Novel Solar Panel Placement

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What is Lexington doing well?

- Lexington already has solar panels on top of many municipal buildings.
  - Solar arrays at the Hartwell Avenue Compost Facility have generated over **9.6 gigawatt/hours (GWh) of power since 2018**.
  - Rooftop solar arrays on 5 school buildings as well as the Lexington Library, which have produced over **4.5 GWh of electricity** since installation.

What is Lexington doing well?

- Lexington homeowners are adopting solar
  - **127 new residential installations in FY 2020**
  - Added an estimated **1.117 GWh of solar capacity per year** (based on average of 8,800 KWh per installation generated annually)
- Lexington Town Government supports solar
  - Sustainability Committee and Office
  - 2019 Zoning regulations update: easier for residential and parking lot solar installations

SUSTAINABLEX
TOWN OF LEXINGTON
OFFICE OF SUSTAINABILITY

Focus Areas

Commercial Energy Usage

- Non-residential electricity use accounts for 77% of the total electricity used in Lexington.
- The Town's energy inventory estimates that non-residential enterprises are responsible for about 59% of total GHG emissions.
- How can local government facilitate the transition of the private sector to solar?

Right of Way Solar

- Maximizing land use efficiency with small-scale solar generation.
- Highways and utility access.

Novel Solar Ideas

- Parking lot installations (carports) with Electric Vehicle charging stations.

Engaging The Private Sector

Public Private Partnerships

Lexington is home to many BioTech and pharmaceutical firms.

Pharmaceutical industry is energy intensive business that have large facilities perfect for integrating solar.

Energy usage for labs is approximately 2.5 times greater than office spaces per square foot.

Biomedical labs are the largest consumers of energy among lab facilities.

Figure 8: Tree Diagram Showing Source Energy Consumption for Each Building. (Size of rectangle reflects total source energy consumption of building.)

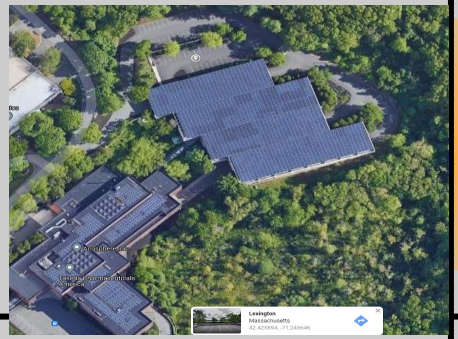
Engaging The Private Sector

Public Private Partnerships

The Town can partner with private entities for solar installations.

Some companies such as Takeda Pharmaceuticals already have solar installations at their facilities, but many do not.

Solar can also provide power for heating and cooling, which is an asset for biomedical facilities that use 32% of their electricity for refrigeration, the largest single usage, and 14% of their electricity for cooling.



Engaging The Private Sector

Draw up a comprehensive contract between municipality and the business:

