

Building Energy Audits for Washington County, Maine



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1.0 Executive Summary

Beginning in August 2012, Breakaway Energy Services LLC (“Breakaway”) has been engaged by Washington County to visit and assess the potential for energy reductions at various County properties to develop an energy audit report.

Over the next month, Breakaway completed site visits to five buildings to examine equipment and systems and to discuss any operational or comfort issues related to these buildings with staff. Based on the information gathered, Breakaway completed a report describing where energy savings can be created in the buildings visited, specific projects that the County may want to implement, estimated savings that will result from each project and what the project will cost. Also included in the report are suggested next steps for the County to take to realize these savings.

Breakaway estimates that there is a potential to reduce utility use in these facilities by as much as 18 percent.

The opportunities that Breakaway identified have been grouped together according to the relative cost and financial return into three levels of priority for implementation:

- Priority 1 opportunities that should be pursued immediately. This project group will reduce utility cost by approximately \$7,600 and use by roughly 7%. These projects are anticipated to cost just under \$30,000 to execute for a simple payback of 3.6 years;
- Priority 2 opportunities that will require more planning, are more capital intensive, and should be installed within the next 1-5 years. These projects will add an additional 9% savings (roughly \$18,000/year) at a cost of about \$130,000; and
- Priority 3 opportunities that are predominantly “wish list” items that have longer payback and/or require considerable planning. These projects offer another 2% savings at a cost of about \$70,000.

Descriptions of individual project opportunities in each building are provided in this report.



2.0 Introduction

Beginning in August 2012, Breakaway Energy Services LLC (“Breakaway”) has been engaged by Washington County to visit and assess the potential for energy reductions at the County’s principal buildings in Machias, Maine. Breakaway was tasked by Washington County to complete energy audits of five buildings.

This report summarizes our findings with respect to the five municipal buildings we visited:

- Courthouse, including Sheriff’s Department and County Jail, 85 Court Street
- District Attorney’s Office, 82 Court Street
- RCC, EMA, UTO and UMM Cooperative Offices, 28 Center Street

Report Overview

This Energy Audit provides a technical overview and budget financial information suitable for budgeting and planning purposes for all utility reduction related opportunities identified. The study is intended to serve as a tool and road map for use by County decision makers. Breakaway hopes the Energy Committee will use the study to implement policies and projects that direct ongoing operations toward increased energy efficiency, reduce future energy use and related costs, improve building performance, and encourage a life cycle cost perspective in pursuing all new construction and energy-related capital projects.

The Study report begins with a set of tables that summarize findings and recommendations for the County’s portfolio, including cost of implementation by building and by technology. This is followed by a summary of utility consumption across the portfolio, and including a table of calculated energy use index (EUI) that show the performance of each building. Next, there is a separate report chapter for each of the five buildings that includes a table of recommended improvements, a facility description based on observations from the site visits and other information provided by the County. The last section of the report describes the recommendations and suggested next steps.

Summary of Findings

On August 30th, supported by Betsy Fitzgerald and accompanied by Mike Preniner with the Buildings and Ground Department, Breakaway toured the five Washington County properties. Breakaway collected information about current energy-related building practices and systems, learned about operating issues and comfort problems in buildings, and investigated future plans for building renovations and use. Using this information, Breakaway identified and evaluated potential improvements and projects that will allow the County to reduce and better manage energy use and cost and achieve other ancillary benefits (e.g., increased occupant comfort, better reliability, and reduced maintenance expense).



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This report summarizes Breakaway's findings and recommendations for specific opportunities for energy efficiency improvement. The estimated cost and financial return associated with implementing these recommended opportunities have been used to sort them into three priority levels:

- Priority 1 opportunities that are recommended for immediate implementation. These are generally low-cost improvements spread across the portfolio.
- Priority 2 measures require more planning and are more capital intensive and should be installed within the next 1-5 years. Some of these projects may be fundable out of annual budgets or through a longer-term capital improvement process.
- Priority 3 measures are predominantly "wish list" items and have longer payback and/or require significant additional study.

Tables 1, 2, and 3 provide a summary of each Priority category by building, with total anticipated costs and utility savings for each building for the projects in that category. Table 4 provides a summary of all projects for all Priority categories by building, again with costs and savings. Table 5 is a matrix organized by building and ECM that shows which of the recommended energy conservation measures (ECMs) is applicable in each of the buildings. The ECMs fall into five named technology categories: lighting, controls, mechanical (HVAC), building envelope, and a miscellaneous group. Table 6, 7, and 8 provide summary information on each measure for each respective priority level.

Suggested Next Steps for Achieving Energy Reductions

We suggest that the County move forward aggressively with specific recommended projects once the Green Communities Energy Reduction Plan has been completed. All projects identified in this report require further development to obtain firm pricing and to tighten up the saving projections.

Immediate next steps include:

- Commit to pursuing recommended projects and establish an implementation schedule with corresponding integration of projects in the capital investment plan and budget.
- Develop request for proposal documents and/or contact preferred contractors in the required trades (general, electrical, lighting, mechanical, controls and airseal/insulation). Efficiency Maine may have suggestions or requirements for specific vendors to use for work supported by their incentive programs.
- Secure quotes for projects and select contractor(s).

Beyond Efficiency

Beyond efficiency, the Energy Committee has expressed a desire to look for clean energy alternatives to current supply. There is a particular interest in biomass heating. An option for a wood pellet system has been included in this assessment. There is also a potential opportunity to install solar photovoltaic panels at the jail and 28 Center Street, also included in this report.



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Table 1 – Priority 1 Opportunity Assessment Results

Building	Approximate Implementation Cost	Utility Incentive Available	Potential Utility Savings				Annual Cost Avoidance	Baseline EUI kBtu/sf	Projected EUI kBtu/sf	Overall Savings	Simple Payback Yr
			Demand kW	Electric kWh/yr	Oil Gal/yr	Propane Gal/yr					
Courthouse	\$13,350	\$1,600	4	9,100	220	-	\$1,690	155	152	1.9%	7.0
Sheriff's Department	\$5,400	\$400	2	6,300	430	-	\$2,050	155	151	2.5%	2.4
County Jail	\$2,000	\$0	-	-	120	-	\$380	155	154	0.5%	5.3
DA Office	\$2,900	\$130	1	2,500	-	560	\$1,680	127	99	21.5%	1.6
28 Center Street	\$6,130	\$700	2	3,100	460	-	\$1,790	133	118	11.0%	3.0
Total	\$29,780	\$2,830	8	21,000	1,230	560	\$7,590	149	138	6.9%	3.6

Table 2 – Priority 2 Opportunity Assessment Results

Building	Approximate Implementation Cost	Utility Incentive Available	Potential Utility Savings				Annual Cost Avoidance	Baseline EUI kBtu/sf	Projected EUI kBtu/sf	Overall Savings	Simple Payback Yr
			Demand kW	Electric kWh/yr	Oil Gal/yr	Propane Gal/yr					
Courthouse	\$84,000	\$200	3	4,300	14,770	-	\$13,710	152	141	7.2%	6.1
Sheriff's Department	\$1,500	\$0	0	700	100	-	\$400	151	150	0.5%	3.8
County Jail	\$28,000	\$1,800	-	27,100	-	-	\$3,010	154	150	2.8%	8.7
DA Office	\$1,600	\$0	-	500	-	100	\$310	99	94	5.0%	5.2
28 Center Street	\$15,200	\$0	0	600	200	-	\$700	118	112	4.9%	21.7
Total	\$130,300	\$2,000	3	33,200	15,070	100	\$18,130	138	125	9.0%	7.1



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Table 3 – Priority 3 Opportunity Assessment Results

Building	Approximate Implementation Cost	Utility Incentive Available	Potential Utility Savings				Annual Cost Avoidance	Baseline EUI kBtu/sf	Projected EUI kBtu/sf	Overall Savings	Simple Payback Yr
			Demand kW	Electric kWh/yr	Oil Gal/yr	Propane Gal/yr					
Courthouse	\$12,500	\$0	-	-	200	-	\$630	141	140	0.9%	19.8
Sheriff's Department	\$15,000	\$0	-	-	225	-	\$710	150	149	1.0%	21.1
County Jail	\$25,000	\$0	5	6,000	-	-	\$670	150	149	0.6%	37.3
DA Office	\$0	\$0	-	-	-	-	\$0	94	94	0.0%	NA
28 Center Street	\$15,000	\$0	3	3,600	-	-	\$400	112	110	2.1%	37.5
Total	\$67,500	\$0	8	9,600	425	-	\$2,410	125	122	2.2%	28.0

Table 4 – Priority 1, 2, and 3 Combined Opportunity Assessment Results

Building	Approximate Implementation Cost	Utility Incentive Available	Potential Utility Savings				Annual Cost Avoidance	Baseline EUI kBtu/sf	Projected EUI kBtu/sf	Overall Savings	Simple Payback Yr
			Demand kW	Electric kWh/yr	Oil Gal/yr	Propane Gal/yr					
Courthouse	\$109,850	\$1,800	7	13,400	15,190	-	\$16,030	155	140	9.8%	6.7
Sheriff's Department	\$21,900	\$400	2	7,000	755	-	\$3,160	155	149	3.9%	6.8
County Jail	\$55,000	\$1,800	5	33,100	120	-	\$4,060	155	149	4.0%	13.1
DA Office	\$4,500	\$130	1	3,000	-	660	\$1,990	127	94	25.4%	2.2
28 Center Street	\$36,330	\$700	5	7,300	660	-	\$2,890	133	110	17.2%	12.3
Total	\$227,580	\$4,830	19	63,800	16,725	660	\$28,130	149	122	18.2%	7.9



