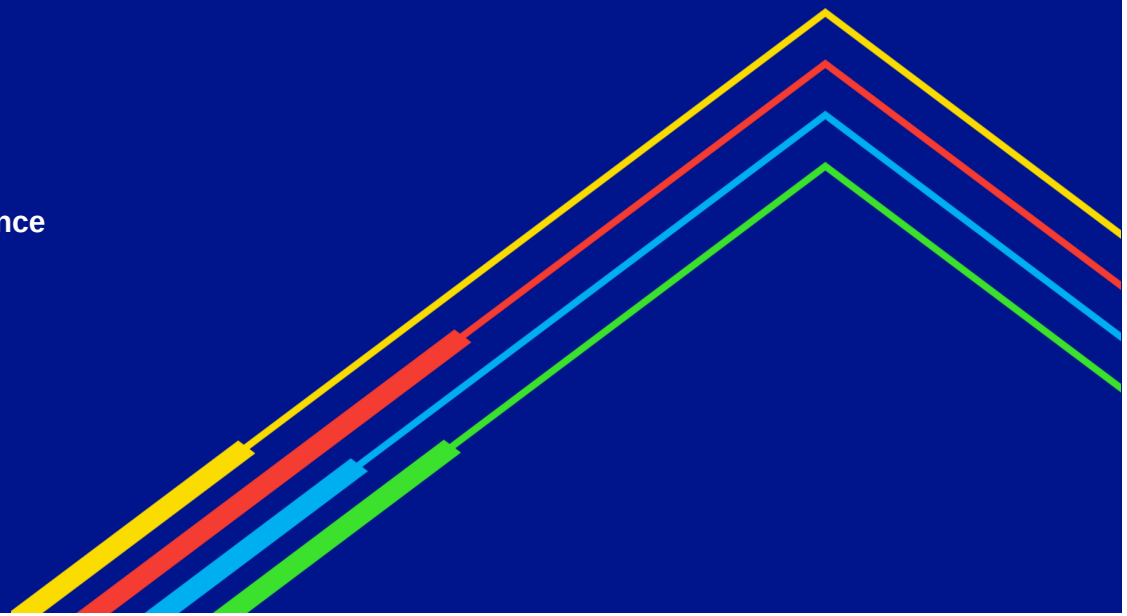
Central & Western MA
ASO Cluster Study Update

March 19, 2020
WebEx Attendance



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Agenda

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- Welcome/Safety
- Affected System Operator (ASO) Study Update
  - Study Status
  - Steady State Results
  - Next Steps

- Distribution System Impact Study Update
  - Timeline
  - Deliver Distribution Impact Study (DSIS)
  - Distribution Modification Costs & Schedule
  - Collect Detailed Agreement w/Study Fees
  - Estimated Detailed Distribution Costs
  - Reconcile Distribution Study Costs
  - Conduct Detailed Study
  - Impact of Attrition
  - Deliver Interconnection Service Agreements (ISAs)
  - Projects not in an "Area Distribution Study"
  - "Early" ISAs (upon request)
  - Project Progression

Safety Message

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Operating BAU and there are no delays to this study

No delays to applications to being processes

Monitoring the fluid situation closely

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01

Central/Western MA ASO Study
Affected System Operator Study Update

Barry Ahern – Transmission Planning, NEP

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Part 2 – Scope Review (Dec 5th)

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Scope – May 2019

- Total: 937MW
- Part 1: 372MW
- Part 2: 565MW

Scope – November 2019

- Total: 751MW
- Part 1: 325MW
- Part 2: 431MW

Scope – February 2020

- Total: 703MW
- Part 1: 312MW
- Part 2: 391MW

Status:

1. Steady State Complete (90%)
2. Stability Ongoing (40%)
3. Short Circuit Ongoing (50%)
4. PSCAD Ongoing (40%)

Note: Study components 2-4 rely on Steady State conclusions

Steady State - Adverse Impacts

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Thermal Overloads

Line

*A-1/B-2 69 kV circuits (All sections)

E-5/F-6 69kV circuits (sections)

Substation

Deerfield 4 - 69 kV buswork and Switches.

Vernon - 69 kV buswork and Switches.

