

# Celtic Energy



## Appalachian Energy Summit

July 19, 2013

energy  
solutions  
for a  
sustainable  
future

“Education is not the filling of a pail,  
but the lighting of a torch”

William Butler Yeats





## Today's Agenda

- Introduction to Celtic Energy
- EE Market History and Future
- Student Engagement
- Green Resilience
- YOUR QUESTIONS!



# Who are we?

- *Celtic Energy* is an Energy Efficiency Consulting firm with expertise assisting Commercial, Industrial, Institutional, and Government clients manage Energy Programs
- Hartford, Boston, Charlotte, Las Vegas offices



*Real value in a changing world*



# Client List

## NC Government

North Carolina Energy Office [energync.net](http://energync.net)



## NC Universities



THE UNIVERSITY  
of NORTH CAROLINA  
at CHAPEL HILL



UNC CHARLOTTE



WSSU

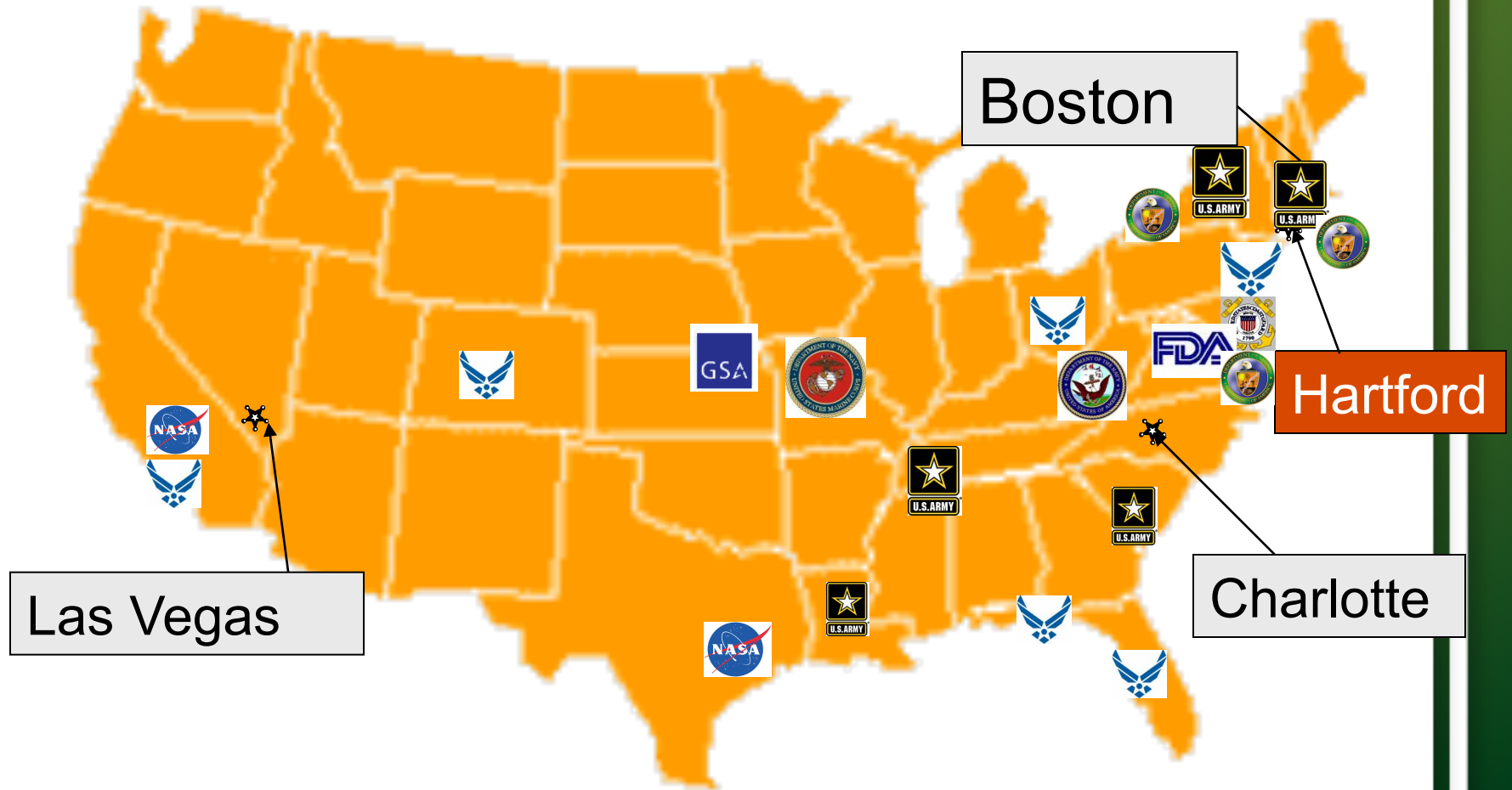


R.A.M.S.

WINSTON-SALEM  
STATE UNIVERSITY



# Celtic Energy Locations



# ESCO Familiarity

- CEI has overseen almost all of North Carolina's pre-qualified ESCOs for other Institutions and Government agencies



## Owners' Focus Over Last Few Years:

- Owner capitalized projects
  - External financing has not played a major role to date
- **Low cost / low risk initiatives**
  - e.g. lighting retrofits
- **2–3 year payback term requirement**
- **Capital intensive, “deep energy retrofits”** (30%+ energy savings) **with longer paybacks often delayed due to**
  - Lack of internal resources
  - Desire to preserve capital in uncertain economic times



## EE Retrofit Market Status

- Pent-up demand to replace outdated energy-consuming equipment represents a significant driver to accelerate EE investment
- Commercially-attractive external financing has emerged to accelerate deep energy retrofit investments
- To realize growth, financing mechanisms must be
  - Easily accessible to building owners
