Constructing & Connecting All-Electric Buildings

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Agenda

Introduction
Joel Martell

Residential New Construction
Keegan Ebbets

Commercial & Industrial New Construction
Joel Martell

Connections - National Grid
Jim Patterson

Connections - Eversource
John Daly

mass save®

Together, we make good happen for Massachusetts.

Your local electric and natural gas utilities and energy efficiency service provider are taking strides in energy efficiency: Berkshire Gas, Cape Light Compact, Eversource, Liberty, National Grid and Unitil.

As one, we form Mass Save®, with the common goal of helping residents and businesses across Massachusetts save money and energy, leading our state to a clean and energy efficient future.

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Decisively Furthering a Zero Carbon Future

Since 2020, Mass Save Commercial New Construction programming has promoted:

- Setting and delivering on low EUI targets
- Electric heating (with more recent heat pump adders) across all 3 Paths

Since 2019 the Residential New Construction program has promoted Passive House construction for multi-family

In 2022, Mass Save Sponsors launched a single family all-electric homes offer.

But projects could still participate if they weren't entirely electric

Now:

- **All participating buildings, residential and commercial, will need to be all electric – with some notable exceptions**

MA Legislation Means Mass Save Program Changes

In August 2022, Governor Baker signed *An Act Driving Clean Energy and Offshore Wind.* Among its provisions:

- Effective January 1, 2025, the Sponsors of Mass Save will no longer be permitted to issue incentive payments tied to fossil fuel equipment or new buildings with fossil fuel equipment.
- The law requires an immediate change to the prerequisites for Mass Save New Construction program participation.

Residential New Construction
&
Renovations and Additions

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Single-Family New Construction

Homes with 1-4 units

Heating, water heating, cooking and clothes drying must be electrified

Designed to support the adoption of stretch code and specialized opt-in

Single family (1–4 units)			
Tier	**Base**	**ENERGY STAR**	**Passive House**
Overview	All-electric heating, water heating, cooking, and clothes drying	ENERGY STAR NextGen	Passive House
Performance Specifications	≥15% savings above baseline	≥30% savings or HERS: ≤45 Infiltration: ≤1.5 ACH50 ENERGY STAR SF NH v3.2 + NextGen	Passive House certification (Phius or PHI)
Incentives	Single Fam: $7,500 2-unit: $8,750 3-unit: $10,000 4-unit: $11,250	Single Fam: $15,000 2-unit: $17,500 3-unit: $20,000 4-unit: $22,500	Single Fam: $25,000 2-unit: $30,000 3-unit: $35,000 4-unit: $40,000
Market Transformation adders*	Wi-Fi Connected Thermostat (Base tier only): $100/unit Induction Cooktop: $250/unit Split-System Heat Pump Water Heater: $750/unit ENERGY STAR v3.2 certification (Base tier only): $250/unit DOE Zero Ready certification (Base and ENERGY STAR tier): $500/unit ENERGY STAR Certified Ground-Source Heat Pump: $9,000/unit		

Multi-Family New Construction

Buildings with 5+ residential dwelling units

Low rise = ≤3 stories

High rise = ≥4 stories

Residential or commercial metering for utilities

Fossil fuel-fired domestic hot water is allowed for now

Multi-family (5+ units)			
Tier	**Base**	**ENERGY STAR**	**Passive House**
Overview	All-electric heating, cooking, and clothes drying. Fossil fuel DHW is allowable	ENERGY STAR Multi-Family New Construction (MFNC) v1.2	Passive House
Performance Specifications	Low-rise: ≥15% savings above baseline or HERS: ≤45 High-rise: Exceed baseline	ENERGY STAR MFNC v1.2	Passive House certification (Phius or PHI)
Incentives	Low-rise: $1,500/Unit High-rise: $1,000/Unit	Low-rise: $2,500/Unit High-rise: $1,750/Unit	Both: $3,750/Unit ($750 Pre-Cert, $3,000 Final Cert)
Passive House adders	$5,000 Feasibility Study Incentive Up to 75% Energy Modeling Costs ($500/Unit or $20,000/Project max)		
Market Transformation adders*	Wi-Fi Connected Thermostat: $100/Unit Induction Cooktop: $250/Unit In-Unit Heat Pump Water Heater: $250/Unit Centralized and Split-System Heat Pump Water Heater: $750/Unit ENERGY STAR Certified Ground Source Heat Pump: $1,000/Unit ENERGY STAR NextGen Certification (ENERGY STAR tier only): $250/Unit DOE Zero Energy Ready Homes Certification (ENERGY STAR tier only): $250/Unit High-rise Whole Building Infiltration Testing (Base and ENERGY STAR tier only): ASTM E779 test results - 0.4 CFM/sf @75pa: $300/Unit ASTM E779 test results - 0.25 CFM/sf @75pa: $400/Unit		