Chestnut Hill - 69 kV buswork and Switches.

Voltages

Substation

Substations off A-1/B-2

Deerfield 2 69kV

***Significant overloads observed under a number of different scenarios on all cases studied**

Steady State – Affected Applications

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Thermal Overloads

Line

A-1/B-2 69 kV circuits (All sections)

E-5/F-6 69kV circuits (sections)

Substation

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Voltages

Substation

Substations off A-1/B-2

Deerfield 2 69kV

A-1/B-2 Blue: 50MW

Applications that cannot connect until T upgrades are completed

E-5/F-6 Orange: 29MW

Applications that cannot connect until T upgrades are completed

Interconnection Timeframe not Affected: 312MW

Provisionally, 312MW can connect before T-upgrades are made

Steady State Adverse Impacts: A-1/B-2, 50MW

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Thermal Overloads	Company System Improvement Contribution[1]	Developer Contribution[2]	Timeline Required before Interconnection[3,4]
A-1/B-2 69 kV circuits (All sections): *Reconductoring*	**Yes**	$10-15M	5-7 years
Deerfield 4 Substation - 69 kV: *Buswork and switches*	**Yes**	**No**	4-5 years
Vernon Substation - 69 kV: *Buswork and switches*	**Yes**	**No**	4-5 years
Chestnut Hill Substation - 69 kV: *Buswork and switches*	**Yes**	**No**	5-7 years
Voltage Issues			
Otter River Substation - 69kV: *Configuration change involving both circuits, and the connection of 32 DVAR of reactive support*	No	$50-60M	5-7 years
Deerfield 2 Substation - 69kV: *Ramp down existing synchronous generation at Deerfield 2 and 3 between contingencies.*	**Not Required**	**No**	N/A

Notes:
[1] Indicates if a NEP project is planned on this asset (A-1/B-2 reconductoring project is in progress)
[2] Indicates if there is potential cost to developers (A-1/B-2 reconductoring scope would be an incremental cost to the in-progress project)
[3] Approximate duration to complete the transmission project (Assessing opportunities to expedite schedules)
[4] A-1/B-2 reconductoring is critical path to allow all 50MW to interconnect

Steady State Adverse Impacts: E-5/F-6, 29MW

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Thermal Overloads	Company System Improvement Contribution[1]	Developer Contribution[2]	Timeline Required before Interconnection[3]
E-5/F-6 Ware Substation - 69kV: *O-15N breaker*	No	$1-5M	2-3 years
Voltage Issues			
None identified	N/A	N/A	N/A

Notes:
[1] Indicates if a NEP project is planned on this asset
[2] Indicates if there is potential cost to developers
[3] Approximate duration to complete the transmission project

Transmission Next Steps

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Feb 2020	Identify the final transmission upgrades required for thermal/voltage
	Engineering/Permitting/Siting activities in progress on relevant asset projects
Mar 2020	Conduct stakeholder meeting
	Complete & Conclude (with identified upgrades)
	PSCAD
	Stability
	Short Circuit
April 2020	Complete stakeholder requested sensitivity analysis on all study components
	Submit all of the PPAs to ISO for review
	Determine cost allocation for upgrades
May 2020	Final Presentation to Reliability Committee
	Expected stakeholder follow up as needed

02

Distribution System Impact Study Update

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Will Kern – Customer Energy Integration
Mike Porcaro – Distribution Planning, MECo

