



# Session #2: Solar and Agriculture







Mr. Bennett joined EDF Renewables in 2007. His renewable energy career started as a Wind Technician on legacy wind projects in Northern California, before transitioning to manage EDF Renewables meteorological towers in the US, Canada, and Mexico. In 2020 he moved to the New York Development team where he currently manages 500MW of solar projects in the state.

Prior to working at EDF Renewables Josh was a Middle School teacher in Oakland California with a degree in Child Psychology from San Francisco State University.



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# EDF Grid-Scale Power



## Bigger Projects. Bigger Benefits.

Providing **origination, development, transaction, and construction** services for large-scale wind (offshore and onshore), solar power generation and storage projects across North America.

Our team of leaders solve energy challenges for businesses and communities no matter the size or complexity having developed wind, solar and storage projects with some of the world's top corporates and utilities.

**35+**  
**years**



On the forefront of the renewable energy industry in the US as a service provider beginning in 1985 and in New York since 2018 with Copenhagen Wind.

**14 GW**



Of developed grid-scale solar, wind and storage projects across North America.

**\$23B+**



Paid to vendors, including lease payments made to landowners, since 2010.

**70,000**

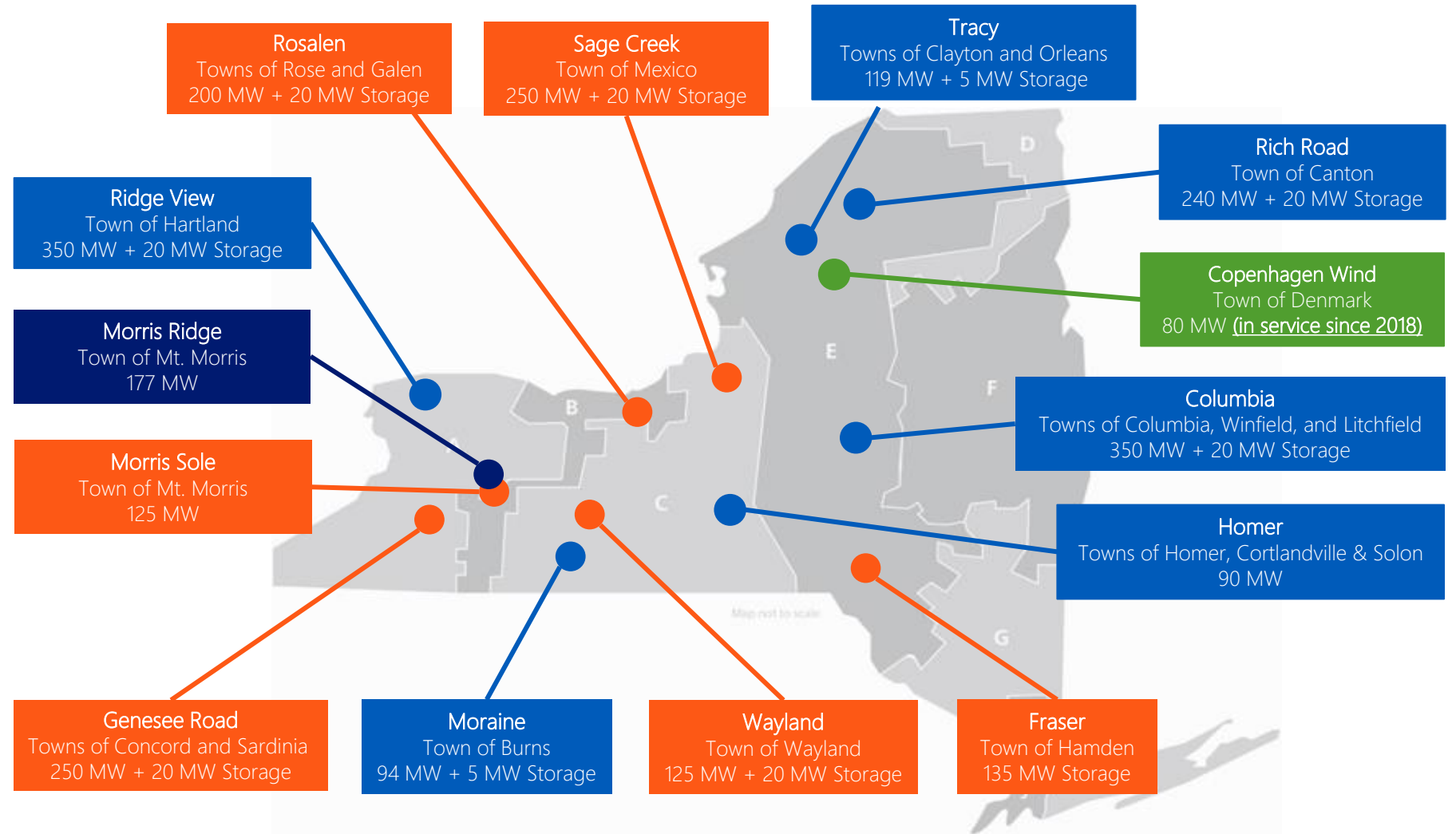


Number of potential jobs created over the project lifetime of our development portfolio.

