GUARANTEED ENERGY SAVINGS CONTRACT

THIS GUARANTEED ENERGY SAVINGS CONTRACT (this "Agreement") is made and effective **11/12/2024** (the "Effective Date"), by and between **Vermilion County, Illinois** ("Owner"), with an address at **201 N Vermilion St Danville, IL 61832**, and **Centrica Business Solutions Services, Inc.** ("Centrica"), with an address at 2111 Ellsworth Blvd, Malta, New York 12020. Owner and Centrica are sometimes referred to herein, individually, as a "Party", and, collectively, as the "Parties".

RECITALS

A. Owner is a County incorporated under the laws of the State of Illinois, and is a Unit of Local Government within the meaning of the Illinois Local Government Energy Conservation Act, 50 ILCS 515 (the "Act").

B. Owner owns and operates certain facilities described on the attached Schedule 1 (the "Facilities"), and desires to procure long-term energy cost savings and reduce related expenses in the operation of such Facilities.

C. Centrica is a New York Corporation and is duly authorized to do business in the State of Illinois, and is a Qualified Provider within the meaning of the Act, engaged in the business of and having experience and capabilities in providing energy efficiency services, including Energy Conservation Measures ("ECMs"), as defined in the Act.

D. Heretofore, Owner is a registered member of TIPS (The Interlocal Purchasing System) and, through utilizing the RFQ issued by TIPS for Contract #220104 Energy Savings Performance Contracts, Owner selected Centrica as the most highly qualified vendor best meeting its needs herein.

E. Thereafter, and pursuant to Owner's selection of Centrica, Centrica and Owner entered into an Investment Grade Audit Agreement, pursuant to which Centrica conducted an investment grade audit and delivered to Owner a detailed engineering and economic report (the "IGA Report') that specifically identifies the ECMs that are recommended to be installed and/or implemented at the Facilities.

F. Pursuant to the IGA Report, Owner now desires to enter into this Agreement with Centrica as a Guaranteed Energy Savings Contract for the installation and implementation of the ECMs at the Facilities (the "Project").

NOW, THEREFORE, the Parties agree as follows:

ARTICLE I
PRELIMINARY MATTERS

1.1 INCORPORATION. The Recitals set forth above are hereby incorporated into the body of this Agreement and made a binding part hereof.

1.2 THE IGA REPORT The IGA Report is attached hereto as Exhibit A. Owner acknowledges that it has approved and accepted the IGA Report, which identifies all ECMs to be performed under this Agreement.

1.3 CONTRACT DOCUMENTS. The entire agreement of the Parties with respect to the Project is contained in the "Contract Documents", which consist of: 1) this Agreement ii) any Change Orders or other amendments to this Agreement, and iii) the following Exhibits and Schedules:

Exhibit A:	The IGA Report
Exhibit B:	Certificate of Substantial Completion
Schedule 1:	The Facilities
Schedule 2A:	Scope of ECM Work
Schedule 2B:	Scope of Services
Schedule 3:	ECM Work Schedule
Schedule 4:	As-Built Drawings Requirements
Schedule 5:	Energy Savings Schedule
Schedule 6A:	ECM Work Schedule of Values
Schedule 6B:	Services Schedule of Values

The provisions of this Agreement shall control in the event of any conflict between its terms and those contained in any of the Exhibits or Schedules

ARTICLE II
SCOPE AND TERM

2.1 SCOPE OF THE PROJECT. The Project shall consist of two phases: 1) the "Construction & Installation Phase", in which the Equipment (as hereinafter defined) will be designed, constructed and/or installed into the Facilities and the ECMs shall be otherwise implemented (the "ECM Work"), and 2) the "Ongoing Services Phase", in which Centrica will provide ongoing energy savings monitoring and reporting services, and management and/or modification of the Equipment (the "MM&V and O&M Services"). The full scope of the ECM Work and the MM&V and O&M Services are set forth and detailed, respectively, on the "Scope of ECM Work" attached as Schedule 2A, and the "Scope of Services" attached as Schedule 2B. Centrica shall be responsible for the professional and technical accuracy of the ECM Work and the MM&V and O&M Services, whether performed by Centrica or by subcontractors or others on its behalf.

2.2 TERM. Subject to Section 2.1(A), the term of this Agreement (the "Term") shall commence on the Effective Date, and, unless sooner terminated in accordance with the terms hereof, shall continue for a period of eight (8) years from the MM&V Services Commencement Date (as hereinafter defined), but subject to the termination rights provided in Sections 2.2.1.

2.2.1 RIGHT TO PARTIAL TERMINATION. At any time following the first (1st) anniversary of the MM&V Services Commencement Date, and upon at least sixty (60) days' prior written notice to Centrica, Owner shall have the right to terminate non-required MM&V Services set forth on Schedule 2B. If Owner so elects to partially terminate, all of the then-applicable terms and provisions of this Agreement shall continue in full force and effect, except that the MM&V Services Fee shall be equitably adjusted by the Parties in a manner consistent with Schedule 6B.

ARTICLE III
THE ECM WORK

3.1 CONSTRUCTION AND INSTALLATION OF THE ECM WORK. Subject to the other provisions of this Agreement, Centrica will act as a turn-key design-builder assuming total responsibility for the design, procurement of labor and materials for the improvements to the Facilities, and the installation and start-up of the energy efficiency equipment (the "Equipment"), as set forth in and in accordance with the Scope of ECM Work.

3.1.1 CONSTRUCTION SCHEDULE. The Construction and Installation Phase will commence upon either the issuance by Owner of a written notice to proceed or the written agreement of the Parties fixing such commencement date. The performance of the ECM Work shall be carried out and proceed in accordance with the schedule (the "ECM Work Schedule") attached as Schedule 3. The ECM Work Schedule may be amended from time to time by the Parties due to changes in the ECM Work or other events affecting the completion of the ECM Work.

3.1.2 STATUTORY COMPLIANCE. In the performance of the ECM Work, including the installation of the Equipment, Centrica shall, and shall require all of its contractors, subcontractors, and all subcontractors under them to, as applicable, comply with the requirements of all applicable statutes and regulations. Without limiting the foregoing, Centrica shall otherwise give all notices and comply with all laws and ordinances legally enacted at the date of execution of the Agreement that govern the proper performance of the ECM Work.

3.1.3 PERMITS AND APPROVALS. Centrica shall be responsible for obtaining all necessary permits and approvals for the ECM Work, including the installation of the Equipment, and shall pay any and all permit fees. Owner shall use its best efforts to assist Centrica in obtaining all such necessary permits and approvals. The Equipment and the operation of the Equipment by Centrica shall conform to all federal, state and local code requirements in effect at the time of installation. Before Centrica commences any portion of the ECM Work that requires a permit or license, Centrica shall furnish copies of each such, approvals, permits or license to Owner.