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Gantt Chart

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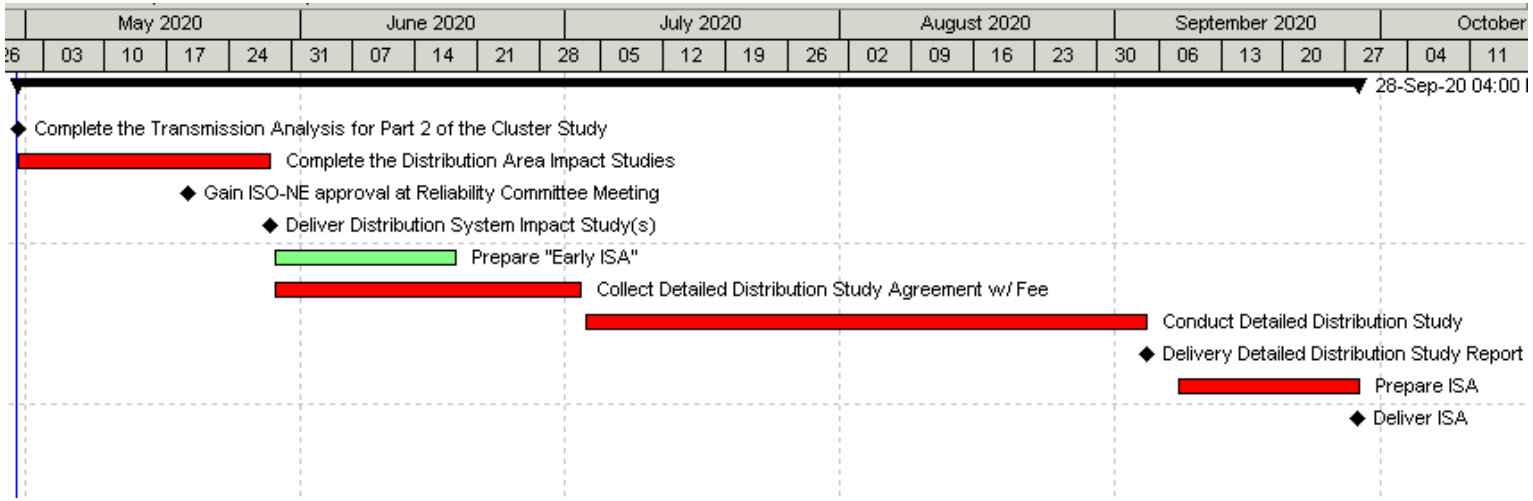

Milestone dates

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Task	Duration (Business Days)	Target Date
Distribution System Impact Study	20	5/28/2020
"Early" ISA	15	upon request
Detailed Study Agreement w/ Payment	15	6/19/2020
Distribution Detailed Study	45*	7/3/2020
ISA Delivery	15	9/28/2020

*from receipt of full payment

Deliver Distribution System Impact Study
(for projects in an Area Study)

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- Impact Studies would be prepared at an "Area Study" level.
- Impact Studies would include:
  - Scope of distribution system modifications required for the Area
  - Total estimated for area distribution system modifications
    - Will not include any site-specific costs
- Impact Studies would not include site specific information that will be in the ISA, such as:
  - A construction schedule
  - Project or site-specific costs or operating conditions
- "Early" ISA would be available upon request

Distribution Estimated Modification Cost & Schedule

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- **Barre Area**
  - Approximately $80M; 4 years
  - Total of 23 applications comprising approx 80MW
- **Belchertown Area**
  - Approximately $19M; 3.5 years
  - Total of 5 applications comprising approx 18MW
- **Athol Area**
  - Approximately $46M; 4.5 years
  - Total of 11 applications comprising approx 36MW
- **Gardner Area**
  - Approximately $94M; 4.5 years
  - Total of 14 applications comprising approx 50MW
- **Leicester Area**
  - Approximately $64M; 5 years
  - Total of 9 applications comprising approx 34.5MW
- **Brookfield Area**
  - Approximately $40M; 4.5 years
  - Total of 4 applications comprising approx 16MW
- **Palmer Area**
  - Approximately $55M; 4.5 years
  - Total of 11 applications comprising approx 42MW

Cost estimates are reflective of overall distribution area scope

Elements of scope in some areas may be qualified as System Improvement, which could reduce customer contribution

*these costs and schedule assume no attrition

Collect Detailed Study Agreement w/ Study Fees

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- Detailed Study fees will be determined on a per MW basis, which will be subject to increase for projects with area solutions if there is project attrition
- 15 business days will be allotted for payment
  - Projects will receive a default warning if not signed with payment paid within 15BD
  - 10 BD cure periods will be applied in accordance with tariff
  - Detailed Study fee will be non-refundable
- Failure to meet timeline to sign and make payment will result in project being withdrawn
- Detailed Study fees collected will be used to reimburse MECo for some work already performed in good faith to progress projects in parallel with transmission study and to complete the remaining Detailed Study work