*Based on an employment factor of 5 jobs per MW  
IRENA Annual Review 2022*

# EDF Renewables New York Portfolio

- In Operation
- Under Construction
- NYSERDA Contract
- In Development





# Agrivoltaics Innovation Around the World



# An Agrivoltaics Success Story: Arnprior Solar



Shady Creek Lamb Co. Team at EDFR's Arnprior Solar in Ontario

## EDF Renewables has partnered with Shady Creek Lamb Co. for sheep grazing at Arnprior Solar near Ottawa, Ontario.

- Solar site built in 2009 on 200 acres and solar grazing PILOT project in 2017.
- Approximately 400 acres grazed for the past five years.
- Shady Creek Lamb Co: Young couple near Ottawa, Ontario wanted to grow flock by grazing outdoors, but needed 400-500 animals to sustain business. Today, they graze Arnprior and other sites – expect to lamb 500+ ewes in 2022!
- Solar grazing reduces EDF Renewables' vegetation management costs of about 35% due to grazing with sheep versus mowing.
- They sell locally produced grass-fed free-range lamb at farmers markets and to local restaurants, and they sell wool to make blankets.



Sheep Grazing



Solar Beekeeping



Monarch Conservation

Scan the QR Code  
to watch a virtual  
site tour!





# EDFR's Leadership in NYS Siting and Agrivoltaics

## Key Contributions and Partnerships



Chairing ACE NY  
Solar Siting  
Committee

Member of the  
NYSERDA Agricultural  
Technical Working  
Group

Member of American  
Solar Grazing  
Association Advisory  
Board

Cornell Extension  
Solar Consortium

Cattle Grazing  
forums with Huwa  
Enterprises and  
American Aberdeen  
Association

Cornell University for  
Columbia Agrivoltaic  
Collective

Other  
Partnerships

- Genesee Valley Conservancy to study the potential of harvesting potatoes under solar panels.
- Propagate Agroforestry- integrating Agricultural visual buffers, including berries and nuts

# Columbia Agrivoltaic Collective

A comprehensive study produced by students from Cornell University

### Columbia Solar Energy Center

- A 350-MW project to be located in the Towns of Columbia, Winfield, and Litchfield in Herkimer County, New York.
- Located on approximately 2,000 acres of leased land, offering a stable source of income for local landowners and families.

### Columbia Agrivoltaic Collective

- Dual-use of land for traditional farming practices and solar PV arrays to create additional economic opportunity and environmental benefits, as well as preserve the character of communities.
- The Columbia Agrivoltaic Collective is what is being proposed.



Scan the QR Code to learn more!





# Key Opportunities for Agrivoltaics in NYS

Least Complex to Implement

Most Complex to Implement



## Native Vegetation

- Provides a habitat for pollinators that improve agricultural yields.
- Retains more water and topsoil, improving soil health.
- Reduces the ambient air temperature by creating a cooler microclimate, enabling the photovoltaic panels to be more efficient.
- Pollinator and native grassland seed mixes.



## Sheep Grazing

- Replaces more costly control methods such as herbicides or mechanical weed removal, reducing vegetation management costs.
- Episodic grazing produces a higher content of carbon and nitrogen in the soil.
- Lamb meat or wool creates a second revenue stream for the farmer and contributes to the regional economy.



## Cattle Grazing

- Lowline cattle are shorter, more docile, require less water and feed, and are likely more profitable per acre.
- Two opportunities for cattle grazing:
  1. Organic dairy operation
  2. Cow-calf beef operation



## Row Cropping

- Shade-tolerant species can be planted between solar panels with increased yields and lower irrigation requirements.
- Reduces land-use conflicts.
- We are currently exploring row cropping for potatoes through a feasibility study with Genesee Valley Conservancy.





Achieve Your Sustainability Goals –  
Because the Future Depends on Us

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# Solar Energy = Emissions-Free Power



## Safe and non-toxic materials

- The modules are comprised of silicon, copper, and aluminum between glass and plastic with an aluminum frame.
- These types of solar modules cannot release any toxic materials .



## Low environmental risk and pollinator benefits

- Inverters and transformers used for grid-scale power do not contain heavy metals or toxins. Even during a malfunction or when damaged, no environmental risk is present.
- Energy storage is self-contained with integrated fire suppression per NYS law.
- Native vegetation to support wildlife & pollinator species in the area, improving carbon sequestration.



## No pesticides and herbicides

- Are used in solar array areas unless mandated by environmental agencies. For example; if invasive plant species were to develop in the area.
- Within substations, herbicides are required by code to ensure plants do not grow into electrical equipment & cause a fire.

# EDFR's Leadership in NYS Siting and Agrivoltaics



## Key Contributions and Partnerships

### Chairing ACE NY Solar Siting Committee

Leading committee of New York developers through state renewable energy association to strategize and respond to threats against siting large-scale solar on farmland.

### Member of the NYSERDA Agricultural Technical Working Group

Including scorecard and agrivoltaic sub-committees. Maintain a siting scorecard as part of NYSERDA Tier I solicitations.