3.1.4 PERFORMANCE. Owner and Centrica shall coordinate the activities associated with the installation of the Equipment by Centrica with any ECM Work or installations of Owner, its employees and agents. Centrica shall not commit or permit any act that will materially interfere with the performance of business activities conducted by

Owner or its employees without the prior written approval of Owner, which shall not be unreasonably withheld, and provided that the ECM Work Schedule shall be modified if Owner requires Centrica to delay or re-sequence the ECM Work in order to accommodate Owner's operations. Centrica shall perform all of the ECM Work in such a manner so as not to harm the structural integrity of the Facilities or their operating systems. Centrica shall repair and restore to its original condition any area of damage caused by Centrica's performance under this Agreement. Owner reserves the right to review the ECM Work and to direct Centrica to take corrective action if, in the reasonable opinion of Owner, the structural integrity of the Facilities or its systems is or will be harmed. In addition, Centrica shall be responsible for the professional and technical accuracy of all ECM Work performed, whether by its own forces or by its subcontractors or others on its behalf. Centrica is responsible for general broom cleaning, and shall, to the fullest extent practicable, at all times keep the Facilities clean and free of debris, rubbish and dust. At the completion of the ECM Work, Centrica shall remove from the worksite all construction equipment, tools, surplus materials, waste materials and debris.

3.2 DESIGN AND CONSTRUCTION DOCUMENTS. Drawings, specifications, and other documents, including those in electronic form, furnished or utilized by Centrica are instruments of service (the "Instruments of Service"). Centrica shall retain all common law, statutory and other reserved rights, including copyrights in the Instruments of Service. Drawings, specifications, and other documents and materials and electronic data are furnished for use solely with respect to the Project.

3.2.1 Centrica grants to Owner a non-exclusive license to reproduce and use the Instruments of Service solely in connection with the Project, provided that Owner shall comply with all obligations, including prompt payment of sums when due. Owner shall not assign or transfer any license herein to another party without prior written agreement of Centrica. Any unauthorized reproduction or use of the Instruments of Service by Owner or others shall be at Owner's sole risk and expense without liability to Centrica, and its design professionals. Termination of this Agreement due to the default of Owner shall terminate this license. If this Agreement is terminated for any reason other than the default of Owner, Owner shall have a non-exclusive license to use the Instruments of Service for the completion, use and maintenance of the Project. Submission or distribution of Centrica's documents to meet official regulatory requirements or for similar purposes in connection with the Project is not to be construed as publication in derogation of the rights reserved here.

3.2.3 Centrica shall pay all royalties and license fees that may be due on the inclusion of any patented or copyrighted materials, methods or systems selected by Centrica and incorporated in the ECM Work. Centrica shall defend, indemnify and hold Owner harmless from all suits or claims for infringement of any patent rights or copyrights arising out of such selection. Owner agrees to defend, indemnify and hold Centrica harmless from all suits or claims of infringement of any patent rights or copyrights arising out of any patented or copyrighted materials, methods or systems specified by Owner.

3.2.4 Centrica shall prepare and submit to Owner final marked up as-built drawings to the extent and as set forth in the attached Schedule 4.

3.3 WARRANTIES.

3.3.1 Centrica warrants that all materials and equipment furnished under the Construction and Installation Phase of this Agreement will be new unless otherwise specified, of good quality, in conformance with the Scope of ECM Work and all documents associated therewith, and free from defective workmanship and materials. Warranties with respect to the ECM Work, or applicable portion of the ECM Work, as the case may be, shall commence on the date of Substantial Completion thereof (as hereinafter defined). Centrica agrees to correct all ECM Work that is defective in workmanship or materials within a period of one (1) year from the date of Substantial Completion, or such longer periods of time as may be set forth with respect to specific warranties required hereunder.

3.3.2 Centrica shall collect, deliver, and, to the extent permissible, assign all manufacturers' warranties and Equipment manuals to Owner. There are no warranties that extend beyond the description on the face of any such warranty.

3.3.3 EXCEPT AS SET FORTH IN SECTIONS 3.3.1 AND 3.3.2, ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTY OF MERCHANTABILITY AND THE WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSLY DISCLAIMED. In addition, the warranties under this Section 3.3 shall be void and do not extend to any ECM Work that has been abused, altered, or misused, or that has been repaired by Owner or third parties without the supervisions or prior written approval of Centrica.

3.4 SAFETY OF PERSONS AND PROPERTY. Centrica shall endeavor to avoid injury, loss or damage to persons or property by taking reasonable steps to protect: a) its employees and other persons at the worksite, and b) and materials, supplies and equipment stored at the worksite for use in performance of the ECM Work. Centrica shall also oversee the safety precautions and programs of its subcontractors and suppliers at the worksite.

3.5 HAZARDOUS MATERIALS.

3.5.1 A "Hazardous Material" is any substance or material identified now or in the future as hazardous under any federal, state or local law or regulation, or any other substance or material that may be considered hazardous or otherwise subject to statutory or regulatory requirements governing handling, disposal and/or clean-up. Centrica shall not be obligated to commence or continue the ECM Work until all Hazardous material discovered at the Project site has been removed, rendered or determined to be harmless by Owner as certified by an independent testing laboratory approved by the appropriate government agency.

3.5.2 If after the commencement of the ECM Work, Hazardous Material is discovered at the Project site, Centrica shall be entitled to immediately stop ECM Work in the affected area. Centrica shall report the condition to Owner and, if required, the government agency

with jurisdiction. Owner shall be responsible for retaining any independent testing laboratory to determine the nature of the materials encountered and whether it is a Hazardous Material requiring corrective measures and/or remedial action. Such measures shall be the sole responsibility of Owner, and shall be performed in a manner minimizing any adverse effects upon the ECM Work. Centrica shall resume ECM Work in the area affected by any Hazardous Material only upon written agreement between the Parties after the Hazardous Material has been removed or rendered harmless and only after approval, if necessary, of the governmental agency or agencies with jurisdiction.

3.5.3 Centrica shall not be required to perform any ECM Work relating to or in the area of Hazardous Material without written mutual agreement.

3.5.4 If Centrica incurs additional costs and/or is delayed due to the presence or remediation of Hazardous Material, Centrica shall be entitled to an equitable adjustment in compensation and/or the ECM Work Schedule.

3.5.5 To the extent not caused by the negligent acts or omissions of Centrica, or its subcontractors or suppliers, and their agents, officers, and employees of each of them, Owner shall defend, indemnify and hold harmless Centrica, its subcontractors, suppliers, and their agents, officers and employees, from and against any and all claims, damages, penalties, losses, expenses, and other liabilities, including attorney's fees, arising out of or relating to the performance of the ECM Work in any area affected by Hazardous Material.

3.5.6 During the performance of the ECM Work, Centrica shall be responsible for the proper handling of all materials brought by it to the worksite. The provisions of this Section 3.5 shall also apply to the MM&V Services, and, without limiting the foregoing, on and after the MM&V Services Commencement Date, Owner shall be responsible under this Section 3.5 for materials and substances brought to the site by Centrica if such materials or substances are required by the Contract Documents.

3.5.7 The terms of this Section 3.5 shall survive the completion of the ECM Work and the termination of this Agreement.

3.6 SYSTEMS START-UP AND TRAINING.

3.6.1 Upon Substantial Completion of the ECM Work, with the assistance of Owner's personnel, Centrica shall direct the checkout of Equipment and start-up operations, and adjusting and balancing of Equipment and for readiness. Centrica shall also secure required certificates of inspection, testing or approval and deliver them to Owner.

3.6.2 Centrica shall conduct the training program described in Schedule 2A. The training specified in Schedule 2A shall be completed prior to Final Completion (as hereinafter defined) of the ECM Work.