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Table 5 – Summary Matrix of Project Opportunities in Each Building

Building	LIGHTING			CONTROLS				HVAC				ENVELOPE				MISC		
	1 Update Fluorescent Lighting	2 Replace Incandescent / Halogen Lighting	3 Replace Metal Halide Lighting	4 Add Window A/C Wall Timers	5 Add Programmable Thermostats	6 Add Radiator Thermostatic Control	7 Add Fan VFD Control	8 Update Pipe Insulation	9 Install Premium Efficiency Motors	10 Update Walk-in Evaporator Fans/Controls	11 Install Wood Pellet Boiler Plant	12 Attention to Exterior Door Seals	13 Replace Window A/C Unit Curtain Seals	14 Add Window Sash Weather Seals	15 Airseal Details (Attic & Basement)	16 Add/Update Building Insulation	17 Add Vending Machine Plug Controller	18 Replace Refrigerator
Courthouse	X		X	X	X	X				X	X	X	X	X	X	X	X	
Sheriff's Department	X	X		X	X						X	X	X	X		X	X	
County Jail							X	X	X		X							X
DA's Office	X	X		X	X		X				X	X		X				
28 Center Street	X				X						X			X	X		X	X



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Table 6 – Summary of Priority 1 Energy Conservation Measures

ECM No.	ECM No. and Description	Technology Group	Approximate Implementation Cost	Utility Incentive Available	Potential Utility Savings				Annual Cost Avoidance	Reduces O&M Liability	Addresses End Of Life Equipment	Provides Visual and/or Comfort Improvement	Simple Payback Yr
					Demand kW	Electric kWh/yr	Oil Gal/yr	Propane Gal/Yr					
1	Update Fluorescent Lighting	LIGHTING	\$16,800	\$2,700	6	12,200	(120)	-	\$980	X			14.4
2	Replace Incandescent / Halogen Lighting	LIGHTING	\$930	\$130	2	1,800	(10)	(10)	\$140	X			5.7
3	Replace Metal Halide Lighting	LIGHTING	\$0	\$0	-	-	-	-	\$0	X		X	NA
4	Add Window A/C Wall Timers	CONTROLS	\$1,800	\$0	-	4,700	-	-	\$510			X	3.5
5	Add Programmable Thermostats	CONTROLS	\$2,200	\$0	-	-	1,000	500	\$4,410				0.5
6	Add Radiator Thermostatic Control	CONTROLS	\$0	\$0	-	-	-	-	\$0	X		X	NA
7	Add Fan VFD Control	CONTROLS	\$0	\$0	-	-	-	-	\$0				NA
8	Update Pipe Insulation	HVAC	\$0	\$0	-	-	-	-	\$0				NA
9	Install Premium Efficiency Motors	HVAC	\$0	\$0	-	-	-	-	\$0				NA
10	Update Walk-in Evaporator Fans/Controls	HVAC	\$0	\$0	-	-	-	-	\$0				NA
11	Install Wood Pellet Boiler Plant	HVAC	\$0	\$0	-	-	-	-	\$0	X			NA
12	Attention to Exterior Door Seals	ENVELOPE	\$7,000	\$0	-	-	360	70	\$1,310			X	5.3
13	Replace Window A/C Unit Curtain Seals	ENVELOPE	\$650	\$0	-	1,500	-	-	\$160		X	X	4.1
14	Add Window Sash Weather Seals	ENVELOPE	\$0	\$0	-	-	-	-	\$0	X	X	X	NA
15	Airseal Details (Attic & Basement)	ENVELOPE	\$0	\$0	-	-	-	-	\$0				NA
16	Add/Update Building Insulation	ENVELOPE	\$0	\$0	-	-	-	-	\$0				NA
17	Add Vending Machine Plug Controller	MISC	\$400	\$0	-	800	-	-	\$80				5.0
18	Replace Refrigerator	MISC	\$0	\$0	-	-	-	-	\$0		X		NA
19	Install Solar Photovoltaic Array	MISC	\$0	\$0	-	-	-	-	\$0				NA
Total			\$29,780	\$2,830	8	21,000	1,230	560	\$7,590				3.6

Table 7 – Summary of Priority 2 Energy Conservation Measures

ECM No.	ECM No. and Description	Technology Group	Approximate Implementation Cost	Utility Incentive Available	Potential Utility Savings				Annual Cost Avoidance	Reduces O&M Liability	Addresses End Of Life Equipment	Provides Visual and/or Comfort Improvement	Simple Payback Yr
					Demand kW	Electric kWh/yr	Oil Gal/yr	Propane Gal/Yr					
1	Update Fluorescent Lighting	LIGHTING	\$0	\$0	-	-	-	-	\$0	X			NA
2	Replace Incandescent / Halogen Lighting	LIGHTING	\$0	\$0	-	-	-	-	\$0	X			NA
3	Replace Metal Halide Lighting	LIGHTING	\$3,000	\$200	3	2,900	(30)	-	\$230	X		X	12.2
4	Add Window A/C Wall Timers	CONTROLS	\$0	\$0	-	-	-	-	\$0			X	NA
5	Add Programmable Thermostats	CONTROLS	\$0	\$0	-	-	-	-	\$0				NA
6	Add Radiator Thermostatic Control	CONTROLS	\$35,000	\$0	-	-	700	-	\$2,200	X		X	15.9
7	Add Fan VFD Control	CONTROLS	\$20,000	\$1,200	-	20,000	-	-	\$2,220				8.5
8	Update Pipe Insulation	HVAC	\$100	\$0	-	500	-	-	\$60				1.7
9	Install Premium Efficiency Motors	HVAC	\$3,000	\$0	-	3,700	-	-	\$410				7.3
10	Update Walk-in Evaporator Fans/Controls	HVAC	\$5,000	\$600	-	3,400	-	-	\$380				11.6
11	Install Wood Pellet Boiler Plant	HVAC	\$0	\$0	-	-	13,200	-	\$8,290	X			-
12	Attention to Exterior Door Seals	ENVELOPE	\$0	\$0	-	-	-	-	\$0			X	NA
13	Replace Window A/C Unit Curtain Seals	ENVELOPE	\$0	\$0	-	-	-	-	\$0		X	X	NA
14	Add Window Sash Weather Seals	ENVELOPE	\$0	\$0	-	-	-	-	\$0	X	X	X	NA
15	Airseal Details (Attic & Basement)	ENVELOPE	\$7,500	\$0	-	-	300	100	\$1,200				6.3
16	Add/Update Building Insulation	ENVELOPE	\$54,600	\$0	-	-	900	-	\$2,830				19.3
17	Add Vending Machine Plug Controller	MISC	\$0	\$0	-	-	-	-	\$0				NA
18	Replace Refrigerator	MISC	\$2,100	\$0	1	2,700	-	-	\$310		X		6.8
19	Install Solar Photovoltaic Array	MISC	\$0	\$0	-	-	-	-	\$0				NA
Total			\$130,300	\$2,000	3	33,200	15,070	100	\$18,130				7.1



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Table 8 – Summary of Priority 3 Energy Conservation Measures

ECM No.	ECM No. and Description	Technology Group	Approximate Implementation Cost	Utility Incentive Available	Potential Utility Savings				Annual Cost Avoidance	Reduces O&M Liability	Addresses End Of Life Equipment	Provides Visual and/or Comfort Improvement	Simple Payback Yr
					Demand kW	Electric kWh/yr	Oil Gal/yr	Propane Gal/Yr					
1	Update Fluorescent Lighting	LIGHTING	\$0	\$0	-	-	-	-	\$0	X			NA
2	Replace Incandescent / Halogen Lighting	LIGHTING	\$0	\$0	-	-	-	-	\$0	X			NA
3	Replace Metal Halide Lighting	LIGHTING	\$0	\$0	-	-	-	-	\$0	X		X	NA
4	Add Window A/C Wall Timers	CONTROLS	\$0	\$0	-	-	-	-	\$0			X	NA
5	Add Programmable Thermostats	CONTROLS	\$0	\$0	-	-	-	-	\$0				NA
6	Add Radiator Thermostatic Control	CONTROLS	\$0	\$0	-	-	-	-	\$0	X		X	NA
7	Add Fan VFD Control	CONTROLS	\$0	\$0	-	-	-	-	\$0				NA
8	Update Pipe Insulation	HVAC	\$0	\$0	-	-	-	-	\$0				NA
9	Install Premium Efficiency Motors	HVAC	\$0	\$0	-	-	-	-	\$0				NA
10	Update Walk-in Evaporator Fans/Controls	HVAC	\$0	\$0	-	-	-	-	\$0				NA
11	Install Wood Pellet Boiler Plant	HVAC	\$0	\$0	-	-	-	-	\$0	X			NA
12	Attention to Exterior Door Seals	ENVELOPE	\$0	\$0	-	-	-	-	\$0			X	NA
13	Replace Window A/C Unit Curtain Seals	ENVELOPE	\$0	\$0	-	-	-	-	\$0		X	X	NA
14	Add Window Sash Weather Seals	ENVELOPE	\$27,500	\$0	-	-	425	-	\$1,340	X	X	X	20.5
15	Airseal Details (Attic & Basement)	ENVELOPE	\$0	\$0	-	-	-	-	\$0				NA
16	Add/Update Building Insulation	ENVELOPE	\$0	\$0	-	-	-	-	\$0				NA
17	Add Vending Machine Plug Controller	MISC	\$0	\$0	-	-	-	-	\$0				NA
18	Replace Refrigerator	MISC	\$0	\$0	-	-	-	-	\$0		X		NA
19	Install Solar Photovoltaic Array	MISC	\$40,000	\$0	8	9,600	-	-	\$1,070				37.4
Total			\$67,500	\$0	8	9,600	425	-	\$2,410				28.0



SUMMARY OF UTILITY USE

3.0 Summary of Utility Use

Washington County's buildings use electricity, No. 2 fuel oil and propane. Electricity is purchased and distributed by Bangor Hydro Electric. Building consumption information for recent 12-month period is summarized in the table below. The average cost of electricity for this period was \$0.111/kWh. Fuel oil and propane were purchased at \$3.14 and \$2.51 per gallon respectively.