### Member of American Solar Grazing Association Advisory Board

EDFR is recognized as a leader in the solar grazing space across North America.

### Project Leadership

Proactive discussions with internal teams to build business case for solar grazing on large-scale New York solar projects.

### Cornell Extension Solar Consortium

Along with other developers, creating a certification system to recognize smart siting and agricultural integration. Potential PILOT project opportunity.

### American Aberdeen Association

Partnering to discuss lowline cattle grazing for a shorter breed of cattle. Exploring feasibility of lowline cattle grazing as an alternative to sheep grazing.

### Cornell University for Columbia Agrivoltaic Co-operative

Partnering to develop a study for an agrivoltaic co-operative model at Columbia Solar.

### Other Partnerships:

- Collaborating with the Genesee Valley Conservancy to study the potential of harvesting potatoes under solar panels.
- Agricultural visual buffers, including berries and nuts



# Opportunities for Agrivoltaics



## Option 1: Pollinator-Friendly and Native Vegetation

- Benefits of planting native plants and grasses between solar panels,
  - **Provides a habitat for pollinators** and other beneficial insects that can improve yields at nearby farms.
  - Their **deep root systems retain more water than agricultural monocultures** retains topsoil and improves soil health over time.
  - **Reduces the ambient air temperature by creating a cooler microclimate**, enabling the photovoltaic panels to be more efficient.
- At EDFR's Arnprior Solar near Ottawa, Ontario, we engage in:
  1. Planting of Native Vegetation
  2. Monarch Conservation
  3. Solar Beekeeping



# Opportunities for Agrivoltaics



## Option 2: Sheep Grazing

- Sheep grazing has a notable revenue increase when co-located with solar and is the **most well-established solar grazing method in the US.**
- As both browsers and grazers, sheep keep vegetation growth below the panels under control, substituting for more costly control methods such as herbicides or mechanical weed removal, reducing maintenance costs.
  - At EDFR's Arnprior Solar near Ottawa, Ontario, the project has **reduced vegetation management costs by 35% due to grazing with sheep** versus mowing.
- The sheep offers **a second revenue stream for the farmer**, as meat or wool from the sheep can be a profitable enterprise in addition to payments from the solar contract.
- Agrivoltaic products, including lamb and wool fiber, contributes to the regional and local economy.
- Grazing is beneficial to soil health.



Sheep Grazing at EDFR's Arnprior Solar



Shady Creek Lamb Co. Team at EDFR's Arnprior Solar



# Opportunities for Agrivoltaics



## Option 3: Lowline Cattle Grazing for Dairy or Beef

- Lowline cattle are shorter, more docile, require less water and feed, and are likely more profitable per acre. **Lowline cattle would be easier to integrate under solar and would align with existing agricultural practices in NYS.**
  - EDFR has established a relationship with the **National Aberdeen Association** (formerly National Lowline Cattle Association)
- When grazing underneath the solar panels, cattle would benefit from the shade and experience reduced heat stress
- The two most likely opportunities would be:
  - 1. Organic dairy operation:** Cattle grazing on cool season grasses (i.e. orchard grass, tall fescue, and perennial ryegrass) during the growing season
  - 2. Cow-calf beef operation:** Fewer logistical challenges



Lowline Cattle



# Opportunities for Agrivoltaics



## Option 4: Row Cropping Under Solar Panels

- Seedlings of shade tolerant species, such as several leafy salad greens, could be transplanted from nearby high tunnels to rows between or partially under the solar panels
- The smaller equipment used with vegetable farming would be easier to integrate with the solar structure.
- By being partially shaded, evaporation rates would be lower under the panels, potentially reducing water usage. This could have the downside of worsening excessive moisture conditions during some times of the year.
- We are currently exploring row cropping for potatoes through a feasibility study with Genesee Valley Conservancy.





# Opportunities for Agrivoltaics



## Option 4: Row Cropping Under Solar Panels



### Alfalfa

- 40% increase under modules on EDF test site in France with wider leaflets and longer stems
- Successful harvesting of alfalfa would benefit to existing NY dairy economy



### Root Vegetables

- EDF France is currently testing potato production under modules
- EDFR is conducting a feasibility study for growing potatoes with the Genesee Valley Conservancy.



### Celery

- Jack's Solar Garden in Colorado: 400% higher yield of celery in an agrivoltaic setting



### Assorted Berries

- Strawberries, Blueberries, Lingonberries, Raspberries
- BlueWave Solar and the University of Maine are testing wild blueberry patches on a 4.2MW site

# Opportunities for Agrivoltaics



## Option 4: Row Cropping Under Solar Panels



### Brassica Vegetables

- Kale, broccoli, arugula
- Cool season crops perform better under solar panels and have experienced season extensions



### Lettuces

- At a research site in France, lettuce grown under solar panels had larger leaf sizes and yields that were equal or greater than non-agrivoltaic lettuce.



### Tomatoes

- At an NREL site, researchers recorded doubling of tomato yields using 30% less water.



### Assorted Peppers

- At an NREL site, researchers recorded tripling of jalapeño pepper yields using 30% less water.