3.7 SUBSTANTIAL COMPLETION/FINAL COMPLETION

3.7.1 **"**Substantial Completion" means that stage in the progress of the ECM Work when the ECM Work, or designated portion thereof, is sufficiently complete in accordance with this Agreement so that Owner can use or occupy the Facilities and utilize the ECM Work or designated portion thereof for its intended use. Upon Substantial Completion, the Parties shall execute a Certificate of Substantial Completion fixing the date of Substantial Completion and listing all unfinished items of ECM Work, in substantially the form attached hereto as Exhibit B.

3.7.2 "Final Completion" means the point when all of the ECM Work is fully and finally complete in accordance with the requirements of this Agreement, and Owner has accepted the ECM Work, which acceptance shall not be unreasonably delayed or conditioned by Owner.

ARTICLE IV
THE MM&V SERVICES

4.1 COMMENCEMENT OF THE MM&V SERVICES. The date of the commencement of Centrica's obligations under the MM&V Services Phase (the "MM&V Services Commencement Date") shall be the date that: (i) Substantial Completion has been achieved for all portions of the ECM Work, and (ii) the systems start-up and training obligations under Section 3.6 have been completed. Centrica's obligations under the MM&V Services Phase shall thereafter continue until the conclusion of the Term or any earlier termination of this Agreement.

4.2 THE MM&V SERVICES.

4.2.1 During the MM&V Services Phase Centrica shall perform those MM&V Services set forth in and in accordance with the Scope of MM&V Services. Without limiting the foregoing, Centrica shall perform and carry out the duties and obligations set forth below in Section 4.2.2.

4.2.2 For each year of the Term after the MM&V Services Commencement Date, within sixty (60) days of the anniversary date of the MM&V Services Commencement Date, Centrica shall provide Owner with an annual energy savings guarantee reconciliation report (the "Savings Reconciliation Report") in substantially the form annexed hereto as Exhibit C, that calculates annual energy savings according to the Energy Savings Methodologies defined in the "Energy Savings Schedule" attached hereto as Schedule 5. Centrica will provide Owner with an explanation as to any variations between annual energy savings and the Guaranteed Energy Savings (as hereinafter defined) shown in the Savings Reconciliation Report. The Savings Reconciliation Report shall initially be submitted by Centrica to Owner in draft form whereupon Centrica and Owner shall use their best efforts to resolve any discrepancies in the draft Savings Reconciliation Report as soon as possible so as to arrive at mutually acceptable Savings Reconciliation Report. Centrica and Owner will indicate their acceptance of the Savings Reconciliation Report by signing at the end thereof. Failure of Owner to respond within 60 days of receipt of the report shall indicate Owner's acceptance of the report.

4.3 GUARANTEED ENERGY SAVINGS.

4.3.1 Centrica has formulated and hereby guarantees the energy and operations savings (the "Guaranteed Energy Savings") to be achieved as a result of the installation and operation of the ECM Work and the provisions of the MM&V Services, as set forth in the Energy Savings Schedule (Schedule 5). The amount of the Guaranteed Energy Savings is subject to modification based upon i) changes in the ECM Work after the Effective Date, ii) changes in the MM&V Services after the Effective Date, iii) Material Changes, and iv) force majeure and the Parties shall reflect all such modifications by revising accordingly the Guaranteed Energy Savings and any other applicable portions of the Energy Savings Schedule.

4.3.2 Commencing with the first twelve (12) month period following the MM&V Services Commencement Date, and for each twelve (12) month period within the Term thereafter, where the energy savings, as calculated using the method defined in the Energy Savings Schedule, are less than the Guaranteed Energy Savings, Centrica agrees to pay to Owner the difference between the Guaranteed Energy Savings and the sum of the actual energy savings as calculated. Centrica will make any such Guaranteed Energy Savings payment within ninety (90) days of the date of Owner's acceptance of the Savings Reconciliation Report pursuant to Section 4.3.1.

4.4 EQUIPMENT SERVICE AND MODIFICATION.

4.4.1 Owner shall not move, remove, modify, alter, or change the Equipment or any part thereof ("Alterations") in any way without the prior written approval of Centrica, except in the event of a *bona fide* emergency where it is not reasonably possible to notify Centrica before carrying out Alterations. In the event of such an emergency, Owner shall take reasonable steps to protect the Equipment from damage or injury, shall follow any instructions for emergency action provided in advance by Centrica, and shall notify Centrica within three (3) business days of such emergency. Any telephonic notice of such emergency shall be followed within one (1) business day by written notice to Centrica from Owner. Owner agrees to maintain the Facilities in good repair and to protect and preserve all portions thereof that may in any way affect the operation or maintenance of the Equipment.

4.4.2 In the event that any actions of Owner, including but not limited to the carrying out of Alterations, affect the performance of the Equipment, the Guaranteed Energy Savings shall be adjusted to reflect the impact of such actions. If Owner unreasonably delays in notifying Centrica of changes resulting from an emergency and/or Owner does not receive written approval to carry out Alterations, all Guaranteed Energy Savings obligations of Centrica under Section 4.3 and elsewhere in this Agreement shall automatically cease and be of no further force or effect.

4.4.3 At all times during the Term, Centrica shall have the right, subject to Owner's prior written approval, which approval shall not be unreasonably withheld, to change the Equipment or any related energy automation management systems, revise any procedures for the operation thereof, and/or implement other energy saving actions in the Facilities,

provided that: (i) such modifications are necessary, in Centrica's reasonable judgment, to enable Centrica to achieve the Guaranteed Energy Savings at the Facilities, and (ii) any cost incurred relative to such modifications, additions or replacement of the Equipment, or operational changes or new procedures shall be the responsibility of Centrica. All such modifications, additions or replacements of the Equipment or revisions to operating or other procedures shall be described in a supplemental schedule to be provided to Owner.

ARTICLE V
OWNER'S RESPONSIBILITIES

5.1 GENERAL RESPONSIBILITIES.

5.1.1 Upon request of Centrica, Owner shall provide all available information in a timely manner regarding requirements for the Project, including all existing reports or studies regarding the physical characteristics of the site (such as surveys, site evaluations and existing conditions reports), legal descriptions, plans and drawings, building controls, systems, apparatus, equipment and machinery.

5.1.2 Owner shall promptly notify Centrica of all known unusual or materially change operating conditions that affect any Facilities, or any condition that may affect the ECM Work or the MM&V Services.

5.1.3 Owner shall appoint an authorized representative to facilitate Centrica's performance of the ECM Work and the MM&V Services. The representative shall:

a) be fully acquainted with the ECM Work and the MM&V Services;

b) agree to furnish the information and MM&V Services required of Owner so as not to delay Centrica's performance of its obligations under this Agreement; and

c) shall have authority to bind Owner in all matters requiring Owner's approval, authorization or written notice. If Owner changes its representative or the representative's authority as listed above, Owner shall notify Centrica in advance.

5.1.4 Owner shall perform any Owner obligations set out in the Schedules to this Agreement as if such obligations were set out in full in this Section 5.1.4.

5.2 RESPONSIBILITIES DURING CONSTRUCTION & INSTALLATION PHASE.

5.2.1 Owner shall review the ECM Work Schedule as set forth in Section 3.1.1, timely approve any milestone dates set forth, and timely respond to its obligations thereunder.

5.2.2 Owner shall provide sufficient space at the site for the performance of the EPC Work. Owner shall provide access to the site and Facilities for Centrica to perform any function related to this Agreement during regular business hours, and at such other

reasonable times as may be requested by Centrica. Owner shall not unreasonably restrict Centrica's access to the site or Facilities to make emergency repairs or corrections as Centrica may determine are needed.

