

Wednesday, October 11, 2023

# Energy Storage Siting

PIERCE ATWOOD 

# Storage Procurement is Mandated

- ***An Act to Advance Clean Energy (August 2018)***
  - Section 20 of the Act established a 1,000 MWh energy storage target to be achieved by 2025
- ***Clean Energy and Climate Plan for 2050***
  - Required by Global Warming Solutions Act of 2008 and 2021 Climate Law (an Act Creating a Net Generation Roadmap for Massachusetts Climate Policy)
  - Storage capacity will need to exceed 5.8 GWs to see a reduction in power sector emissions of 93% in 2050 compared to 1990 levels

# Breakdown For Emission Reductions

Residual Emissions Sub Category	Residual Emissions in 2050 (MMTCO <sub>2</sub> e)	Benchmarks to Enable Emission Reductions	Policy Drivers or Enablers
In-state Emissions <sup>36</sup>	1.6	Offshore wind capacity 23 GW	<ul style="list-style-type: none"> <li>Procure authorized OSW and advance development of floating OSW</li> <li>Support wholesale market reforms, including the use of FCEM for future clean energy procurements</li> <li>Implement Portfolio Standards (RPS, CES, CES-E, CPES)</li> <li>Implement generator emission limit (310 CMR 7.74)</li> <li>Implement Massachusetts CO<sub>2</sub> Budget Trading Program (310 CMR 7.70)</li> <li>Modernize distribution infrastructure</li> <li>Advance solar industry</li> <li>Enable load flexibility and demand management</li> </ul>
		Onshore wind capacity 1 GW	
		Solar capacity 27 GW	
		Storage capacity 5.8 GW	
Out-of-state Emissions <sup>37</sup>	0.4	Total transmission import capacity 34 GW	<ul style="list-style-type: none"> <li>Develop and use FCEM to support large-scale regional clean energy resources</li> <li>Implement Portfolio Standards (RPS, CES, CES-E, CPES)</li> <li>Implement Massachusetts CO<sub>2</sub> Budget Trading Program (310 CMR 7.70)</li> <li>Advance regional transmission planning</li> <li>Reform wholesale markets to facilitate growing need for flexible generation and load</li> </ul>
		Transmission emissions intensity 0.23 MMTCO <sub>2</sub> e/TWh	

# Regulatory Path Muddy

- **Two projects sought approval by the EFSB**
  - Have received DPU approval of comprehensive zoning exemptions
- **Governor established Commission on Energy Infrastructure Siting and Permitting**
  - Siting Practitioner Advisory Committee
- **Legislation**
  - H.3215 (Rep. Roy)
  - S. 2113 (Sen. DiDomenico)
- **Existing Dockets**
  - EFSB 21-01
  - DPU 21-50

# Massachusetts Permitting Themes, Tricks and Traps

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Exclusive Access  
Easement



0.40 miles - School

Bordering Vegetated Wetlands

Mass. Mapped Endangered/  
Threatened Species Habitat

# Land Use is Like Politics

- Policy is Set at the Federal and State Level
- But Success is Heavily Dependent on Local Action
- Massachusetts – 351 Cities and Towns
- Each Can Make its Own Rules (With Some Limits Set by State Law)

# Start With the Easy Part

- Federal Permits
- There Are Either Not Any, or They Are Easy to Get
  - Clean Water Act
  - Clean Air Act
  - FAA
  - Endangered Species Act (i.e., stay away from Long Eared Bat habitat)



# State Permits

- Massachusetts Environmental Policy Act (MEPA)
  - State Action – State Permit or Approval
    - EFSB Order, DPU Order, State Permit
- Impacts Exceed Permitting Thresholds
  - 25 MW of more of Electric Generation
  - 25 Acres or More Land Alteration
  - More than 5 Acres Impervious Surface
  - Wetlands Filling of 5,000 sf or More

# State Permits / Approvals

- DPU Zoning Exemption
- Wetlands Protection Act
  - Any Work Within 100 Feet of Wetland Resource Area or 200 Feet of River
- Mass DOT Highway Access Permit
  - New or Changed Access to State Highway

# State Permits / Approvals (con't)

- Natural Heritage and Endangered Species Program
  - Work in Priority Habitat for Threatened Endangered Species
- Massachusetts Historic Commission
  - Determination of No Significant Impact