Renovations & Additions

Existing buildings with fossil fuels can participate

Enhanced incentives for going all-electric

Updated stretch code requires HERS rating for major renovations

Single-family (1–4 units)			
Tier	**Base**	**Level 1**	**Level 2**
Overview	All major renovations and additions may be eligible. Homes with existing fossil fuels may participate but no incentives will be tied to fossil fuel equipment. Additions must be all-electric.	All-electric heating, water heating, cooking, and clothes drying in the renovated home and any additions.	All-electric heating, water heating, cooking, and clothes drying in the renovated home and any additions.
Performance Specifications	≥5% savings above baseline	≥30% savings above baseline **or** HERS ≤55 Air infiltration: ≤5 ACH50 Ventilation: HRV/ERV optional EV-charging ready: optional	≥ 50% savings above baseline **or** HERS ≤45 Air infiltration: ≤3 ACH50 Ventilation: HRV/ERV required EV-charging ready required
Incentives	Pay-for-Savings (PFS): ($0.50kWh) + ($50/MMBtu) + (% savings x $4,000)	Single-family: $20,000 2-unit: $30,000 3-unit: $40,000 4-unit: $50,000	Single-family: $30,000 2-unit: $40,000 3-unit: $50,000 4-unit: $60,000
Market Transformation adders*	Air-Source Heat Pump (partial): $1,250/ton (Base tier only) Air-Source or Air-to-Water Heat Pump (whole home): $10,000/unit (Base tier only) ENERGY STAR® Certified Ground-Source Heat Pump (partial): $2,000/ton (Base tier only) ENERGY STAR Certified Ground-Source Heat Pump (whole home): $15,000/unit (Base tier only) Wi-Fi Connected Thermostat: $100/unit Induction Cooktop: $500/unit Heat Pump Clothes Dryer: $200/unit DOE Zero Energy Ready Homes Certification: $250/unit ENERGY STAR NextGen Certification: $250/unit		

Project Highlight: 154 Broadway

5 stories, 45 residential units, 38,000 sq ft

All-electric with ductless and ducted heat pumps, and electric DHW

Passive House certified (Phius)