Table 2 – Utility Use and EUI Summary

Bldg Address	Bldg Use	Bldg Size Sq. Ft.	Electricity kWh/Yr	Fuel Oil Gal/Yr	Propane Gal/Yr	Approx. Utility Cost/Yr	EUI ¹
85 Court St.	Court, Sheriff & Jail	21,100	323,900	15,600	-	\$84,900	155
82 Court St.	DA Office	2,200	9,100	-	2,700	\$6,800	127
28 Center St	Multi-Purpose	5,100	76,600	3,000	-	\$9,400	133
Total Portfolio		28,400	409,600	18,600	2,700	\$101,100	149

¹ Energy Use Index (EUI) is building input energy (electricity, oil, etc.) converted to BTU's, divided by building square footage divided by 1,000. EUI is a useful performance metric to compare similar facilities within townships. Typical EUI for air-conditioned office space is 70-90 kBtu/SF. EUIs of police stations, jail facilities, etc. tend to be higher due to continuous operations (70-130 kBtu/SF). It is difficult to use EUI for unique properties with mixed use, such as 85 Court Street.



4.0 Overview of 85 Court Street

Washington County operates a court, sheriff’s department and county jail facility at 85 Court Street. Each function is independent and occupies separate building space. There are three distinct buildings that join in a “U” shape facing Court Street. The front half of the oldest building (built in roughly 1850) is occupied by the Sheriff’s department. The stand-alone court building was constructed in 1855 following a tear down of the prior court facility that dated to 1830. The court is located in the lot next to the sheriff’s building. The county jail facility was built in between the two building in 1986 and also includes the now renovated back half of the original sheriff’s building. Since each of these buildings is unique, they are described separately below:

4.1 Courthouse Description

Breakaway visited the facility on August 30, 2012 to assess energy reduction potential. The building was examined, including all occupied, storage and mechanical areas, mechanical systems, lighting, and the building envelope (windows, doors, insulation, etc.).

Below is a quantitative summary of our recommendations. Further details on the facility and recommendations are included in the balance of this section and in Section 7.

Table 4.1.1 – Summary of Energy Reduction Opportunity for the Courthouse

Opportunity Priority Category ¹	Approximate Implementation Cost	Utility Incentive Available ²	Potential Utility Savings				Annual Cost Avoidance	Baseline EUI kBtu/sf	Projected EUI kBtu/sf	Estimated Utility Reduction	Simple Payback Yr
			Demand kW	Electric kWh/yr	Oil Gal/yr	Propane Gal/Yr					
1	\$13,350	\$1,600	3.6	9,100	220	-	\$1,690	154.8	151.9	1.9%	7.0
2	\$84,000	\$200	2.9	4,300	14,770	-	\$13,710	151.9	54.2	64.3%	6.1
3	\$12,500	\$0	-	-	200	-	\$630	54.2	52.9	2.4%	19.8
Total	\$109,850	\$1,800	6.5	13,400	15,190	-	\$16,030	154.8	52.9	65.8%	6.7

¹Recommended opportunity priority is defined as follows:

- Priority 1: Group of no cost operational, or priority project opportunities recommended for immediate implementation.
- Priority 2: Group of project opportunities that require additional investigation and/or have less attractive returns, but offer other benefits to the building tenants.
- Priority 3: Group of long term “wish-list” projects that are categorized as infrastructure renewal or building investment. Priority 3 recommendations have unattractive return on investment for utility cost savings, but may be desirable for other long-term benefits.

²Estimated based on published Efficiency Maine prescriptive incentive programs subject to review and approval. Additional utility incentives may be offered to the County when projects are more fully developed and presented to the agency, provided the program has remaining funding.

Facility Description

This brick building has two floors, plus a partially occupied basement. There is small district court on the first floor, plus judge’s chambers, registrar of probate and multiple offices including clerk of courts and



county commissioner as well as four bathrooms. The second floor includes the much larger superior court, judge's chambers, jury room, attorney's room, law library and six bathrooms. There is also a "news room" with media equipment and heated archives room at a small third level mezzanine behind the main courtroom. In the attic there is a small IT closet with servers for RCC. This IT function will be relocated from the building in the near future.

This facility is generally open from 8:00 a.m. to 4:00 p.m. weekdays. Within the building, courts are usually in session two to three days a week and otherwise locked with the lights out. There is limited, if any, afterhours activities.

Building Envelope

The building has brick and wood framed walls with timber pitched roof structure. There is a small masonry block extension for additional egress stairs. The attic has rough wood flooring to accommodate storage. Neither the roof deck or attic subflooring has any insulation. There is unlikely to be any wall insulation either (unconfirmed). There are a number of fireplaces, none of which are in use at this facility. All the fireplace flues have been sealed with fiberglass insulation and/or wood paneling. Windows on the first level are newer vinyl double hung units with double pane glazing. This glass does not appear to be of a particularly high efficiency type. Windows on the second floor are older wood framed double hung units. These second story windows are in decent working order, but many are loose in their tracks. Glazing on the older windows is single pane. Window A/C units are poorly fitted to window frames, but are all removed for the winter heating season. Doors are mostly in good condition, but almost all could use attention to weather stripping, which has come loose or is missing in some sections.

HVAC

The building is hydronically heated via large cast iron radiations. These are steam radiators and it is presumed that the building was originally steam-heated and was since converted to hot water. About half the radiators have two-way electrically actuated control valves, which are controlled by local thermostats. All thermostats are conventional dial type (not programmable). Other radiators have ball valves, which are opened/closed by maintenance personnel as needed to approximately maintain space temperature setpoint. It is understood some thermostats are turned down by staff when they leave work, but there is unlikely an effective space temperature reset in this building given the lack of control and timeframe needed to heat the large building mass back up in the morning.

There are at least three window air conditioning units serving offices. These units run for approximately 500 hours a year, or less. Otherwise there is no other air conditioning equipment in this facility.

Boiler Plant

The courthouse has a central hot water boiler plant that also serves the sheriff's department and County Jail. The plant consists of an older oil-fired Weil McLain BI-786-WS sectional unit rated at 1,200 MBH (IBR net rating). This boiler probably dates to the 1986 jail addition (unconfirmed). Full-load combustion



efficiency testing records in the boiler room indicate efficiency was 83.9% (measurement taken in 2009). This is typical efficiency for this type of boiler. There is a second newer Weil McLain section boiler. The second boiler is an oil-fired model 88 unit rated at 1,220 MBH (IBR net rating). Combustion efficiency for the second boiler was 86.9% (also 2009). Heating hot water is circulated within the building complex by one of two constant speed 3 hp in-line centrifugal pumps (one pump standby). There does not appear to be any centralized boiler controller. Staff turn on the plant when it gets cold in the fall and off again when warmer weather allows, typically in May.

Two oil-fired tank units generate domestic hot water. The first heater is 50 gallons with 152 MBH burner (166 gph recovery rating). The second heater is 32 gallons with 104 MBH burner (114 gph recovery). Domestic hot water is required around the clock at the jail.

Lighting

Fluorescent lighting fixtures in the courts use older T12 lamps and ballasts. The lamps are predominately four-foot 34-watt type. Ballasts are likely to be magnetic. Bathrooms have two-foot lamps and there are also some compact fluorescent lamps replacing older incandescent applications. The second floor courtroom has six 400-watt metal halide ceiling fixtures. A complete lighting inventory was completed and is summarized in the table below.

This building does not have any lighting motion sensors in use. However, it appears that most occupants turn off the lights when they vacate their offices. As long as lights remain off when they aren't needed, it doesn't make sense to invest in lighting control.

