energy Storage Equipment

CONTENTS

SCHEMATICS

2.19.1 ELECTRICAL ENERGY STORAGE EQUIPMENT

Electrical energy storage equipment (described in subparagraph (d)(xviii) of Class 43.1) includes equipment that is used primarily for the purpose of storing and discharging electrical energy.

If the electrical energy to be stored is generated by equipment included in Class 43.2 the electrical energy storage equipment is eligible for inclusion in Class 43.2.

If the electrical energy to be stored is generated by equipment included in Class 43.1, the electrical energy storage equipment is eligible for inclusion in Class 43.1.

Stand-alone electrical energy storage equipment is eligible for inclusion in Class 43.1 provided it has a roundtrip efficiency greater than 50%.

Roundtrip efficiency is the useful energy output of an electrical energy storage system divided by the energy input into the system, expressed as a percentage, and inclusive of all system losses and electrical inefficiencies involved in the storage of the energy under normal conditions.

2.19.2 ELIGIBLE PROPERTIES

Eligible properties for electrical energy storage equipment include the following:

- batteries;
- compressed air energy storage;
- flywheels;
- ancillary equipment (including control and conditioning equipment);

and

- related structures.

2.19.3 INELIGIBLE PROPERTIES

Ineligible properties for electrical energy storage equipment include the following:

- buildings;
- pumped hydroelectric storage;
- hydro electric dams and reservoirs;
- property used solely for backup electrical energy;
- batteries used in motor vehicles;

and

- fuel cell systems where the hydrogen is produced via steam reformation of methane.

2.19.4 APPLICATION FOR TECHNICAL OPINION WITH RESPECT TO CLASS 43.1 OR 43.2 ELIGIBILITY OF ELECTRICAL ENERGY STORAGE EQUIPMENT

FORM 2.19 Details of Electrical Energy Storage Project

Company Information

Company Name

Company Address

Class 43.1 or 43.2 Property Address | Activity at this Location

Company Liaison for this Request | Title | Telephone Number

Company Technical Contact | Title | Telephone Number

Status of Project

☐ Installed Equipment or Completed Project ☐ Potential Project

Project Cost and Completion Date

Estimated Total Capitalized Cost of Project: $

Estimated Portion of Total Capitalized Cost Eligible Under Class 43.1 or 43.2: $

Estimated Project Completion Date (yyyy/mm/dd):

Eligible Property Description

For property that is proposed for inclusion in Class 43.1 or 43.2, attach the following information:

- A list including: 1) reference no., 2) item description, 3) name of manufacturer, 4) date of acquisition and 5) notes.
- A simple sketch or process flow diagram of the system or equipment and a process narrative.
- A completed Schedule A as per the following page.

Were any components used previously? Yes ☐ No ☐

If "Yes", provide details on a separate sheet.

Certification

I certify that the information provided in this application is true.

Dated at _____ on _____

Signature of owner, partner or authorized officer

Name and title in block letters

Corporate Seal of Applicant

SCHEDULE 2.19 A Configuration of Proposed Electrical Energy Storage Equipment

(i) Indicate the type of Electrical Energy Storage System:

- ☐ Lithium-Ion Battery
- ☐ Flow Battery
- ☐ Compressed Air Energy Storage
- ☐ Flywheel
- ☐ Other (specify) _____

(ii) Indicate the source of electrical energy for the Electrical Energy Storage Equipment:

- ☐ Utility Grid (provide details on roundtrip efficiency of the Electrical Energy Storage Equipment)
- ☐ Cogeneration, Enhanced Combined Cycle or Specified-Waste Fuelled Electrical Generation Equipment (complete Form 2.1)
- ☐ Thermal Waste Electrical Generation Equipment (complete Form 2.2)
- ☐ Small-Scale Hydroelectric Installation (complete Form 2.4)
- ☐ Wind Energy Conversion Systems (complete Form 2.6)
- ☐ Photovoltaic Electrical Generation Equipment (complete Form 2.7)
- ☐ Geothermal Energy Equipment (complete Form 2.8)
- ☐ Expansion Engine Systems (complete Form 2.11)
- ☐ Fixed Location Fuel Cell Equipment (complete Form 2.13)
- ☐ Water-Current, Tidal or Wave Energy Equipment (complete Form 2.15)
- ☐ Other (specify) _____

(iii) Indicate how the Electrical Energy Storage Equipment will be used for the purpose of gaining or producing income (e.g. peak shaving, ancillary services etc.).

_____

_____

_____

_____

_____

_____

(iv) Provide an electrical single line diagram indicating how the Electrical Energy Storage Equipment is connected to a utility grid and/or in relation to electrical energy generation equipment included in Class 43.1 or 43.2.

2.19.5 CAPITAL COSTS TYPICALLY INCLUDED IN CLASS 43.1 OR 43.2

Project Cost Table 2.19 Electrical Energy Storage Equipment

	Typical Capital Cost
1	Construction of working platforms that are not an integral part of a building or other structure.
2	Purchase and installation of battery storage equipment including battery modules, inverters, cooling systems and housings or enclosures that are not buildings.
3	Purchase and installation of compressed air energy storage equipment including motors, compressors, expanders, generators, cooling and lubrication equipment, thermal storage equipment, heat exchangers, air filters, piping and compressed air storage vessels or the cost of drilling air injection/extraction wells, related well casings and well head equipment used in connection with geological compressed air energy storage systems.
4	Purchase and installation of flywheel equipment including rotors, motor/generators, bearings, vacuum pumps, cooling systems and housings and the cost of vaults, structures or other civil works other than buildings that are required for the safe anchoring and containment of the flywheel equipment.
5	Purchase and installation of ancillary power electronics, controls, instrumentation and safety equipment required to operate the electrical energy storage equipment.
6	Purchase and installation of power transformers and switchgear equipment required for grid interconnection or integration with electrical generation equipment included in Class 43.1 or 43.2.

2.19.6 SCHEMATICS OF QUALIFYING SYSTEMS

Typical configurations of components that would qualify as electrical energy storage equipment are shown in the schematics below.

2.19.6.1 Key to Notes on Schematics for Electric Vehicle Charging Stations

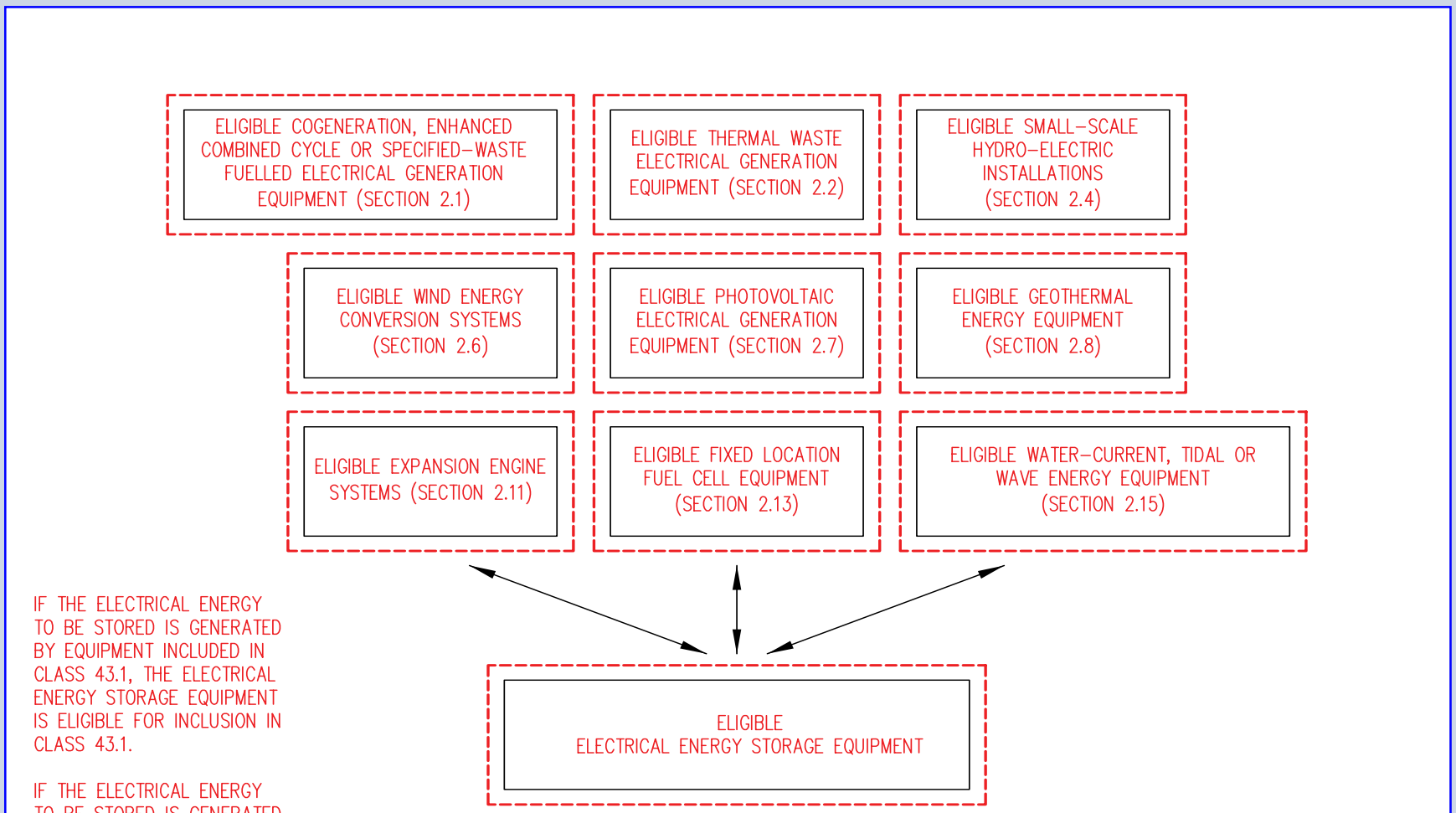
EESE-1 For eligible properties, see Section 2.19.2 of this Guide.