# Municipal Permits

- Zoning Approvals
- Special Permits
- Site Plan Approval
- Variances

# Municipal Permits (con't)

- Local Wetlands Bylaw
- Fire Chief Permit for Energy Storage
- Stormwater Discharge Permit
- Earth Removal Permit
- Curb Cut Permit



# ESS SAFETY

October 11, 2023

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# INSTALLATION LOCATIONS

## ▪ **Outdoor Installations:**

- Outdoor Near Exposures
- Outdoor Remote Dedicated-Use
- Non-Dedicated Use
- Rooftops
- Parking Garages

## ▪ **Indoor Installations:**

- Dedicated-Use
- Non-Dedicated Use

## ▪ **Mobile**



# ENCLOSURE TYPES

- **Walk-in Containers**

- Can be physically entered by facility personnel
- **Similar to Surprise, AZ**

- **Cabinet**

- Cannot be physically entered for any reason
- Internal components accessed via external doors for maintenance and repairs





# ESS Hazards

# PRIMARY HAZARDS OF LI-ION BATTERIES

ESS Fire Safety

**Thermal Runaway**



**Fire**



**Explosion**



**Stranded Energy**



**Off-Gassing**



**Arc Flash / Electrical**



# PRIMARY FAILURE MODES OF LI-ION BATTERIES

## ESS Fire Safety

### Primary failure modes of li-ion batteries include:

- Thermal abuse (overheating, external heating)
- Electric abuse (over-charging, over-discharging)
- Mechanical abuse (impact, puncture, crushing)
- Cell defects (due to manufacturing / factory defects or natural degradation)
- Component failure



***Improper installation and / or system integration can exacerbate or lead to failures!***

# **NATIONAL CODES & STANDARDS**

# PRIMARY ESS CODES & STANDARDS

## National Codes & Standards

### Primary Codes / Standards for ESS Installations:

- 2021 International Fire Code (IFC)
- NFPA 855: Standard for the Installation of Stationary Energy Storage Systems

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# PRIMARY ESS CODES & STANDARDS

## National Codes & Standards

### Listings / Certifications for ESS and Associated Equipment:

- **UL 9540:** Standard for Energy Storage Systems and Equipment

#### Includes:

- UL 1642 Cell
- UL 1973 Module
- UL 1741 for inverters

### Large-Scale Fire Testing:

- **UL 9540A:** Standard for Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems







# UL 9540A LARGE-SCALE FIRE TESTING

## National Codes & Standards

### UL 9540A Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems:

- Code and Standard requirement
- Testing performed at multiple levels:
  - Cell
  - Module
  - **Unit**
  - Installation
- Test results inform system design and installation requirements
  - Fire mitigation and protection
  - Ventilation
  - Incident management

Test Level	Reported Information / Performance Criteria
<b>Cell</b> 	<ul style="list-style-type: none"> <li>• Can cell exhibit thermal runaway?</li> <li>• Thermal runaway characteristics</li> <li>• Flammability / composition of vent gas</li> </ul>
<b>Module</b> 	<ul style="list-style-type: none"> <li>• Thermal runaway containment / characteristics</li> <li>• Flammability / composition of vent gas</li> <li>• Heat and gas release rates</li> </ul>
<b>Rack / Unit</b> 	<ul style="list-style-type: none"> <li>• Evaluation of fire / thermal runaway spread</li> <li>• Heat and gas release rates</li> <li>• Deflagration and re-ignition behavior</li> </ul>
<b>Installation</b> 	<ul style="list-style-type: none"> <li>• Effectiveness of fire protection systems</li> <li>• Heat and gas release rates</li> <li>• Deflagration and re-ignition behavior</li> </ul>

# UL 9540A INSTALLATION TEST EXAMPLE

National Codes & Standards

## UL 9540A Installation Level Test, © UL



Figure 85 – Deflagration images from Test 2.