Estimated Detailed Distribution Study Fees

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- **Gardner Area**
  - Detailed Distribution Study – $265k
  - Expected cost per MW - $10,600
- **Leicester Area**
  - Detailed Distribution Study – $209k
  - Expected cost per MW - $12,100
- **Brookfield Area**
  - Detailed Distribution Study – $132K
  - Expected cost per MW - $16,500
- **Barre Area**
  - Detailed Distribution Study – $95k
  - Expected cost per MW - $2,400
- **Belchertown Area**
  - Detailed Distribution Study – $62k
  - Expected cost per MW - $6,900
- **Athol Area**
  - Detailed Distribution Study – $69k
  - Expected cost per MW - $3,900
- **Palmer Area**
  - Detailed Distribution Study – $51k
  - Expected cost per MW - $2,500

*these costs assume 50% attrition - $$ are approximated

Reconcile Distribution Study Costs

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- Detailed Study fee will be allocated based on prorated MW basis and will be initially calculated assuming 50% attrition rate as a worst-case scenario.
- These costs will be allocated among all of the projects in that area.
- Detailed Study fees are non-refundable except to the extent actual costs are less than estimated costs (see last bullet).
- The Company has incurred DSIS costs of >$180K for work already performed in good faith to progress projects in parallel with the ASO study.
  - A portion of the Detailed Study fees collected will be used to reimburse MECo for such previously incurred DSIS cost
- The Detailed Studies will be reconciled at the end of the study and any unused funds will be returned.

Conduct Detailed Study

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- Expected to take 45 business days to complete
  - Delivery date may be impacted by significant attrition
- Incorporate Transmission study results
- Assess effects of attrition
- Refine scope and cost and deliver estimates at a project specific level provided, for projects that are part of an area solution, total costs will still need to be accounted for in manner of allocation
- Results will be delivered as they become ready

Impact of Attrition

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- Attrition is expected due to significant scope and high cost of Distribution modifications along with extended timelines for both Distribution and Transmission modifications
- Significant attrition would impact:
  - Transmission Cluster Study results
  - Distribution Detailed Study timelines
  - per MW Detailed Study fees
  - Scope of the Distribution and/or Transmission modifications
  - Delivery timeline for the ISA or "Early" ISA Amendment

Deliver Interconnection Service Agreements (ISAs)

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- Will be delivered 15 business days after completion/delivery of Detailed Study
- Will include:
  - Distribution area modifications
    - Project specific cost
    - Implementation schedule
  - Transmission modifications (if applicable)
    - Project specific cost
    - Implementation schedule
  - "Cost Allocation" based on area costs (if applicable) and reassessments for attrition. The current method is based on Cost Causation principle. The Company filed comments in the open DPU 19-55 DG interconnection tariff docket that propose potential refinements to the Cost Causation principle.
  - Contingencies for permitting, approvals and land rights

Projects not in a Distribution Area Study

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- These projects will move forward under their own individual timeframes
  - 26 projects
  - 112MW
  - 10 substations
    - Walker St, Bear Swamp, E. Webster, Litchfield, Millbury, Shutesbury, Fiskdale, Snow St, Treasure Valley, W. Charlton
- Will be regulated by the Tariff process and timelines
- These projects may or may not require a Detailed Study
- Will be subject to Transmission modification costs and timelines (if applicable)

"Early" ISAs

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- Will be delivered within 15BD after formal request from the interconnecting customer
  - Request to be made in the National Grid DG Portal
- Will be based on the Distribution System Impact Study
  - High level area distribution system modifications scope and cost
- Will be subject to the payment timelines outlined in the Tariff for 25% and 75% payments
- "Early" ISA will be amended once Detailed Study is complete
  - Payment timelines will be maintained

Project Progression

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- Customer confirmation & commitment
  - Minimize speculative projects
  - Payments toward Detailed Studies
  - Timely ISA execution & payment
- Prior to September
  - Coordinating with internal project management and construction teams
  - Securing contractors to engineer, procure, construct activities
- Regulatory discussions occurring on permitting complexities
- Exploring construction phasing opportunities to expedite
- Progressing work in parallel to greatest extent possible

03

QUESTIONS?

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