EESE-2 For ineligible properties, see Section 2.19.3 of this Guide.

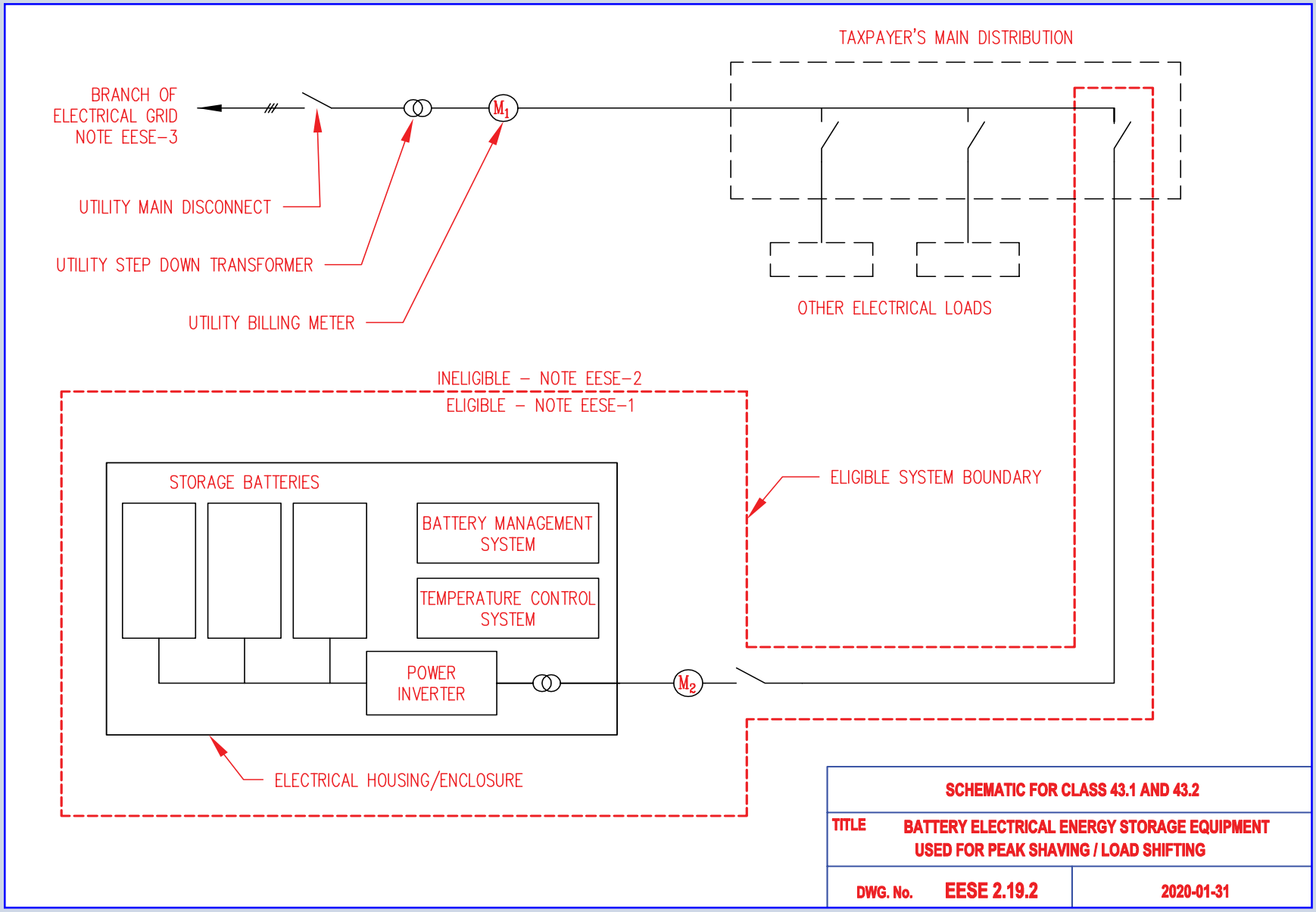
EESE-3 Stand-alone electrical energy storage equipment is eligible for inclusion in Class 43.1 provided it has a roundtrip efficiency greater than 50%. There is no roundtrip efficiency threshold for electrical energy storage equipment used in connection with other equipment included in Class 43.1 or 43.2.

EESE-4 Eligible electrical energy storage property includes equipment used to discharge electrical energy and equipment used at the first level of power transformation. The first level of transformation includes equipment used for phase synchronization and voltage regulation. After the first level of transformation, the storage and subsequent discharge of electrical energy stops, and the electricity is ready for use (e.g., ready to be put on transmission lines). Typically, the eligible system boundary for electrical energy storage equipment is located after the first level of transformation at isolation switches that allow a utility to lock out a generating plant's power production.

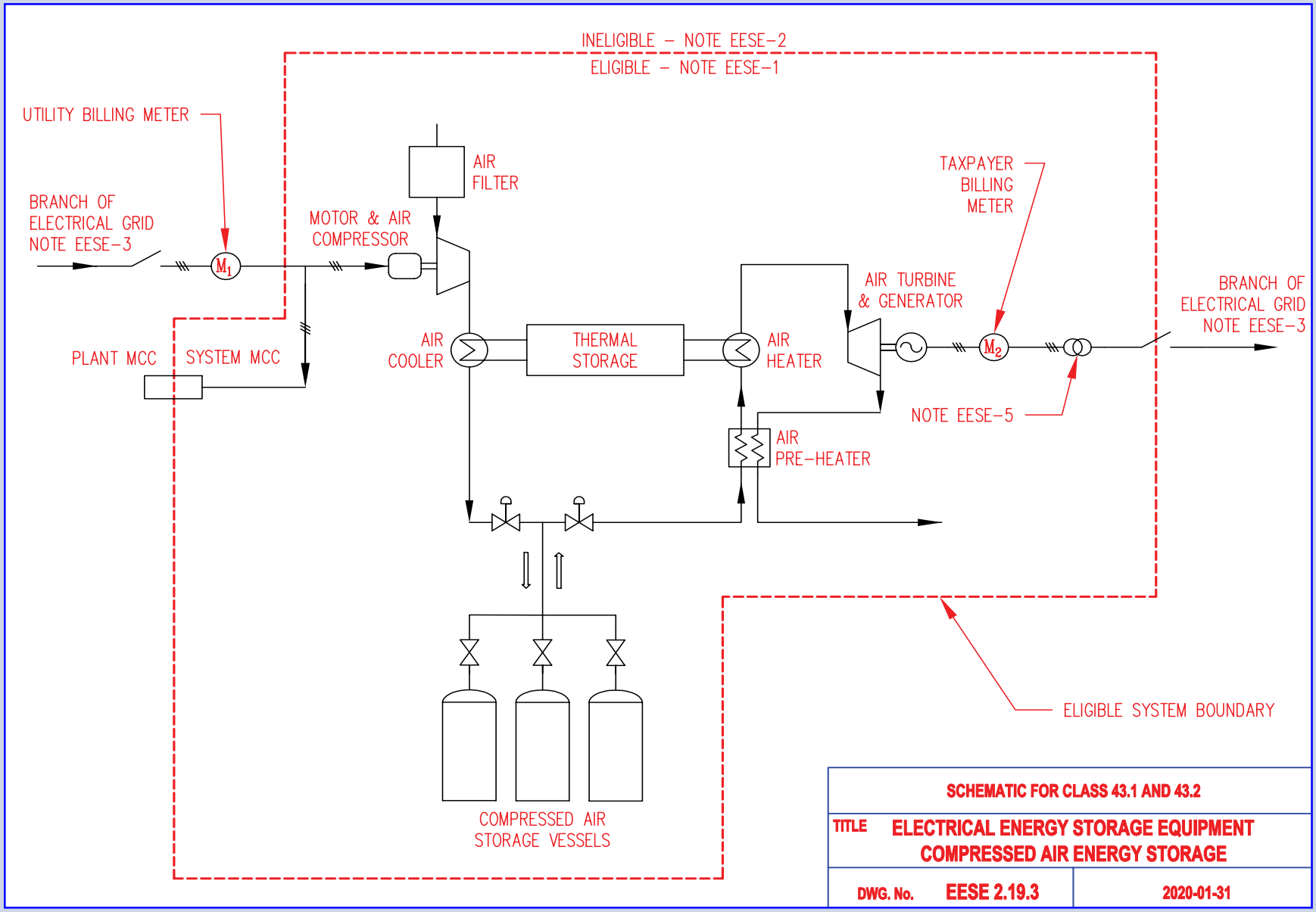
EESE 2.19.1 Sources of Electrical Energy that are Equipment Included in Class 43.1 or 43.2