Table 4.1.2 Courthouse Lighting Details

<i>Flr</i>	<i>Room</i>	<i>Qty</i>	<i>Fixture Type</i>	<i>Estimated Hours</i>
B	Room B1 - Treasurer Office	3	2LT12	2,500
B	Room B1 - Treasurer Office	2	4LT12	2,500
B	Room B2 - Archives	1	2LT12	500
B	Room B2 - Archives	1	4LT12	500
B	Backup IT	1	2LT12	2,000
B	Room B3 - Shop	2	2LT12	2,500
B	Room B4 - Storage	1	4LT12	125
B	Room B5 - Lunch Room	1	4LT12	2,500
B	Room B7 - Office/Printer	2	2LT12	2,500
B	Ramp	3	2LT12	3,000
B	Room B12 - Reg. of Deeds	17	2LT12	2,500
B	Room B13 - Office	8	2LT12	2,500
B	Men Restroom	1	1LF17	1,250
B	Women Restroom	1	1LF17	1,250
1	Front Stairwell	1	2LT12	3,000
1	Back Stairwell	6	2LT12	3,000
1	Room 102 - Clerk of Courts	6	2LT12	2,500
1	Room 103 - County Commissioner	4	2LT12	2,500
1	Room 104 - Clerk of Courts	2	2LT12	2,500
1	Room 105 - Office	4	2LT12	2,500



<i>Flr</i>	<i>Room</i>	<i>Qty</i>	<i>Fixture Type</i>	<i>Estimated Hours</i>
1	Room 106 - Clerk of Courts	4	2LT12	2,500
1	Room 107 - Office	4	2LT12	2,500
1	Men Restroom	1	1LF17	1,500
1	Women Restroom	1	1LF17	1,500
1	District Court	12	2LT12	1,168
1	Judge Chambers	4	2LT12	2,000
1	Clerk	3	2LT12	2,000
1	Registrar & Probate	8	2LT12	2,500
1	Elevator Lobby	2	2LT12	2,500
2	Room 201 - Storage	1	2LT12	250
2	Superior Court	6	MH400	1,168
2	Men Restroom	1	1LF17	1,500
2	Women Restroom	1	1LF17	1,500
2	Room 205 - Jury Room	9	2LT12	1,500
2	Men Restroom	1	1LF17	1,500
2	Women Restroom	1	1LF17	1,500
2	Room 209 - Attorney Office	6	2LT12	1,168
2	Men Restroom	1	1LF17	876
2	Women Restroom	1	1LF17	876
2	Room 211 - Library	15	2LT12	1,168
2	Room 210A - Judges	8	2LT12	1,168
2	Room 210 - Clerk	4	2LT12	1,168

Miscellaneous

- Elevator: a hydraulic elevator serves the first and second floor.
- Refrigeration: There is a refrigerated drink vending machine on the first floor.

Energy Efficiency Opportunities

Potential efficiency opportunities are summarized in the table on the next page. Implementing all the recommendations, including contracted biomass central heating source, could substantially reduce utility cost at the 85 Court Street. Nearly all fuel oil use can be eliminated with a 20 percent fuel cost savings on wood pellets. Biomass heating is considered carbon neutral as the pollution from combustion is about equal in terms of greenhouse gas emissions than natural biodegrading, which would otherwise occur in the forest. Recommendations are described in Section 7.



Table 4.1.3 – Summary of Courthouse Recommendations

ECM No. and Description	Technology Group	Approximate Implementation Cost	Utility Incentive Available(1)	Potential Utility Savings				Annual Cost Avoidance	Simple Payback Yr
				Demand kW	Electric kWh/yr	Oil Gal/yr	Propane Gal/yr		
1 Update Fluorescent Lighting	LIGHTING	\$10,000	\$1,600	3.6	7,000	(70)	-	\$560	15.0
3 Replace Metal Halide Lighting	LIGHTING	\$3,000	\$200	2.5	2,900	(30)	-	\$230	12.2
4 Add Window A/C Wall Timers	CONTROLS	\$500	\$0	-	1,300	-	-	\$140	3.6
5 Add Programmable Thermostats	CONTROLS	\$1,000	\$0	-	-	200	-	\$630	1.6
6 Add Radiator Thermostatic Control	CONTROLS	\$35,000	\$0	-	-	700	-	\$2,200	15.9
11 Install Wood Pellet Boiler Plant	HVAC	\$0	\$0	-	-	13,200	-	\$8,300	-
12 Attention to Exterior Door Seals	ENVELOPE	\$1,500	\$0	-	-	90	-	\$300	5.0
13 Replace Window A/C Unit Curtain Seals	ENVELOPE	\$150	\$0	-	400	-	-	\$40	3.8
14 Add Window Sash Weather Seals	ENVELOPE	\$12,500	\$0	-	-	200	-	\$600	20.8
15 Airseal Details (Attic & Basement)	ENVELOPE	\$5,000	\$0	-	-	200	-	\$600	8.3
16 Add/Update Building Insulation	ENVELOPE	\$40,000	\$0	-	-	700	-	\$2,200	18.2
17 Add Vending Machine Plug Controller	MISC	\$200	\$0	-	400	-	-	\$40	5.0
18 Replace Refrigerator	MISC	\$1,000	\$0	0.4	1,400	-	-	\$160	6.3
Total		\$109,850	\$1,800	6.5	13,400	15,190	-	\$16,000	6.8

¹Estimated based on published Efficiency Maine prescriptive incentive program

4.2 Sheriff’s Department Description

As above, this facility was toured on August 30, 2012 to assess energy reduction potential. The building was examined in detail, including all occupied, storage and mechanical areas, mechanical systems, lighting, and the building envelope (windows, doors, insulation, etc.).

Below is a quantitative summary of our recommendations. Further details on the facility and recommendations are included in the balance of this section and in Section 7.

Table 4.2.1 – Summary of Energy Reduction Opportunity for the Sheriff’s Department

Opportunity Priority Category ¹	Approximate Implementation Cost	Utility Incentive Available ²	Potential Utility Savings				Annual Cost Avoidance	Baseline EUI kBtu/sf	Projected EUI kBtu/sf	Estimated Utility Reduction	Simple Payback Yr
			Demand kW	Electric kWh/yr	Oil Gal/yr	Propane Gal/yr					
1	\$5,400	\$400	1.8	6,300	430	-	\$2,050	154.8	150.9	2.5%	2.4
2	\$1,500	\$0	0.2	700	100	-	\$400	150.9	150.2	0.5%	3.8
3	\$15,000	\$0	-	-	225	-	\$710	150.2	148.7	1.0%	21.1
Total	\$21,900	\$400	2.0	7,000	755	-	\$3,160	154.8	148.7	3.9%	6.8

¹Recommended opportunity priority is defined as follows:

- Priority 1: Group of no cost operational, or priority project opportunities recommended for immediate implementation.
- Priority 2: Group of project opportunities that require additional investigation and/or have less attractive returns, but offer other benefits to the building tenants.
- Priority 3: Group of long term “wish-list” projects that are categorized as infrastructure renewal or building investment. Priority 3 recommendations have unattractive return on investment for utility cost savings, but may be desirable for other long-term benefits.

²Estimated based on published Efficiency Maine prescriptive incentive programs subject to review and approval. Additional utility incentives may be offered to the County when projects are more fully developed and presented to the agency, provided the program has remaining funding.



Facility Description

This is another brick building, similar in architecture to the courthouse. The Sheriff's department occupies three floors. Originally this building included jail facilities and has an old cellblock area (3 cells), now used for exercise equipment. On the first floor there is a patrol room, administrative offices, and the lieutenant's office, which has its own bathroom. The second and third floors have additional offices and bathrooms, as well as a conference room and IT area. The attic area is used for evidence and general storage.

This facility is typically in use from roughly 7:00 a.m. to 5:00 p.m. weekdays. The patrol room is used as needed during off-hours.

Building Envelope

The building has brick and wood framed walls with timber pitched roof structure. The attic has rough wood flooring to accommodate storage. The roof deck over the former jail area has six inches of fiberglass batt insulation with plastic vapor barrier. In one area, the plastic and insulation has been opened to access the roof structure and was not reinstalled. There isn't any insulation in the attic space directly above the sheriff's offices on the third floor. Further, there is an entirely open staircase leading to the open attic. There are a number of fireplaces, none of which are in use at this facility. All the fireplace flues have been sealed. Windows at the Sheriff's department are exactly the same as at the courthouse. Window A/C units are poorly fitted to window frames, but are all removed for the winter heating season. Doors are mostly in good condition, but almost all could use attention to weather stripping.

HVAC

The building is hydronically heated via large cast iron radiations. Again, it is presumed that this was formally a steam building. About half the radiators have thermostatic radiator valves, which mechanically regulate water flow to the radiator to maintain an approximate space temperature setting. The other half of the radiators are controlled by two-way electric valves tied to conventional thermostats.

There are at least six window air conditioning units. There is no other air conditioning equipment in this facility.

Boiler Plant

Heating and domestic hot water is supplied to the sheriff's department from the courthouse boiler plant.



Lighting

Fluorescent lighting fixtures throughout the building are mostly older T12 lamps and ballasts. The lamps are predominately four-foot 34-watt type, although there are some eight-foot lamps as well. Bathrooms have incandescent and/or fluorescent lamps. There is halogen track lighting in the patrol room. The old cell area has incandescent lights in use. A complete lighting inventory was completed and is summarized in the table below.