Completed construction in November 2024

Program incentive: $186,988

Developer: CMD Boston

Project Highlight: Leland House

3 stories, 68 residential units, 73,000 sq ft

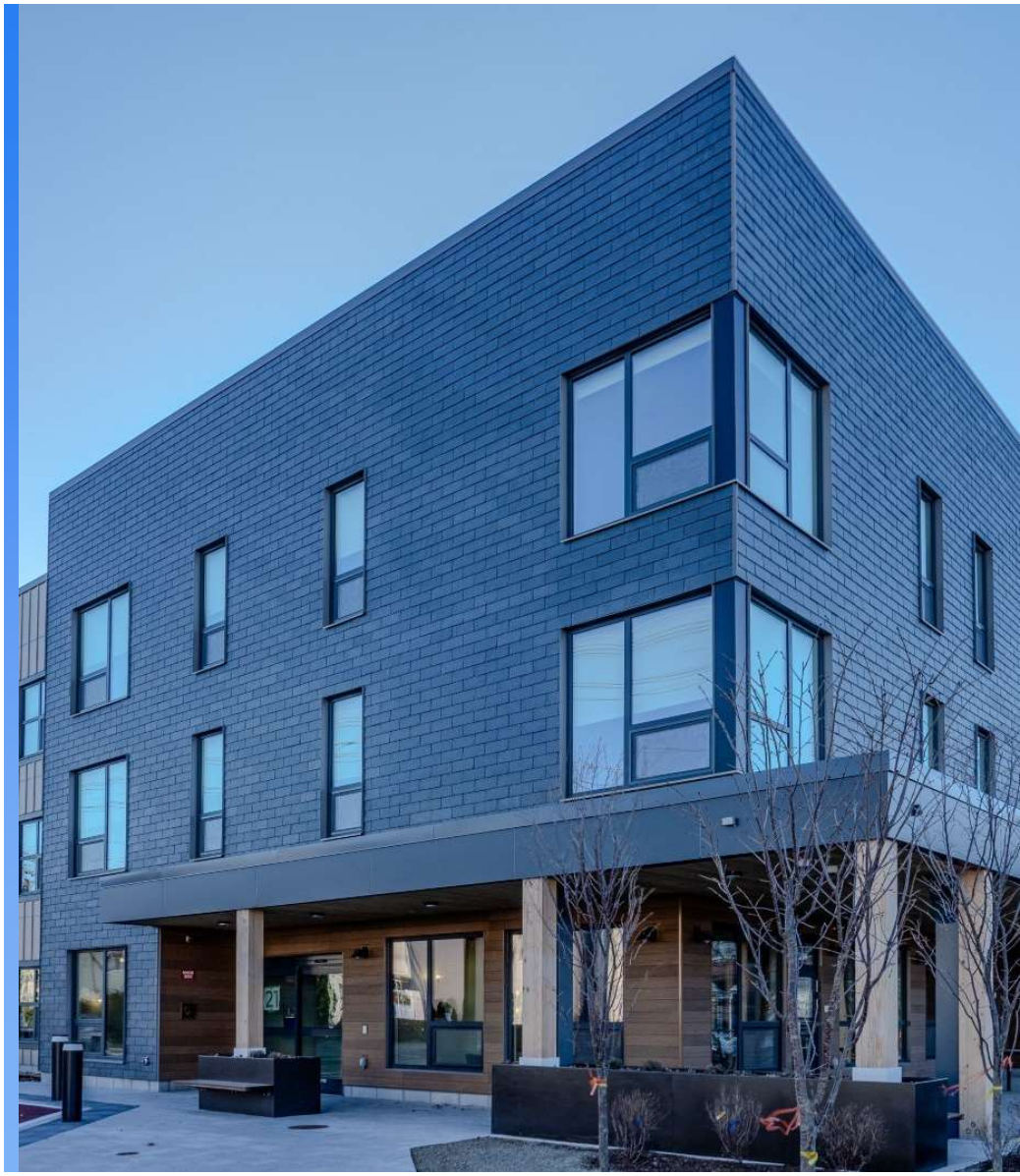
All-electric with VRF heating and cooling and centralized HPWH

Passive House certified (Phius)

Completed construction in December 2024

Program incentive: $315,800

Developer: 2Life Communities



Passive House & All-Electric Homes Trainings

Supporting workforce development and market transformation

Partnered with Passive House Massachusetts (PHMA)

No-cost monthly in-person and webinar trainings – announced in Newsletter

Commercial & Industrial

New Construction & Major Renovations

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Commercial New Construction Participation Pathways

Path 1	Path 2	Path 3
Net Zero & Low EUI Buildings	Whole Building EUI Reduction	High Performance Buildings

Low EUI Pathways

Path 1: Net Zero & Low EUI Buildings

ACTON-BOXBOROUGH DOUGLAS-GATES ELEMENTARY SCHOOL

Opened Fall 2022 | All-electric

Objectives:

Set an ultra-low EUI target at outset of design

Design, build and operate to achieve that target

Building is carbon free

Path 1: Net Zero & Low EUI Buildings

Participating Buildings Must be Fossil Fuel Free

- No natural gas equipment or meter of any kind
  - Exception for emergency generators in facilities designated as emergency shelters
- Non natural gas fossil fuel use prohibited as well
  - Exceptions for diesel emergency generation and propane for school sciences labs