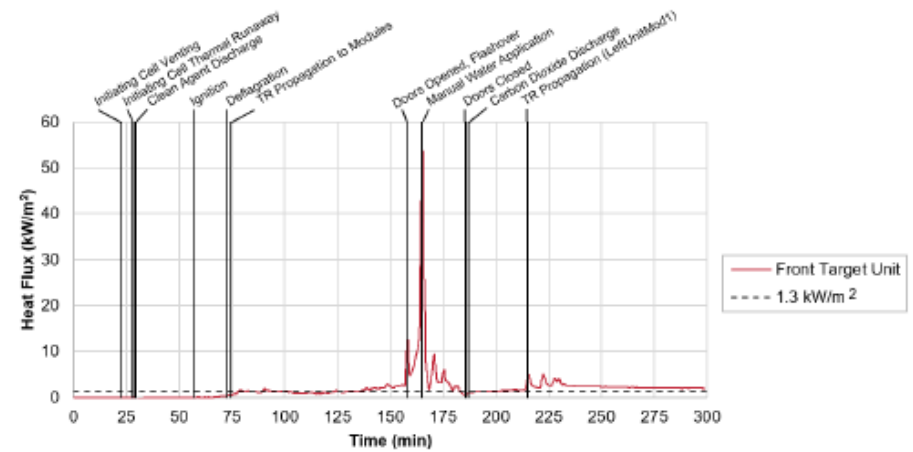


Figure 86 – Heat flux measured in the egress path during Test 2.<sup>a</sup>



# EXPLOSION CONTROL

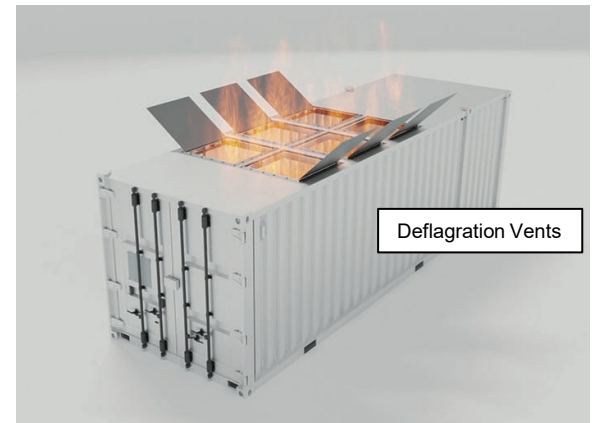
2020 FCNYS §1206 Electrical  
Energy Storage Systems

## ▪ Explosion Prevention

- NFPA 69
- What gas is being monitored by detectors?
- UL 9540A 4<sup>th</sup> Edition

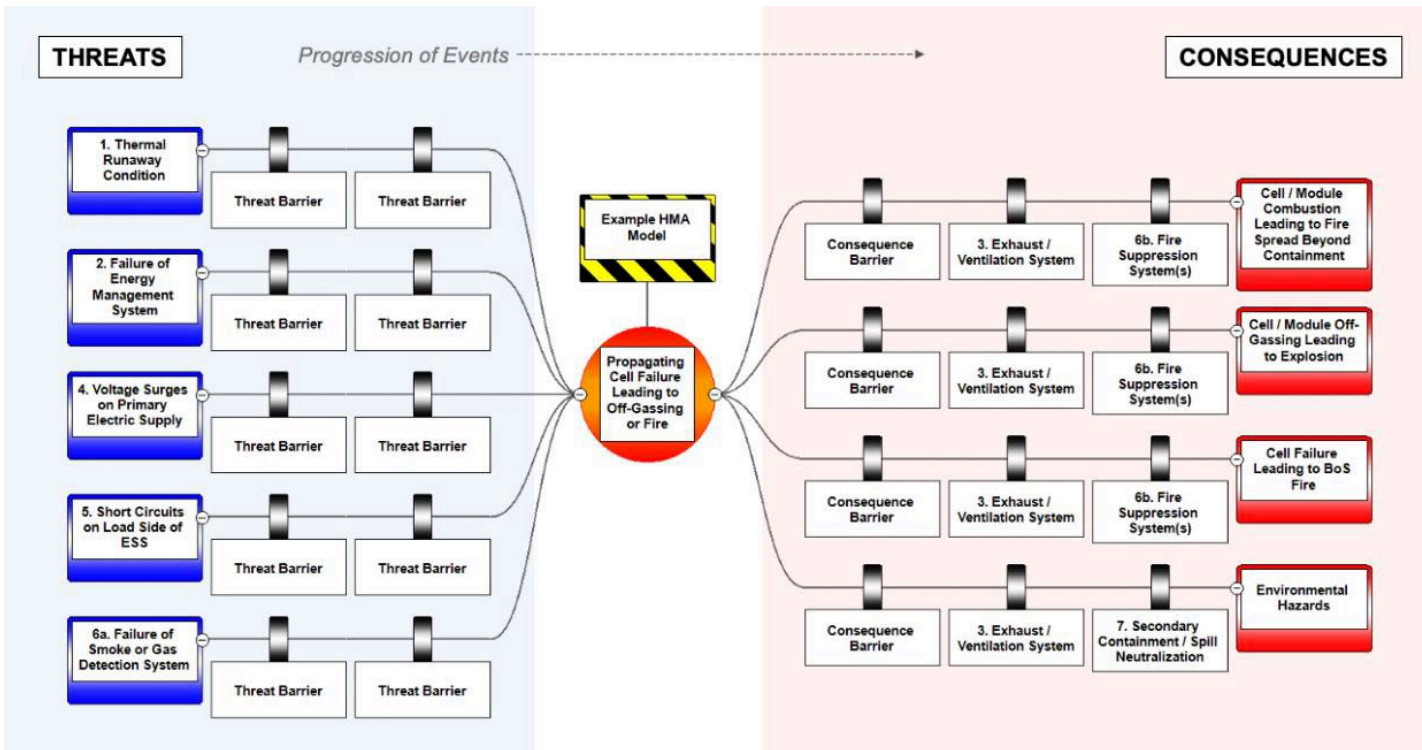
## ▪ Explosion Protection (Deflagration Venting)

