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Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
DEPARTMENT OF ENERGY RESOURCES

Massachusetts Stretch and Specialized Codes
(225 CMR 22.00 and 23.00)

Guideline on District Energy Systems

Effective Date: TBD

Introduction

Massachusetts hosts a number of district energy systems (DESs). DESs traditionally make steam or hot water at a central location for distribution to a network of buildings to be used for space heating and/or service water heating. Some DESs also make chilled water for space cooling. A more modern DES arrangement is to provide mid-temperature, or variable temperature, water to a network of buildings to be used as a heat source and heat sink for buildings' heating, cooling, and service water in conjunction with locally sited heat pumps, thus improving overall system efficiency.

Most existing DESs use heat from burning fossil fuels to generate hot water or steam and some of these systems' owners are seeking ways to transition from fossil fuel to efficient electrification using electric heat pumps. The Massachusetts Stretch and Specialized energy Codes do not restrict the use of DESs using fossil fuels, however, buildings served by DESs using fossil fuels are by definition 'mixed fuel' buildings. Buildings seeking to be classified as 'all electric' buildings under the energy codes are typically served by on-site efficient electrification of space and water heating, however, some buildings may wish to connect to an existing DES that is undergoing a transition to efficient electrification and are seeking relief from the full requirements of mixed fuel buildings to provide electric capacity for on-site electrification as a result.

To support this effort, on February 14, 2025, the Department of Energy Resources (DOER) published updates to the Massachusetts Stretch and Specialized Codes for commercial buildings under 225 CMR 23.00 that introduced the concept of a District Energy Order of Conditions (OoC) which provide relief from some of these codes' efficient electrification provisions which would otherwise be required for buildings connecting to these systems.

District Energy Order of Conditions are defined under 225 CMR 23.00, Section C202 as:

> A document issued by the Commonwealth of Massachusetts Department of Energy Resources which regulates the decarbonization and efficient electrification of all energy inputs of a district energy system for the purposes of building energy code compliance.

A. DES Type

There are two types of DESs under the Stretch and Specialized Code. As noted above, the efficient electrification relief available depends upon the DES type that the building is connecting to. The requirements of an OoC application also depend on the DES type.

- **District Energy System, Heat Recovery Enabled** (**Heat Recovery Enabled DES**)– this is a DES capable of recovering excess heat energy from buildings on the distributed network which are in cooling mode for useful space and/or service water heating in other buildings on the network. This approach typically uses one, or a pair, of hydronic loop(s) that connect the buildings in the DES network together and requires new heat pumps in each building and/or at a central location.

  It is also possible to achieve Heat Recovery Enabled DES using a hot water (or steam) loop paired with a chilled water loop to each building in the DES network so long as both the chilled water and hot water (or steam) loops are provided to multiple buildings and are brought to a central location so that the chilled water return can usefully transfer its excess energy via a heat exchanger to offset hot water (or steam) production.

- **District Energy System, Non-Heat Recovery Enabled (Non-Heat Recovery Enabled DES)** – this is any DES that does not meet the definition of Heat Recovery Enabled DES and is therefore unable to transfer heat energy from buildings on the DES network with cooling demand to other buildings on the network to supply useful heating demand. DESs that make steam (or hot water) for distribution and do not have a heat exchange capability with a chilled water loop to buildings on the DES network that can usefully recover heat energy from cooling are Non-Heat Recovery Enabled DESs.

B. Decarbonization and Efficient Electrification Plans

In order to qualify for an OoC, a DES Owner must demonstrate that it has a long-term plan to decarbonize the entire district energy system and efficiently electrify all energy inputs to its system through the creation of a Decarbonization and Efficient Electrification Plan (DEEP). The DEEP will serve as the foundation for any OoC issued by DOER.

1. Minimum Qualification Standards for a DEEP

A DEEP must meet the below minimum standards to demonstrate that the DES has a long-term plan to decarbonize the entire district system and efficiently electrify all energy inputs to its system.

a. Minium Standards for Heat Recovery Enabled DES and Non-Heat Recovery Enabled DESs

- no new electric resistance[1] or fossil fuel[2] heat inputs (including CHP) into any part of DES after the original publication date of this Guideline;

- maximum of 5% of total heat supply from electric resistance inputs to the DES by 2035;

- minimum of 95% of total DES annual heat production with electric heat pumps by 2050 with progress commitments by 2030, 2035, 2040, and 2045;