Technical Assistance – 50% cost share up to $10,000

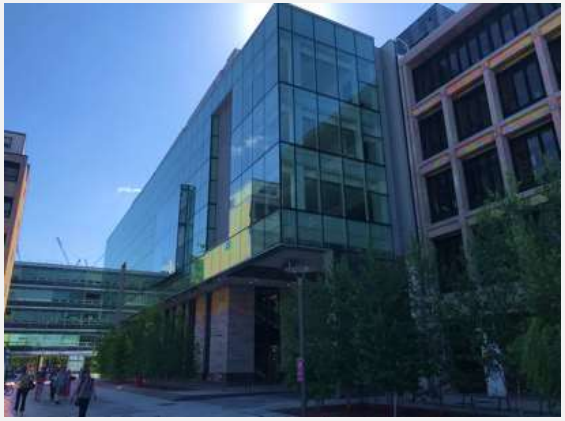
Customer Incentives – remain the same

Construction	Post Occupancy	Heat Pump Adder
Up to $2.00/sf	$1.50/sf	Air Source Heat Pumps: $800/ton Variable Refrigerant Flow (VRF): $1,200/ton Ground Source Heat Pumps: $4,500/ton


Construction Incentive Workflow
Participant Registers (MOU) and Provides Project Documentation
Participant Commits to a Target EUI & ZNE Consultant Cost Share
Participant Produces Iterative Model Scenarios for Target EUI
The Sponsors Provide Incentive Offer Letter
The Sponsors Conduct Verification at Construction Completion
The Sponsors Pay Construction and Heat Pump Incentives
Post Occupancy Incentive Process
Energy Monitoring Period Starts When Building is Occupied
Participant Provides One Year Post Occupancy Data
If Operating EUI ≤ Than Target EUI, The Sponsors Pay Post Occupancy Incentives

Path 2: Whole Building % EUI Reduction

Cambridge Lab Building



Participating projects must not utilize natural gas. Full electrification of space heating, ventilation air heating, domestic hot water and kitchen required.

Exceptions:

- Space and ventilation air heating in highly ventilated buildings must meet stretch code electrification requirements*
- Emergency generators in facilities designated as emergency shelters
- Vocational technical school for teaching purposes
- In labs for scientific research purposes or hospitals
- In major renovations where gas equipment is not being removed

Path 2: Whole Building % EUI Reduction

Technical Assistance setting EUI: up to 75%

Post Occupancy: TA Support

Construction	Heat Pump Adder
Vary by tier from $0.35/sf to $1.25/sf	Air Source Heat Pumps: $800/ton Variable Refrigerant Flow (VRF): $1,200/ton Ground Source Heat Pumps: $4,500/ton

Measure by measure support;
not an EUI approach

Path 3: High Performance Buildings

Community Center

Full electrification for participating projects of space heating, ventilation air heating, domestic hot water and kitchen required.

Exceptions:

- Space & ventilation air heating in highly ventilated buildings must meet stretch code electrification requirements
- Emergency generators in designated emergency shelters
- Vocational technical school teaching needs
- In labs for scientific research purposes or hospitals
- In major renovations where gas equipment is not being removed

Path 3: High Performance Buildings

Technical assistance: 100% up to $7,000 for engagement before design development or up to $4,000 before completed construction documents.

Construction	Heat Pumps
Custom incentives at $0.35/kWh and $2.00/therm	Air Source Heat Pumps: $800/ton Variable Refrigerant Flow (VRF): $1,200/ton Ground Source Heat Pumps: $4,500/ton

