This should be a stand-alone document and not embedded into the TA report
The MRD should be **submitted as a WORD document.**
A copy of this document in Microsoft Word is attached to this PDF

Minimum Requirements Document

Customer	Generic Lab Co.	**Electric PA**	Eversource	**Application #**	NC170671
Facility	Lab Building Z, 123 Lab Street, Boston, MA	**Gas PA**	National Grid	**Application #**	3575484

This Minimum Requirements Document ("MRD") states the minimum equipment specifications and operational requirements of the energy saving equipment and system(s) planned for the project identified above per the project's design documents. Equipment and systems shall be installed per the [illegible]s in this document to ensure that the demand and energy savings estimated in the Mass Sa[illegible]sis/energy model are realized. Upon construction completion, Mass Save Program Admi[illegible]that these minimum requirements are met before making incentive payments. Verification m[illegible] post inspection walk through and review of documents and trend data identified in these MRDs.

Leave blank; Application #'s for the project wouldn't be known when study is finalized

The Energy Conservation Measures (ECMs) in this project provide both electric and gas savings (as applicable). The ECMs and associated fuel savings are listed in the table below. A separate detailed MRD for each ECM follows on subsequent pages.

	Applicability	
ECM	**Electric**	**Gas**
ECM 1: Efficient Lighting Design	☒	☐
ECM 2: Energy Recovery	☒	☒
ECM 3: Condensing Boilers	☐	☒

In the event there are to be changes to the equipment and systems described in these MRDs, customers must notify the Mass Save Program Administrators of the expected changes prior to the equipment purchase and installation, as the change in design and operation may affect the available incentive and anticipated energy savings.

Technical Representative	**Pre-Installation**		**Post-Installation**	
	Signature	Date	Signature	Date
Customer	Jane Doe, VP, Generic Lab Co.	7/31/2018		
Electric PA	Greg Dennis, Eversource	7/26/2018		
Gas PA	Alex Frost, National Grid	7/26/2018		

1/2/2018

Be sure to indicate who prepared the MRD (typically the TA Vendor)

Minimum Requirements Document

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ECM 1: Purchase and install new lighting fixtures for the core & shell space types identified in the following table. The lighting power density (w/sqft) shall not exceed the performance values outlined below.

Yes/No checkboxes are intended for use as program administrator's post-installation inspection record (check one).

EQUIPMENT: *Provide a list of equipment or materials installed as part of this project. Include equipment counts, HP, kW, efficiency and capacity ratings, rating conditions, location of controls hardware, etc.*

	Project Design Intent	Post Inspection Findings
Yes ❑ No ❑	1. Lighting power densities designed not to exceed:	
Yes ❑ No ❑	2. LED lighting should be listed on the DesignLights Consortium® (DLC) qualified products list.	

Space Type	Design LPD [W/ft²]
Corridor	0.27
Electrical/mechanical	0.42
Laboratory	1.80
Office - enclosed	0.75
Office - open plan	0.68
Parking area, interior	0.06
Stairwell	0.27
Storage room	0.30

Check boxes used at POST-installation. "Yes" indicates the findings match the design intent

Baseline inputs should never be included on the MRD

The width's of the "Project Design Intent" and "Post inspection findings" can be adjusted as needed for each MRD. Want to leave adequate space for the inspector's notes

SEQUENCES OF OPERATION: *Provide a description of equipment operating sequences, setpoints, operating schedules, balancing requirements (flow, velocity, head, etc.) or any other required operating parameters. Describe requirements separately.*

Yes ❑ No ❑	3. n/a	

DOCUMENTATION: *List written documentation required to train, verify, operate, or maintain the equipment being installed or controlled. This may include specification sheets, test reports, construction drawings, etc.*

Yes ❑ No ❑	4. As-Built Drawings	
Yes ❑ No ❑	5. Latest and final COMCheck (or equivalent)	
Yes ❑ No ❑	6. Final and approved Lighting Submittals	
Yes ❑ No ❑	7. Lighting invoice or packing slip (not needed if submittals indicate quantities)	

POST INSTALLATION VERIFICATION: *Provide a list of controls and monitoring capabilities required to verify proper system operation. Trends should document operational sequences, set points and scheduling of equipment as described in TA Study.*

Yes ❑ No ❑	8. n/a	

OTHER REQUIREMENTS: *Describe any requirements for demolition, removal, etc. of existing equipment.*

Yes ❑ No ❑	9. n/a	

The beginning of the MRD for each measure should start at the top of the page (use page breaks as necessary)

Minimum Requirements Document

Customer	Generic Lab Co.	**Electric PA**	Eversource	**Application #**	NC170671
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ECM 2: Purchase and install new intelligent glycol energy recovery system

Yes/No checkboxes are intended for use as program administrator's post-installation inspection record (check one).

EQUIPMENT: *Provide a list of equipment or materials installed as part of this project. Include equipment counts, HP, kW, efficiency and capacity ratings, rating conditions, location of controls hardware, etc.*

	Project Design Intent	Post Inspection Findings
Yes ❑ No ❑	1. System Controller (basis of design: Konvetka) – Demand dependent regulation of the entire energy recovery system (circulation pumps, valves, bypass, etc.), including controller hardware and software, display unit for energy efficiency, temperatures, and volumetric flows.	
Yes ❑ No ❑	2. (2) 200 HP centrifugal pumps (one is stand-by) – GLYP-1 and GLYP-2 Each equipped with VSDs	
Yes ❑ No ❑	3. (5) Plate & Frame heat exchangers – HR-P&F-1,-2,-3,-4,-5	
Yes ❑ No ❑	4. Supply and exhaust energy recovery coils: • Supply SHRCs 1-5 (AHU-1-5) • Supply SHRCs 6-7 (HVU-1, HVU-2) • Exhaust SHRCs 1-5 (EAHU-1-4)	