Table 4.2.2 Sheriff’s Department Lighting Details

<i>Fir</i>	<i>Room</i>	<i>Qty</i>	<i>Fixture Type</i>	<i>Estimated Hours</i>
1	Patrol Room	3	2LT12	8,760
1	Patrol Room	9	Hal. Track	1,500
1	Admin	5	2LT12	2,500
1	Lieutenant Office	2	2LT12	2,000
1	Jail Warden	2	2LT12	2,500
1	Office Storage	1	2LT12	125
1	Bathroom	3	Inc	250
2	Office	2	2LT12	2,500
2	Office	2	2LT12	2,500
2	Office	2	2LT12	2,500
2	Bathroom	1	2LF17	250
3	Conference Room	4	2LT12	2,500
3	IT Office	1	2LT12	2,000
3	Old Cell Area - General	6	1LT128'	500
3	Cell Exercise Rooms	3	Inc	500

This building does not have any lighting motion sensors in use. However, it appears that most occupants turn off the lights when they vacate their offices.

Miscellaneous

- Refrigeration: There is at least one personal sized refrigerator in use.

Energy Efficiency Opportunities

Potential efficiency opportunities are summarized in the table on the next page. Recommendations are described in Section 7.



Table 4.2.3 – Summary of Sheriff’s Department Recommendations

ECM No. and Description	Technology Group	Approximate Implementation Cost	Utility Incentive Available(1)	Potential Utility Savings				Annual Cost Avoidance	Simple Payback Yr
				Demand kW	Electric kWh/yr	Oil Gal/yr	Propane Gal/yr		
1 Update Fluorescent Lighting	LIGHTING	\$2,100	\$300	0.7	1,900	(20)	-	\$150	12.0
2 Replace Incandescent / Halogen Lighting	LIGHTING	\$600	\$100	1.1	1,200	(10)	-	\$100	5.0
4 Add Window A/C Wall Timers	CONTROLS	\$800	\$0	-	2,100	-	-	\$230	3.5
5 Add Programmable Thermostats	CONTROLS	\$400	\$0	-	-	400	-	\$1,300	0.3
12 Attention to Exterior Door Seals	ENVELOPE	\$1,000	\$0	-	-	60	-	\$190	5.3
13 Replace Window A/C Unit Curtain Seals	ENVELOPE	\$300	\$0	-	700	-	-	\$80	3.8
14 Add Window Sash Weather Seals	ENVELOPE	\$15,000	\$0	-	-	225	-	\$700	21.4
15 Airseal Details (Attic & Basement)	ENVELOPE	\$500	\$0	-	-	50	-	\$160	3.1
17 Add Vending Machine Plug Controller	MISC	\$200	\$0	-	400	-	-	\$40	5.0
18 Replace Refrigerator	MISC	\$500	\$0	0.2	700	-	-	\$80	6.3
Total		\$21,400	\$400	2.0	7,000	705	-	\$3,030	6.9

¹Estimated based on published Efficiency Maine prescriptive incentive program

4.3 County Jail Description

As above, this facility was toured on August 30, 2012 to assess energy reduction potential. All accessible areas of building were examined, including common occupied areas, storage and mechanical areas, mechanical systems, lighting, and the building envelope (windows, doors, insulation, etc.).

Below is a quantitative summary of our recommendations. Further details on the facility and recommendations are included in the balance of this section and in Section 7.

Table 4.3.1 – Summary of Energy Reduction Opportunity for the County Jail

Opportunity Priority Category ¹	Approximate Implementation Cost	Utility Incentive Available ²	Potential Utility Savings				Annual Cost Avoidance	Baseline EUI kBtu/sf	Projected EUI kBtu/sf	Estimated Utility Reduction	Simple Payback Yr
			Demand kW	Electric kWh/yr	Oil Gal/yr	Propane Gal/yr					
1	\$2,000	\$0	-	-	120	-	\$380	154.8	154.0	0.5%	5.3
2	\$28,000	\$1,800	-	27,100	-	-	\$3,010	154.0	149.6	2.8%	8.7
3	\$25,000	\$0	5.0	6,000	-	-	\$670	149.6	148.6	0.6%	37.3
Total	\$55,000	\$1,800	5.0	33,100	120	-	\$4,060	154.8	148.6	4.0%	13.1

¹Recommended opportunity priority is defined as follows:

- Priority 1: Group of no cost operational, or priority project opportunities recommended for immediate implementation.
- Priority 2: Group of project opportunities that require additional investigation and/or have less attractive returns, but offer other benefits to the building tenants.
- Priority 3: Group of long term “wish-list” projects that are categorized as infrastructure renewal or building investment. Priority 3 recommendations have unattractive return on investment for utility cost savings, but may be desirable for other long-term benefits.

²Estimated based on published Efficiency Maine prescriptive incentive programs subject to review and approval. Additional utility incentives may be offered to the County when projects are more fully developed and presented to the agency, provided the program has remaining funding.

Facility Description

This facility has forty-two prisoner beds. Prisoner intake, holding cells and toxicology are on the ground



floor, which also consists of the main/visitors entrance, security center, kitchen, laundry room and small library. Housing cells are on the second floor. The facility is occupied continuously.

Building Envelope

The building is constructed with masonry block with brick facing. Floors are poured concrete and steel beams support the pitched roof deck for the addition. There is no available documentation on the building design, which would indicate type and thickness of insulation in use. Based on the age of the building, it is likely that roofing system includes 1½ - 2 inches of rigid insulation board. There is also likely to be 1" or more of rigid insulation board in the wall assembly. There are very few windows at this facility. Those in the lobby are non-operable. The metal entrance doors are in reasonably good condition with weather stripping, but there are sections where the seals don't touch with a resulting gap to the outside.

HVAC

The building is heated and ventilated by three McQuay air-handling units located in an attic mechanical room. There is also a small rooftop unit in the same mechanical space that provides heating and air conditioning to the security center on the first floor. A small make-up air unit is in-place in the kitchen, but apparently isn't used and may no longer be functional. See field data information for the main units in the table below.

Table 4.3.2 – County Jail Air Handler Information

Unit	McQuay Model No.	McQuay Serial No.	Motor HP
AHU-1	LSL111CV	3SV000279-06	7.5
AHU-2	LSL106CH	3SB00146-06	3
AHU-3	LSL106CH	3SN00280-06	3

Boiler Plant

Heating and domestic hot water is supplied to the jail from the courthouse boiler plant.

Lighting

Fluorescent lighting fixtures in the jail and support areas were all updated with T8 lamps and electronic ballasts within the last year. All lighting is centrally controlled.

Kitchen

The commercial kitchen at this jail facility serves three meals a day. There is a six-burner propane range with six standing pilots. The kitchen hood is connected to a sidewall exhauster, which is manually turned on/off as needed. There is a walk-in cooler with internal walk-in freezer. Refrigeration compressors are air-cooled. There is also a small dishwasher with internal electric hot water booster heater.



Laundry

The jail has in-house laundering with an approximately 30 pound washer and propane-fired drier. There is a propane-fired hot water booster heater for the washing machine.

Miscellaneous

A hydraulic elevator serves the first and second floor.

Energy Efficiency Opportunities

Potential efficiency opportunities are summarized in the table below. Recommendations are described in Section 7.

Table 4.3.3 – Summary of County Jail Recommendations

ECM No. and Description	Technology Group	Approximate Implementation Cost	Utility Incentive Available(1)	Potential Utility Savings				Annual Cost Avoidance	Simple Payback Yr
				Demand kW	Electric kWh/yr	Oil Gal/yr	Propane Gal/yr		
7 Add Fan VFD Control	CONTROLS	\$20,000	\$1,200	-	20,000	-	-	\$2,220	8.5
9 Install Premium Efficiency Motors	HVAC	\$3,000	\$0	-	3,700	-	-	\$410	7.3
10 Update Walk-in Evaporator Fans/Controls	HVAC	\$5,000	\$600	-	3,400	-	-	\$380	11.6
12 Attention to Exterior Door Seals	ENVELOPE	\$2,000	\$0	-	-	120	-	\$400	5.0
19 Install Solar Photovoltaic Array	MISC	\$25,000	\$0	5.0	6,000	-	-	\$700	35.7
Total		\$55,000	\$1,800	5.0	33,100	120	-	\$4,110	12.9

¹Estimated based on published Efficiency Maine prescriptive incentive program



5.0 District Attorney’s Office Description

The County’s District Attorney office is located across the street from the court at 82 Court Street. Breakaway visited the facility on August 30, 2012 to assess energy reduction potential, as the County. The building was reviewed in detail, including all occupied, storage and mechanical areas, mechanical systems, lighting, and the building envelope (windows, doors, insulation, etc.).

Below is a quantitative summary of our recommendations. Further details on the facility and recommendations are included in the balance of this section and in Section 7.

Table 5.1 – Summary of Energy Reduction Opportunity for the DA’s Office

Opportunity Priority Category ¹	Approximate Implementation Cost	Utility Incentive Available ²	Potential Utility Savings				Annual Cost Avoidance	Baseline EUI kBtu/sf	Projected EUI kBtu/sf	Estimated Utility Reduction	Simple Payback Yr
			Demand kW	Electric kWh/yr	Oil Gal/yr	Propane Gal/Yr					
1	\$2,900	\$130	0.6	2,500	-	560	\$1,680	126.5	99.3	21.5%	1.6
2	\$1,600	\$0	-	500	-	100	\$310	99.3	94.4	5.0%	5.2
3	\$0	\$0	-	-	-	-	\$0	94.4	94.4	0.0%	NA
Total	\$4,500	\$130	0.6	3,000	-	660	\$1,990	320.3	288.1	26.5%	6.8

¹Recommended opportunity priority is defined as follows:

- Priority 1: Group of no cost operational, or priority project opportunities recommended for immediate implementation.
- Priority 2: Group of project opportunities that require additional investigation and/or have less attractive returns, but offer other benefits to the building tenants.
- Priority 3: Group of long term “wish-list” projects that are categorized as infrastructure renewal or building investment. Priority 3 recommendations have unattractive return on investment for utility cost savings, but may be desirable for other long-term benefits.