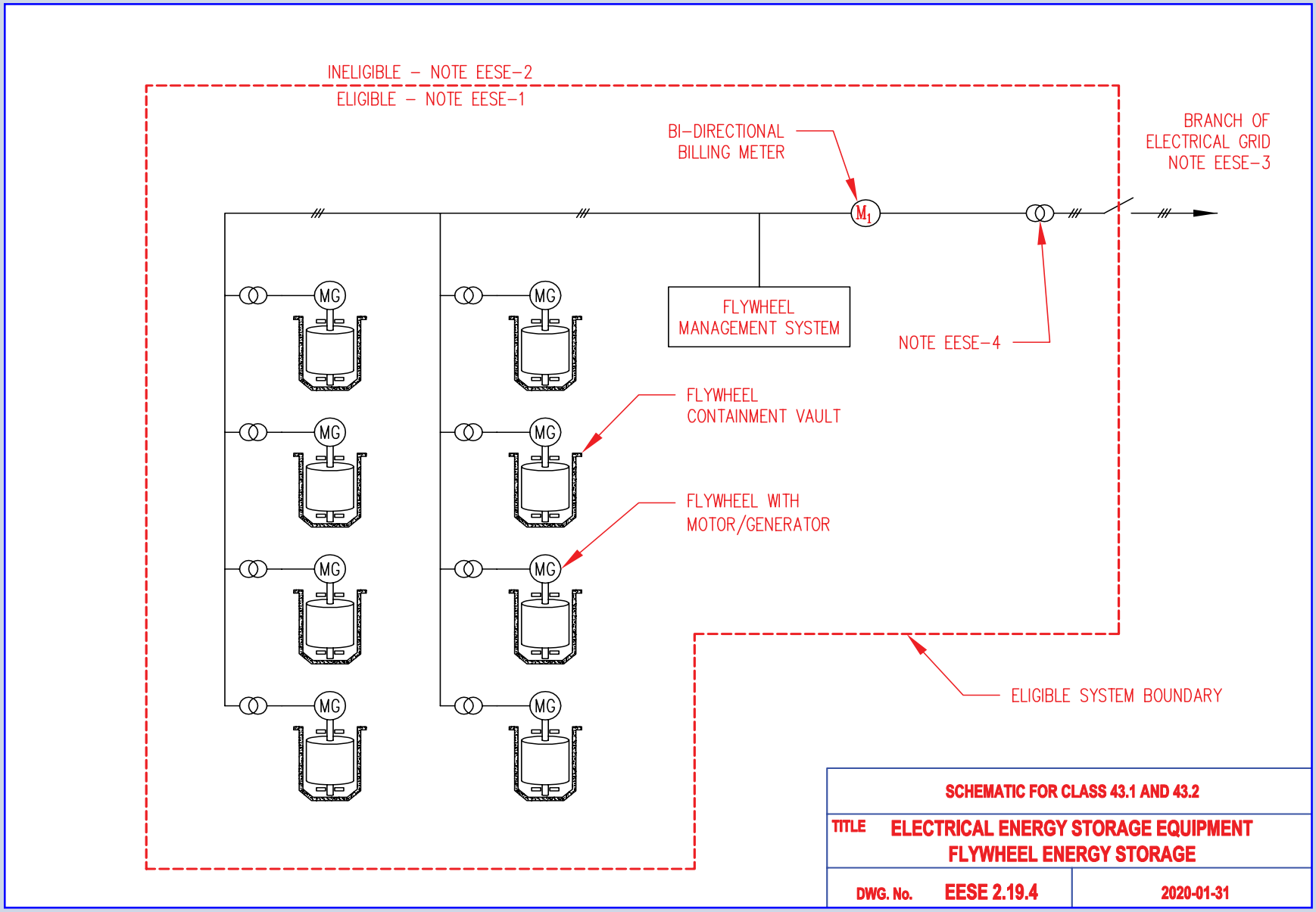
EESE 2.19.2 Battery Electrical Energy Storage Equipment used for Peak/Load Shifting



EESE 2.19.3 Compressed Air Energy Storage Equipment



EESE 2.19.4 Flywheel Energy Storage Equipment



3.0 Glossary of Terms

Certain terms used in this guide are explained below. Terms bolded in italics are defined in subsection 1104(13) of the Regulations. Text in italics is excerpted from the Regulations.

Basic oxygen furnace gas: *The gas that is produced intermittently in a basic oxygen furnace of a steel mill by the chemical reaction of carbon in molten steel and pure oxygen.*

Biogas: *The gas produced by the anaerobic digestion of organic waste that is food and animal waste, manure, plant residue, pulp and paper by-product, separated organics, wood waste or sludge from an eligible sewage treatment facility.*

Bio-oil: *Liquid fuel that is created from wood waste or plant residues using a thermo-chemical conversion process that takes place in the absence of oxygen.*

Blast furnace gas: *The gas produced in a blast furnace of a steel mill, by the chemical reaction of carbon (in the form of coke, coal or natural gas), the oxygen in air and iron ore.*

Cheng Cycle: A cogeneration system in which high-pressure steam produced in a topping cycle is returned to the gas turbine just in front of the combustor section. This increases the mass flow through the gas turbine section (thereby increasing the electrical output) without increasing fuel consumption. In this system configuration, which is a variation of a combined cycle cogeneration system, the gas turbine also serves as a non-condensing steam turbine.

Classifier: An industrial machine for sorting or mechanical screening of materials by size, shape, or density.

Cogeneration System: A system that simultaneously produces electricity and useful thermal energy from eligible fuel or fuels in an integrated process. For example, a natural gas-fired boiler producing steam used by a steam turbine generator would be considered to be a cogeneration system if the heat in the low pressure steam exhausted (extracted) from the steam turbine were used in an industrial process. If, however, the heat in the steam turbine exhaust (or extraction) were not used, and the steam requirements of the industrial process were supplied directly from the boiler, the electricity generation and thermal energy supply processes would not be considered to be integrated and therefore the boiler and steam turbine would not be considered to be a cogeneration system.

Combined Cycle Cogeneration System: A cogeneration system consisting of a gas turbine generator, a HRSG and a steam turbine generator. Hot exhaust gases from the gas turbine generator are used to produce steam in the HRSG, the steam from which is used to drive the steam turbine generator. Useful heat may be extracted from the steam turbine exhaust, an extraction point on the steam turbine, or from the HRSG.

Digester gas: *A mixture of gases that are produced by the decomposition of organic waste in a digester and that are extracted from an eligible sewage treatment facility for that organic waste.*

Distribution equipment: *Equipment (other than transmission equipment) used to distribute electrical energy generated by electrical generating equipment.*

District energy equipment: *Property that is part of a district energy system and that consists of pipes or pumps used to collect and distribute an energy transfer medium, meters, control equipment, chillers and heat exchangers that are attached to the main distribution line of a district energy system, but does not include*

(a) property used to distribute water that is for consumption, disposal or treatment; or

(b) property that is part of the internal heating or cooling system of a building.

District energy system: *A system that is used primarily to provide heating or cooling by continuously circulating, from a central generation unit to one or more buildings through a system of interconnected pipes, an energy transfer medium that is heated or cooled using thermal energy.*

Eligible landfill site: *A landfill site that is situated in Canada, or a former landfill site that is situated in Canada, and, if a permit or licence in respect of the site is or was required under any law of Canada or of a province, for which the permit or licence has been issued.*

Eligible sewage treatment facility: *A sewage treatment facility situated in Canada for which a permit or license is issued, pursuant to any law in Canada or of a province.*

Eligible waste fuel: *Biogas, bio-oil, digester gas, landfill gas, municipal waste, plant residue, pulp and paper waste and wood waste.*

Eligible waste management facility: *A waste management facility that is situated in Canada and for which a permit or license is issued under any law of Canada or of a province.*

Enhanced combined cycle system: *An electrical generating system in which thermal waste from one or more natural gas compressor systems is recovered and used to contribute at least 20 percent of the energy input of a combined cycle process in order to enhance the generation of electricity, but does not include the natural gas compressor systems.*

Food and animal waste: *Organic waste that is disposed of in accordance with the applicable laws of Canada or a province and that is*

(a) generated during the preparation or processing of food or beverage for human or animal consumption;

(b) food or beverage that is no longer fit for human or animal consumption; or

(c) animal remains.

Fossil fuel: *A fuel that is petroleum, natural gas or related hydrocarbons, basic oxygen furnace gas, blast furnace gas, coal, coal gas, coke, coke oven gas, lignite or peat.*

Gas Turbine Cogeneration System: A cogeneration system that uses a gas or combustion turbine (Brayton cycle) to produce electrical power. The exhaust gas from the turbine is the source of useful heat energy and is most often used to generate steam in a heat recovery steam generator.

Generation of Electricity: The provisions of Class 43.1 and Class 43.2 differentiate between equipment used principally for electrical generation, for transmission and for distribution. The generation system ends at the point where the electricity is ready for use. Typically, this is after voltage regulation, frequency adjustment and phase synchronization.

Knockout Pot: A device used in industrial processes to separate a vapour-liquid mixture.

Landfill gas: *A mixture of gases that are produced from the decomposition of organic waste and that are extracted from an eligible landfill site.*

Motor Control Centre: A central panel with motor starters, circuit breakers and disconnect switches for control and operation of several electric motors in a plant.

Municipal waste: *The combustible portion of waste material (other than waste material that is considered to be toxic or hazardous waste pursuant to any law of Canada or of a province) that is generated in Canada and that is accepted at an eligible landfill site or an eligible waste management facility and that, when burned to generate energy emits only those fluids or other emissions that are in compliance with the law of Canada or of a province.*

Nacelle: The enclosure covering the gearbox, electrical energy generator and control systems that are mounted on top of the tower of a wind turbine generator.

Photovoltaic: Pertains to the direct conversion of light into electricity.

Photovoltaic Array: An interconnected system of photovoltaic panels that function as a single electricity-producing unit. The panels are assembled as a discrete structure, with common support or mounting.

Photovoltaic Cell: A device that converts light directly into electricity. Photovoltaic cells are the building blocks of a photovoltaic module.