  - Supported by a technically sound & fully-transparent underwriting process able to provide a high degree of confidence in the projected savings

## Alternative Finance mechanisms making impact

- PACE (Property Assessed Clean Energy)
- PPAs (Power Purchase Agreements for CHP, solar, wind)
- ESPC (Energy Savings Performance Contracts)
- Grid Resilient Microgrids (Green Resilience)

# Principal Obstacle with EE Financing to Date

**Key challenge: “Will the projected energy savings be realized?”**

- **Problem #1:** Energy savings can't be measured directly
- **Problem #2:** No standard methodology to underwrite energy efficiency
- **Problem #3:** Without a solution to #1 & #2, EE Financing cannot become a mainstream financial asset class with a high degree of standardization, predictability and scale.

*...No longer true today!*

# Underwriting EE Project Financing

**Nationally recognized technical standards are now available that define a process from data collection to energy savings measurement and verification, enabling...**

- Energy savings to be forecast with a high degree of confidence
- Actual energy savings performance to be measured and verified in a reliable, consistent and fully-transparent manner
- Risk of underperformance to be low

# EE Retrofit Technical & Financial Underwriting Best Practice Has Emerged to Accelerate Market

Relies on three established industry protocols:

- ***ASTM Building Energy Performance Assessment Standard E2797-11***
  - Methodology for collecting & analyzing baseline energy data
- ***ASHRAE Energy Audit Guidelines*** (Level I, II, III)
  - Methodology to identify energy conservation measures (ECMs) & project energy savings with high degree of confidence
- ***International Performance Measurement & Verification Protocol***
  - Methodology for energy savings measurement & verification