- NFPA 68
- Proper surface area
- Hydrogen Explosive
- Direction of blast overpressure



# HAZARD MITIGATION ANALYSIS (cont'd)

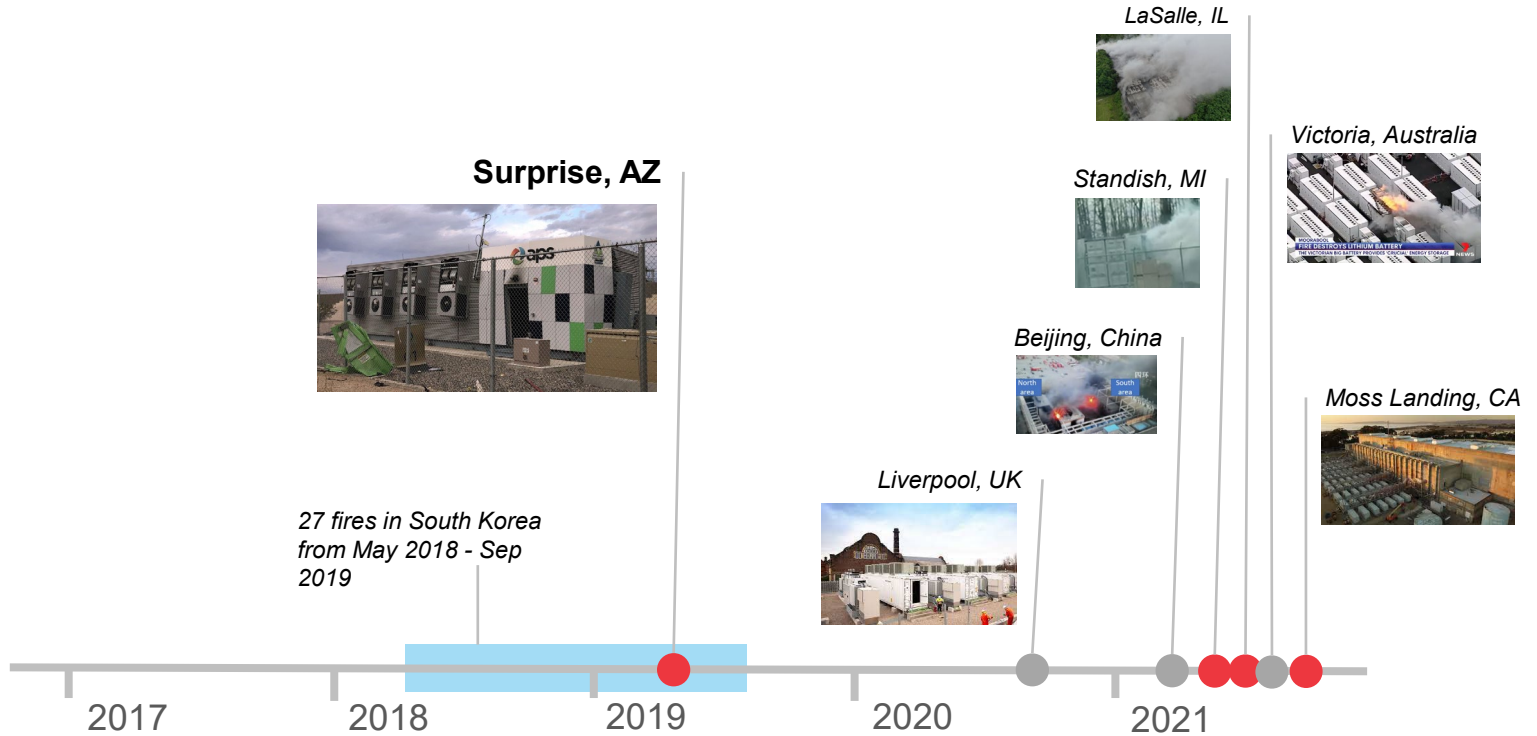
2020 FCNYS §1206 Electrical  
Energy Storage Systems