Photovoltaic Module: A number of photovoltaic cells electrically interconnected in either series or parallel and mounted together, usually in a sealed unit of convenient size for shipping, handling and assembling into panels or arrays.

Photovoltaic Panel: A group of modules fastened together and wired in series or parallel. The term "panel" is often used interchangeably with the term "module".

Plant residue: The residue of plants (not including wood waste and waste that no longer has the chemical properties of the plants of which it is a residue) that would otherwise be waste material and that is used

(a) in a system that converts biomass into bio-oil or biogas, or

(b) as an eligible waste fuel.

Producer Gas: Fuel the composition of which, excluding its water content, is all or substantially all non-condensable gases that is generated primarily from eligible waste fuel using a thermo-chemical conversion process and that is not generated using any fuels other than eligible waste fuel or fossil fuel.

Programmable Logic Controller: A programmable digital computer that is programmed to automate the control of an electromechanical process in a plant according to established operating logic.

Pulp and paper by-product: *Pulp and paper by-product means tall oil soaps and crude tall oil that are produced as by-products of the processing of wood into pulp or paper and the by-product of a pulp or paper plant's effluent treatment or its de-inking processes.*

Pulp and paper waste: *Pulp and paper waste means:*

(a) tall oil soaps, crude tall oil and turpentine that are produced as by-products of the processing of wood into pulp or paper; and

(b) the by-product of a pulp or paper plant's effluent treatment, or its de-inking processes, if that by-product has a solid content of at least 40 per cent before combustion.

Primarily/Principally: These terms generally refer to more than 50 percent for a given purpose.

Reciprocating Engine Cogeneration System: A cogeneration system in which stationary, industrial, piston engines (based on either the Diesel or Otto cycle) drive an electric generator while useful heat is recovered from the engine's hot exhaust gases, cooling water and lubricating oil.

Roundtrip Efficiency: The useful energy output from an electrical energy storage system divided by the energy input into the system, expressed as a percentage, and inclusive of all system losses and electrical inefficiencies involved in the storage of the energy under normal conditions.

Separated organics: *Organic waste (other than waste that is considered to be toxic or hazardous waste under any law of Canada or a province) that could, but for its use in a system that converts biomass into biogas, be disposed of in an eligible waste management facility or eligible landfill site.*

Supervisory Control and Data Acquisition (SCADA): Computer control systems that monitor and control entire industrial processes or complexes of systems spread over large areas.

Solution gas: *A fossil fuel that is a gas that would otherwise be flared and has been extracted from a solution of gas and produced oil.*

Spent pulping liquor: *The by-product of a chemical process of transforming wood into pulp, consisting of wood residue and pulping agents.*

Steam Turbine Cogeneration System: A cogeneration system in which a boiler produces steam to drive a turbine generator (Rankine cycle) and to provide useful heat. Steam turbines are either extraction-condensing or non-condensing. In the former, useful thermal energy is taken from an intermediate extraction port of a condensing turbine. In the latter, the useful heat is discharged from a non-condensing or back-pressure turbine, which drives a generator. Depending on the process, the condensate may or may not be returned to the boiler.

Substantially: Generally means greater than or equal to 90 percent.

Thermal waste: *Waste heat energy extracted from a distinct point of rejection in an industrial process that would otherwise*

(a) be vented to the atmosphere or transferred to a liquid; and

(b) not be used for a useful purpose.

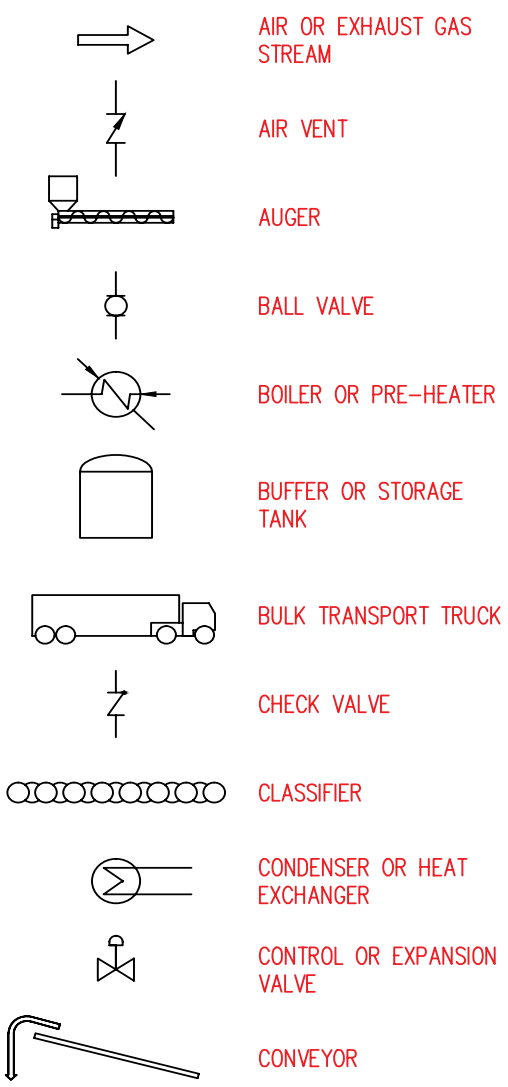
Transmission equipment: *Equipment used to transmit more than 75 percent of the annual electrical energy generated by electrical generating equipment, but does not include a building.*

Wood waste: *Includes scrap wood, sawdust, wood chips, bark, limbs, saw-ends and hog fuel, but does not include spent pulping liquor and any waste that no longer has the physical or chemical properties of wood.*

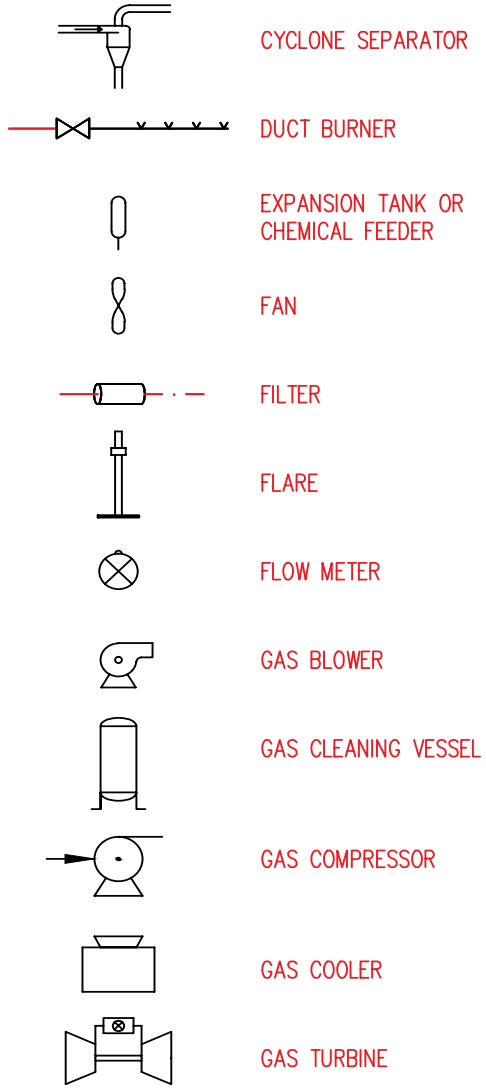
4.0 Key to Symbols Used in Schematics

Key 4.1 Key to Mechanical Symbols Used in Schematics

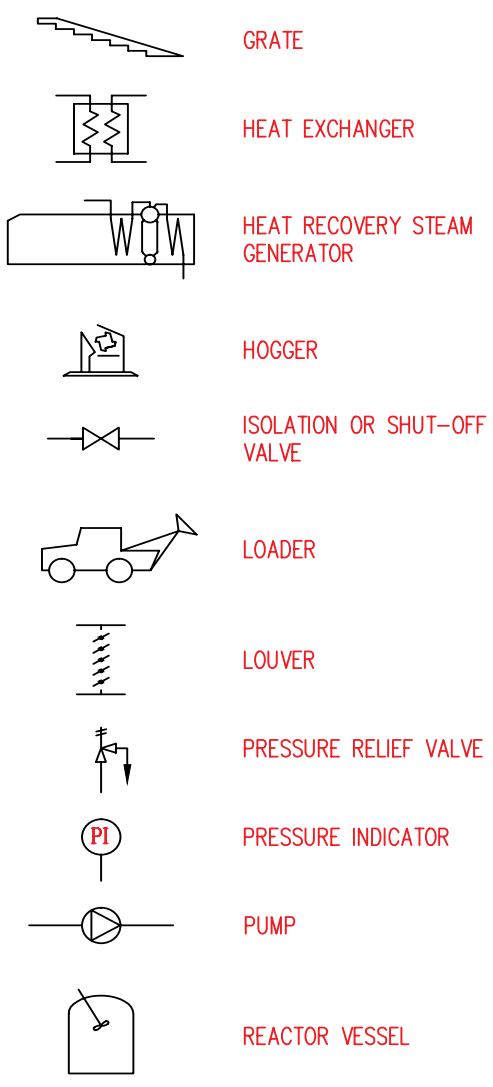
MECHANICAL SYMBOLS



MECHANICAL SYMBOLS (CONT'D)

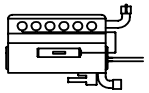


MECHANICAL SYMBOLS (CONT'D)



Key 4.2 Key to Mechanical Symbols (Cont'd), Electrical Symbols, Line Types and Hatch Patterns Used in Schematics

MECHANICAL SYMBOLS (CONT'D)