SEQUENCES OF OPERATION: *Provide a description of equipment operating sequences, setpoints, operating schedules, balancing requirements (flow, velocity, head, etc.) or any other required operating parameters. Describe requirements separately.*

Yes ❑ No ❑	5. The control software is based on a simulation/optimization algorithm with the Supply Air Set Temperatures as setpoints or command signal, the glycol/water temperatures and volumes in the supply air heat exchangers as the actuating variables, and the air volumes in the air handlers, the outside air temperature and the exhaust air temperatures as disturbance variables. The simulation algorithm continuously calculates the theoretical system performance (energy recovery efficiency) based on all control variables, the pump and heat exchanger performance curves and different glycol/water volumes pumped through the system. The optimization algorithm then sets the actuating variables based on the simulated system performance.	
Yes ❑ No ❑	6. The heat recovery system attempts to maintain the AHU pre-heat coil leaving air temperature of 55.2F db during winter conditions and 80.3 F db/69.6 F wb during summer conditions. During winter operation, heating from the boiler plant may be required to supplement the heat recovery.	
Yes ❑ No ❑	7. Glycol heat recovery pumps are driven by VFDs and should vary flow as load changes	

DOCUMENTATION: *List written documentation required to train, verify, operate, or maintain the equipment being installed or controlled. This may include specification sheets, test reports, construction drawings, etc.*

Yes ❑ No ❑	8. As-built drawings and specifications	
Yes ❑ No ❑	9. Commissioning report and test procedures	
Yes ❑ No ❑	10. Final and approved submittals pertinent to this ECM	

When an MRD for one ECM extends across multiple pages, section headings should be on the same page as its components when possible (use page breaks as necessary)

Minimum Requirements Document

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POST INSTALLATION VERIFICATION: *Provide a list of controls and monitoring capabilities required to verify proper system operation. Trends should document operational sequences, set points and scheduling of equipment as described in TA Study.*

Yes ❑ No ❑	11. To verify proper operation of the system, a trend report from the Building Automation System must be provided. The following points shall be trended for a minimum of 2 weeks. Data samples should be taken at no greater than 1 minute intervals. 1) AHU glycol loop supply pre-heat coil air entering temperature (outside air dry-bulb temperatures 2) AHU glycol loop supply pre-heat coil air leaving temperature 3) EAHU glycol loop exhaust heat recovery coil air entering temperature 4) EAHU glycol loop exhaust heat recovery coil air leaving temperature 5) AHU CFM 6) EAHU CFM 7) Heat recovery plate & frame heat exchanger valve position 8) Heat recovery plate & frame heat exchanger glycol entering temperature 9) Heat recovery plate & frame heat exchanger glycol leaving temperature 10) Heat recovery pump % VFD speed command Data should be collected for AHU-1-5, HVU-1-2, EAHU-1-4, HR-P&F-1-5, and GLYP-1-3	

OTHER REQUIREMENTS: *Describe any requirements for demolition, removal, etc. of existing equipment.*

Yes ❑ No ❑	12. A substantial lab tenant(s) must be operational to demonstrate proper implementation of this measure	

Trending requirements should clearly state which points need to be trended as well as the interval and duration.

If Model completed based on a particular piece of equipment, explicitly state the basis of design including the model number

Minimum Requirements Document

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ECM 3: Purchase and install (8) condensing boilers

Yes/No checkboxes are intended for use as program administrator's post-installation inspection record (check one).

EQUIPMENT: *Provide a list of equipment or materials installed as part of this project. Include equipment counts, HP, kW, efficiency and capacity ratings, rating conditions, location of controls hardware, etc.*

	Project Design Intent	Post Inspection Findings
Yes ❑ No ❑	1. (8) 6,000 MBH, 94% efficient condensing boilers Basis of design: AERCO BMK6000 GWBF32	
Yes ❑ No ❑	2. Provide acid neutralization for condensation	

SEQUENCES OF OPERATION: *Provide a description of equipment operating sequences, setpoints, operating schedules, balancing requirements (flow, velocity, head, etc.) or any other required operating parameters. Describe requirements separately.*

Yes ❑ No ❑	3. Hot Water Reset Control: The supply temperature shall be reset between a maximum of 140°F at ambient ≤20°F db and a minimum of 120°F at ambient ≥50°F.	
Yes ❑ No ❑	4. Boiler Staging Control: Inactive boilers shall be automatically isolated. The number of active boilers shall be automatically staged in a manner that minimizes the active boiler count. Active boilers are to run at the same firing rate.	

DOCUMENTATION: *List written documentation required to train, verify, operate, or maintain the equipment being installed or controlled. This may include specification sheets, test reports, construction drawings, etc.*

Yes ❑ No ❑	5. Invoices or final approved submittals for boilers.	
Yes ❑ No ❑	6. Section from ATC submittal describing the approved sequences governing the hot water plant.	
Yes ❑ No ❑	7. Commissioning agent verification that the hot water plant is operating as intended by the design documents.	

POST INSTALLATION VERIFICATION: *Provide a list of controls and monitoring capabilities required to verify proper system operation. Trends should document operational sequences, set points and scheduling of equipment as described in TA Study.*

Yes ❑ No ❑	8. Record 15-minute integrated data for a period of 2 weeks during shoulder season operation for the following points: • Ambient drybulb temperature, °F • HW Supply Temperature from Boilers, °F • HW Return Temperature to Boilers, °F • % fire status of each boiler	

OTHER REQUIREMENTS: *Describe any requirements for demolition, removal, etc. of existing equipment.*

Yes ❑ No ❑	9. n/a	