

LEADING THE WAY **CampusEnergy**2022

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Blue Delta Energy

Energy Efficiency, Renewable
Thermal & CHP – How the
Changing Landscape of
Environmental Attributes
Provides Revenue to College
Campuses

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CLIMATE CHANGE CRISIS = OPPORTUNITY

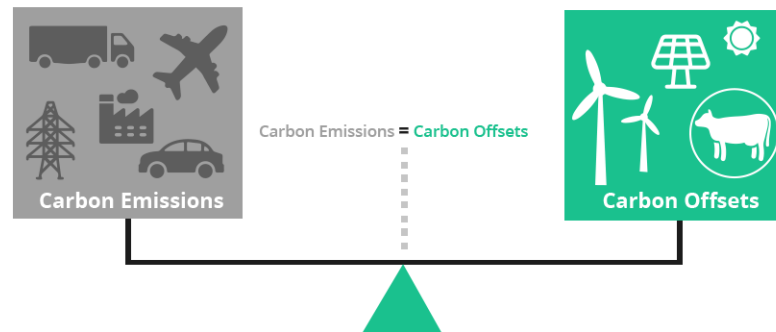
- Global market-based solutions essential to achieving decarbonization
 - In parallel with policy, develop robust, transparent, high-quality projects & environmental attributes
- 2021 - exponential growth in demand w/in environmental markets
 - Global voluntary commitment ramp up by corporates, funds, banks, and higher education
 - Increases opportunities for generating revenue from campus clean energy & carbon reduction projects via environmental attributes
 - Broadens range of attribute solutions to integrate with campus decarbonization and GHG accounting (more products to procure)
- COP 26, Glasgow highlighted importance of environmental attributes, particularly carbon offsets

CARBON OFFSETS

- **Carbon Offset** = 1 Metric Tonne CO₂ reduced or removed
 - Landfill methane gas capture, forest management, animal waste, wind
 - Reforestation, carbon capture technology

How a Carbon Offset works.



1 CO₂ Offset = 1 Metric Ton of Carbon Dioxide Reductions



- How do offsets integrate with campus decarbonization?
- 2021 demand = 2-3x increase in offset prices, global scaling or carbon markets
 - Relevant for colleges & universities as offset purchases are planned

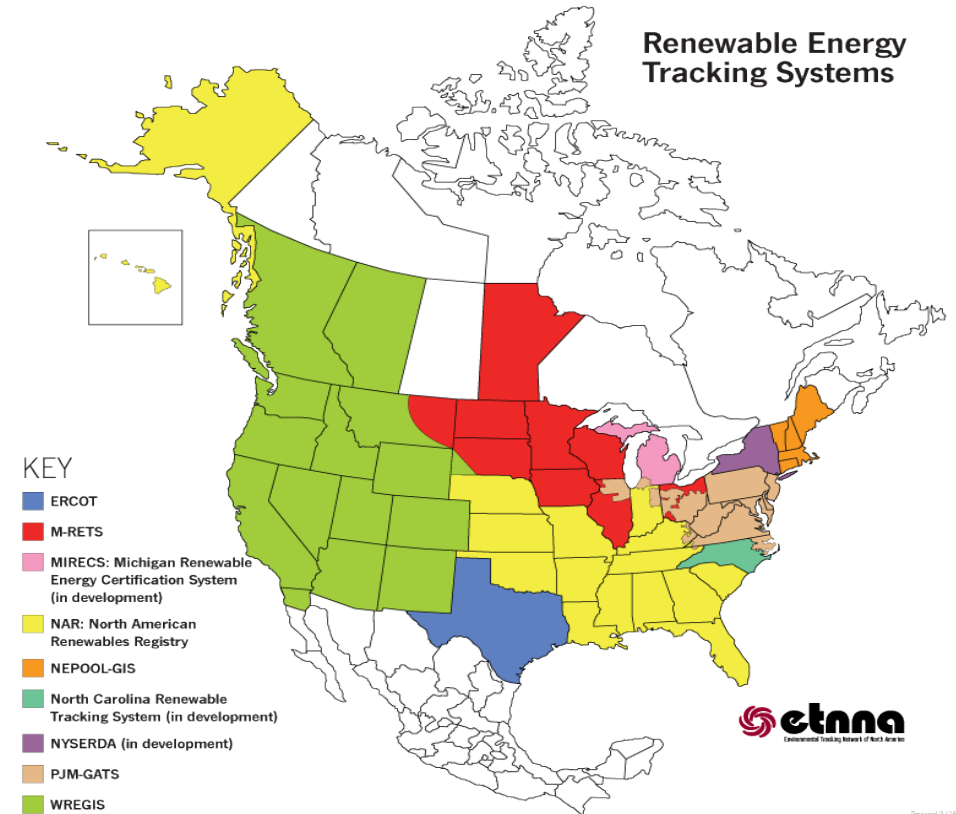
ENVIRONMENTAL ATTRIBUTE LANDSCAPE

Growth of products & markets = opportunity for higher education

- **Renewable Energy Credit (REC)** - 1 MWh of renewable energy generated
 - Electricity – wind, solar, CHP, biogas, hydroelectric
 - Energy Efficiency – lighting retrofits, peak shaving,
- **Hourly RECs** - to closely match load with renewables 24/7  
- **Renewable Thermal Certificates** - attribute from RNG, g.s. heat pumps, wastewater heat recov., renewably produced hydrogen (w/carbon intensity data)
- **Clean Peak Credits** – Massachusetts, with credit multipliers
 - Energy storage, new renewables, demand response
- **Renewable Fuels Credits** – RINs, LCFS, eRINs?