Methodology is technically sound, standardized, reliable & transparent

# C-PACE: Commercially Attractive Financing



CLEAN ENERGY  
FINANCE AND INVESTMENT AUTHORITY



An  
Energize CT  
Program

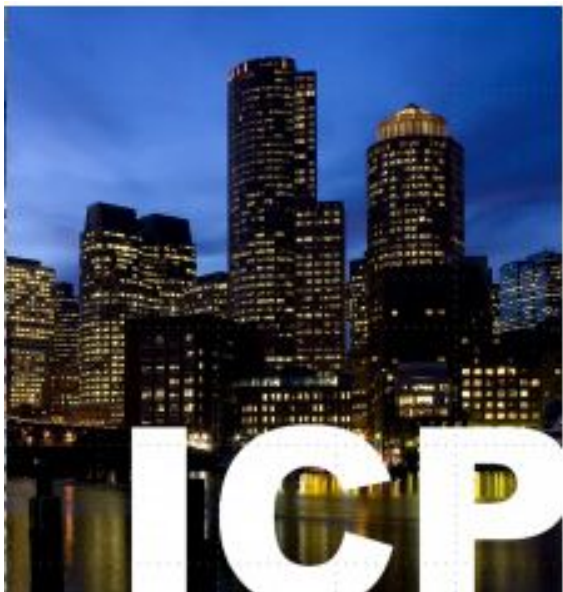
C-PACE provides an *innovative financing structure* enabling commercial, industrial, & multi-family property owners to access financing for qualified energy upgrades and repay through a benefit assessment on their property

**Private capital provides 100% upfront, low-cost, long-term funding**

**Repayment through property taxes**

**A senior PACE lien is put on the property and stays regardless of ownership**

# Environmental Defense Fund's Investor Confidence Project (ICP)



- Environmental Defense Fund's Investor Confidence Project team defining open standards in order to enable the flow of private investment required to launch a global market for energy efficiency in the built environment.



Finding the ways that work

# Student Engagement

- CEI commits to engaging with Student/Faculty Groups for brainstorming at the inception of each project
- STEM and Liberal Arts students ‘shadow’ energy professionals during project development, implementation, and performance phases.
- Learn “how to” advocate for their desires in a professional setting
- Learn the ‘fine art’ of collaboration early in their careers
- Focus on the ability to join seemingly disparate topics and objectives into a forward looking, well integrated deal/program/initiative, where all stakeholders benefit
- Non-technical people can be just as important as the engineers in securing successful projects



# Green Resilience

- Sustainability includes resilience
- Challenges to critical infrastructure
  - Disasters, climate change, terrorism, pandemics, ...
  - Deferred investment in aging infrastructure & workforce
- Legacy: big generators + centralized grid
- Emerging: smaller gen + microgrids
- Future: self-sufficient buildings

# Campuses ideal for green resilience

- Comprehensive energy & water efficiency
  - First lower loads, then size more costly generation
- Sustainable energy systems
  - Combined power, heat and cooling networks
  - Renewable power
  - Microgrids
- Capital improvements funded by energy savings
- Portfolio of upgrades mitigates & adapts to risks
- Maintain functionality, shelter in place