- maximum of 5% of total DES annual heat production with fossil fuel and/or electric resistance heat sources by 2050 with progress commitments by 2030, 2035, 2040, and 2045;

b. Additional Minimum Standards for Heat Recovery Enabled DESs

- Enabling all or almost all[3], buildings on a DES network to have inter-building energy recovery function across all other buildings on DES network by 2050 with progress commitments by 2030, 2035, 2040, and 2045;

c. Demand Reduction Minimum Standards for DES Served Buildings Owned or Operated by the DES Provider

- specialized code compliance (225 CMR 23.00 Appendix CC) for all new buildings and additions added to the DES. This includes Passive House standards[4] for new residential buildings over 12,000-sf per Section CC101.2; and

- strong commitment to demand reduction strategies for existing buildings, particularly R-use, I-use and B-use buildings, on the DES using the latest version of either the Passive House Institute or PHIUS renovation standards[5] (PHI) EnerPhit standard; or, PHIUS' REVIVE standard, for buildings undergoing Level 3 alterations or change of use.

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[1] For the purposes of this Guideline, DOER defines "electric resistance" as heating which uses electricity inputs and converts to space heating at an efficiency of no greater than 100%.

[2] For the purposes of this Guideline, DOER defines "fossil fuel" as an energy source derived from the subsurface remains of living organisms including, but not limited to: gas, oil, propane, and coal. In this context "fossil fuel inputs" also includes recovered heat energy originating from any source that uses fossil fuel such as combined heat and power (CHP), electric power generation plants, or industrial process equipment.

[3] DOER anticipates at least 90% of the conditioned floor area served by the DES network.

[4] PHIUS standards: CORE, ZERO. Passive House Institute standards: Classic, Plus, Premium, Low Energy Building

[5] PHIUS standards: CORE REVIVE, ZERO REVIVE. Passive House Institute standard: EnerPhit

2. Preparing the DEEP

A DEEP is a technical submission and the team preparing the plan should include engineers and other qualified technical staff familiar with the DES's energy systems, equipment, and processes.

At a minimum, the DEEP shall include the following sections. Additional sections may be necessary depending on the complexity of the DES.

a. Existing Conditions

The DEEP must characterize all the existing DES infrastructure and operations, including:

- detailed description of existing equipment including all sizes, capacity, inputs, outputs, and efficiencies. The DEEP should label each piece of equipment and include production and consumption information tied to each piece of equipment.

- Operation information for each unique piece of equipment, including:
  - annual steam, hot water, chilled water, power, and all other energy production outputs in million British thermal units (MMBtu/yr), provide supply delivery temperature range, volume, pressure, quantity, etc. as necessary to fully characterize outputs;
  - monthly steam, hot water, chilled water, etc. peak production rate in thousand British thermal units per hour (MBtu/hr)
  - annual and monthly energy consumption, disaggregated by electric, gas, oil, etc. (MMBtu/yr);
  - equipment efficiencies under all operating conditions;
  - energy stored, characterized by charge and discharge amount, rate, and capacity; and
  - energy recovered, characterized by recovery amount, rate, and effectiveness.

- Detailed description of distribution, including:
  - Method(s) of distribution (steam, hydronic) and characteristics of supply/return (temperature and flowrates) to/from the central plant and
  - distribution losses.

- Electric Infrastructure:
  - detailed description of electric infrastructure servicing the DES and
  - detailed description of DES components' electric service requirements.

- End users[6]:
  - database and inventory of all buildings/spaces and areas being provided energy from the DES;
  - estimated energy use by end user;

[6] Certain information required under this section may qualify as energy information under G.L. c. 25A, § 7 and as such may not be deemed a public record as defined in M.G.L. c. 4, § 7, clause twenty-sixth. To the extent permitted by law, DOER will treat such information submitted pursuant to this requirement as confidential.

  - method of distribution (steam, hydronic) and characteristics of supply/return (temperature and flowrates) to/from the central plant;
  - distribution losses; and
  - details describing terminal equipment in the end user buildings to convey how the heat energy is converted to useful space heating (or space cooling, if applicable).