5.2.3 Owner shall provide inspection and testing services during construction as required by law or as mutually agreed.

5.2.2 If Owner becomes aware of any error, omission or failure to meet the requirements of this Agreement or any fault or defect in the ECM Work, Owner shall give prompt written notice to Centrica.

5.3 RESPONSIBILITIES DURING THE MM&V SERVICES PHASE.

5.3.1 Owner shall provide Centrica with complete energy usage information and energy-using equipment information, as requested by Centrica. This information will include, but not be limited to:

a) Copies of all utility and fuel bills for the Facilities; for the two years prior to the MM&V Services Commencement Date and ongoing throughout the Term.

b) Direct access, by telephone modem or other reasonable means installed at Centrica's expense, to any and all energy management systems or building automation systems installed in or used in connection with the Facilities, with permission granted to Centrica to download any and all information from these systems and to store such information for the Term;

c) Permission to install, at Centrica's expense, add-on devices to any and all utility and energy use meters, to enable Centrica to directly observe Facility utility usage, with permission granted to Centrica to download any and all information from these systems and to store such information for the Term;

d) Permission, as an agent of Owner, to obtain and utilize any and all energy usage information from any and all utilities or energy suppliers providing service to the Facilities, with permission granted to Centrica to download any and all information from these systems and to store such information for the Term. In connection herewith, Owner agrees to execute such permission or authorization forms, which utilities or energy suppliers may from time to time require to release such information to Centrica; and

e) Copies of any and all energy-using equipment repair orders or invoices for repairs or maintenance ECM Work not subject to the direct control of Centrica.

5.3.2 Failure by Owner to provide the information required in this Section 5.3 or otherwise comply with its obligations under this Agreement in timely fashion, will suspend the Energy Savings Guarantee described in the Energy Savings Schedule until the information is provided or other obligation is met. The failure of Owner to provide this

information within ninety (90) days of the end of the applicable annual period shall be deemed a material breach of this Agreement in accordance with Section 8.2.1(d) hereof.

ARTICLE VI
COMPENSATION AND PAYMENT

6.1 COMPENSATION FOR THE ECM WORK.

6.1.1 For the performance of the ECM Work, and all obligations in connection therewith under this Agreement, Owner agrees to pay Centrica the following sum (the "ECM Work Price"): **Three million four hundred and twenty thousand and nine hundred twenty-two dollars ($3,420,922).** A detailed "ECM Work Schedule of Values", setting forth the breakdown of the total ECM Work Price, is attached hereto as Schedule 6A.

6.1.2 Based upon itemized applications for payment submitted to Owner by Centrica during the Construction and Installation Phase, Owner shall make payment to Centrica of the ECM Work Price as follows:

a) The period covered by each application for payment shall be one calendar month ending on the last day of the month. Provided an application for payment is received by Owner not later than the 5th day of a month, Owner shall make payment pursuant to such application to Centrica not later than the 20th day of the same month. If an application for payment is received by Owner after the application date fixed above, payment shall be made by Owner not later than twenty (20) days after receipt of the application for payment.

b) Each application for payment shall provide such detail and back-up information or data as Owner may reasonably require, and shall be based upon the ECM Work completed and materials stored on site and/or at locations approved by Owner in its reasonable discretion for the period ending on the last day of the applicable month. The ECM Work Schedule of Values shall be used in establishing percentages of completion in payment applications.

c) Final payment, constituting the entire unpaid balance of the ECM Work Price, shall be made by Owner to Centrica within fifteen (15) days of the date of Final Completion.

d) Payments due and unpaid shall bear interest from the date due at the legal rate prevailing from time to time at the place where the Project is located.

6.2 COMPENSATION FOR THE MM&V and O&M SERVICES.

6.2.1 For the performance of the MM&V and O&M Services during the Term, Owner agrees to pay Centrica the following fee in the sum of(the "MM&V Services Fee"): **eight thousand six hundred and forty six dollars ($8,646)**. A detailed " Services Schedule of

Values", setting forth the annual breakdown of the total MM&V and O&M Services Fee for each item of Services, is attached hereto as Schedule 6B.

6.2.2 Effective as of each anniversary of the Services Commencement Date, the MM&V and O&M Services Fee shall be increased by an amount equal to three (3%) percent of the amount of the Service Fee for the immediately preceding one (1) year period.

6.2.3 The Service Fee shall be paid in arrears in equal annual installments on the first (1st) day of the month in which the anniversary of the MM&V Services Commencement Date occurs.

ARTICLE VII
CHANGES

7.1 CHANGE ORDERS. Changes in the ECM Work or MM&V Services that are within the general scope of this Agreement, and that are not minor changes in the ECM Work or MM&V Services, shall be accomplished without invalidating this Agreement by a written instrument executed by both Parties in accordance with this Article VII (a "Change Order"). Centrica may request or Owner may order changes in the ECM Work or MM&V Services within the general scope of this Agreement consisting of adjustment to the ECM Work Price and/or MM&V Services Fee, respectively, or the ECM Work Schedule. All such changes in the ECM Work shall be authorized by applicable Change Order.

7.1.1 Centrica shall be entitled to an equitable adjustment to the ECM Work Price, MM&V Services Fee and/or the ECM Work Schedule. Acceptance of the Change Order and any adjustment in the ECM Work Price, MM&V Services Fee and/or ECM Work Schedule shall not be unreasonably withheld. An increase or decrease in the ECM Work Price or MM&V Services Fee resulting from a change in the scope of the ECM Work or MM&V Services shall be determined by one or more of the following methods:

a) unit prices set forth in this Agreement or as subsequently agreed;

b) a mutually accepted, itemized lump sum; or

c) if an increase or decrease cannot be agreed upon as set forth in this Section 7.1, the adjustment in the ECM Work Price or MM&V Services Fee shall be determined by the reasonable expense and savings of the performance of the ECM Work resulting from the change. If there is a net increase in the ECM Work Price or MM&V Services Fee, then a reasonable adjustment shall be made for Centrica's overhead and profit. In the case of a net decrease in cost, the amount of the decrease in the ECM Work Price or MM&V Services Fee shall not include reduction for overhead and profit.

7.2 MINOR CHANGES IN THE ECM WORK. Centrica may make minor changes in the design and construction of the ECM Work consistent with the intent of this Agreement that do not involve an adjustment in the ECM Work Price or MM&V Services Fee or the ECM Work

Schedule, so long as such changes do not materially and adversely affect the ECM Work, the quality of the materials or equipment specified herein, the performance of any materials, equipment or systems specified herein, or the quality of the workmanship required by this Agreement.

7.3 CHANGES AFFECTING THE GUARANTEED ENERGY SAVINGS. The Parties acknowledge that changes that negatively or positively affect the scope of the ECM Work will necessarily affect the Guaranteed Energy Savings set forth in Section 4.3. Change Order documents containing such scope changes shall also delineate the corollary Guaranteed Energy Savings adjustments.

7.4 UNKNOWN CONDITIONS. If in the performance of the ECM Work or the MM&V Services Centrica finds latent, concealed or other conditions that materially differ from the conditions Centrica reasonably anticipated, or if the physical conditions are different from those normally encountered and generally recognized as inherent in the kind of ECM Work or MM&V Services provided for in this Agreement, then the ECM Work Price or the MM&V Services Fee shall be equitably adjusted, and, as applicable, the ECM Work Schedule and Guaranteed Energy Savings shall be appropriately modified, by a Change Order within a reasonable time after the conditions are first observed. Centrica shall provide Owner with written notice of its discovery of any of the foregoing conditions as soon as practicable after such discovery.