# Microgrids

**Dispatchable  
Generation**

**Intermittent  
generation**

**Storage**

Internal  
Combustion  
Engines

Fuel Cells

Microturbines

Wind  
Turbines

Photovoltaics

Batteries,  
Ultra  
capacitors,  
Flywheels

Electric  
vehicles

From Mendes, Loakimidis and Ferrão, 2011

# FDA White Oak campus microgrid

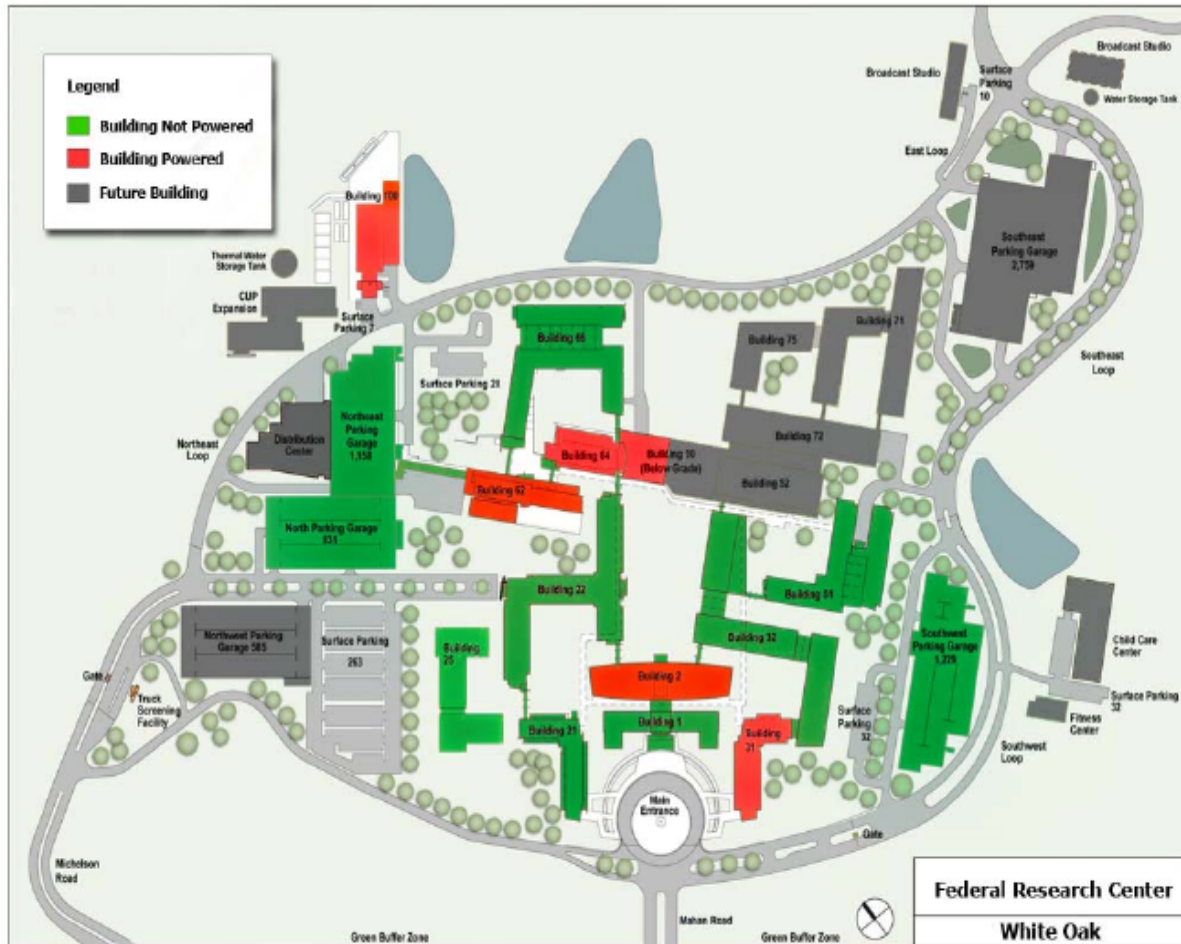


# Electrical Energy Security

- Utility Power
  - Two High Voltage Feeders and Transformers
  - Two Feeders to CUP – 20 MW
- Island Mode on Site Generation
  - One Dual Fuel Generator – 5.7 MW
  - Four Natural Gas Generators – 17 MW
- Black Start on Total Outage
  - One Standby Fuel Oil Generator – 2 MW
- Underground Electrical Distribution System