RECIPROCATING ENGINE


STACK

TEMPERATURE INDICATOR

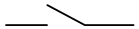
TEMPERATURE TRANSMITTER


TURBO EXPANDER, TURBINE OR COMPRESSOR

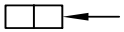

VIBRATING CONVEYOR


WASTE TRANSPORT TRUCK

ELECTRICAL SYMBOLS


DISCONNECT SWITCH

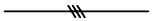

ELECTRIC MOTOR


ELECTRIC MOTOR CONTROL CENTRE


ELECTRICAL ENERGY GENERATOR

ELECTRICAL OR ENERGY METER


ELECTRICAL TRANSFORMER


THREE PHASE CONDUCTOR

LINE TYPES

ELIGIBLE SYSTEM BOUNDARY

FUEL LINE

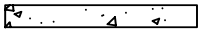
MATERIAL FLOW

OBJECT LINE

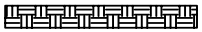
PERFORATED SURFACE

HATCH PATTERNS


CLAY


CONCRETE

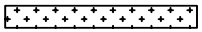

CROSS SECTION (GENERAL)

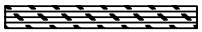

EARTH

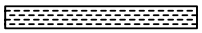

GRAVEL


GROUT


IMPERMEABLE ROCK


MEMBRANE (FUEL CELLS)


MUNICIPAL WASTE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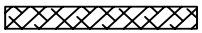
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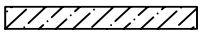
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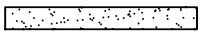
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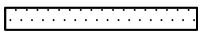
SEAL


WATER

5.0 List of Forms

6.0 List of Schedules

7.0 List of Project Cost Tables

8.0 List of Schematics

Appendix I Legislative History: Class 43.1 and Class 43.2

This Appendix summarizes the legislative history of Class 43.1 and Class 43.2 and is provided for information purposes only. It is not a complete history of Class 43.1 and Class 43.2 or other legislation that may have a bearing on Class 43.1 and 43.2. For additional information regarding the income tax legislation, taxpayers are invited to consult Statutory Orders and Regulations (SOR) published by the Privy Council (P.C.) in the Canada Gazette, the Statutes of Canada (S.C.) or other income tax information sources.

Contents

A.0 GENERAL AMENDMENTS

Enacted in 1997

Class 43.1 was added by P.C. 1997-1033, section 13, July 25, 1997, applicable to certain new clean energy and energy conservation property acquired by a taxpayer after February 21, 1994. This amendment implements measures announced in Budget 1994 as well as certain transitional measures that permitted the following to be eligible for Class 43.1 treatment:

- certain reconditioned or re-manufactured equipment acquired after February 21, 1994 and before June 27, 1996

and

- certain property, acquired after February 21, 1994 and before September 27, 1994, that is part of an enhanced combined cycle system that has an incremental heat rate not exceeding 7,000 BTU per kWh of electricity generated by the system.

Enacted in 2000

Paragraphs (b) and (e) of Class 43.1 were amended by P.C. 2000-1331, section 7, August 23, 2000, applicable to property acquired after June 26, 1996, with certain transitional measures applicable in respect of property acquired before 1998 pursuant to an agreement in writing made by the taxpayer before June 27, 1996. The Budget 1997 measure relaxed restrictions that were previously announced on June 27, 1996 (with certain transitional measures) that made used, reconditioned or remanufactured equipment ineligible for inclusion in Class 43.1.

Paragraphs (c) and (d) of Class 43.1 were also amended by P.C. 2000-1331, section 7, August 23, 2000. Subsection 7(2) applies to property acquired after February 16, 1999, and subsection 7(3) applies to property acquired after February 18, 1997. These amendments implement measures announced in Budgets 1997 and 1999 concerning photovoltaic systems and electrical generating equipment using solution gas.

Enacted in 2005

The opening words of Class 43.1, were amended by P.C. 2005-2186, subsection 12(1), November 22, 2005, applicable to property acquired after February 27, 2000, to include a reference to electrical generating equipment described in subparagraph (a.1)(i) of Class 17. The amendment is consequential to a measure introduced in Budget 2000, to increase the CCA rate for certain electrical generating equipment from 4 percent (Class 1) to 8 percent (Class 17).

The portion of Class 43.1 between paragraphs (c) and (d) was amended by P.C. 2005-2186, subsection 12(2), November 22, 2005, applicable to property acquired by a taxpayer on or after September 3, 2005, other than property acquired by a taxpayer on or after that day pursuant to a written agreement made before that day by the taxpayer and a person with whom the taxpayer deals at arm's length. This amendment ensures that property described in paragraph (d) of Class 43.1 excludes reconditioned or remanufactured equipment, to better reflect proposals originally announced on June 27, 1996.

Enacted in 2006

Class 43.2 was added by P.C. 2006-439, section 13, June 1, 2006, deemed to have come in force on February 23, 2005. This amendment implements a measure announced in Budget 2005 to include certain highly efficient fossil fuel and clean energy generation equipment—which was previously eligible for the 30 percent CCA rate under Class 43.1—in a new class eligible for a 50 percent CCA rate. The increased rate applies to such equipment acquired after February 22, 2005 and before 2012.

The opening words of Class 43.1 and subclauses (b)(iii)(A)(I) and (II) and (e)(iii)(A)(I) and (II) of Class 43.1 were amended by said P.C. 2006-439, subsections 12(1), (3) and (5), June 1, 2006, deemed to have come in force on February 23, 2005. These amendments include, in part, references consequential to the introduction of new Class 43.2 in Budget 2005.

Enacted in 2009

The opening words of Class 43.2 were amended by P.C. 2009-581, section 8, April 23, 2009, deemed to have come in force on March 19, 2007, to implement a measure announced in Budget 2007 to extend the eligibility for Class 43.2 to assets acquired before 2020.

Enacted in 2012

Subsection 1104(17) of the Regulations was added by S.C. 2012 chapter 31, subsection 61(3), on December 14, 2012, applicable to new property acquired after March 28, 2012, to ensure that certain property that would otherwise be eligible for inclusion in Class 43.1 or 43.2 because it collects, produces or uses eligible waste fuels, is not eligible for inclusion in Class 43.1 or 43.2 if the property fails to comply with the applicable environmental laws, by-laws and regulations of Canada or of a province, territory, municipality, or a public or regulatory body performing a function of government in Canada at the time the property becomes available for use.

Enacted in 2013

Subsection 13(18.1) of the Income Tax Act was amended by S.C. 2013, chapter 40, subsection 6(2) on December 12, 2013, to refer to the *Technical Guide to Class 43.1 and 43.2*. This amendment was deemed to have come into force on December 12, 2014, the day on which the *Technical Guide to Class 43.1 and 43.2* was first published.

Enacted in 2018

Class 43.2 was amended by S.C. 2018, chapter 12, section 45 on June 21, 2018, by extending by five years (to 2025) eligibility for Class 43.2.

Enacted in 2019

Subsection 1100(2) of the Regulations was amended by S.C. 2019, chapter 29, subsection 52(6) on June 21, 2019, to provide an enhanced first-year allowance for property included in Class 43.1 or 43.2 that is acquired after November 21, 2018 and becomes available for use before 2028.

A.1 COGENERATION, ENHANCED COMBINED CYCLE AND SPECIFIED-WASTE FUELLED ELECTRICAL GENERATION SYSTEMS

Enacted in 1997

Paragraphs (a) to (c) of Class 43.1 were included when Class 43.1 was originally added by P.C. 1997-1033, section 13, July 25, 1997, applicable to property acquired after February 21, 1994.

Enacted in 2000

Clause (c)(i)(B) of Class 43.1 was amended by P.C. 2000-1331, subsection 7(2), August 23, 2000, applicable to property acquired after February 16, 1999, to allow cogeneration systems using solution gas to be eligible for Class 43.1. Subsection 1104(13) of the Regulations was amended to add the definition of ***solution gas*** by said P.C. 2000-1331, section 2, applicable after February 16, 1999.

Enacted in 2005

Clause (c)(i)(A) of Class 43.1 was amended by P.C. 2005-2287, subsection 2(3), December 6, 2005, applicable to property acquired after February 18, 2003, to allow cogeneration systems using bio-oil to be eligible for Class 43.1. The definition of fossil fuel in subsection 1104(13) of the Regulations was amended and the definitions of basic oxygen furnace gas and blast furnace gas were added to subsection 1104(13) of the Regulations by said P.C. 2005-2287, subsections 1(1) and (2), applicable in respect of property acquired after 2000.

Subparagraphs (a)(ii) and (a)(iv) of Class 43.1 were amended and subparagraph (a)(ii.1) of Class 43.1 was added, by P.C. 2005-2287, subsections 2(1), (2), December 6, 2005, applicable to property acquired after February 18, 2003, to allow fuel cell equipment that uses hydrogen and with a peak capacity of at least 3 kW to be eligible for Class 43.1.

Enacted in 2006

Clause (c)(i)(A) of Class 43.1 was amended by P.C. 2006-1103, section 2, October 19, 2006, applicable to property acquired after November 13, 2005, to allow cogeneration systems that use spent pulping liquor to be eligible for Class 43.1 and 43.2. Subsection 1104(13) of the Regulations was amended to add the definition of spent pulping liquor by said P.C. 2006-1103, subsection 1(2), applicable after November 13, 2005.

Enacted in 2009

Subparagraph (a)(ii.1), clause (c)(i)(A) and the closing words of paragraph (a) of Class 43.1 were amended by P.C. 2009-581, subsections 7(1), (2) and (3), April 23, 2009, applicable to property acquired after March 18, 2007, to

- remove the requirement that fuel cells have a peak capacity of at least 3 kW;
- extend the types of equipment that can be included in a cogeneration system to include equipment that upgrades the combustible portion of the fuel;

and

- allow cogeneration systems that use pulp and paper waste to be eligible for Class 43.1 and 43.2. The definition of eligible waste fuel in subsection 1104(13) of the Regulations was amended by said P.C. 2009-581, subsection 4(5) to include pulp and paper waste.