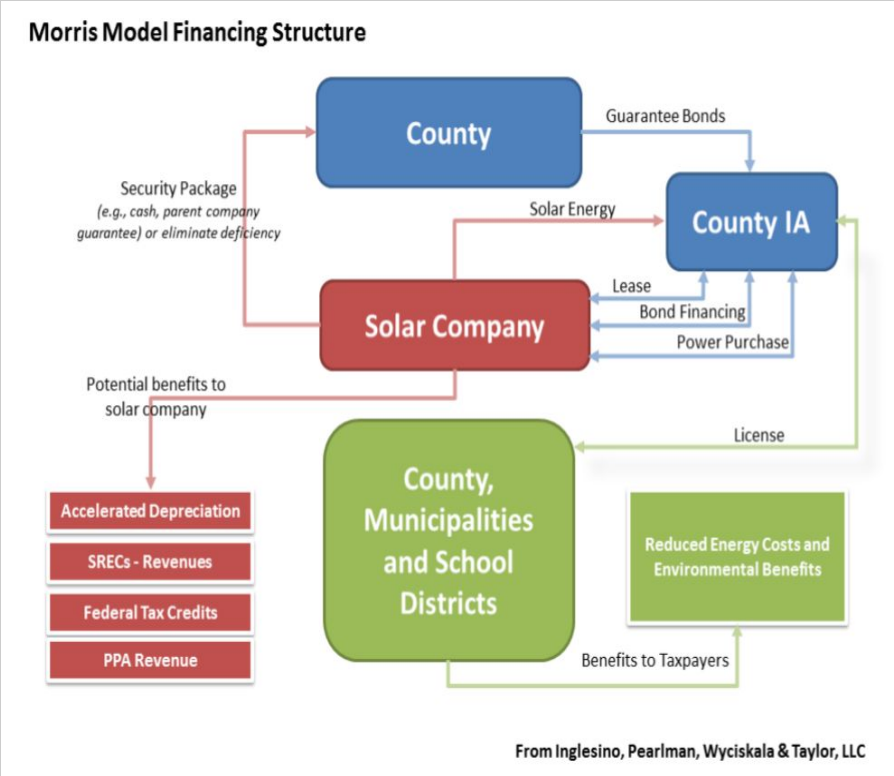
- Scale of installation
- Cost burdens and financing
- Establish who is responsible for installation and maintenance
- Liability associated with installation and operation
- Provision of solar power generated (ex. Does 50% of the solar power created go to the business?)
- Express shared long term goals and interests
- When partnership is renewed & how to arbitrate disputes.

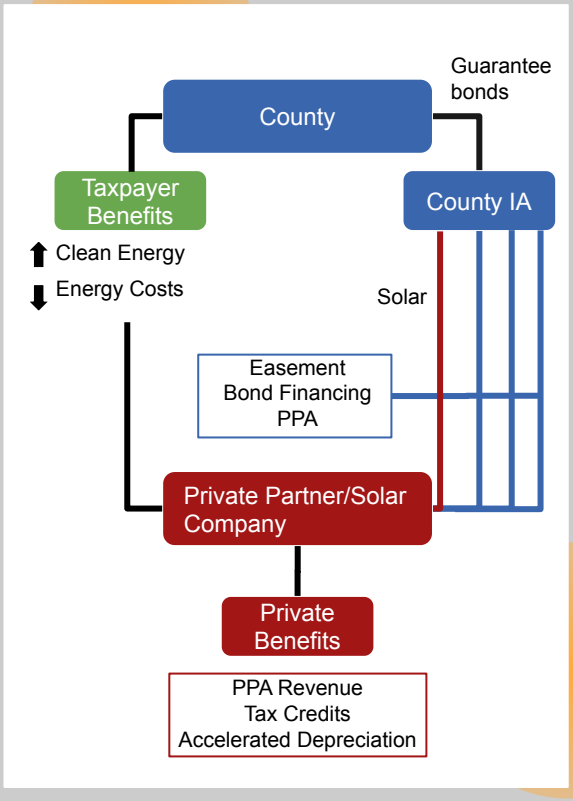
The Morris Model of Funding PPPs

- The Public entity issues taxable bonds for private use to fund the solar project.
- Bonds are pooled across multiple project sites.
- In consideration for the bonds, the public partner can often arrange a Power Purchase Agreement (PPA) at a lower rate per kWh.
- Private partner maintains tax ownership of the project, but provides cheaper energy.
- The bonds are double-barreled, backed by project revenues and a public guarantee.
- Morris Model allows the Town to leverage its financial resources to contribute to the project in addition to the private partner. The bonds will allow the Town to match the private sector commitment instead of the private partner relying on future revenue once the project is completed.

Innovating the Morris Model

- Apply model to privately-owned facilities.
- Use bond financing, PPA, and aggregation to offset electricity cost for low income or nearby residents
- Public guarantee enables partnerships with larger businesses, not just solar companies.
- Municipal bonds adapted to renewable energy projects directly benefiting town.