- Permits and licenses:
  - Copies of relevant permits and licenses already obtained by the DEEP submission date accompanied with a summary of conditions and
  - a detailed description of all relevant future permits and licenses required to successfully implement the DEEP accompanied with a summary of anticipated limits and obligations.

b. Future Decarbonized Conditions

The DEEP must characterize all the future DES infrastructure and operations to the level of detail outlined above for existing conditions, for years 2030, 2035, 2040, 2045, and 2050, as applicable.

c. Transition and Milestones

The DEEP must provide a description of key intermediate milestones between current and future state described above, such as:

- approximate annual dates of existing equipment removal and new equipment being put in place;

- projection of electric requirements between current and future state and detailed description of changes in electric service requirements, tied to individual equipment going in/out of service; and

- permit or license implementation and updates required to support planned future conditions.

d. Maximum DES Growth and Utilization

The DEEP must include peak service load forecast and maximum rated capacity to ensure that the utilization of the DES does not exceed its capacity to produce and deliver heating and cooling using efficient electrification. Accordingly, the DEEP needs to provide the following:

- approximate growth (or reduction) projections of steam, hot water, chilled water, etc. production by year and

- maximum lifetime annual production cap.

e. Equipment Design and Specifications

The DEEP should provide a description and specifications for all district energy system equipment, current and future, including:

- capacities, efficiencies, and source requirements, at the range of anticipated operating conditions;
- cut-sheets and equipment specifications;
- for ground source equipment: detailed design of geo-exchange field including time-step analysis of source use, modeled over multidecade period of use;
- for water source equipment: flow requirements under the range of operating conditions, detailed information about water source, infrastructure requirements, and water use permitting; and
- permits from appropriate agencies, including operating limits.

f. Demand Reduction Strategies

As applicable, the DEEP needs to include a demand reduction plan which:

- characterizes the commitment to meeting Specialized Code, and where appropriate Passivehouse standards, for new buildings and additions;
- characterizes the commitment to meeting EnerPhit and/or REVIVE standards for relevant use-types of existing buildings undergoing alterations or change of use; and
- characterizes the commitment to other demand reduction strategies where EnerPhit or REVIVE building renovation standards are not being followed.

3. DOER Review of a DEEP

DOER will review all DEEPs submitted pursuant to the process listed above to confirm compliance with the requirements listed in Sections B(1)-(2) of this Guideline. DOER may reach out to an applicant to request clarification, further information, or revisions to a DEEP. DOER may deny an OOC application if it determines the DEEP does not meet the requirements of the Guideline.

C. District Energy System Order of Conditions.

Upon satisfactorily demonstrating compliance with Sections B(1)-(2) of this Guideline, DOER will develop and issue an OoC for the DES. The OoC will require the DES to achieve the transition milestones contained in the DEEP (existing conditions, future conditions, transition milestones, maximum DES utilization, equipment information, demand reduction strategies, permits, licenses, and dates).

The OoC will make building projects that receive space or water heating from the DES eligible for certain exemptions under 225 CMR 23.00.

1. Reporting Requirements under an OoC

The OoC will detail annual reporting requirements designed to ensure that the DES's decarbonization transition is keeping pace with the DEEP. These reporting requirements may include, but are not limited to, operating data, milestone completion, permit acquisition and compliance, equipment implementation, demand reduction implementation, etc.

2. Updates to a DEEP subject to an OoC.

DOER recognizes that a DEEP is a multi-year and potentially multi-decade plan and therefore is likely to change. In the event that a DES owner needs to update an approved DEEP, the DES owner should prepare a revised DEEP for DOER's review as soon as practicable, preferably at least two years prior to the anticipated change. The revised DEEP should contain a narrative explanation of the changes and the impact to any milestones contained in the approved DEEP along with a redline of the changes to the approved DEEP.

DOER shall review the revised DEEP to ensure the revisions comply with Sections B(1)-(2) of the Guideline. If DOER approves the revised DEEP, it shall issue a revised OoC.

3. Compliance with an OoC.

A DES owner shall be required to comply with all applicable milestones and requirements of an OoC. Failure to comply with a milestone or requirement of an OoC may result in its revocation.

4. Confirming That a Project is Subject to a Valid OoC

Building project design teams and municipal inspectional service departments (ISDs) should use the following process to verify that a building seeking the utilize the exception provisions under of C407.2.1, CC105.3.2, or CC106.1 is connected to a DES that has received an OoC from DOER (Qualified DES).

i. Prior to building permit application, design teams should consult with the DOER to:

- verify that the building's DES is a Qualified DES;
- confirm whether the Qualified DES is Heat Recovery Enabled or Non-Heat Recovery Enabled; and
- review which efficient electrification exceptions the building project is seeking.

ii. When preparing the building permit application, the design team should incorporate a copy of the OoC in the project documents, as required in Section C103.2, Part 18 of 225 CMR 23.00. The design documents in the application should also indicate whether the project is getting relief from:

- Section C407.2.1 (electrification for highly ventilated) – this is only available to qualified Heat Recovery Enabled DESs or

- section CC106.1 (electrification readiness of mixed fuel pathway) – this is available for all qualified DESs.

iii. Upon receipt of a building permit application, the ISD should verify the following:

- the project documents include the current version of the OoC;

- verify that the building's DES is a Qualified DES;

- whether the DES is Heat Recovery Enabled or Non-Heat Recovery Enabled;

- the project documents indicate which relief is being pursued:

  - highly ventilated – only available for Heat Recovery Enabled DESs;
  - electric readiness – available to all DESs;

- the project includes efficient electrification with in-building heat pumps for highly glazed buildings (C402.1.5.2); and

- the project includes installed solar in Specialized Code jurisdictions (CC105.2).

D. Examples of Buildings Connecting to Qualified DES and Buildings Connecting to not Qualified DESs

The requirements for a new construction building project connecting to a DES depend on the specifics of that construction and whether the building is connected to a Qualified DES. A Qualified DES entitles certain buildings to relief from some, but not all, heat pump efficient electrification requirements. Similarly, new construction is permitted for certain types of buildings regardless of whether it is connecting to a Qualified DES. The below section outlines some of the different circumstances that may apply for buildings connecting to a DES.

1. Building Efficient Electrification Relief for Buildings Connecting to Qualified DESs

Building projects are eligible for relief from some of the heat pump efficient electrification requirements (see appendix) when those building projects are connecting to a Qualified DES.

For building projects in both Stretch and Specialized jurisdictions connecting to a Qualified DES:

- Highly glazed[7] buildings – **Consistent application of** the Stretch code update in 2023, whereby new buildings, additions (Section C502), change of use (Section C505), alterations (Section C503) that include the envelope, and alterations using C407 compliance pathway must have electric heat pumps in the building sized to 100% of peak space heating load and no fossil fuels can be used. **A Qualified DES does not satisfy this in-building heat pump requirement and cannot be used in lieu of in-building heat pumps.**

- Highly ventilated[8] buildings – **Heat Recovery Enabled DESs can satisfy this requirement** in new buildings, large additions, and buildings where the total compliance pathway is used. **DESs which are not Heat Recovery Enabled cannot satisfy this requirement** and therefore consistent with C407.2.1 must install electric heat pumps in the building, sized to 25% of peak space heating load, and the heat pump shall be used as the primary heating source.

For building projects in Specialized jurisdictions connecting to a qualifying DES:

- Both **Heat Recovery Enabled and non-Heat Recovery Enabled DESs are relieved** from the electrification readiness (pre-wiring) requirements of the mixed fuel compliance path (Section CC105). Note that there is **no relief** from the solar PV requirement of the mixed fuel pathway, but this requirement already includes exceptions, e.g. for heavily shaded sites.

In addition, DESs electric equipment efficiency **is lower** than the heat pump equipment efficiency specified in Sections C401.4.4 and CC105.3.1.

2. New Construction Buildings Connecting to DESs that are not Qualified

In limited circumstances, new construction is permitted for certain types of buildings regardless of whether it is connecting to a Qualified DES.

i. In Stretch Code jurisdictions:

- If the building project is neither highly ventilated nor highly glazed, the DES can be used for all space and service water heating.

- If the building project is highly ventilated **and** in-building electric heat pumps (sized to 25% of building peak load) are used for primary space heating. DES can be used for secondary space heating and all service water heating.

[7] Per Section C402.1.5.2, a building is highly glazed when more than 50% of the total, above-grade wall area of the building thermal envelope is a *glazed wall system*. Per Section C202, a *glazed wall system* is a "system consisting of any combination of both vision glass and/or spandrel sections to create an above-grade wall that is designed to separate the exterior interior environments. These systems include, but are not limited to, curtain walls, window walls, and storefront windows."

[8] Per Section C401.2.1 a highly ventilated building is a building having average ventilation at full occupancy of greater than 0.5 cfm/sf.

- If the building project is highly glazed, all space heating is through electric heat pumps **and** the DES cannot be used for any space heating. The DES can be used for all service water heating.

ii. In Specialized jurisdictions:

- the three bullets above apply, **plus**

- the DES is used for all space and service water, however, the mixed fuel pathway of the Specialized Code is pursued through electric readiness requirements and installed solar PV.