7.5 EMERGENCIES. In any emergency affecting the safety of persons or property, Centrica shall act, at its discretion, to prevent threatened damage, injury or loss. Any change in the ECM Work Price, MM&V Services Fee or ECM Work Schedule on account of such emergency ECM Work shall be determined as provided in this Article VII.

7.6 CHANGES IN LAW AND FORCE MAJEURE. In the event that either: (i) any changes in laws or regulations affecting the performance of the ECM Work are enacted after the date of this Agreement; and/or (ii) Section 12.3 (*Force Majeure*) applies, the ECM Work Price, the MM&V Services Fee and/or the ECM Work Schedule or Guaranteed Savings shall be equitably adjusted by Change Order.

7.7 MATERIAL CHANGES.

7.7.1 Definition. A "Material Change" is any change in or to the Facilities, whether structural, operational or otherwise in nature that reasonably can be expected, in the judgment of Owner and Centrica to decrease annual energy savings in accordance with the provisions and procedures set forth in the Energy Savings Schedule (Schedule 5) after adjustments for climatic variations. Actions by Owner that may result in a Material Change include, but are not limited to the following;

a) The manner of use of the Facilities by Owner;

b) The hours of operation for the Facilities or for any Equipment or energy using systems operating at the Facilities;

c) Permanent changes in the comfort and service parameters set forth in Scope of ECM Work (Schedule 2A);

d) Occupancy of the Facilities;

e) The structure of the Facilities;

f) The types and quantities of equipment used at the Facilities;

g) The modification, renovation or construction at the Facilities (other than the ECM Work);

h) Owners' failure to provide maintenance of and repairs to the Equipment; or

i) Any other conditions other than climate affecting energy use at the Facilities.

7.7.2 Reported Material Changes. Owner shall use best efforts to deliver to Centrica a written notice describing all actual or proposed Material Changes at least thirty (30) days prior to the implementation of such Material Change, or as soon as is practicable after an emergency or other unplanned event. After Centrica's review of the notice, the Parties shall meet as soon as practicable to agree upon adjustments to the Energy Savings Schedule and the MM&V Services Fee, which adjustments shall be set forth in a Change Order.

ARTICLE VIII
TERMINATION

8.1 TERMINATION BY OWNER FOR CAUSE. Upon thirty (30) days' advance written notice to Centrica, Owner may terminate this Agreement for Cause (as hereinafter defined) if after giving Centrica written notice of such Cause, Centrica fails to cure the same within thirty (30) days following receipt of such notice or, if such cure cannot reasonably be effected within thirty (30) days, such cure is undertaken within such time period and is thereafter continued diligently until completion.

8.1.1 For purposes of this Agreement, "Cause" shall mean the occurrence of any of the following:

a) Any material failure on the part of Centrica to perform or comply with the terms and conditions of this Agreement; or

b) The commencement by or on behalf of Centrica of any voluntary or involuntary case or matter relating to or associated with the U.S. Bankruptcy Code, or for liquidation, reorganization, or an arrangement pursuant to any other U.S. or state bankruptcy Laws, or Centrica being adjudicated a debtor or declared bankrupt or insolvent under the U.S. Bankruptcy Code, or any other U.S. Federal or state laws relating to bankruptcy, insolvency, winding-up, or adjustment of debts, or Centrica making a general assignment for the benefit of

creditors, or admitting in writing its inability to pay its debts generally as they become due, and/or if a custodian, receiver, trustee or liquidator of Centrica, all or substantially all of the assets or business of Centrica or of Centrica's interest in this Agreement, is appointed in any proceeding.

8.1.2 If termination occurs during the Construction and Installation Phase, Owner shall be responsible for paying for all ECM Work performed by Centrica through the effective date of termination, and Owner may deduct from the amount due to Centrica the reasonable cost to Owner of any necessary remediation required with respect to the matters resulting in such termination. In the event that Centrica is terminated by Owner under this provision and it is later determined that such termination was improper, Centrica shall be entitled to the remedies set forth in Section 8.3 below.

8.1.3 If termination occurs during the MM&V Services Phase, Owner shall be responsible for paying for all reasonable costs and expenses incurred by Centrica under Section 4.4 hereof prior to the effective date of termination, but subject to Owner's right to deduct its remediation costs in the same manner as provided in Section 8.1.2.

8.2 TERMINATION BY CENTRICA

8.2.1 Upon ten (10) days' advance written notice to Owner, Centrica may, in addition to any other rights or remedies, terminate this Agreement for any of the following reasons:

a) If the ECM Work has been stopped for at least thirty-day period under court order or order of other governmental authorities having jurisdiction, or as a result of the declaration of a national emergency or other governmental act during which, through no fault of Centrica, materials, supplies, tools, and construction equipment and machinery for the ECM Work are not available;

b) If Owner has failed to pay any compensation due to Centrica in accordance with this Agreement for a period of thirty (30) days or more;

c) If the ECM Work has been suspended for any reason by Owner for a continuous period exceeding sixty (60) days;

d) If Owner has materially hindered or delayed Centrica in the performance of any of its obligations, or Owner has otherwise has materially breached any covenant, agreement, warranty or representation set forth in this Agreement, and if after giving Owner written notice of thereof Owner fails to cure the same within thirty (30) days following receipt of such notice or, if such cure cannot reasonably be effected within thirty (30) days, such cure is undertaken within such time period and is thereafter continued diligently until completion.

8.2.2 Upon such termination, Centrica shall be entitled to recover from Owner as provided in Section 8.3.

Upon the payment of amounts due under this Section 8.2, neither Party shall have any further liability to the other except for those obligations expressly specified in this Agreement to survive its termination.

8.3 TERMINATION BY OWNER WITHOUT CAUSE.

8.3.1 If Owner terminates this Agreement other than pursuant to Section 8.1, Centrica shall be entitled to recover from Owner as follows:

a) If termination occurs during the Construction and Installation Phase, Owner shall be responsible for paying for all ECM Work performed by Centrica through the effective date of termination;

b) If termination occurs during the MM&V Services Phase, Owner shall be responsible for paying for all reasonable costs and expenses incurred by Centrica under Section 4.2 hereof prior to the effective date of termination;

c) Owner shall pay for all demobilization costs incurred by Centrica, and purchase or rental costs incurred by Centrica, for any equipment acquired by the Centrica in connection with the ECM Work and MM&V Services;

8.3.2 In addition to the foregoing, Owner shall further assume and become liable for obligations, commitments, and unsettled claims that Centrica has previously undertaken or incurred in good faith on behalf of Owner in connection with the Project hereof.

8.4 GUARANTEED ENERGY SAVINGS. Upon the termination of this Agreement pursuant to either Section 8.2 or Section 8.3, all Guaranteed Energy Savings obligations of Centrica under Section 4.3 and elsewhere in this Agreement shall automatically cease and be of no further force or effect.