# Fire Department Concerns

# RECENT ESS INCIDENTS

## Incident Management



# Fire Department Concerns



# INCIDENT MANAGEMENT

## *Decommissioning*

## Incident Management

- **SME support**
- **Continuity of operations**
- **Fire department extended operations?**
- **Fire watch**
- **Potential reignitions**





# Fire Department Help

## 2020 FCNYS §1206 Electrical Energy Storage Systems

- **Special Expert**
  - Understanding of ESS
  - Respond to incidents
  - Fire Dept. extended operation
  - Complex installations
  - Commissioning report
  - Decommissioning Plan
  - M and O records
  - Inspections
  - NYC C of F B 28 ( Example )



# INCIDENT MANAGEMENT

## Fire Operations

### Incident Management

#### ■ Fire

- Stored and stranded energy
- Assume defensive operation
- Prevent propagation (enclosure to enclosure)

#### ■ No Fire

- Battery Management System (BMS)
  - Battery's State of Health
  - Temperature monitoring
  - Gas detection
- Smoke without fire → explosion concern?





THANK YOU!

Questions or Comments?

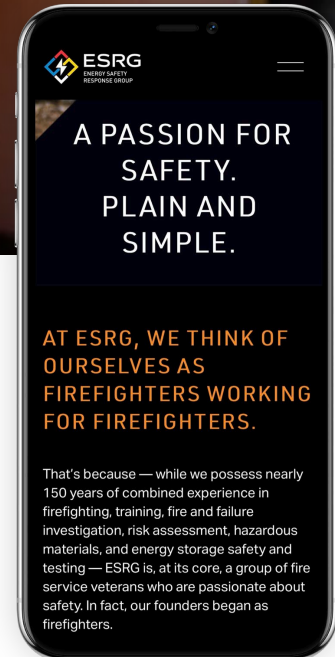
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# Special Massachusetts Real Estate Problems

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# Potential Trouble: MA Subdivision and Easement rules

- Subdivision
- In general, a buildable lot in MA requires a separate legal lot under MGL c. 41 (“Subdivision Control Law”)
- Lot size and compliance tied to local zoning under MGL c. 40A
  - Plan routes
    - Definitive Plan – large multi lot type with new roads
    - ANR (“Approval Not Required”) plan – must have frontage and comply with zoning dimensional requirements
- Major exception: **leased** lots in MA do not need to meet subdivision rules
  - Caveat: if your interconnection requires additional land owned in **fee** by the LDC, there is a subdivision issue to resolve.
    - Consider MGL c 41 Section 81X “not a separate building lot.”

# Subdivision and Easements (con't)

- Does Your Access Easement allow your use?
  - The parcel may have a great road access over the abutter's parcel, including a robust existing road, perhaps from a prior agricultural use
  - But do the easement documents adequately allow access for construction and operation of an energy storage project?
  - And the supporting electric and alarm infrastructure?

# REAL Trouble: MA “Chapter” Lands

- In general, MA real estate is subject to full and fair market “*highest and best use*” valuation and taxation under MGL c 59.
- But the high tax bills from full “highest and best use” valuation creates a perverse incentive for MA owners of agricultural, forest and recreational lands to convert those parcels to residential or commercial development.
- Three separate chapters of the General Laws: MGL c. 61 (forest land), MGL c. 61A (agricultural land) and MGL c. 61B (recreational land) accordingly subsidize those favored land uses by allowing owners to apply for a special, lower RE tax assessment for the duration of the favored use. Lands so assessed are called Chapter Lands.
- All three statutes are similar, but with minor key differences. The statutory drafting is byzantine – read every word every time.