Enacted in 2010

Subparagraph (a)(iii) of Class 43.1 was amended by S.C. 2010, chapter 25, subsection 90(1), December 15, 2010, applicable to new property acquired after March 3, 2010, to remove the restriction that requires the recovered heat from electrical or cogeneration equipment be reused by such equipment.

The definition of eligible waste fuel in subsection 1104(13) of the Regulations was amended by said S.C. 2010, chapter 25, subsection 76(2), applicable to property acquired after February 25, 2008, to include biogas, thereby allowing cogeneration systems that use biogas to be eligible for Class 43.1 and 43.2.

Enacted in 2012

The definitions of “plant residue” and “eligible waste fuel” in subsection 1104(13) of the Regulations were amended by S.C. 2012 chapter 31 subsection 61(2), on December 14, 2012, applicable to property acquired after March 28, 2012, to allow specified-waste fuelled heat production systems and cogeneration systems that use plant residue to be eligible for Class 43.1 and 43.2.

Enacted in 2014

Clause (c)(i)(A) of Class 43.1 was amended by S.C. 2014, chapter 39, subsection 90(1), December 16, 2014, applicable to property acquired after February 10, 2014, to allow cogeneration systems that use producer gas to be eligible for Class 43.1 and 43.2. Subsection 1104(13) of the Regulations was amended to add the definition of producer gas by said S.C. 2014, chapter 39, subsection 85(1).

A.2 THERMAL WASTE ELECTRICAL GENERATION EQUIPMENT

Enacted in 2011

Subparagraph (c)(ii) of Class 43.1 was amended and subparagraph (c)(iii) of Class 43.1 was added by, S.C. 2011, chapter 24, subsections 101(2) and (3), applicable to eligible new assets acquired on or after March 22, 2011, to include equipment that is used by the taxpayer, or by a lessee of the taxpayer, to generate electrical energy in a process in which all or substantially all of the energy input is from thermal waste.

A.3 ACTIVE SOLAR HEATING EQUIPMENT AND GROUND-SOURCE HEAT PUMP SYSTEMS

Enacted in 1997

Subparagraph (d)(i) of Class 43.1 was included when Class 43.1 was originally added by P.C. 1997-1033, section 13, July 25, 1997, applicable to property acquired by a taxpayer after February 21, 1994.

Enacted in 2005

Subparagraph (d)(i) of Class 43.1 was amended by P.C. 2005-2287, subsection 2(4), December 6, 2005, applicable to property acquired after February 18, 2003, to extend Class 43.1 eligibility to certain active solar heating equipment that is used for the purpose of heating a liquid or a gas used directly in a greenhouse.

Enacted in 2009

Subparagraph (d)(i) of Class 43.1 was amended by P.C. 2009-581, subsection 7(4), April 23, 2009, applicable to property acquired after March 18, 2007, to

- extend Class 43.1 and Class 43.2 eligibility for active solar heating systems to include other commercial and residential applications such as air and water heating, other than swimming pool heating,

and

- ensure that solar collectors (other than a window) integrated into a building can qualify for Class 43.1 and Class 43.2.

Enacted in 2010

Subparagraph (d)(i) of Class 43.1 was amended by S.C. 2010, chapter 25, subsection 90(2), December 15, 2010, applicable to property acquired after February 25, 2008, to

- limit eligible ground-source heat pump systems to those that meet the standards set by the Canadian Standards Association for the design and installation of earth energy systems;
- broaden the use of ground-source heat pump systems to allow the systems to be used in applications other than industrial processes or greenhouses, such as space and water heating (but excluding swimming pool heating);

and

- ensure that back-up energy equipment that supplements a ground-source heat pump system and equipment that distributes energy within a building will not qualify for Class 43.1 and Class 43.2.

Subparagraph (d)(i) of Class 43.1 was amended by said S.C. 2010, chapter 25, subsection 90(2), to include as part of the cost of an eligible ground-source heat pump system, well drilling or trenching costs incurred after May 2, 2010, for the purpose of installing piping.

Enacted in 2019

Subclauses (d)(i)(A)(I) and (II) of Class 43.1 were amended by S.C. 2019, chapter 29, subsection 61(1), June 21, 2019, applicable to property acquired by a taxpayer after March 21, 2016 to clarify that only thermal energy storage equipment used in connection with active solar heating equipment and ground source heat pump systems is eligible for inclusion in subparagraph (d)(i).

A.4 SMALL-SCALE HYDRO-ELECTRIC INSTALLATIONS

Enacted in 1997

Subparagraphs (d)(ii) and (iii) of Class 43.1 were included when Class 43.1 was originally added by P.C. 1997-1033, section 13, July 25, 1997, applicable to property acquired by a taxpayer after February 21, 1994.

Enacted in 2005

The portion of subparagraph (d)(ii) of Class 43.1 after clause (B) was amended by P.C. 2005-2186, subsection 12(4), November 22, 2005, applicable to property acquired after February 27, 2000. The amendment is consequential to a measure introduced in Budget 2000, to increase the CCA rate of certain electrical generating equipment from 4 percent (Class 1) to 8 percent (Class 17) and clarifies that the exclusion for property otherwise included in Class 17 does not apply to electrical generating equipment described in subparagraph (a.1)(i) of that class.

Clause (d)(ii)(A) of Class 43.1 was amended by P.C. 2005-2287, subsection 2(5), December 6, 2005, applicable to property acquired after December 10, 2001, to increase the maximum capacity of eligible systems from 15 MW average generating capacity to 50 MW rated capacity at the installation site.

Subparagraph (d)(iii) of Class 43.1 was amended by P.C. 2005-2287, subsection 2(6), December 6, 2005, applicable to additions or alterations acquired after February 21, 1994 and before December 11, 2001, which results in an average generating capacity not exceeding 15 MW. Additions or alterations to a qualifying installation after February 21, 1994 are eligible for inclusion in Class 43.1 where the small scale hydro-electric installation was originally acquired before that date provided that the facility would have qualified for inclusion in Class 43.1 if it had been acquired after February 21, 1994.

Subparagraph (d)(iii.1) of Class 43.1 was added by P.C. 2005-2287, subsection 2(6), December 6, 2005, applicable to additions or alterations acquired after December 10, 2001 which result in an increase rated capacity not exceeding 50 MW.

A.5 HEAT RECOVERY EQUIPMENT

Enacted in 1997

Subparagraph (d)(iv) of Class 43.1 was included when Class 43.1 was originally added by P.C. 1997-1033, section 13, July 25, 1997, applicable to property acquired by a taxpayer after February 21, 1994.

Enacted in 2010

Subparagraph (d)(iv) of Class 43.1 was amended by S.C. 2010, chapter 25, subsection 90(4), December 15, 2010, applicable to property acquired after March 3, 2010, to remove the restriction that requires the recovered thermal waste to be reused directly in an industrial process (other than in an industrial process that generates or processes electrical energy). Also, subparagraph (d)(iv) does not apply to property that is employed in re-using recovered heat (such as property that is part of the internal heating or cooling system of a building or electrical generating equipment), is a building or is equipment that recovers heat primarily for use for heating water in a swimming pool.

Enacted in 2017

Subparagraph (d)(iv) of Class 43.1 was amended by S.C. 2017, chapter 33, subsection 104(1), December 14, 2017, applicable to property acquired after March 3, 2010, to apply where the primary purpose of the heat recovery equipment is “extracting heat for sale”.

A.6 WIND ENERGY CONVERSION SYSTEMS

Enacted in 1997

Subparagraph (d)(v) of Class 43.1 was included when Class 43.1 was originally added by P.C. 1997-1033, section 13, July 25, 1997, applicable to property acquired by a taxpayer after February 21, 1994.

Enacted in 2005

Subparagraph (d)(v) of Class 43.1 was amended by P.C. 2005-2186, subsection 12(5), November 22, 2005, applicable to property acquired after February 27, 2000, to clarify that the exclusion for property otherwise included in Class 17 does not apply to electrical generating equipment described in subparagraph (a.1)(i) of that class.

Enacted in 2019

Subclause (d)(v)(B)(I) of Class 43.1 was amended by S.C. 2019, chapter 29, subsection 61(2), June 21, 2019, applicable to property acquired by a taxpayer after March 21, 2016 to remove a reference to battery storage equipment that is used in connection with a wind energy conversion system. Such battery storage equipment and other electrical energy storage equipment are now described in new subparagraph (d)(xviii).

A.7 PHOTOVOLTAIC ELECTRICAL GENERATION EQUIPMENT

Enacted in 1997

Subparagraph (d)(vi) of Class 43.1 was included when Class 43.1 was originally added by P.C. 1997-1033, section 13, July 25, 1997, applicable to property acquired by a taxpayer after February 21, 1994.

Enacted in 2000

Clause (d)(vi)(B) of Class 43.1 was amended by P.C. 2000-1331, subsection 7(3), August 23, 2000, applicable to property acquired after February 18, 1997, to reduce the minimum peak capacity for qualifying photovoltaic systems from 10 kW to 3 kW of electrical output.

Enacted in 2005

Subparagraph (d)(vi) of Class 43.1 was amended by P.C. 2005-2186, subsection 12(6) November 22, 2005, applicable to property acquired after February 27, 2000, to clarify that the exclusion for property otherwise included in Class 17 does not apply to electrical generating equipment described in subparagraph (a.1)(i) of that class.