²Estimated based on published Efficiency Maine prescriptive incentive programs subject to review and approval. Additional utility incentives may be offered to the County when projects are more fully developed and presented to the agency, provided the program has remaining funding.

Facility Description

Washington County’s DA office is located across the street from the courthouse/sheriff’s department/jail at 82 Court Street. The age of the 2,200 square foot residential style building is unknown. The building contains offices on the first and second floors as well as kitchenette and file storage. The back, southern portion of the building is used less than the front section.

This facility is generally in use from roughly 8:00 a.m. to 4:00 p.m. weekdays. There usually isn’t any evening or weekend activity.

Building Envelope

The wood framed building on stone foundation has newer vinyl siding and pitched tin roof sections. There is fiberglass batt insulation laid on top of the attic flooring, which is an unusual approach to insulating a building. The front (northern) section of the attic has plastic vapor barrier laid on top of the



insulation. In the back portion of the attic, there is no plastic on the insulation, but ceilings are plaster and should provide an acceptable vapor barrier. Windows are older wood framed double hung units. These windows are in decent working order, but many are loose in their tracks whereas others are painted shut. Glazing on the older windows is single pane. Window A/C units are poorly fitted to window frames, but are all removed for the winter heating season. Doors are mostly in good condition, but almost all could use weather stripping improvements.

HVAC

The building is hydronically heated via perimeter fin-tube. There are seven hot water piping zones each of which is thermostatically controlled. Thermostats are conventional electric units (not programmable). There are at least three window air conditioning units.

Boiler Plant

A single Weil McLain propane fired boiler located in the basement generates heating hot water. The boiler is rated at 133 MBH. This is a fairly new installation, including new piping. None of the piping is insulated, but the basement area is sealed from the outdoors and the majority of heat loss in this area will migrate upward into the occupied first floor of the building.

Domestic hot water is supplied by small electric tank unit. Domestic hot water piping is not insulated, but should be (at least near the tank).

Lighting

Fluorescent lighting consists of older T12 lamps and ballasts. There are also CFLs and some incandescent and halogen lights in use. There aren't any motion sensors. See details presented in the table below.

Table 5.2 DA's Office Lighting Details

<i>Flr</i>	<i>Room</i>	<i>Qty</i>	<i>Fixture Type</i>	<i>Estimated Hours</i>
1	Kitchen	3	CFL	2,750
1	Dinning Rm	1	Inc	2,750
1	Bathroom	2	Inc	500
1	Office	2	2LT12	2,750
1	Councilor	2	2LT12	2,000
1	Entrance	2	CFL	3,000
2	Office	1	2LT12	2,000
2	Office	1	2LT12	2,000
2	Office	1	2LT12	2,000
		4	Halogen	2,000
2	Bathroom	3	Inc	250
2	Records Storage	2	Inc	500

Miscellaneous

- Refrigeration: There is a residential type refrigerator in the kitchenette.



Energy Efficiency Opportunities

Potential efficiency opportunities are summarized in the table below. Recommendations are described in Section 7.

Table 5.3 – Summary of DA’s Office Recommendations

ECM No. and Description	Technology Group	Approximate Implementation Cost	Utility Incentive Available(1)	Potential Utility Savings				Annual Cost Avoidance	Simple Payback Yr
				Demand kW	Electric kWh/yr	Oil Gal/yr	Propane Gal/yr		
1 Update Fluorescent Lighting	LIGHTING	\$600	\$100	0.1	300	-	-	\$30	16.7
2 Replace Incandescent / Halogen Lighting	LIGHTING	\$300	\$30	0.5	500	-	(10)	\$30	9.0
4 Add Window A/C Wall Timers	CONTROLS	\$500	\$0	-	1,300	-	-	\$140	3.6
5 Add Programmable Thermostats	CONTROLS	\$300	\$0	-	-	-	500	\$1,300	0.2
8 Update Pipe Insulation	HVAC	\$100	\$0	-	500	-	-	\$60	1.7
12 Attention to Exterior Door Seals	ENVELOPE	\$1,000	\$0	-	-	-	70	\$180	5.6
13 Replace Window A/C Unit Curtain Seals	ENVELOPE	\$200	\$0	-	400	-	-	\$40	5.0
15 Airseal Details (Attic & Basement)	ENVELOPE	\$1,500	\$0	-	-	-	100	\$250	6.0
Total		\$4,500	\$130	0.6	3,000	-	660	\$2,030	2.2

¹Estimated based on published Efficiency Maine prescriptive incentive program



6.0 Description of 28 Center Street

There is a multipurpose office and emergency response center located in downtown Machias near the Courthouse complex. Breakaway visited this facility on August 30, 2012 to assess energy reduction potential. The building was examined, including all occupied, storage and mechanical areas, mechanical systems, lighting, and the building envelope (windows, doors, insulation, etc.).

Below is a quantitative summary of our recommendations. Further details on the facility and recommendations are included in the balance of this section and in Section 7.

Table 6.1 – Summary of Energy Reduction Opportunity for 28 Center Street

Opportunity Priority Category ¹	Approximate Implementation Cost	Utility Incentive Available ²	Potential Utility Savings				Annual Cost Avoidance	Baseline EUI kBtu/sf	Projected EUI kBtu/sf	Estimated Utility Reduction	Simple Payback Yr
			Demand kW	Electric kWh/yr	Oil Gal/yr	Propane Gal/Yr					
1	\$6,130	\$700	2.0	3,100	460	-	1,790	133	118.2	11.0%	3
2	\$15,200	\$0	0.2	600	200	-	700	118	112.3	4.9%	22
3	\$15,000	\$0	3.0	3,600	-	-	400	112	109.9	2.1%	38
Total	\$36,330	\$700	5.2	7,300	660	-	2,890	132.7	109.9	17.2%	12.3

¹Recommended opportunity priority is defined as follows:

- Priority 1: Group of no cost operational, or priority project opportunities recommended for immediate implementation.
- Priority 2: Group of project opportunities that require additional investigation and/or have less attractive returns, but offer other benefits to the building tenants.
- Priority 3: Group of long term “wish-list” projects that are categorized as infrastructure renewal or building investment. Priority 3 recommendations have unattractive return on investment for utility cost savings, but may be desirable for other long-term benefits.

²Estimated based on published Efficiency Maine prescriptive incentive programs subject to review and approval. Additional utility incentives may be offered to the County when projects are more fully developed and presented to the agency, provided the program has remaining funding.

Facility Description

This is a multi-function residential style building, which has been added onto with additional office space. The total square footage of the facility is 5,200. The University of Maine at Machias (UMM) cooperative extension offices occupies the original residential building. In the addition, there are offices for Emergency Management Assistance (EMA), Unorganized Territories, which includes a conference room, Regional Communications Center (RCC) with large control center and kitchenette. There is also one small state police office that is intermittently used.

The RCC is open around the clock. The balance of this facility is generally in use from roughly 8:00 a.m. to 4:00 p.m. weekdays.



Building Envelope

The original structure is wood framed on a stone foundation. Siding is wood. The attic space is partially finished, but lacking insulation. There is unlikely to be any wall insulation. The basement has an unsealed dirt floor. Windows are newer wood framed double hung thermal pane units. The few basement windows and other penetrations appear to be reasonably well sealed. Doors are mostly in good condition, but almost all could use attention to weather stripping, which has come loose or is missing in some sections.

The addition is also wood framed on a concrete foundation with full basement. The attic space is insulated with two layers of R12 fiberglass batt insulation over sheetrock. The first floor is also insulated from the basement with batt insulation. Windows are the same model as in the original building occupied by the U of M cooperative. Exterior door are mostly in good shape, but need attention to weather stripping.

HVAC

The original building has a forced hot air system. The addition has two small ceiling hung hydronic heating and ventilating units in the basement with ducting to each zone. These units are located in the main basement and have hot water coils. There are also a handful of perimeter fin tube radiators.

There is at least one window air conditioning unit. This unit sees limited use. A small spot cooler provides air conditioning to the IT servers. Otherwise there is no other air conditioning equipment in this facility.

Furnaces and Boiler

The original building has two newer oil-fired furnaces. The furnaces are identical Kerr Gemini model KD-115 units. A single Energy Kinetics System 2000 oil-fired sectional boiler (model EK-1F) in the basement of the addition generates heating hot water for the addition. Domestic hot water for the building is generated indirectly off the heating plant via 40-gallon tank unit. The boiler plant must remain online during the summer to provide domestic hot water.

Lighting

Fluorescent lighting consists of older T12 lamps and ballasts. The lamps are predominately four-foot 34-watt type, although there are some “U” lamps as well. There are also CFLs in use. There are no motion sensors and occupants are generally keeping lights off when they aren’t needed. See lighting details in the table below.