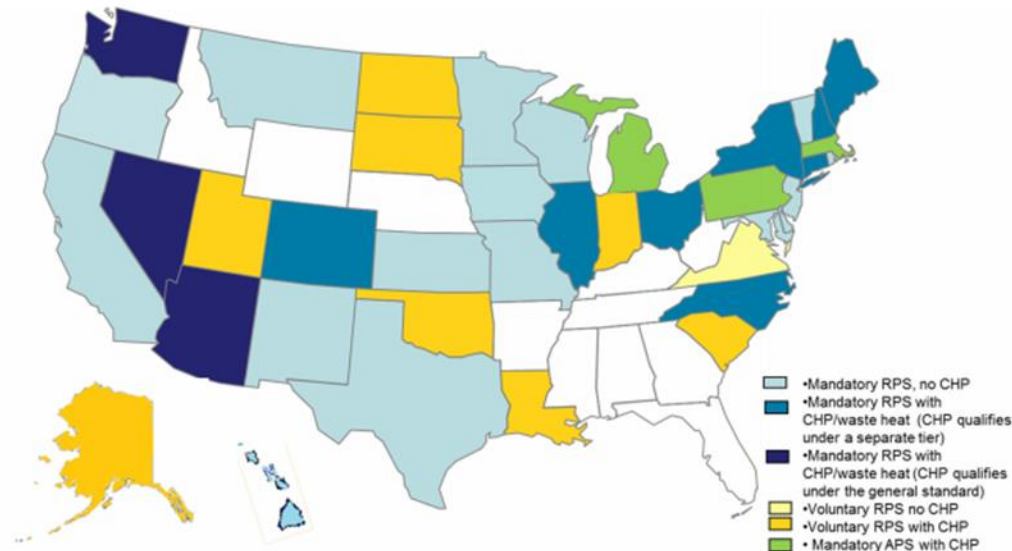
RENEWABLE ENERGY CREDITS (RECs)

- Electronic Tracking Systems provide secure mechanism to create and manage attributes
- When RECs are sold, project owner gives up environmental/clean energy claims
- College campus - generator and buyer of RECs
- **Boston University (2020)** – 205k Green-e RECs/yr (& power) x 15 years, South Dakota wind
 - Enabled project construction
 - 2-3 times avoided emissions vs. New England project



COMBINED HEAT & POWER RECs

- 29 States + D.C. have a Renewable Portfolio Standard (RPS)
- **CHP and/or WHP** – called out in 20 states as eligible under RPS type program – qualified to generate RECs or thermal equivalent (convert MMBTUs to MWh)
- **Natural gas fired CHP** – under fire in some states (MASS APS)
 - Need to communicate long-standing benefits to lawmakers

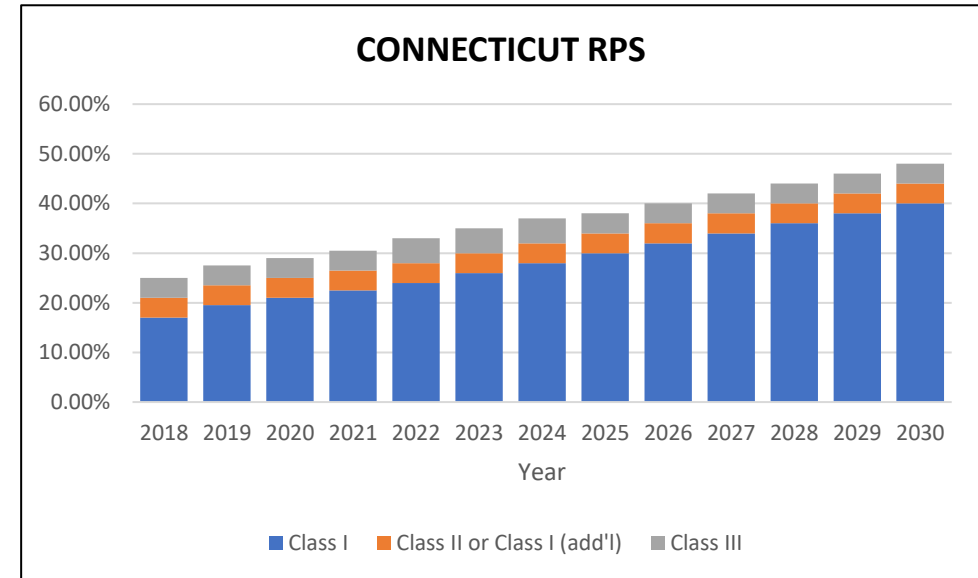


CT RENEWABLE PORTFOLIO STANDARD

- Class I – solar, wind, fuel cell, landfill gas
- Class II – trash to energy
- **Class III – CHP & waste heat recovery**
- CHP valued - reliable onsite generation
- Wesleyan - first to receive state microgrid funds - includes CHP