Connections – National Grid

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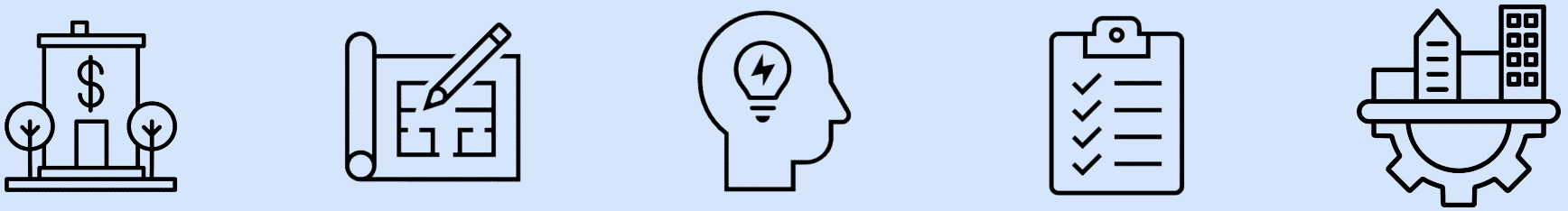
Complex Electric Connections

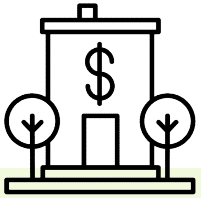
Answering your questions

Long Term Planning → Near-term Planning → Design → Obtain Permits & Rights → Construction



The average complex electric connection, from initiation to energization, is 40 weeks, but the min/max duration greatly fluctuates from two weeks to more than five years based on the nature of the customer's installation

Long Term Planning



Large loads may require studies, which can add significant time to a project duration, as well as require complex, multi-year construction projects

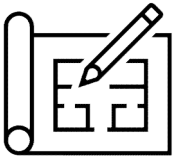
- Transmission studies are ISO-NE dependent, potentially multi-year impact
- Study outputs determine costs which may be passed onto the customer depending on revenue justification, which can be significant

Engage with National Grid Account Management teams early

Support Services Agreement can be established to assist with long range planning for new additions and expansions

- Inform customer options analysis and decision-making
- Improve transparency to long duration and complex activity required to expand the electric system with transmission, substation, and distribution projects

Near Term Planning



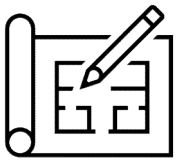
Distribution System Studies

- Determines scope, schedule, and cost the electrical infrastructure to be added and/or upgraded to serve the customer load
- The location greatly impacts when a study is required
- There is a queue when multiple loads >0.2MW are requested in an area
- Distribution Studies may be up to 6 months in duration with a $50 - $75k cost

Quick “Step 0” 21-day Reviews

- Customers can inquire about potential new loads at a given location.
- National Grid will review the customer’s information and determine if a transmission and/or distribution study is required.
- This review remains applicable for ninety days

Near Term Planning (cont.)



Account Creation & Work Initiation

- The customer submits a request for new service or service upgrade
- Loads exceeding 0.2MW are reviewed for potential distribution study if not previously done
- A National Grid Job Owner will make contact and request the needed information to proceed with design, or in cases where a distribution study is needed, engineering
- This information may include: electrical one-line diagrams, site plans, load information, environmental order of conditions, deed book & page, electric vehicle/DG applications
- Once required information is collected, design and/or engineering will begin

Design

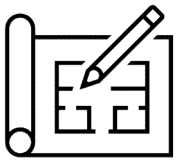
A National Grid Design Engineer is assigned as the technical point of contact, reviews detail in hand, and schedules a site visit is scheduled with the customer to

- Verify customer needs & equipment requirements
- Agree upon equipment locations
- Identify space/access constraints and any encroachment to overhead lines
- Guide the customer on construction responsibilities and sequencing
- In some cases, a request for more site or technical information may be needed to fine-tune design and permitting needs based on these field conditions

Once complete, Design collaborates with Engineering & Operations departments to

- Create an efficient design and construction work package
- Develop cost estimates and order long lead material items
- Initiate processes to obtain permits and/or rights

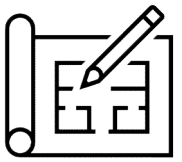
Obtain Permits & Rights



National Grid actions:

- Determine Contributions-in-aid-of-Construction (CIAC) based on construction estimate and expected revenue
- Send Customer service agreement and CIAC invoice (if applicable)
- Draft easement, obtain Property Owner signature, and record easement when returned
- Assure customer environmental permits cover National Grid
- Submit and obtain local and state permits
- Assign a National Grid trench inspector, with site meeting

Obtain Permits & Rights (cont.)