# Capabilities – Emergency Preparedness

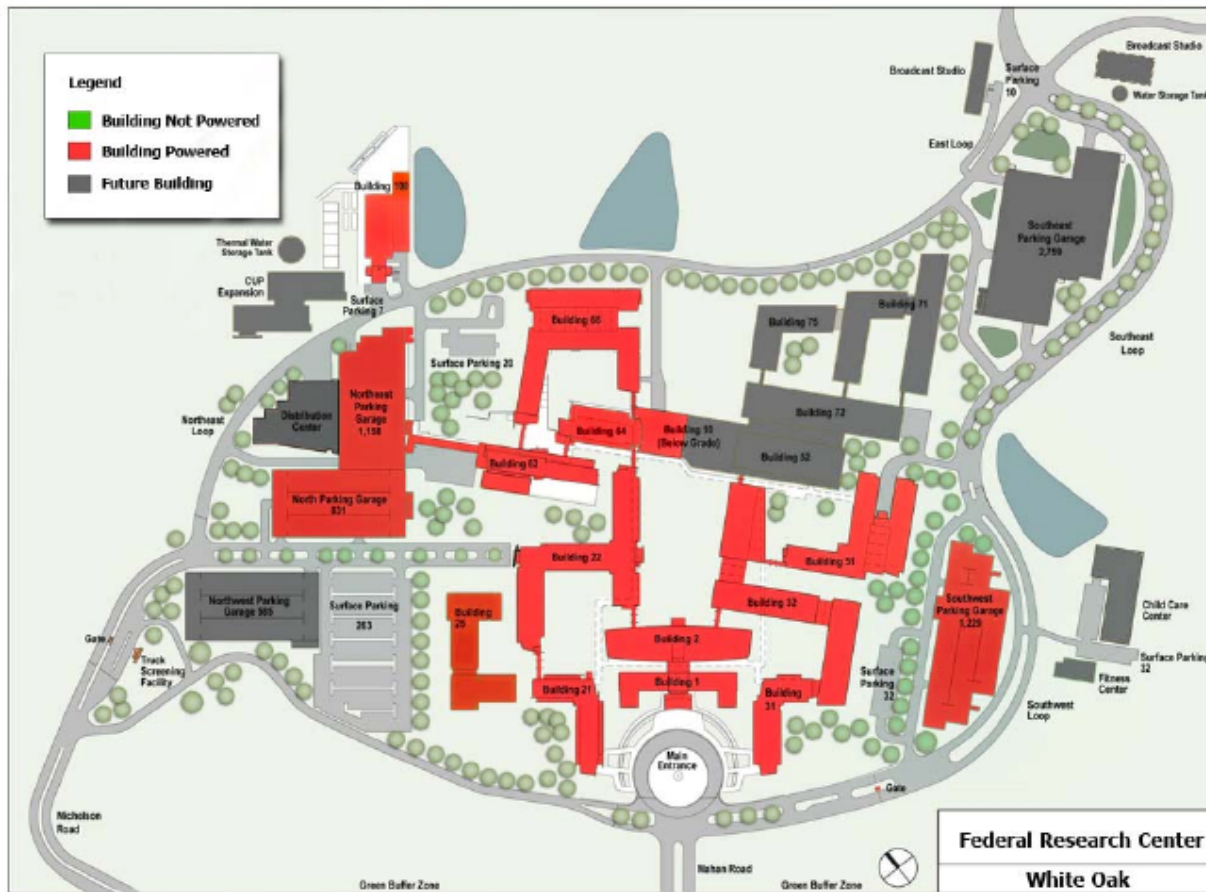
## Black-Start Power Restoration: 30 Seconds – 20 Minutes