ARTICLE IX
INDEMNIFICATION/INSURANCE/BONDING/WAIVERS

9.1 INDEMNIFICATION.

9.1.1 Centrica shall indemnify and hold Owner harmless from and against all third party claims, losses, or damages arising from the performance of the ECM Work or the MM&V Services provided that the same are attributable to bodily injury, death and/or damage to property, but only to the extent caused by the negligent or reckless acts or omissions of Centrica. In no event shall this indemnification apply to liability to the extent caused by the negligence or willful misconduct of the party to be indemnified or held harmless. This indemnification shall not be limited to damages, compensation or benefits payable under insurance policies, any worker's compensation act, or other employee benefit acts.

9.2 CENTRICAS INSURANCE. At all times during the Term, Centrica shall provide and maintain the insurance set forth in this Section 9.2. All insurers shall be authorized and licensed to provide insurance in the State of Illinois, and shall be rated as A- or better by A.M. Best

9.2.1 Workers' Compensation. Centrica shall obtain and maintain Worker's Compensation insurance with statutory limits and Employers' Liability insurance in the amount $1,000,000 per accident/occurrence.

9.2.2 Commercial General Liability. Centrica shall obtain and maintain Commercial General Liability Insurance written on an occurrence basis, with the following limits:

Each Occurrence Limit:	$1,000,000
General Aggregate Limit:	$2,000,000
Products/Completed Operations Aggregate Limit:	$2,000,000
Personal and Advertising Injury Limit:	$1,000,000
Medical Pay:	$5,000

9.2.3 Automobile Liability. Centrica shall obtain and maintain Business Automobile Liability Insurance covering owned, non-owned, and hired automobiles, with the following limits:

Combined Single Limit Bodily Injury and Property Damage:	$1,000,000 Each Occurrence

9.2.4 Professional Liability. Centrica shall obtain and maintain professional liability or errors & omissions insurance for claims arising from the negligent performance of any professional MM&V Services under this Agreement, which shall be General Office Coverage, with the following limits:

Per claim:	$1,000,000
Aggregate:	$2,000,000

9.2.5 Excess Umbrella. All liability insurance may be arranged under a single policy for the full limits required or by a combination of primary, excess, and/or umbrella liability policies.

9.2.6 Policy Terms. Owner shall be named as loss payee on all coverage obtained by Centrica under all liability policies except Professional Liability and Workers'

Compensation, on a primary and non-contributory with respect to any liability coverage maintained by Owner. The foregoing policies shall contain a provision that coverage will not be cancelled or not renewed until at least thirty (30) days' prior written notice has been given to Owner. Upon request, a certificates of insurance showing such coverage will be provided.

9.3 OWNER'S INSURANCE.

9.3.1 Liability Insurance. Owner shall obtain and maintain its own liability insurance for protection against claims arising out of the performance of this Agreement.

9.3.2 Property Insurance.

a) Owner shall obtain and maintain Builder's Risk or equivalent property insurance in a form reasonably acceptable to Centrica upon the entire Project, including the Equipment and the Facilities and all other existing structures in which any of the ECM Work is to be performed, as well as all Project structures that are fully or partially owned or occupied by Owner or its affiliates, for the full cost of replacement at the time of any loss. This insurance shall include as insureds Owner, Centrica, Centrica's subcontractors, and all other subcontractors and suppliers, as their interests may appear. This insurance shall insure against loss from the perils of fire and extended coverage, and shall include "all risk" coverage including at a minimum coverage for theft, vandalism, malicious mischief, inland transit, collapse, temporary buildings, debris removal, flood, earthquake, wind, testing, and damage resulting from defective design, workmanship, or material. Owner shall increase limits of coverage, if necessary, to reflect estimated replacement cost. Owner shall be responsible for all premiums and any co-insurance penalties, exclusions, sublimits, or deductibles.

b) On or before the MM&V Services Commencement Date, Owner shall procure and thereafter maintain at all times during the Term, at its sole cost and expense a policy or policies of property damage insurance on all fixtures and improvements and betterments to the Facilities, including the Equipment, against any peril generally included within the classification "all risks", including, but not limited to, risks covered by fire, extended coverage, vandalism and malicious mischief, in amounts at least equal to the full replacement cost thereof (without deduction for depreciation). Such coverage shall include boiler and machinery and equipment breakdown insurance. Centrica shall be included as an insured or loss payee on all such policies, as its interests may appear.

9.3.3 Policies. Upon Centrica's request, Owner shall provide Centrica with a copy of all policies including all endorsements thereto. Centrica shall be given thirty (30) days' prior written notice of cancellation, non-renewal, or any endorsements restricting or reducing coverage.

9.3.4 Loss Adjustment. Any insured loss shall be adjusted with Owner and Centrica and made payable to Owner as trustee for the insureds, as their interests may appear, subject to any applicable mortgagee clause.

9.4 WAIVER OF CLAIMS AND SUBROGATION.

9.4.1 Property Damage. Owner and Centrica waive all claims and other rights they may have against each other for loss of and/or damage to (i) the Project, including the Equipment and Facilities, (ii) all materials, machinery, equipment, and other items used in accomplishing the ECM Work and/or to be incorporated into the Project, while the same are in transit, at the Project site, during erection, and otherwise, and (c) all property owned by or in the custody of Owner and its affiliates, however such loss or damage shall occur, except the rights each Party has to the proceeds of such insurance held by Owner as trustee in accordance with Section 9.3.4.

9.4.2 Waiver of Subrogation. Owner and Centrica shall have their respective insurers waive all rights of subrogation they may have against one another for claims arising thereunder. If the policies of insurance referred to in this Article IX require an endorsement to provide for continued coverage where there is a waiver of subrogation, the Parties will cause them to be so endorsed.

9.4.3 Damages Waiver. Owner agrees to waive all claims against Centrica for all special, indirect, consequential, remote, punitive, exemplary, or similar damages that may arise out of or relate to this Agreement. This waiver includes, but is not limited to, Owner's loss of use of the Facilities, all rental expenses incurred, loss of services of employees, or loss of reputation, loss of profits not related to this Project, or loss of reputation. The provisions of this Section 9.4.3 shall survive the termination of this Agreement.

9.4.4 Limitation of Liability The Parties have discussed the risk and rewards associated with the ECM Work, as well as Centrica's compensation for the MM&V Services. The Parties agree that Centrica shall procure and maintain insurance policies with such coverages and amounts and for such periods of time as required by this Agreement. In light of the foregoing, Owner agrees that Centrica's liability under or in connection with this Agreement, regardless of the form of action, shall in no event exceed the amount of the compensation actually received by Centrica pursuant to Section 6.1 and Section 6.2 of this Agreement, unless and only to the extent that such liability is covered by a policy of insurance procured pursuant to this Agreement. The provisions of this Section 9.4.4 shall survive the termination of this Agreement.

9.5 BONDING.

9.5.1 Performance and Payment Bonds are required of Centrica as a condition to the commencement and performance of the ECM Work and the MM&V Services. All Bonds must be acceptable to Owner, and its reasonable discretion, and shall: i) be issued by good

and sufficient sureties licensed in the State of Illinois, ii) fully comply with the requirements of the Illinois Public Construction Bond Act (30 ILCS 550).

ARTICLE X
CASUALTY AND CONDEMNATION

10.1 CASUALTY.

10.1.1 After the MM&V Services Commencement Date, Owner assumes and shall bear the risk of damage, loss, theft, or destruction, partial or complete, of the Equipment and the Facilities (a "Casualty Loss"), however arising, except to the extent that the same may be caused by the negligent or willful acts or omissions of Centrica that are not covered by insurance to be procured pursuant to this Agreement. If Owner fails to repair or replace any Casualty Loss within a reasonable time, and in no event more than one hundred twenty (120) days from its occurrence (except to the extent that the same is the responsibility of Centrica in accordance with the foregoing), Centrica may, at its option: (i) terminate this Agreement by delivery of a written notice to Owner, and such termination shall be deemed a termination without Cause and will be subject to the provisions of Section 8.3 hereof, or (ii) require Owner to amend this Agreement in a manner that equitably accounts for the loss of such Equipment and/or Facilities.