Morris Model Financing Structure
County
Guarantee Bonds
Security Package
(e.g., cash, parent company guarantee) or eliminate deficiency
Solar Energy
County IA
Lease
Bond Financing
Power Purchase
Solar Company
Potential benefits to solar company
License
Accelerated Depreciation
SRECs - Revenues
Federal Tax Credits
PPA Revenue
County, Municipalities and School Districts
Reduced Energy Costs and Environmental Benefits
Benefits to Taxpayers
From Inglesino, Pearlman, Wyciskala & Taylor, LLC


Guarantee bonds
County
Taxpayer Benefits
County IA
Clean Energy
Energy Costs
Solar
Easement
Bond Financing
PPA
Private Partner/Solar Company
Private Benefits
PPA Revenue
Tax Credits
Accelerated Depreciation

Where has the Morris Model Worked?

William G. Mennen Sports Arena, NJ – 1.57MW solar project with panels installed on the roof of 3 ice rinks and above more than 500 parking spaces.

Sussex County, NJ – Solar panels installed on Sussex County Community College and other public school buildings; expected savings of $1.3M over 15 years, at no cost to the public.

Engaging The Private Sector

Benefits of Public Private Partnerships

- Easements for public entities to install solar on private property
- Harness private sector facilities and financing capabilities
- Energy benefits to the partner company, which leads to monetary benefits
- Public relations opportunity for large companies

P3

PUBLIC-PRIVATE PARTNERSHIPS

Solar for Small Businesses

- Many small businesses do not have fixed rate contracts with power utilities.
- This leaves them vulnerable to market and seasonal price fluctuations.
    - **35% of businesses in MA struggle with increasing electricity bills.**
- Towns have a role to play in connecting businesses with low cost solar installers to catalyze the transition over to solar.
- Advantages of solar for businesses:
    - Increasingly lower installation costs (approx. $2.82/watt)
    - Cut overhead business costs,
    - Energy independence,
    - Tax benefits ,
    - An investment with continuous economic and environmental returns.

Available Programs for Businesses

Federal Investment Tax Credit: A credit of up to 26 percent of qualifying project costs (Declining to 22 percent in 2023 then 10 percent in 2026 and beyond)

Modified Accelerated Cost Recovery System (MACRS): Business owners can depreciate solar electric systems over a five-year schedule.

Solar Massachusetts Renewable Target (SMART) Program - A production-based incentive that is paid directly by investor-owned utilities in Massachusetts to solar electric system owners. SMART was launched by the Department of Energy Resources (DOER) in conjunction with investor-owned utilities. The selected Solar Program Administrator, CLEAResult, intakes and processes applications.

Case Study: Melrose Solar Challenge

The Melrose Energy Commission pulled in the key ingredients to a successful campaign: **local community support, trusted introductions to decision-makers, technical expertise, and highly visible examples of success.**

The community partnered with the Solar Massachusetts Renewable Target (SMART) Program and Boston-based Resonant Energy, a solar provider specializing in nonprofit solar finance options and with the technical knowledge to serve projects from 25 kW to 300 kW in scale.

The ongoing program offers business the following:

1. Incentives up to 70% off:
2. Site specific energy efficiency upgrades
3. Flexible payment plans
4. Eligible customers can have their share of the efficiency improvements placed on their monthly electric bill for up to 24 months or pay in once lump sum and receive an additional 15 % discount.

Case Study: Melrose Solar Challenge

Accomplishments

In 6 months, Melrose Energy Commission (MEC) met with 160 businesses

- 67 of them completed the no-cost business energy assessment,
- 55 completed energy efficiency improvements such as lighting upgrades
- These business are now saving nearly $50K annually from these improvements.

Currently, over 300 Melrose businesses, non-profits, and residents have installed solar PV.

The combined impact of these installations is **2.3 MW of clean, local, renewable power from the rooftops of Melrose.**

Obstacles

- Many businesses lease their commercial space, so they may not want to pay to install solar.
- Outreach to landlords.