Customer actions:

- Return all required documentation timely, particularly service agreement and notarized easement, if applicable.
  - Delays in returning documentation often causes delay to starting construction.
- Pay CIAC invoice (if applicable)
- Install private property civil infrastructure and obtain trench inspection
- Complete private property tree trimming

Construction

A Pad mount Transformer Installation Example

- Public Way Civil Infrastructure and/or Pole Set
- Trenching and civil infrastructure on private property
- Customer's transformer delivery is initiated and coordinated
- Pre-Muni Inspection Electric Construction Completed
- Secondary electrical & metering work, obtains municipal inspection
- Final Electric Construction, Energization, & Meter sets

Key:

- NG Action
- Customer Action

Connections – Eversource

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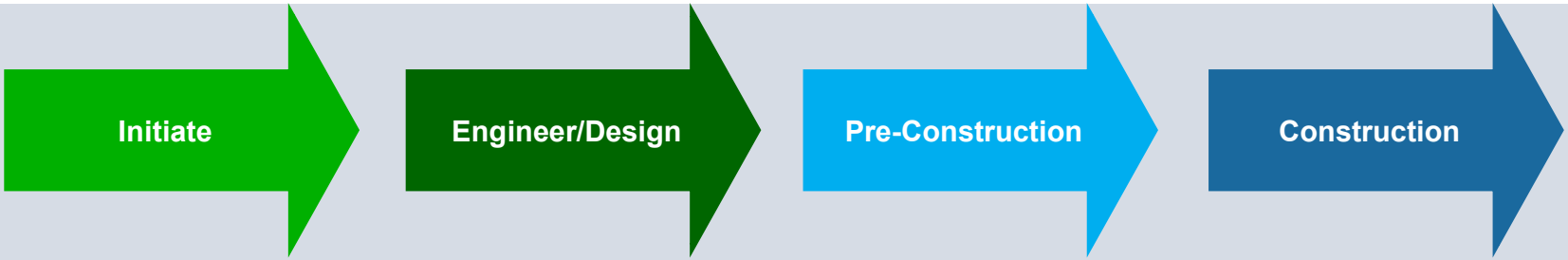
Electric Service Support Center (ESSC)

ESSC Process

Phases of the project:



- Customer submits work order application
- Customer submits Site plans
- Customer pays design deposits and/or fees
- Eversource creates Work Order

- Eversource coordinates site meeting (if required)
- Eversource finalizes design & detailed sketch identifying customer scope of work and Eversource scope
- Eversource Sketch, Specs and customer costs are mailed to customer

- Customer costs are paid
- Customer completes their scope of work
- Customer executes Private Property Easement Agreement with Eversource
- Customer has the Local inspector approve job
- Eversource receives approvals of Public Way Rights & obtains local approvals

- Eversource construction is completed
- Customer is energized
- Meter is installed

Initiate – Apply

Residential, <400A

Call 888-633-3797

(M-F, 7:45 AM to 4:45 PM)

eversource.com

All Other

Submit an application with applicable Customer Service Engineer (CSE) or Account Executive (AE)

eversource.com

Initiate – Required Info

- Service address
- Customer of record
- Voltage
- Amperage
- Load (KVA or KW)
- Brief description of work
- Site plans (when Eversource equipment will be installed on private property, i.e padmount transformer or pole)
- One-Line diagram for 3-phase services
- CAD file (new developments)

Initiate

Eversource

- Provide work order number to the customer
- Discuss Eversource process and timeframes
- See if the customer wants a site meeting with engineering team

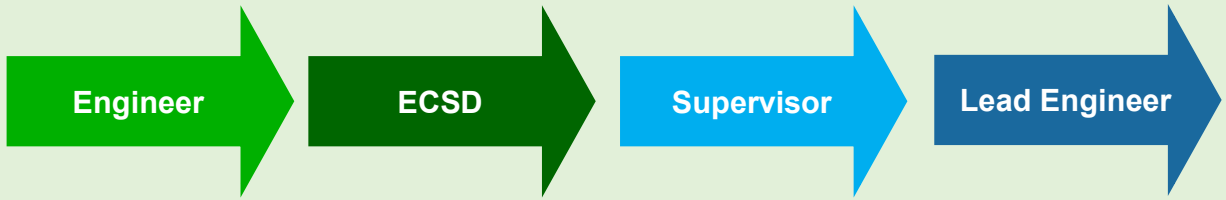
Engineer/Design

Engineer

- Reviews jobs with load 75KVA or higher (or 600A main or higher)
- Looks at load and impact on entire circuit
- Provides instructions on required Eversource work and a sketch in most cases
- Will meet with the customer on site, via TEAMS, or in an Eversource office if needed