10.1.2 In the event of a Casualty Loss caused by the negligent or willful acts or omissions of Centrica that is not covered by insurance to be procured pursuant to this Agreement, Owner may require Centrica to promptly repair or replace the damaged or destroyed Equipment and/or Facilities, and in the event of Centrica's failure to do so, Owner may, at its option: (i) repair or replace such items and recover the reasonable cost thereof from Centrica, or (ii) terminate this Agreement for Cause pursuant to Section 8.1 hereof.

10.2 CONDEMNATION.

10.2.1 In the event of the condemnation resulting in a taking of substantially all of the Facilities, this Agreement shall terminate upon the effective date of such taking, and such termination shall be deemed a termination without Cause in accordance with Section 8.3 hereof, provided, however, that the proceeds of such condemnation shall belong to Owner.

10.2.2 In the event of a condemnation resulting in a taking of less than substantially all of the Facilities, the Parties shall amend this Agreement in a manner that equitably accounts for such taking.

ARTICLE XI
COMPLIANCE OBLIGATIONS

11.1 STATUTORY AND REGULATORY COMPLIANCE. Centrica will comply with all applicable provisions of federal, state and local law when performing the ECM Work AND the MM&V Services. Where required by law, all drawings, plans, reports, and other documents delivered to Owner as part of the ECM Work must bear the stamp or seal of architects or engineers licensed by the State of Illinois. Without limiting the generality of the foregoing, Centrica shall, to the extent applicable, comply with the following:

i) The Illinois Human Rights Act (775 ILCS 5);
ii) The Prevailing Wage Act (820 ILCS 130);
iii) The Public Construction Bond Act (30 ILCS 550);
iv) The Public Works Preference Act (30 ILCS 560);
v) The Employment of Illinois Workers on Public Works Act (30 ILCS 570);
vi) The Freedom of Information Act (5 ILCS 140);
vii) The Open Meetings Act (5 ILCS 120);
viii) The Illinois Architecture Practice Act of 1989 (225 ILCS 305);
ix) The Professional Engineering Practice Act of 1989 (225 ILCS 325);
x) The Structural Engineering Practice Act of 1989 (225 ILCS 340);
xi) The Local Government Professional Services Selection Act (50 ILCS 510);
xii) The Contractor Unified License and Permit Bond Act (50 ILCS 830);
xiii) All Anti-Terrorism Laws, including Executive Order No. 13224 on Terrorist Financing and regulations of the U.S. Treasury Department's Office of Foreign Assets Control (OFAC) related to Specially Designated Nationals and Blocked Person (SND's OFAC Regulations), and/or the Uniting and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism Act of 2001 (Public Law 107-56);
xiv) All "Anti-Kickback" laws and regulations, including the "Anti-Kickback" Act of 1986, 41 U.S.C. §§ 51-58 (1992); 18 U.S.C. § 874 (1992); 40 U.S.C. § 276c (1986) and the Illinois Criminal Code of 1961 720 ILCS 5/33E-1 et seq.; and
xv) The Illinois Human Rights Act, 775 ILCS 5/1-101 et seq. (1990), as amended; the Discrimination in Public Contracts Act, 775 ILCS 10/0.01 et seq. (1990), as amended; the Environmental Barriers Act., 410 ILCS 25/1 et seq; and all federal non-discrimination laws and regulations.

11.2 FAILURE TO COMPLY. If Centrica performs and ECM Work or MM&V Services knowing or having reason to know that such Work or Services are contrary to applicable laws, rules and/or regulations, Centrica shall be responsible for payment of all reasonable costs and expenses arising therefrom.

ARTICLE XII
GENERAL PROVISIONS

12. 1 NOTICE. All notices required under this Agreement shall be in writing and shall be given either by: (i) personal delivery; or (ii) a nationally-recognized overnight delivery service that provides proof of delivery and addressed to the other Party at such Party's address specified below. Such address may be changed by a Party giving notice thereof in accordance with this provision.

To Owner: Vermilion County
201 N Vermilion St
Danville, IL 61832
Attn: Larry Baughn Jr

To: Centrica Business Solutions Services, Inc.

2111 Ellsworth Blvd, Malta
New York 12020
Attn: Alex Coleman

12.2 INDEPENDENT CAPACITY. The Parties agree that Centrica is an independent contractor, and that Centrica and its employees and agents, shall act in an independent capacity in the performance of this Agreement, and shall not be construed as officers, employees, or agents of Owner. In addition, this Agreement shall not be construed as creating any partnership or joint venture between the Parties.

12.3 FORCE MAJEURE. If causes beyond a Party's reasonable control delay, impair or prevent the performance of any of such Party's obligations hereunder, expressly excepting, however, the payment of money, then: (i) the time for such performance shall be extended for a reasonable period of time commensurate with the time and nature of the cause; and (ii) the ECM Work Price, the MM&V Services Fee and/or the ECM Work Schedule or Guaranteed Savings shall be equitably adjusted by Change Order. Such causes shall include, but not be limited to: changes ordered in the ECM Work, acts or omissions of the other Party or others beyond the control of the Party whose performance is required, adverse weather conditions not reasonably anticipated, fire, unusual transportation delays, general labor disputes impacting the ECM Work, acts of governmental agencies, or unavoidable accidents or circumstances, Hazardous Materials or differing site conditions.

12.4 FURTHER DOCUMENTS. The Parties agree to execute and deliver all further documents and perform all further acts that may be reasonably necessary to effectuate the provisions of this Agreement.

12.5 GOVERNING LAW. This Agreement shall be construed in accordance with and governed by the laws of the State of Illinois, without regard to conflicts of laws rules or principles of this State or any other jurisdiction.

12.6 SEVERABILITY. The partial or complete invalidity of any one or more provisions of this Agreement shall not affect the validity or continuing force and effect of any other provision.

12.7 NO WAIVER OF PERFORMANCE. The failure of either Party to insist, in any one or more instances, on the performance of any of the terms, covenants or conditions of this Agreement, or to exercise any of its rights hereunder, shall not be construed as a waiver or relinquishment of such term, covenant, condition or right with respect to further performance.

12.8 INTERPRETATION. The Parties agree that the following shall govern the interpretation of this Agreement:

12.8.1 Headings and captions are for convenience of reference only and shall not affect the construction or interpretation of this Agreement.

12.8.2 The grouping of the articles in this Agreement and of specifications under the various headings is solely for the purpose of convenient organization and in no event shall

the grouping of provisions, the use of paragraphs or the use of headings be construed to limit or alter the meaning of any provisions.

12.8.3 The terms "herein," "hereof" and "hereunder," and words of similar import, refer to this Agreement as a whole and not to any particular Section, Subsection or Schedule or Exhibit.

12.8.4 The Parties have participated jointly in the negotiation and drafting of this Agreement, and no presumption or burden of proof shall arise favoring or disfavoring either Party by virtue of the authorship of any of the provisions hereof.