# Chapter Lands (con't)

- Many energy storage and other renewable development sites are Chapter Lands.
- Many landowners and local assessment boards draw the special assessment lines with no thought as to future access, development, or conveyance to third parties.
- Erroneous Chapter Lands withdrawal tactics are a common pitfall for out-of-region developer

# Chapter Lands Exits– Grounds

The 61 Chapters anticipate three possible grounds for exit:

- “Lapse” of special assessment status – the landowner does not renew the special assessment and the land reverts to regular assessment. True lapse is uncommon as the incentive to retain the low tax rate is material.
- “Conversion” of all or part of the parcel to another use, e.g. an energy storage facility. Note that landowner conduct objectively indicating an intent to convert (filing plans, entering into development agreements, etc.) may legally constitute a “deemed conversion” under *Sudbury vs Scott* 439 Mass. 288 (2003) regardless of technical filed notices.
- “Sale” to a third party for other use.

# Chapter Lands Exits– “Paying the Piper”

On non-lapse termination of Chapter Lands status there are two adverse consequences; one minor, one major

- Minor: “recapture tax” of a formulaic monetary amount based on number of years in special classification and the amount saved below regular taxation
  - In the context of an energy storage project redevelopment this amount is typical not major.
- **Major: Sale, Conversion and Deemed conversion all trigger Town purchase rights under the chapters. For sale it is a matching right, for conversion it is an appraised value purchase right.**



# Chapter Lands Exits– Fatal Town Purchase Rights

Failure to correctly terminate the Town Purchase rights is **fatal** to your project – the outstanding purchase rights are a title defect rendering project title unmarketable and no responsible lender or tax credit investor will provide funding.

- The Chapters were drafted to favor the Towns, and terminating the Town rights is difficult.
- The Town rights to purchase can be assigned to a nonprofit (which may have been purposely created and funded by your project opponents).
- Many town counsel and project opponent counsels are adept at manipulating the Chapter Lands exit process to leave the Town rights alive but in limbo – which is fatal to your project.
- Erroneous Chapter Lands withdrawal tactics are a common pitfall for out-of-region developers

# Chapter Lands - Bad Tactics “Quiet Quitting”

- “*Quiet Quitting*”. In Quiet Quitting, the landowner has been in formal or informal discussion with developers about conversion or sale. Aware of the Chapter Lands problems, the developer and the landowner quietly agree to proceed on an informal handshake until the land can be quietly withdrawn by lapse. Then, they wait 12 months and convert or sell.
- The Flaw: After *Sudbury Vs Scott*, Quiet Quitting is wholly unreliable. A project opponent can file affidavits as to the underlying fact and in a declaratory judgment action discover all electronic and other evidence of the “quiet” deal between the landowner and the developer. With that evidence, opponent can show that a “deemed conversion occurred under Scott, the Town rights were never addressed and the Town rights remain outstanding – indefinitely.

# Chapter Lands – Bad Tactics – “Friend in Town Hall”

- “My Friend in Town Hall” Waiver. In the “Friend” scenario, the landowner or their lawyer has a good relationship with local town officials, and a town manager or other apparently authorized person has waived the town rights in writing. No bribes or other corruption are involved; the town official thinks he is acting in the Town’s best interest.
- The Flaw: the 61 Chapters spell out a very specific process of notices, filings and public actions required to issue a valid waiver of the Town rights. If these steps are not followed, the Town rights arguably survive. Because the town right are a real estate title flaw, title insurer will insist on clear documentation.

# Chapter Lands – Bad Tactics – “This Town Cannot Raise the Money”

- In the “*This Town Cannot Raise Money*” scenario, the landowner or developer takes false comfort from the fact that the Town, likely many, is in tight financial straits and does not have extra funding to buy a potentially expensive site.
- The Flaw: the 61 Chapters do **not** require the Town to spend its own money – the Town purchase rights can often be assigned to a nonprofit and the right type of nonprofit can easily be created by a deep pocketed project opponent.

# Chapter Lands – Correct Tactics

- Plan way ahead. The process can take 3-6 months or more to manage and navigate. Coordination with assessors and appraisers is likely required.
- Pick the Right Lawyers. Make sure your Chapter 61 counsel is in fact prepared and experienced in the intricacies and traps of these unusual statutes.



# Presenters

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