Highway ROW Solar Overview

Renewable energy utility projects along highway ROWs are allowed (and encouraged) by FHWA

Approval, oversight, and management of sites are left to state transit agencies, which must create Utility Accommodation Plans (UAPs).

Three conditions by FHWA under which highway ROWs can be developed:

1. Must be in the public interest;
2. Must not affect safety or operation of the facility;
3. Must consider Environmental effects;

MassDOT relies on its Office of Real Estate and Asset Development (OREAD) to oversee the deployment of renewable energy and telecommunications installations on highway ROWs.

For Lexington, OREAD will be the primary contact, arbiter of the permit application, and the office that negotiates the terms of the lease for the ROW.

Advantages of Highway ROW Solar

- Unshaded acreage
- Ease of access
- Public ownership status
- Lack of competing development efforts

MassDOT Already does this!

- Federal Highway Administration Regulations allow renewable energy utility projects on highway R.O.Ws (23 CFR 645)
- MASSDOT has a Utility Accommodation Policy on State Highway Right of Ways that define renewable infrastructure as within the public interest.
- MassDOT launched solar PPP along I-90 in 2015 for their facilities. Generated $15 million in savings for MassDOT.

Current Examples

MassDOT Sound Barrier Solar on I-95 in Lexington.

Utilizing highway space and infrastructure to support renewable energy goals.

Funded by state grants -- $345,000 grant from the MA Department of Energy Resources.

Size of System	**650 kW**
Estimated Annual Production	**825,000 KWh**
Annual CO2 Reductions	**720,000 lbs/year**
Number of homes supplied with energy	**120 homes per year**

Example

I-95 & Bedford St. Intersection

- Blue rectangles represent 100 x 10 ft of solar panels
- Approximately 15,000 sq ft of solar possible at this site based on diagram.
- At 15 watts per sq ft of solar panels, an ROW site such as this can generate 225,000 watts of solar electricity.

massDOT
Massachusetts Department of Transportation
Highway Division

Application for Permit to Access State Highway

This Access Permit Application, including the attached Access Permit Submittal Checklist, must be completed in full by the Applicant. Instructions for this page are located on page 2. Descriptions of the two types of access permits and related categories are located on page 6. MassDOT will make the final determination regarding Access Permit Application type and category.

1. **Town/City:** Lexington
2. **State Highway route number and/or name:** I-95 / Yankee Division Highway & Route 4
3. **Locus/Property Address:** Exit 49B Location: 42.470176, -71.243524
4. **Description of property and/or facility for which access is sought** (attach additional sheets if necessary):
   Land enveloped by interchange from I-95 to Route 4 (Bedford St.). Including land adjacent to I-95N exit 49B & Bedford St. overpass.
   See Appendix A for map of property
5. **Description of work to be performed within State Highway Layout** (attach additional sheets if necessary):
   Installation of 15 100x10 foot arrays of solar panels . Burrowing of utility wire to power line on Bedford St. from solar installations.
   See Appendix B for design specifications.

   ☑ **Telecommunications** (wireless or wireline) or **Renewable Energy** (Solar, Wind, etc) – Agreement Process and OREAD* coordination required. (*see pg 2 Instruction)
6. **Dig Safe number:**
7. **Applicant Information** [1] (See footnote below.)
   Name: Town of Lexington
   Mailing Address: 1625 Massachusetts Ave, Lexington, MA 02420
   Telephone:
   Fax:
   E-Mail:
8. **Property Owner**
   Name: Massachusetts Dept. of Transit Highway District 4
   Mailing address: 519 Appleton Street, Arlington, MA 02476
   Telephone:
   Fax:
   E-Mail:

Utility Right of Way

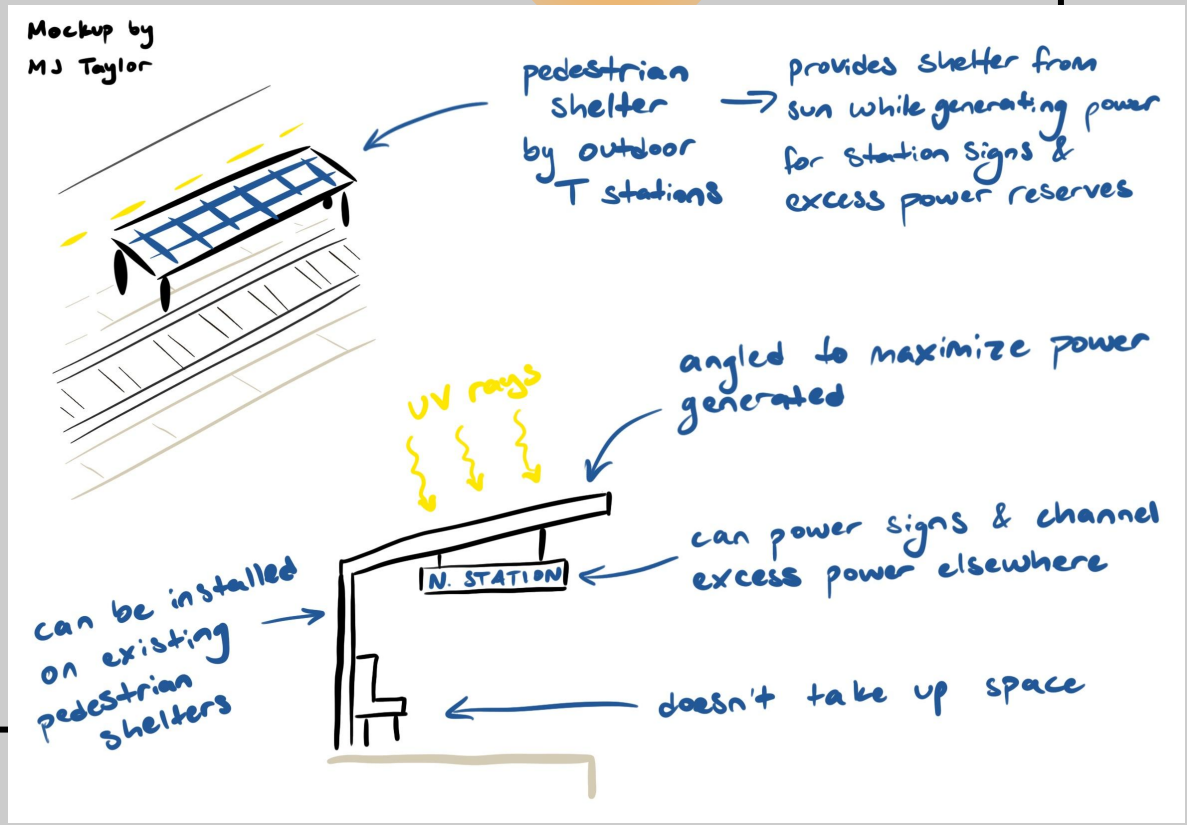
- Using land under power lines to generate solar electricity
- Maximize land use efficiency
- No additional loss of trees or habitats

Could this work in Lexington?

1. National Grid: Company policy to not build under ROWs
2. Eversource: easements from private landowners to build on ROWs
    a. Possible, but difficult
    b. Would need to interface directly with land owners of easement
    c. What if the original owner is the Town?
        i. Town could negotiate with utility.

Design Submission

- Transit shelters with solar
- Provides energy and passive cooling
- More pleasant experience for riders
- Necessity for urban design to integrate small scale solar



Overview

- Areas of opportunity for local governments to facilitate green energy transition.
- Many options to get there: PPP, Small Business solar, ROWs, and roof covers, *all while minimizing environmental harm*
- Emphasis on fair pricing for what is fed into the grid.
- Public ownership of solar utilities, own the future
- Community Choice Aggregation with solar allows communities to have more agency with their energy policy.

Thank You!

Questions?

For additional information, please refer to the full report!

Or contact Rick Reibstein (rreibste@bu.edu)
Daniel Daponte (ddaponte@bu.edu)
Ian Galinson (galinson@bu.edu)