Table 6.2 Center Street Lighting Details

<i>Flr</i>	<i>Room</i>	<i>Qty</i>	<i>Fixture Type</i>	<i>Estimated Hours</i>
1	UT Office	5	2LT12	2,500
1	Conf Rm.	8	2LT12	2,000
1	Bathroom	2	Inc	500



28 CENTER STREET

Flr	Room	Qty	Fixture Type	Estimated Hours
1	Bathroom	2	CFL	500
1	Hall	2	2LT12	4,380
1	State PD	4	2LT12	500
1	RCC Equip.	2	3LT12	500
1	Computer	3	3LT12	1,000
1	Bathroom	2	CFL	500
1	Control Rm	9	3LT12	2,190
		2	2LT12	2,190
1	EMU Office	4	3LT12	2,000
1	UMM Copy Rm	2	2LT12	2,500
1	UMM Bathroom	2	Inc	250
1	Office	2	2LT12	1,500
1	Lunch Rm	2	2LT12	2,500
2	Office	4	2LT12	1,500
2	Office	4	2LT12	1,500
2	Office	4	2LT12	1,500
2	Office	2	2LT12	1,500
2	Bathroom	2	Inc	250

Miscellaneous

- Refrigeration: There are at least two refrigerators in use at this building.

Energy Efficiency Opportunities

Potential efficiency opportunities are summarized in the table below. Recommendations are described in Section 7.

Table 6.3 – Summary of 28 Center Street Recommendations

ECM No. and Description	Technology Group	Approximate Implementation Cost	Utility Incentive Available(1)	Potential Utility Savings				Annual Cost Avoidance	Simple Payback Yr
				Demand kW	Electric kWh/yr	Oil Gal/yr	Propane Gal/yr		
1 Update Fluorescent Lighting	LIGHTING	\$4,100	\$700	2.0	3,000	(30)	-	\$240	14.2
2 Replace Incandescent / Halogen Lighting	LIGHTING	\$30	\$0	-	100	-	-	\$10	3.0
5 Add Programmable Thermostats	CONTROLS	\$500	\$0	-	-	400	-	\$1,300	0.4
12 Attention to Exterior Door Seals	ENVELOPE	\$1,500	\$0	-	-	90	-	\$280	5.4
16 Add/Update Building Insulation	ENVELOPE	\$14,600	\$0	-	-	200	-	\$630	23.2
18 Replace Refrigerator	MISC	\$600	\$0	0.2	600	-	-	\$70	8.6
19 Install Solar Photovoltaic Array	MISC	\$15,000	\$0	3	3,600	-	-	\$400	37.5
Total		\$36,330	\$700	5.2	7,300	660	-	\$2,930	12.2

¹Estimated based on published Efficiency Maine prescriptive incentive program



RECOMMENDED ENERGY CONSERVATION MEASURES

7.0 Recommended Energy Conservation Measures (ECMs)

This section provides a brief description of each recommended ECM for Washington County's buildings.

LIGHTING

7.1 Update Fluorescent Lighting (Courthouse, Sheriff's Department, DA's Office, 28 Center Street)

The listed buildings contain older T12 florescent lighting lamps and ballasts. Significantly more efficient T8 lamp and ballast technology is available and we recommend converting to 28-watt lamp/ballast systems. Making the conversion is typically a simple swap of lights and ballasts, including cleaning or replacement of lenses as appropriate. In some cases, where there is an eight-foot fixture involved (i.e. Sheriff's Department), new fixtures are generally recommended to standardize on four-foot lamps and to avoid the need to modify existing fixtures to accommodate different clip types for HO lamps.

Next Steps: Confirm quantity and wattage of existing lamps. We recommend using a qualified lighting contractor who will look at the existing lights and propose a fixed price T8 solution. The lighting contractor's proposal normally includes energy savings and other information, which will be of interest to Efficiency Maine. We recommend pursuing all lighting updates as one contracted project to assure completeness and consistency of work, and to generate economies of scale.

7.2 Replace Incandescent / Halogen Lighting (Sheriff's Department, DA's Office)

The majority of incandescent lighting in the subject buildings has been replaced with compact fluorescent (CFL). There are few lingering light fixtures that should be updated as follows:

- Sheriff's Department: There is a halogen track lighting system in the patrol room. Replacement with a LED system is recommended. Also, replacement of the several incandescent bathroom and exercise (cell) rooms lamps with CFLs
- DA's Office: Similarly, there is track halogen lighting here that should be updated to LED, as well as several incandescent lamps that can be replaced with CFL.

Next Steps: Confirm quantity and wattage of existing lamps. This is a project that the county could pursue using its own staff since selecting replacement equipment does not require engineering, nor is the installation difficult. Otherwise, we recommend combining all lighting work for sole-source contracted services to simplify the process.

7.3 Replace Metal Halide Lighting (Courthouse)

Six pennant metal halide fixtures provide illumination of the Superior courtroom. Fluorescent or LED lighting is preferable because it is more energy efficient and provides immediate light without a warm-up period. There a number of lighting replacement options. Assuming a similar aesthetic is required, direct replacement LED source pennant lights could be installed. Surface fluorescent fixtures could also be considered, which would cost less to install but would significantly change the appearance of the room's lighting.



RECOMMENDED ENERGY CONSERVATION MEASURES

Next Steps: As above, we recommend using a qualified lighting contractor who will look at the existing lights and propose a fixed price lighting solution. The historic nature of the building must be taken into consideration and appropriate parties consulted before lighting is changed.

CONTROLS

7.4 Add Window AC Timers (Courthouse, Sheriff's Department, DA's Office, 28 Center Street)

These facilities have window A/C units. Whether the A/C units get shutdown at the end of the workday is entirely dependent on occupants. There are wall-plug timers available for this application that automatically cut power to the A/C unit at preset time and then restarts the unit in the morning so space is comfortable when occupants arrive.

Next Steps: Select timer unit from the numerous products available. County staff should be able to install and program the units.

7.5 Add Programmable Thermostats (Courthouse, Sheriff's Department, DA's Office, 28 Center Street)

There is an excellent opportunity at the above facilities to lower the level of space heating during unoccupied or low-occupancy periods. Each of these buildings has conventional dial thermostat without time of day or day of week scheduling capability. Adding programmable thermostats and spending the time to properly set them up and manage them will yield large fuel savings. The normal recommendation for setback is 55°F, which is achievable with a well-found heating system so that the building can quickly recover to occupied space temperature setpoint in the morning.

Next Steps: Select programmable thermostat from the plethora of excellent low-cost units available. We recommend discussion with staff regarding implications of lowered heating setpoints. For example, are there areas in the building where piping could freeze if the temperature in the core is allowed to drop to 55°F? When new stats are installed, plan to take time to learn how each building responds to deep resets and adjust start-up times accordingly to assure comfort when the building is opened.

7.6 Add Radiator Thermostatic Control (Courthouse)

About half the radiators in the courthouse are not thermostatically controlled. These uncontrolled radiators have ball valves that are opened/closed by staff to very roughly maintain local temperature. To improve space temperature control and capture the full benefit of off-hour space temperature setback (see above), thermostatic control should be added to these radiators. The project requires installation of two-way electrically actuated valves at each radiator. The valves will be wired to new zone programmable thermostats.

Next Steps: Field confirm location and quantity of uncontrolled radiators. Develop installation specifications and RFP material to solicit bids from qualified contractors.



RECOMMENDED ENERGY CONSERVATION MEASURES

7.7 Add Fan VFD Control (County Jail)

Variable frequency drives (VFDs) are the most efficient way to unload fan systems to match load requirements in the air handler zones. VFDs work by reducing the frequency of alternating current feeding the motor. Since induction motor speed follows line frequency, the motor slows down when frequency is reduced. Power use goes down exponentially. For example, if a motor is slowed down by 15 percent, the power savings is roughly 32 percent. There is also the advantage of “soft start”, which is much gentler on the systems mechanically and electrically.

At the jail facility, the three main air handlers are constant volume. There is potential to add VFDs that modulate based on satisfying zone temperature setpoint. The key will be to assure that there is adequate ventilation as the fans slow down. This can be accomplished by adding CO2 sensors in the return ducts of each unit with new controls that adjust the outside air damper position to maintain the right amount of fresh air in the building. To achieve this, some work will be needed to go through existing dampers and damper actuators as the systems are currently in disrepair.

Next Step: Develop project requirement documentation for bid solicitation. This project can be pursued as design-build from qualified electrical, or controls contractors. Efficiency Maine offers incentives for VFD installations, which should be pursued before work is awarded.

MECHANICAL

7.8 Update Pipe Insulation (DA's Office)

Piping off the domestic hot water system at the DA's office is not insulated. The hot water line should be insulated at least near the tank minimize standby losses.

Next Steps: Assign insulating task to County building maintenance.

7.9 Install Premium Efficiency Motors (County Jail)

The jail has original (1980's) electric induction motors on the three main air handlers. These include two 3 hp and one 7.5 motor. While continuing to operate reliably, older motors are much less efficient than premium efficiency (PE) models currently available. PE motors are designed with larger winding coils and low friction bearings and fans to optimize performance. Breakaway recommends replacement of older motors with PE motors with priority on any motors that have been rewound, a process that has been documented to degrade motor efficiency.

