• **Background**

• **The Concept**
  - Brunswick Renewable Energy Center and Microgrid

• **The Reality**
  - Electrical Distribution System – Existing Conditions
  - Services provided by MRRA
  - “Volume” of operations
  - Distributed Generation Deployment

• **The Way Ahead**
NAS Brunswick was a 3,200 acre military enclave within the Town of Brunswick.

Closed as part of FY 2005 Federal Base Realignment and Closure (BRAC).

Navy ceased operations in May 2011.

Navy transferred utility systems to MRRA on 30 September 2011.

Midcoast Regional Redevelopment Authority (MRRA)
- Public municipal corporation
- Created by the State of Maine (5 MRSA §13083-G) to manage transition to civilian uses, redeveloping base properties and attracting new, high quality jobs.
Brunswick Landing envisioned to be a science and technology park in a campus setting with:

- Centers of excellence in advanced technologies
- Regional Executive Airport
- Business-focused educational facilities
- Renewable Energy development

Opportunities for **high quality job creation** in:

- Aviation and Aerospace
- Energy
- Composite Technologies
- Information Technology
- Biotechnology and Biomed
- Education
MRRA’s Reuse Master for Brunswick Landing calls for:

- Developing a Renewable Energy Center
- Focusing on clean tech industries

The creation of a Renewable Energy Center will:

- Help establish and grow a new clean tech cluster around renewable energy
- Combine energy technology business operations with on-site, alternatively-fueled energy production
- Allow new technologies to be developed, manufactured, and deployed on our “smart” microgrid (“plug-and-play”) for test and evaluation
Key to Renewable Energy Center is development of:

- on-site, alternatively-fueled, Distributed Generation (DG)
- dynamic, “smart” microgrid that allows deployment of new technologies as they evolve

As upgrades are made to the existing distribution system “smart” technology will be incorporated as appropriate

MRRA is exploring strategic partnerships to assist with microgrid implementation
• Business Attraction and Business Retention
  o Reliable and resilient power supply
  o Lower cost “green” energy generated on-site
  o Ability to manage demand charges and capacity charges
• “Smart grid” technology development and deployment in a plug-and-play environment
Feasibility Assessment funded by grants from EDA, MTI, and EPA and completed in 2013 determined:

- Existing utility infrastructure will support a Renewable Energy Center (with some upgrades)
- NREL identified viable renewable energy generation technologies

An analysis of existing electrical distribution system by Power Systems Engineering completed in May 2014 found:

- Facilities are “generally … in good condition”
- Excess capacity available on system
- Excellent voltage levels even during peak conditions
MRRA is presently operating the electrical distribution system as an “unregulated grid” (like a mobile home park)

**Point of Common Coupling (PCC)**
- 34.5kV distribution circuit on Route 24 (Gurnet Road)
- One master meter for all of Brunswick Landing
- Fed from Cooks Corner Substation

**Internal Distribution**
- From PCC, comes aboard at 34.5kV overhead to MRRA’s main distribution center (4 pole mounted reclosers)
- Serves everything east of the runways and Building 231
- Primary distribution voltage is 34.5kV (with some 4.16kV) on 4 internal distribution circuits (mostly overhead)
Brunswick Landing
Electrical Distribution System

System consists of:

- Over 15 miles of overhead conductors
- Over 200 utility poles
- 4 pole-mounted Siemens SDR reclosers with controls
- 80 pad-mounted transformers ranging between 34.5 kV and 1500 kV and 50 pole-mounted transformers
- Over 275 fuse cutouts
- 4 manual Gang Operated Air Break Switches (GOAB)
- 3 manual pad-mounted oil switches
- 104 “smart” meters
- No Network Operations Center or SCADA system
- No Microgrid Controller or Distribution Automation
Brunswick Landing
Electrical Distribution System
Services Provided

• Power Purchase
• Electricity Delivery including:
  o metering
  o billing
• Maintenance, Repair, and Operation including:
  o Vegetation management
  o Wildlife deterrence
  o Outage recovery
• Capital Improvements
• Service Extensions/Upgrades
• Integration of Distributed Energy Resources (DERs)
Brunswick Landing
Electrical Distribution System

Current Operations

• Delivering electricity to over 125 customers/buildings MRRA including:
  o data center
  o medical device manufacturer
  o senior living facility
  o memory care facility
  o college campus including a dormitory
  o 163 single family housing units
  o general aviation airport

• Average total monthly consumption is over 1,400,000 kWh with a peak demand in September 2016 of 3.5MW
BRUNSWICK LANDING LOAD GROWTH

- 2012: 7,532,000 kWh
- 2013: 9,674,000 kWh
- 2014: 12,012,000 kWh
- 2015: 13,657,000 kWh
- 2016: 16,064,011 kWh
- 2017: 18,101,909 kWh

Forecast
Electricity Purchase

• 100% of the electricity delivered to Brunswick Landing is generated by “green” sources
  o About 80% is Green-E certified and purchased from Constellation NewEnergy (wind-generated) at a fixed price per kWh plus capacity charge
  o About 20% is purchased under a PPA with Village Green Ventures from their one megawatt anaerobic digester generator

• MRRA is an EPA Green Power Partner

Delivery Service

• Delivery from CMP is under LGS-P-TOU rate tariff
Brunswick Landing
Electrical Distribution System

BRUNSWICK LANDING ELECTRICITY

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Brunswick Landing
Distributed Generation Deployment

- 1 MW anaerobic digester currently operating at south end of parking apron
- 1.5 MW dc solar PV project under development at north end of the airfield
- Currently operating under Level III Interconnection Agreement
Village Green Maine owns and operates the 1 MW anaerobic digester
MRRA purchases 100% of generated electricity under PPA
Facility went operational in April 2016
Plant receives waste from municipal and commercial sources including wastewater treatment sludge, septage, and some other organic wastes
System not yet at full capacity
Currently provides about 20% of campus requirement
Brunswick Landing
Distributed Generation Deployment

- Project currently in development
- ReVision Energy will own and operate the 1.5 MW dc PV array
- MRRA will purchase 100% of generated electricity under PPA
- Facility expected to go operational in December 2017
- Estimated output over 1.9 million kWh per year
Partnership with Introspective Systems

• Phase II/III Small Business Innovation Research grant : “Fractal Graph Framework for an Evolving Grid Architecture”.
• Will develop model of electrical distribution system at Brunswick Landing utilizing Fractal Grid Architecture
• First step in developing a “smart” microgrid at Brunswick Landing that will:
  o be fully autonomous control system with self-balancing load and generation
  o allow seamless integration of new distributed energy resources
  o lower costs and increase alternative energy utilization
  o provide “plug and play” infrastructure giving companies at Brunswick Landing a research and demonstration platform for new energy-related technologies
The vision of the Brunswick Renewable Energy Center is becoming a reality. Our studies have concluded the Renewable Energy Center concept is viable and development of a smart microgrid is achievable.

Brunswick Renewable Energy Center has already begun attracting clean technology businesses with the potential to create new and sustainable “green” jobs:

- Village Green Ventures – 1 MW Anaerobic Digester
- ReVision Energy – 1.5 MW dc PV Solar project
- Introspective Systems

Future development will likely require creation of strategic partnerships.

Long way to go, but we are on the way!