3. Large Additions at Existing Buildings Connecting to DESs that are not Qualified

In most cases for an existing building proposing large additions,[9] a DES does not need to be a Qualified DES to allow the addition (in both Stretch and Specialized Code jurisdictions):

- the large addition meets the conditions for D.2.i **and**

- provided the scope of the project does not include creating a new highly glazed envelope or new highly ventilated building, the DES can be used for all space and service water heating in an alteration, change of use, or small addition; **or**

- if the scope of the project includes creating new highly glazed envelope or new highly ventilated building, it follows the rules for new construction, as applicable.

4. Alterations, Change of Use, and Additions at Buildings with Existing, non-qualified, DES Connection

i. The following provides clarification for buildings having an **existing** connection to a non-Qualified DES undergoing alteration or change of use.

- If the building is already highly glazed and is undergoing an Alteration or Change of Use, in-building heat pumps are not required and the existing, non-qualified DES can continue to be used so long as the amount of glazed wall system is not increased.

- If the building is already highly ventilated and is undergoing an alteration or change of use, in-building heat pumps are not required and the existing, non-Qualified DES can continue to be used.

[9] Per Section C502.1, a large addition is an addition to an existing building which is more than 100% of the size of the existing building; or, greater than or equal to 20,000-sf.

- If the building is not highly ventilated and is undergoing an alteration or change of use which will result in a highly ventilated building, in-building heat pumps are required to be added for a minimum of 25% of primary space heating capacity and the non-qualified DES can continue to be used for secondary space heating only.

ii. The following provides clarification for buildings having an **existing** connection to a non-qualified DES undergoing an addition.

- Highly glazed or highly ventilated **large** additions (20,000 sf or greater, or more than doubling the conditioned floor area of the existing building) shall have in-building heat pumps, as required.

- Highly glazed or highly ventilated **small** additions (up to 100% of the size of the existing building and less than 20,000 sq. ft.) shall have in-building heat pumps if the total building performance compliance pathway is used (C407).

- A non-qualifying DES cannot be “extended” into the addition in these cases.

Appendix A: Efficient Electrification Requirements

Efficient Electrification Requirements of the Stretch and Specialized Codes

The February 2025 updates to the Stretch and Specialized Code (225CMR 22 & 23) introduced a definition for Efficient Electrification, in Section C202, as follows:

> Space heating using equipment having a system efficiency and a coefficient of performance greater than one (100%) at outdoor design temperature or water heating equipment with a system efficiency or Uniform Energy Factor (UEF) of greater than two (200%) at indoor operating temperature.

The **Stretch Code** requires efficient electrification with air source, ground source, or exhaust source heat pumps, as follows:

- Highly glazed buildings must have electric heat pumps sized to 100% of peak space heating load and no fossil fuels can be used for space heating per Section C401.4.2 in the following circumstances:
    - New construction buildings following Chapter 4 of the code;
    - Additions (Section C502);
    - Alterations (Section C503) where the scope of the alteration includes the envelope;
    - Alterations where total building performance compliance pathway is used (C407); and
    - Change of Use (Section C505).
- Highly ventilated buildings must have electric heat pumps sized to 25% of peak space heating load and the heat pump shall be used for primary heating per Section C401.4.1 in the following circumstances:
    - New construction buildings following Chapter 4 of the code;
    - Large additions (Section C502). A large addition is one that more than doubles the size of the existing building; or, is 20,000-sf or larger;
    - Small additions, Alterations, or Change of Use where total building performance compliance pathway is used (C407).

The **Specialized Code** requires efficient electrification with air source, ground source, or exhaust source heat pumps, as follows:

- All new construction buildings following Chapter 4 shall comply with either:

    - The all-electric compliance path (Section CC104) which requires electric heat pumps sized to 100% of peak space heating load; electric heat pumps, electric resistance, or solar thermal for 100% of the service water heating; and no fossil fuel can be used for space heating or service water heating per Section C401.4.3.

      Or

    - The mixed fuel compliance path (Section CC105) which requires efficient electrification readiness be included in the new construction building (e.g. space and electric service capacity and infrastructure) to be able to retroactively add the heat pumps described in the above bullet in the future. This path also requires installation of solar PV.

Where heat pumps are required, heat pump efficiency must comply with efficiency ratings of C401.4.4.

Note that in Specialized Code jurisdictions, the efficient electrification requirements of the Stretch Code still apply. This means that highly glazed and highly ventilated buildings are required to have heat pumps as described above. This is true even when the mixed fuel pathway of the Specialized Code (CC105) is used.