Next Steps: Field confirm existing motor horsepower, frame size, speed and amp rating, etc. Use data to create bid documentation for motor replacement.

7.10 Update Walk-in Evaporator Fans/Controls (County Jail)

The county jail has walk-in cooler/freezer boxes. Each has multiple fan evaporator unit. Almost all older evaporator fan motors are standard shaded pole technology, most of which run continuously. Several refrigeration vendors are offering evaporator upgrades that include replacing motors with much more efficient electrically commuted (EC) DC motors that are better suited for refrigeration service. More



RECOMMENDED ENERGY CONSERVATION MEASURES

importantly, the update includes new refrigeration controls that cycle fan motors on/off when appropriate while monitoring space temperature. Potential vendors to consider include National Resource Management, Frigitek, and Heatcraft Refrigeration Products, among many others.

Next Step: Contact refrigeration vendor(s) to identify EC motor and control updates available and to obtain price quote(s). The bidders should visit the site to review refrigeration systems. Vendors should be asked to provide a savings analysis for the update and include an ROI or simple payback in their proposal.

7.11 Install Wood Pellet Boiler Plant (Courthouse)

There is opportunity to install a biomass heating plant to replace/supplement the central oil-fired boiler plant in the courthouse that serves both the courthouse and the sheriff's department and jail facility. This heating load on these buildings is too small to warrant considering a wood chip boiler system, which requires expensive fuel storage and handling systems, but offers the advantage of very low cost fuel. A commercial wood pellet system is appropriate and can be installed either in the existing boiler room, or adjacent to the building. Wood pellets are highly processed and therefore are easy to handle and burn consistently. However, pellet fuel is much more expensive than wood chips and is not competitive with current natural gas pricing, but is significantly cheaper than fuel oil. Since there is no natural gas service in Machias, or plans for any, investing in a wood pellet system offers security in reduced utility cost for years to come.

One option to consider is contracting for biomass-based heating service. Pelletco in Orono Maine is a small energy services company (ESCO) that offers to install and maintain their own boiler system with no upfront cost. There are other ESCO options, but none that we know of that are as local. The saving generated from the cost differential between fuel oil and wholesale wood pellets is partially shared with the County. The balance of the savings remains with the ESCO to pay for the equipment, maintenance, and as profit margin. Pelletco is offering to install a boiler package behind the courthouse building with new interconnecting hot water piping to the existing boilers. They require a 4 to 10 year wood pellet purchase contract and will price the pellets in such a way that the County will pay 20 percent less for fuel compared to current oil purchases. For the duration of the contract Pelletco owns and maintains the boiler and fuel handling equipment. When the contract expires, it can be renewed, or Pelletco will remove their equipment and the Courthouse will need to switch back to operating the existing boilers.

Incidentally, boilers generally do not do well sitting in idle for long periods and continued maintenance of the oil-fired boilers and occasional use is recommended to keep them in serviceable condition.

For purposes of this study, Breakaway has included the Pelletco offer in the economic analysis.

Next Steps: Further discussions with Pelletco and/or other vendors to flush out project feasibility details such as equipment location, emissions permitting, and contract language.



RECOMMENDED ENERGY CONSERVATION MEASURES

ENVELOPE

7.12 Attention to Exterior Door Seals (All Buildings)

At all of the County facilities seen, some or most of the exterior doors are not closing properly and/or do not have weather stripping or sweeps to seal the doorsill. There are significant exposed gaps to the outside. During the winter heating season, these gaps create uncomfortable drafts and impose extra load on adjacent heating devices. A program should be developed that gives attention to all exterior doors to make sure they provide a reasonable seal to the elements. We suggest realignment and adjustments to salvageable doors, plus the addition (or in some case replacement) of weather stripping and bottom sweeps. Any doors deemed beyond repair should be replaced. Annual attention to doors is recommended as weather stripping tends to wear out quickly.

Next Step: Conduct more detailed review of exterior doors to establish a detailed scope of work. Develop a request for proposal for door services.

7.13 Replace Window AC Curtain Seals (Courthouse, Sheriff's Department, DA's Office)

The above facilities have window A/C units. The plastic devices that seal the sides of the A/C unit to the window frame are in rough condition with large gaps to the outside. These low-cost curtain seals should be replaced to minimize air conditioning load.

Next Step: Assign replacement to County building maintenance.

7.14 Add Window Sash Weather Seals (Courthouse, Sheriff's Department)

Windows on the second story of these buildings are older single pane with fairly loose sashes. Outright replacement would be optimal, but is very expensive and will not generate enough fuel savings to warrant the investment. Work to tighten the windows to reduce draft is recommended. Often the window assembly can be taken apart with weather seals added on mating surfaces to improve performance.

Next Step: Determine long term plans for the building and if/when windows will be replaced. Assuming interim window tightening makes sense, consult with window vendor / general contractors to obtain pricing.

7.15 Air Seal Details (Courthouse, Sheriff's Department, DA's Office, 28 Center Street)

The above buildings could use airsealing attention. Airsealing focuses on building envelop penetrations and areas where unwanted outside air can enter the building and/or to prevent air movement up through a building and out the top. Common trouble areas include electrical and plumbing routing through walls, chimneys exits, wall to roof joints, basement perimeter, as well as windows and doors (doors and windows are being treated separately in this study). Airsealing mostly involves application of expanding foam and/or caulk to seal voids. It is common practice to employ blower door(s) to help the airsealing practitioner identify leaks and measure the "tightness" of the building as work is completed.



RECOMMENDED ENERGY CONSERVATION MEASURES

At the Sheriff's Department, the airsealing scope should include restoring the plastic vapor barrier and displaced insulation in the attic where it was opened up to gain access to the roof.

Next Step: Contact airseal specialist(s) to review the buildings and provide pricing for services.

7.16 Add/Update Building Insulation (Courthouse, 28 Center Street)

The attic space in the courthouse and original two-story structure at 28 Center Street are not insulated. Due to flooring and need for storage space, the most cost effective means to add insulation to these buildings is probably to spray the underside of the pitched roof deck and wall gables with high density foam (versus blowing cellulose on attic flooring). Foam provides an effective air barrier as well as excellent insulating characteristics. Five inches of foam equates to roughly R30, which should suffice for this application.

The Machias fire department should be involved in the planning phase of this project, as some localities have prohibitive requirements for fire retardant treatment of the foam. Usually an application of intumescent paint is acceptable.

Foam insulation products generally produce an offensive smell when applied, but there are also health concerns with respect to exposure to off gassing during curing. Normally closure of the building is recommended during the insulating process and for eight hours or more after spray application. Since both buildings are unoccupied on weekends, scheduling shouldn't be difficult. If necessary, temporary exhaust systems can be installed as part of the job to keep the building safely open. Foam requires roughly a week of cure time.

In addition to insulating the attic, Breakaway recommends adding insulated walls and sealing of the stairwell area leading to the attic at 28 Center Street.

Next Step: Develop initial insulation application specifications and RFP material for public bid.

7.17 Vending Machine Controller (Courthouse, Sheriff's Department)

There are vending machine occupancy-based controller products that cycle the machines on/off depending on presents of people in the vicinity of the vending machine. Vendmiser is the most well know supplier of vending machine controllers. Their product installs on top of the vending machine with the unit plugging directly into the controller. The Vendmiser turns off the vending machine when the area is determined to be vacant. The shutdown cycle includes timed delay to filter out false readings from passing foot traffic. Once every two or so hours the unit restarts itself to maintain refrigeration in drink machines. The manufacture claims 35-50 percent savings for typical office applications.

The Courthouse and Sheriff's Department both have vending machines and intermittent occupancy, which makes them good candidates for vending machine controller. There could be additional machines in other county buildings that could be included in the scope.

Next Step: Obtain and review list of all vending machines in service at Washington County's municipal buildings. Determine which ones to control and contact Vendmiser or other manufacture to obtain purchasing guidance and pricing.



RECOMMENDED ENERGY CONSERVATION MEASURES

7.18 Replace Refrigerator (Courthouse, Sheriff's Department, 28 Center Street)

The above facilities have older refrigerators and freezer appliances. New Energy-Star rated units offer considerable efficiency advantages.

Next Step: Select refrigerator model(s). There are incentives available for which the refrigerator supplier should be able to provide all necessary paperwork.

7.19 Add Solar Photovoltaic Array (County Jail, 28 Center Street)

The County Jail as well as 28 Center Street facility both have south facing pitched roof sections that could be suitable for solar-electric photovoltaic (PV) panels. Solar remains somewhat cost prohibitive, especially for public entities which cannot benefit from government tax breaks. However, cost for installing PV systems is steadily coming down as the technology evolves and it is well worth keeping an eye on these sites for future PV installation.

Another option is to pursue third party ownership of the solar system in an ESCO arrangement much like is being suggested for the biomass option at the courthouse. For solar system, the County would have to sign a power purchase agreement with the third party. The agreement would set forth a price of electricity generated by the PV system that County would be obligated to buy.

Next Step: Determine if solar PV is something the County wants to pursue. Next, evaluate options to pursue a power purchase contract or if the system will be funded directly by the county, commission a feasibility study that include structural assessment of the roofs.