ECSD (Electrical Customer Service Designer)

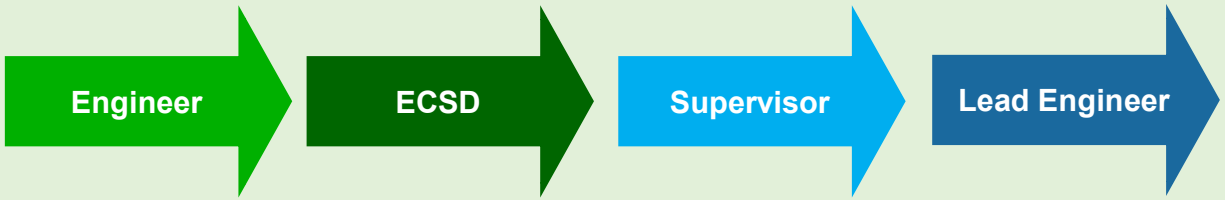
- Adds all the necessary labor and material costs to the work order based on the engineer instructions (or by themselves when load is less than 75KVA)
- Drafts a design sketch, which highlights work performed by the customer and work performed by Eversource
- Stake pole locations in the field
- Meets with the customer on site when requested or they deem necessary



Engineer/Design

Supervisor/Lead Engineer

- Approve the engineer and ECSD designs
- Supervisors approve jobs with costs up to $10K
- Lead Engineers Approve jobs with costs up to $50K



Preconstruction

CSE (Eversource)
- Contacts the customer to inform them the design is complete and next steps
- A copy of the design sketch, invoice and cost breakdown is provided to the customer

Rights Agent (Eversource)
Will collect applicable rights such as:
- Private property license (typically for pole set)
- Easement (typically for pad transformer)
- City/Town Grant (for new infrastructure being installed in public way). These rights require Eversource survey team to draft a field survey to submit to the city/town

Customer
- Submits payment
- Returns any applicable licenses/easements
- Has applicable Eversource inspections completed (conduits)
- Received municipal inspection for their electrical work from the municipal wire inspector

Construction

CSE (Eversource)

- Contacts the customer to inform them all preconstruction prerequisites are complete, and their job will be scheduled with the construction team (tentative timeframes are discussed and depend on job size)

Construction Team (Eversource)

- Schedule and build the job

Metering (Eversource)

- Install meters

Typical Job Durations

Job Type	Engineering/Design	Construction	Average Duration
Simple overhead or simple overhead temp (<400A)	1 - 3 weeks	1 - 3 weeks	2 - 6 weeks
Underground small service (0-75kva)	2 - 5 weeks	2 - 4 weeks	4 - 9 weeks
Overhead small service (0-75kva)	2 - 5 weeks	2 - 4 weeks	4 - 9 weeks
Underground medium service (75-300kva)	4 -10 weeks	4 - 8 weeks	8 - 18 weeks
Overhead medium service (75-300kva)	4 - 10 weeks	3 - 5 weeks	7 - 15 weeks
Underground & Overhead large service (>300kva)	8 - 14 weeks	8 - 10 weeks	16 - 24 weeks
Developments (residential and commercial)	8 - 14 weeks	8 - 10 weeks	16 - 24 weeks
Customer stations, TNV's, SNV's and SC's*	16 - 20 weeks	10 - 52 plus weeks	26 - 52 plus weeks

* Tertiary Network Vault; Secondary Network Vault; Single Customer (station)

Jobs requiring rights from the city/town (dig in the street) can add an additional 8-12 weeks to obtain, prior to starting construction

Questions?

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