2.4 MW CHP



Yale

30 MW CHP



4.6 MW CHP



24.9 MW CHP

UConn & CHP

UConn QUALIFYING CHP UNIT	
Load (MW)	24.9
Approximate Gross REC Generation/Yr	160,000
Net Generation (Remit 25%)	120,000
Indicative 2022 Class III REC Value	\$13.00
Approx. Gross Annual REC Revenue	\$1,560,000



- Main campus energy need - 100% met with CHP
 - Technically tri-generation - thermal via steam driven chillers is used in summer months
- **Class III REC revenue - into Green Revolving Fund for energy and water conservation efforts & projects which would otherwise not be funded**
- Not claiming carbon reduction value of CHP (selling RECs & environmental claims)

MARKETS DRIVEN BY REGULATION

- Pennsylvania Tier II Market responded to legislative change in RPS

PENNSYLVANIA TIER II PRE-RULE CHANGE		PENNSYLVANIA TIER II POST-RULE CHANGE	
CHP (MW)	3	CHP (MW)	3
Approximate Gross REC Generation/Yr	22,000	Approximate Gross REC Generation/Yr	22,000
Tier II Pre-Rule Change	\$0.50	Tier II Post Rule Change	\$17.00
Approx. Gross Annual REC Revenue	\$11,000	Approx. Gross Annual REC Revenue	\$374,000

- Colleges & universities can be effective in engaging legislators to increase support for campus clean energy projects

BUCKNELL UNIVERSITY



- Attribute generator under PA Tier II AEPS
 - **CHP**
 - **Energy Efficiency**
 - Lighting retrofits
 - Chilled Water Storage

BUCKNELL PA TIER II QUALIFIED CHP

Load (MW)	4.75
Approximate Gross REC Generation/Yr	35,000
Indicative Tier II AEC Value	\$17.00
Approx. Gross Annual REC Revenue	\$595,000



BUCKNELL UNIVERSITY

- **Energy Efficiency** qualifies as PA Tier II resource
 - Campus lighting retrofit projects from 2014-2019
 - PA AEPS - 15-year Tier II AEC crediting mechanism for lighting retrofits

BUCKNELL PA TIER II QUALIFIED LIGHTING RETROFIT	
Approximate savings - MWh/year	2,300
Crediting Period	15 years/project
Indicative Tier II AEC Value	\$17.00
Approx. Gross Annual REC Revenue	\$39,100



- **Thermal Energy Storage** – eligible to generate Tier II AECs??
 - Chilled Water Tanks generate large % of campus chilled water needs
 - tanks charged overnight with power from the CHP (free cooling in cold months)
 - Stored water discharged during peak electric load periods – decrease utility purchased power
 - Real \$\$ savings & flexibility for hourly decisions on operating tanks in conjunction with CHP

CREATING CAMPUS CARBON OFFSETS

- **Ball State University** teamed up with Chevrolet (2012) to create methodology
 - Clean energy & energy efficiency
 - District-scale geothermal ground source heat pump (GSHP) heating and cooling
 - 2 energy stations, 47 buildings
 - Chevy committed to three-year contract for offsets (110k)
 - More \$\$ for campus wide EE projects
 - **Report sales accurately to avoid double counting** – income used to reduce GHG impact more greatly/at a deeper level in the long-term – sell for years up to “anchor year” – sell some, retire some....
- Carbon revenue can take from Business as Usual to GHG reduction leadership
- **Boston University, Valencia College, University of Illinois Urbana Champaign**



BALL STATE
UNIVERSITY.

BIOGAS/RNG ON CAMPUS

- Landfill methane capture, sewerage (WWTPs), farms, food waste (heating needs, not just for transportation)
- **University of California System**
 - RNG as part of commitment toward 40% natural gas from renewables by 2025, buildings and vehicle fleet
- **Duke University**
 - approx. 50% of operations rely on natural gas
 - teamed up with Google and Duke Energy to fund swine waste to energy anaerobic digestion project – **from carbon offset procurement to RNG user for meeting GHG reduction goals**
- **Middlebury College (100% renewable by 2028)**
 - Vermont farm w/cow manure & food waste – RNG via pipeline (33% of campus heating & cooling)



Middlebury



CONCLUSION

- Existential problem of climate change yields opportunity
- Environmental Attribute landscape – diverse & changing
 - Increased opportunities for campus revenue generation
 - More products to source for achieving decarbonization goals
- Carbon offset market to grow exponentially - increased cost/metric tonne?
 - Important for campuses generating, buying, **investing in** offsets
 - Viable addition to endowment strategies linked w/ fossil-based divestment?
- Monetization of Attributes = no GHG reduction claims
- State policies influence value of Attributes
 - CHP – could be better recognized with increased attention of placement within RPS structures