# Capabilities – Emergency Preparedness

## Black-Start Power Restoration: 20 Minutes – 60 Minutes



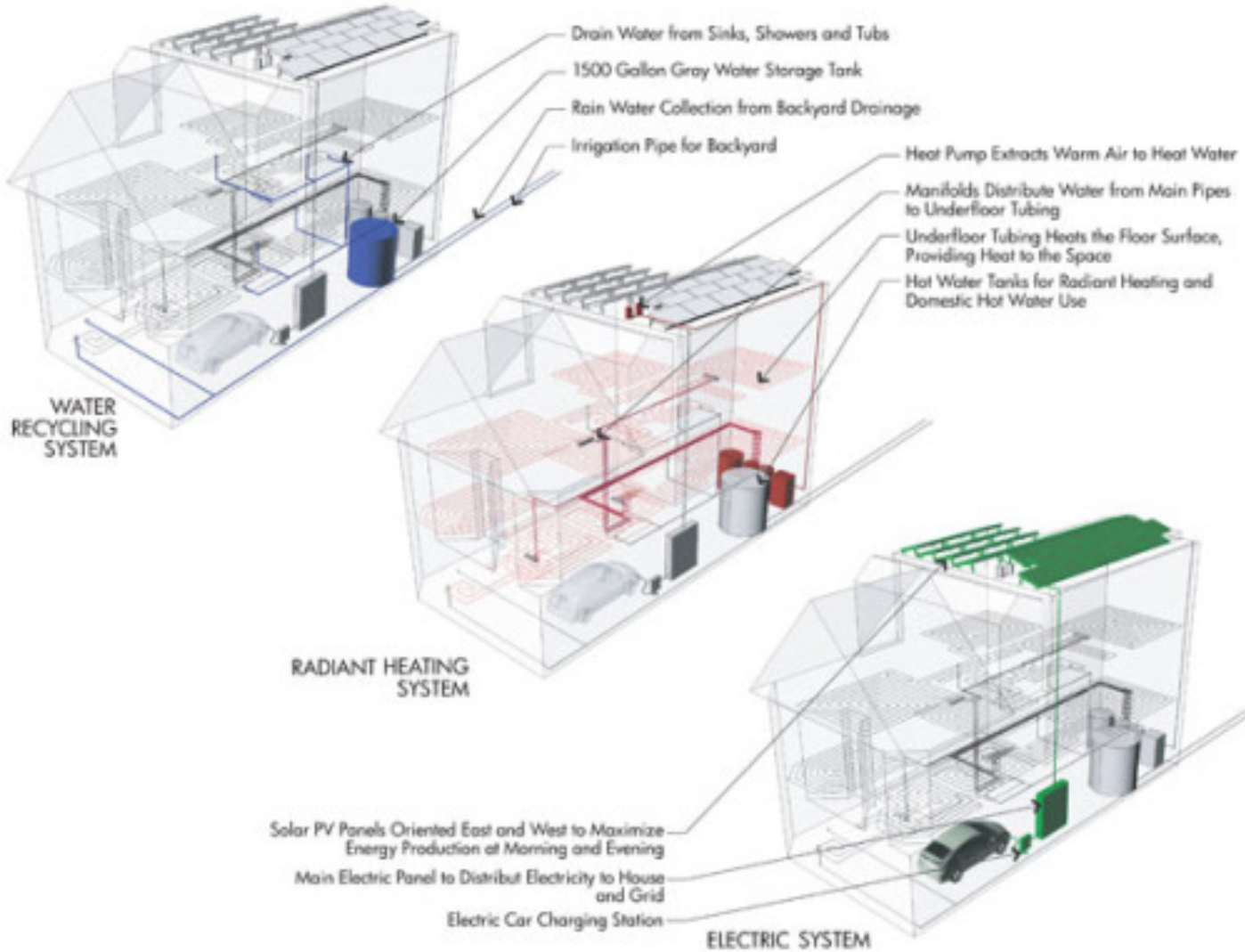
## Connecticut microgrid program (1<sup>st</sup> in US)

- \$15 million for critical facility microgrids
- Structure, goals, design requirements
- Constraints, status, lessons learned

# Microgrids lessons learned

- Barriers to implementation
- Bigger is easier
- Business model
- Controls, integration, interconnection
- Generation selection, load matching
- Infrastructure hardening

# Self-sufficient buildings are resilient



# Aggressive passive



Thank you for your time...  
*QUESTIONS?*

**Christopher F. Halpin, PE**  
**LEED Accredited Professional**  
**Certified Energy Manager**  
**Certified Energy Procurement Professional**  
**Certified Measurement & Verification**  
**Professional**

**President**  
**Celtic Energy, Inc.**

**(860) 882-1515**  
**(860) 328-0535 mobile**  
**chris@celticenergy.com**  
**[www.celticenergy.com](http://www.celticenergy.com)**