Enacted in 2009

Subparagraph (d)(vi) of Class 43.1 was amended by P.C. 2009-581, subsection 7(5), April 23, 2009, applicable to property acquired after March 18, 2007, to:

- remove the requirement that photovoltaic equipment have a peak capacity of at least 3 kW;

and

- ensure that solar cells or modules acquired after March 18, 2007 that are integrated into a building can qualify for Class 43.1 or 43.2.

Enacted in 2019

Subparagraph (d)(vi) of Class 43.1 was amended by S.C. 2019, chapter 29, subsection 61(3), June 21, 2019, applicable to property acquired by a taxpayer after March 21, 2016 to remove a reference to battery storage equipment that is used in connection with fixed location photovoltaic equipment. Such battery storage equipment and other electrical energy storage equipment are now described in new subparagraph (d)(xviii).

A.8 GEOTHERMAL ENERGY EQUIPMENT

Enacted in 1997

Subparagraph (d)(vii) of Class 43.1 was included when Class 43.1 was originally added by P.C. 1997-1033, section 13, July 25, 1997, applicable to property acquired by a taxpayer after February 21, 1994.

Enacted in 2005

Subparagraph (d)(vii) of Class 43.1 was amended by P.C. 2005-2186, subsection 12(7), November 22, 2005, applicable to property acquired after February 27, 2000, to clarify that the exclusion for property otherwise included in Class 17 does not apply to electrical generating equipment described in subparagraph (a.1)(i) of that class.

Enacted in 2010

Subparagraph (d)(vii) of Class 43.1 was amended by S.C. 2010, chapter 25, subsection 90(5), December 15, 2010, applicable to property acquired after May 2, 2010, to remove the requirement that eligible geothermal equipment be above-ground. This amendment also extends eligibility for Class 43.1 or 43.2 to equipment that consists of piping (including well drilling or trenching costs for the purpose of installing the piping) acquired after May 2, 2010.

Enacted in 2017

Subparagraph (d)(vii) of Class 43.1 was amended by S.C. 2017, chapter 33, subsection 104(2), December 14, 2017, applicable to property acquired after March 21, 2017, to extend Class 43.1 and Class 43.2 eligibility to electricity transmission equipment and geothermal equipment that is used primarily for the purpose of generating heat or a combination of heat and electricity.

Subsection 1104(17) was amended by S.C. 2017, chapter 33, subsection 91(1), December 14, 2017, applicable to property acquired after March 21, 2017, by adding geothermal energy equipment to the list of property not eligible for inclusion in Class 43.1 or 43.2 if the property fails to comply with the applicable environmental laws, by-laws and regulations of Canada or of a province, territory, municipality, or a public or regulatory body performing a function of government in Canada at the time the property becomes available for use.

Subsection 1219(1) was amended by S.C. 2017, chapter 33, subsection 92(2), December 14, 2017, applicable to property acquired after March 21, 2017, by allowing expenses incurred for all geothermal drilling and expenses incurred solely for the purpose of determining the extent and quality of a geothermal resource eligible as CRCE.

Enacted in 2019

Subparagraph (d)(vii) of Class 43.1 was amended by S.C. 2019, chapter 29, subsection 61(4), June 21, 2019, applicable to property acquired by a taxpayer after March 21, 2016 to remove a reference to electrical storage equipment from the list of equipment that is excluded for the purposes of the subparagraph. Such electrical energy storage equipment is now described in new subparagraph (d)(xviii).

A.9 LANDFILL GAS AND DIGESTER GAS COLLECTION EQUIPMENT

Enacted in 1997

Subparagraph (d)(viii) of Class 43.1 was included when Class 43.1 was originally added by P.C. 1997-1033, section 13, July 25, 1997, applicable to property acquired by a taxpayer after February 21, 1994.

Enacted in 2010

Subparagraph (d)(viii) of Class 43.1 was amended by 2010, chapter 25, subsection 90(5), December 15, 2010, applicable to property acquired after May 2, 2010, to remove the requirement that eligible landfill gas or digester gas collection equipment be above-ground. This amendment also extends eligibility for Class 43.1 or 43.2 to equipment that consists of piping (including well drilling or trenching costs for the purpose of installing the piping) acquired after May 2, 2010.

Enacted in 2013

Subparagraph (d)(viii) of Class 43.1 was amended by S.C. 2013, chapter 40, subsection 119(1), December 12, 2013, applicable to property acquired after March 20, 2013, to expand the range of cleaning and upgrading equipment that can be used to treat eligible gases from waste by replacing the reference to “other ancillary equipment” with “related equipment,” as that reference applies to the equipment used to collect, store, clean or upgrade landfill or digester gas.

A.10 SPECIFIED-WASTE FUELLED HEAT PRODUCTION EQUIPMENT

Enacted in 1997

Subparagraph (d)(ix) of Class 43.1 was included when Class 43.1 was originally added by P.C. 1997-1033, section 13, July 25, 1997, applicable to property acquired by a taxpayer after February 21, 1994.

Enacted in 2005

Subparagraph (d)(ix) of Class 43.1 was amended by P.C. 2005-2287, subsection 2(7), December 6, 2005, applicable to property acquired after February 18, 2003, to add bio-oil as an eligible waste fuel and to permit the heat generated by an eligible system to be used in a greenhouse of the taxpayer.

Enacted in 2009

Subparagraph (d)(ix) of Class 43.1 was amended by P.C. 2009-581, subsection 7(6), April 23, 2009, applicable to property acquired after March 18, 2007, expanding the types of feedstocks that may be used in specified-waste fuelled heat production systems to include pulp and paper waste and to ensure that only eligible waste fuels and fossil fuels are used in such systems. Subsection 1104(13) of the Regulations was amended by said P.C. 2009-581, subsection 4(5), to include a definition of eligible waste fuel that lists the allowable feedstocks for waste-fuelled heat production systems.

Enacted in 2010

Subparagraph (d)(ix) of Class 43.1 was amended by S. C. 2010, chapter 25, subsection 90(5), December 15, 2010, applicable to property acquired after February 25, 2008, to permit the heat produced by specified-waste fuelled heat production systems to be used in any industrial process or greenhouse and not just those operated by the taxpayer or lessee of the taxpayer. The amendment also expands the types of feedstocks that may be used in specified-waste fuelled heat production systems to include biogas. The definition of eligible waste fuel in subsection 1104(13) of the Regulations was amended by said S.C. 2010, chapter 25, subsection 76(2), applicable to property acquired after February 25, 2008, to include biogas.

Enacted in 2012

Subparagraph (d)(ix) of Class 43.1 was amended by S.C. 2012, chapter 31, subsection 70(1), on December 14, 2012, applicable to new property acquired after March 28, 2012, to remove the requirement that heat energy generated from specified-waste fuelled heat production equipment be used in an industrial process or a greenhouse. The amendment to subparagraph (d)(ix) also clarifies that specified-waste fuelled heat production equipment must be acquired for the sole purpose of generating heat energy primarily from the consumption of eligible waste fuel and not using any fuels other than eligible waste fuel or fossil fuel. The definitions of plant residue and eligible waste fuel in subsection 1104(13) of the Regulations were amended by said S.C. 2012, chapter 31, subsection 61(2), on December 14, 2012, applicable to property acquired after March 28, 2012, to include plant residue in eligible waste fuel.

Enacted in 2014

Subparagraph (d)(ix) was amended by S.C. 2014, chapter 39, subsection 90(2), December 16, 2014, applicable to property acquired after February 10, 2014, to allow specified-waste fuelled heat production equipment that uses producer gas to be eligible for Class 43.1 and 43.2. Subsection 1104(13) of the Regulations was amended to add the definition of producer gas by said S.C. 2014, chapter 39, subsection 85(1).

A.11 EXPANSION ENGINE SYSTEMS

Enacted in 1997

Subparagraph (d)(x) of Class 43.1 was included when Class 43.1 was originally added by P.C. 1997-1033, section 13, July 25, 1997, applicable to property acquired by a taxpayer after February 21, 1994.

A.12 SYSTEMS TO CONVERT BIOMASS INTO BIO-OIL

Enacted in 2005

Subparagraph (d)(xi) of Class 43.1 was added by P.C. 2005-2287, subsection 2(8), December 6, 2005, applicable to property acquired after February 18, 2003, extending eligibility under Class 43.1 and 43.2 to bio-oil producing equipment if that bio-oil is used by the taxpayer (or a lessee) primarily to generate electricity or electricity and heat.

Enacted in 2010

Subparagraph (d)(xi) of Class 43.1 was amended by S.C. 2010, chapter 25, subsection 90(6), December 15, 2010, applicable to property acquired after February 25, 2008, to remove the requirement that an electrical generating facility fuelled with bio-oil be operated by the same taxpayer (or lessee) that produced the bio-oil, thereby allowing taxpayers to sell the bio-oil to third parties for the designated uses. In addition, eligibility is extended to equipment that produces bio-oil where the bio-oil is used to produce heat that is used in an industrial process or a greenhouse.

A.13 FIXED LOCATION FUEL CELL EQUIPMENT

Enacted in 2005

Subparagraphs (a)(ii.1) and (d)(xii) of Class 43.1 were added by P.C. 2005-2287, subsections 2(1) and 2(8), December 6, 2005, applicable to property acquired after February 18, 2003, extending eligibility for Class 43.1 to fixed location hydrogen fuel cell equipment with a peak capacity of at least 3 kW.

Enacted in 2009

Subparagraphs (a)(ii.1) and (d)(xii) of Class 43.1 were amended by P.C. 2009-581 subsections 7(1) and 7(7), April 23, 2009, applicable to property acquired after March 18, 2007, to eliminate the minimum electrical output requirement. The amendment to subparagraph (d)(xii) also clarifies that, for property acquired after February 25, 2008, eligibility of fuel cells applies only if the fuel cells use electricity, all or substantially all of which is generated by photovoltaic, wind energy conversion or hydro-electric equipment of the taxpayer or lessee of the taxpayer.

Enacted in 2019

Subparagraph (d)(xii) of Class 43.1 was amended by S.C. 2019, chapter 29, subsection 61(6), June 21, 2019, applicable to property acquired by a taxpayer after March 21, 2016 to include geothermal energy equipment and water-current, tidal or wave energy equipment to the range of equipment that can be used to produce electricity that is to be used by ancillary electrolysis equipment.

A.14 SYSTEMS TO PRODUCE BIOGAS BY ANAEROBIC DIGESTION

Enacted in 2006

Subparagraph (d)(xiii) of Class 43.1 was added by P.C. 2006-439, subsection 12(4), June 1, 2006, applicable to property acquired after February 22, 2005, extending eligibility for Class 43.1 and 43.2 to biogas producing equipment used primarily by the taxpayer or the lessee to produce electricity, or to produce heat that is used directly in an industrial process or in a greenhouse.

Enacted in 2009

Subparagraph (d)(xiii) of Class 43.1 was amended by P.C. 2009-581, subsections 7(8) and 7(9), April 23, 2009, applicable to property after March 18, 2007, removing the restriction that biogas be produced from manure, thereby expanding the types of feedstock that may be used in eligible biogas production systems. Subsection 1104(13) of the Regulations was amended by said P.C. 2009-581, subsection 4(5), to include a definition of biogas that lists the allowable feedstocks for biogas production.

Enacted in 2010

Subparagraph (d)(xiii) of Class 43.1 was amended by S.C. 2010, chapter 25, subsection 90(7), December 15, 2010, applicable to property acquired after February 25, 2008, to remove the following requirements: (1) that biogas produced by a taxpayer's eligible anaerobic digester system be used by the taxpayer and (2) that the biogas be used to produce heat for use in an industrial process or a greenhouse or to produce electricity.

Enacted in 2013

Subsection 1104(13) of the Regulations was amended by S.C. 2013, chapter 40, subsections 103(6), 103(7) and 103(8) December 12, 2013, applicable to property acquired after March 20, 2013, in three ways. First, the definition of biogas was amended to add references to pulp and paper by-product and separated organics as eligible feedstocks. Second, the definition of "food and animal waste" was amended to add references to beverages. Third, new definitions of "pulp and paper by-product" and "separated organics" were introduced.

Subparagraph (d)(xiii) of Class 43.1 was amended by said S.C. 2013, chapter 40, subsection 119(2), applicable to property acquired after March 20, 2013, to expand the range of cleaning and upgrading equipment that can be used to treat eligible gases from waste by replacing the reference to "biogas scrubbing equipment" with "equipment used to remove non-combustibles and contaminants from the gas". In addition the list of equipment that can be included in subparagraph (d)(xiii) was expanded to include fans, compressors and heat exchangers.

A.15 WATER-CURRENT, TIDAL OR WAVE ENERGY EQUIPMENT

Enacted in 2009

Subparagraph (d)(xiv) of Class 43.1 was added by P.C. 2009-581, subsection 7(10), April 23, 2009, applicable to property acquired after March 18, 2007, extending eligibility for Class 43.1 and 43.2 to wave and tidal energy equipment.

Enacted in 2014

Subparagraph (d)(xiv) of the Regulations was amended by S.C. 2014, chapter 39, subsection 90(3), December 16, 2014, applicable to property acquired after February 10, 2014, by making equipment that generates electricity using the kinetic energy of flowing water (otherwise than by diverting the natural flow of the water or by using physical barriers or dam-like structures) eligible for inclusion in Class 43.1 or 43.2.

Subsection 1104(17) was amended by said S.C. 2014, chapter 39, subsection 85(2), applicable to property acquired after February 10, 2014, by adding water-current, tidal or wave energy equipment to the list of property not eligible for inclusion in Class 43.1 or 43.2 if the property fails to comply with the applicable environmental laws, by-laws and regulations of Canada or of a province, territory, municipality, or a public or regulatory body performing a function of government in Canada at the time the property becomes available for use.

Enacted in 2019

Subparagraph (d)(xiv) of Class 43.1 was amended by S.C. 2019, chapter 29, subsection 61(7), June 21, 2019, applicable to property acquired by a taxpayer after March 21, 2016 to remove a reference to battery storage equipment that is used in connection with water-current, tidal or wave energy equipment. Such battery storage equipment and other electrical energy storage equipment are now described in new subparagraph (d)(xviii).

A.16 DISTRICT ENERGY SYSTEMS/EQUIPMENT

Enacted in 2006

Subparagraph (a)(iii.1) of Class 43.1 was added, by P.C. 2006-439, subsection 12(2), June 1, 2006, applicable to property acquired after February 22, 2005, extending eligibility for Class 43.1 and 43.2 to distribution equipment used in district energy systems to distribute thermal energy that is primarily supplied by eligible cogeneration systems. The definitions "district energy equipment" and "district energy system" were added to subsection 1104(13) of the Regulations by said P.C. 2006-439, subsection 4(3), applicable to property acquired after February 22, 2005.

Enacted in 2010

Subparagraph (a)(iii.1) of Class 43.1 was amended and subparagraph (d)(xv) of Class 43.1 was added by S. C. 2010, chapter 25, subsections 90(1) and 90(8), December 15, 2010, applicable to new property acquired after March 3, 2010, extending eligibility for Class 43.1 and 43.2 to include specified distribution equipment that is part of a district energy system used by the taxpayer to provide district heating or cooling through the use of thermal energy provided primarily by a ground-source heat pump system, an active solar system, heat recovery equipment or a combination of these sources, provided that these sources qualified for Class 43.1 or 43.2.

Enacted in 2012

Clause (d)(xv)(B) of Class 43.1 was amended by S.C. 2012, chapter 31, subsection 70(2), on December 14, 2012, applicable to new property acquired after March 28, 2012, to include specified distribution equipment that is part of a district energy system used by the taxpayer to provide district heating or cooling through the use of equipment that uses thermal energy primarily generated by specified-waste fuelled heat production equipment, provided that the equipment otherwise qualifies for Class 43.1 or 43.2.

Enacted in 2017

Clause (d)(xv)(B) of Class 43.1 was amended by S.C. 2017, chapter 33, subsection 104(3), December 14, 2017, applicable to property acquired after March 21, 2017, to make heat primarily supplied by geothermal energy equipment eligible for Class 43.1 or 43.2 an eligible thermal energy source for use in a district energy system.

A.17 PRODUCER GAS GENERATING EQUIPMENT

Enacted in 2014

Subparagraph (d)(xvi) of Class 43.1 was added, by S.C. 2014, chapter 39, subsection 90(4), December 16, 2014, applicable to property acquired after February 10, 2014, extending eligibility for Class 43.1 and 43.2 to equipment used to generate producer gas. The definition “producer gas” was added to subsection 1104(13) of the Regulations by said S.C. 2014, chapter 39, subsection 85(1), applicable to property acquired after February 10, 2014.

Subsection 1104(17) was amended by said S.C. 2014, chapter 39, subsection 85(2) by adding equipment used to generate producer gas to the list of property not eligible for inclusion in Class 43.1 or 43.2 if the property fails to comply with the applicable environmental laws, by-laws and regulations of Canada or of a province, territory, municipality, or a public or regulatory body performing a function of government in Canada at the time the property becomes available for use.

A.18 ELECTRIC VEHICLE CHARGING EQUIPMENT

Enacted in 2019

Subparagraph (d)(xvii) of Class 43.1 was added, by S.C. 2019, chapter 29, subsection 61(8), June 21, 2019, applicable to property acquired after March 21, 2016, extending eligibility for Class 43.1 and 43.2 to equipment used for the purpose of charging electric vehicles.

Paragraphs (a) and (b) of Class 43.2 were amended by said S.C. 2019, chapter 29, subsection 62(1) applicable to property acquired after March 21, 2016 to specify that only electric vehicle charging stations supplying at least 90 kilowatts of continuous power or equipment used in connection with electric vehicle charging stations supplying more than 10 kilowatts of continuous power and in connection with at least one electric vehicle charging station that supplies at least 90 kilowatts of continuous power are eligible for inclusion in Class 43.2.

Subsection 1104(17) was amended by said S.C. 2019, chapter 29, subsection 55(2) by adding electric vehicle charging equipment to the list of property not eligible for inclusion in Class 43.1 or 43.2 if the property fails to comply with the applicable environmental laws, by-laws and regulations of Canada or of a province, territory, municipality, or a public or regulatory body performing a function of government in Canada at the time the property becomes available for use.

A.19 ELECTRICAL ENERGY STORAGE EQUIPMENT

Enacted in 2019

Subparagraph (d)(xviii) of Class 43.1 was added, by S.C. 2019, chapter 29, subsection 61(8), June 21, 2019, applicable to property acquired after March 21, 2016, extending eligibility for Class 43.1 and 43.2 to equipment used for the purpose of storing electricity.

Paragraphs (a) and (b) of Class 43.2 were amended by said S.C. 2019, chapter 29, subsection 62(1) applicable to property acquired after March 21, 2016 to specify that electrical energy storage equipment only qualifies for Class 43.2 when used in connection with property eligible for Class 43.2.