12.9 CENTRICA PROPERTY. All property used by Centrica in connection with the ECM Work and the MM&V Services, including equipment, tools, drawings, designs, documentation, schematics, test equipment, software, and associated media remain the exclusive property of Centrica. Owner agrees not to use such property for any purpose at any time. Owner agrees to allow Centrica personnel to retrieve and to remove all such materials remaining after the ECM Work has been completed or at the end of the Term. Owner acknowledges that any Centrica software included in the ECM Work is proprietary and will be delivered only after execution of and pursuant to a Centrica standard licensing agreement.

12.10 BINDING EFFECT. This Agreement and the Contract Documents shall inure to the benefit of, and be forever binding upon, the Parties and their respective successors, legal representatives and permitted assigns.

12.11 AMENDMENT. This Agreement may be amended, modified or supplemented only by written agreement signed by the Parties.

12.12 ASSIGNMENT. Neither Party may assign this Agreement in whole or in part to another person or entity, without the prior written approval of the other (such approval not to be unreasonably withheld or delayed).

12.13 ENTIRE AGREEMENT. This Agreement, including all Schedules and Exhibits hereto, constitutes the entire agreement and understanding of the Parties and supersedes all prior agreements and understandings between the Parties with respect to the subject matter hereof. Each Party acknowledges that no Party has made any promises, representations, warranties, covenants or understandings other than those expressly set forth herein.

12.14 EXECUTION. This Agreement may be executed in several counterparts, each of which, when executed, shall be deemed to be an original, but all of which together shall constitute one and the same instrument. The transmission of the signature of a Party by facsimile, email or other electronic means shall be deemed an original thereof by the Party receiving such signature.

[Signature Page Immediately Follows]

IN WITNESS WHEREOF, the Parties have executed this Agreement by their duly authorized representatives as of the Effective Date.

Centrica Business Solutions Services, Inc.
New York Corporation

By:_____
Name: Cassandra Moore
Title: Head of Finance

Vermilion County, IL

By:_____
Name:
Title:

EXHIBIT A
Investment Grade Audit Report

Investment Grade Audit

October 4, 2024

Vermilion County, IL

Prepared by:

Blaine Meadows
Account Executive
815-216-2011
blaine.meadows@centrica.com

Brian Burcham, CEM, CMVP
Project Director
210-347-5731
brian.burcham@centrica.com

centrica Business Solutions

Investment Grade Audit

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Appendix A: Baseline Utility Usage Data

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1.0 Executive Summary

1.1 Project Overview

Centrica Business Solutions, Inc. (CBS) is pleased to provide this Investment Grade Audit (IGA) for Vermilion County, IL (County). We developed the following report to identify, document, and present a full complement of infrastructure improvements and cost reduction strategies for the County.

We greatly value the support we have received from numerous members of the County staff and the Board of Commissioners during the IGA and look forward to expanding our partnership with the County by implementing the Energy Conservation Measures (ECM) described in the report through a Guaranteed Energy Savings (GES) Contract.

This report provides the scope of work, energy savings estimates, and cost proposal for infrastructure improvement and cost reduction strategies at the following buildings in the County:

- Joseph G. Cannon Building

CBS will complete the scope of work described in this proposal for an installed cost of **$3,420,922**. We will procure utility incentives with an estimated value of **$2,850**. The incentives will be retained by the Owner.

1.2 Summary of Proposed Energy Conservation Measures

Centrica previously conducted a Preliminary Feasibility Assessment (PFA) to document the potential energy savings and budgetary costs. Additional improvements were identified during the IGA audit. These ECMs were evaluated in detail and the ECMs shown in ***Table 1*** were selected by the County for implementation.

Table 1 provides savings, implementation price, and utility incentives for the recommended ECMs. The ECM recommendations presented will provide the County the ability to accomplish the following:

- Reduce annual electricity cost by 2%
- Reduce annual natural gas cost by 39%

Table 1: Summary of Recommended Energy Conservation Measures

ECM Name	Annual Utility Savings ($/yr)	ECM Cost	Avoided Capital Cost Savings ($/yr)	Incentives
ECM 1 – Window Replacement	**$1,261**	**$3,297,246**	**$122,500**	**$2,850**
ECM 2 – Building Envelope Improvements	**$1,153**	**$123,677**		**-**
TOTAL	**$2,414**	**$3,420,922**	**$122,500**	**$2,850**

1.3 Project Guidelines and Goals

Centrica has worked with the following objectives in mind for the County facilities:

- Reduce energy costs for the County.
- Replace end-of-life equipment.
- Maintain or improve existing environment within the facility.
- Improve comfort levels for the occupants within the facility.

Additional benefits to the County will include:

- Work performed under a normal, properly planned and executed schedule and not under an emergency situation.
- Guaranteed quality engineering, construction and long-term performance under a turnkey approach.

1.4 Utility Incentives

During this study, we confirmed that utility incentives will be available for some of the ECMs to be completed. We will work directly with the Utility to provide the incentives indicated in ***Table 1***. We will fill out the required forms and provide for the County's review and signature. The incentives will be retained by the County.

1.5 Environmental Benefits

In addition to reducing energy consumption, these turnkey improvements give the County the opportunity to reduce its carbon footprint, reducing harmful environmental impacts. The positive impact this project will have on the environment is quantifiable. Most of the energy generated by power plants in the United States comes from burning fossil fuels. By reducing energy consumption in the County's buildings, fewer fossil fuels are consumed which means less pollution. For Vermilion County, the project will reduce greenhouse gases by about:

- 19 metric tons CO2e each year

***Figure 1* illustrates the reduction in greenhouse gases each year in terms of equivalencies**

Figure 1: Greenhouse Reduction Equivalencies

3 VEHICLES OFF THE ROAD | ***25 ACRES OF CARBON SEQUESTERED BY TREES*** | ***ENERGY FOR 2 HOMES***

1.6 Other Measures Considered

Two ECMs identified during the development process were evaluated during the IGA and did not meet the goals of the County at the time of delivery of the IGA. These ECMs were removed from consideration for the reasons described in ***Table 2***.

Table 2 - ECMs Investigated but not Recommended

Potential ECM	Description	Reason Not Recommended
HVAC Duct Sealing	**Seal HVAC ductwork to prevent leakage to unconditioned spaces.**	**High cost vs. savings for the short runs of ductwork that provide air from the WSHPs at the Joseph G. Cannon Building and Courthouse.**
HVAC Upgrades	**Replace existing split system HVAC units at the county Animal Control building**	**The county is considering moving the animal control to a new location.**

2.0 Facility Description

Centrica Engineers audit was focused on the Joseph G. Cannon Building, shown in **Table 3**.

Table 3 - Summary of Audited Facilities

Facility	Address
Joseph G. Cannon Building	201 N Vermilion St. Danville, IL 61832

2.1 Joseph G. Cannon Building

The Joseph G. Cannon Building is a three-story building with a basement and attic. This building was transferred to the county from the federal government in 2017, and is on the National Register of Historic Places. Preservation of this building is managed by the National Parks Service and the Illinois State Historic Preservation Office. The building houses several county functions, including the Treasurer's Office, County Clerk's Office, and County Auditor. The building also has a boardroom where the County's committee and board meetings are held. The building is typically open weekdays between 8AM – 4:30 PM. The total area of the building is approximately 54,000 ft^2.

3.0 Utility Usage Overview

3.1 Utility Usage and Cost Summary

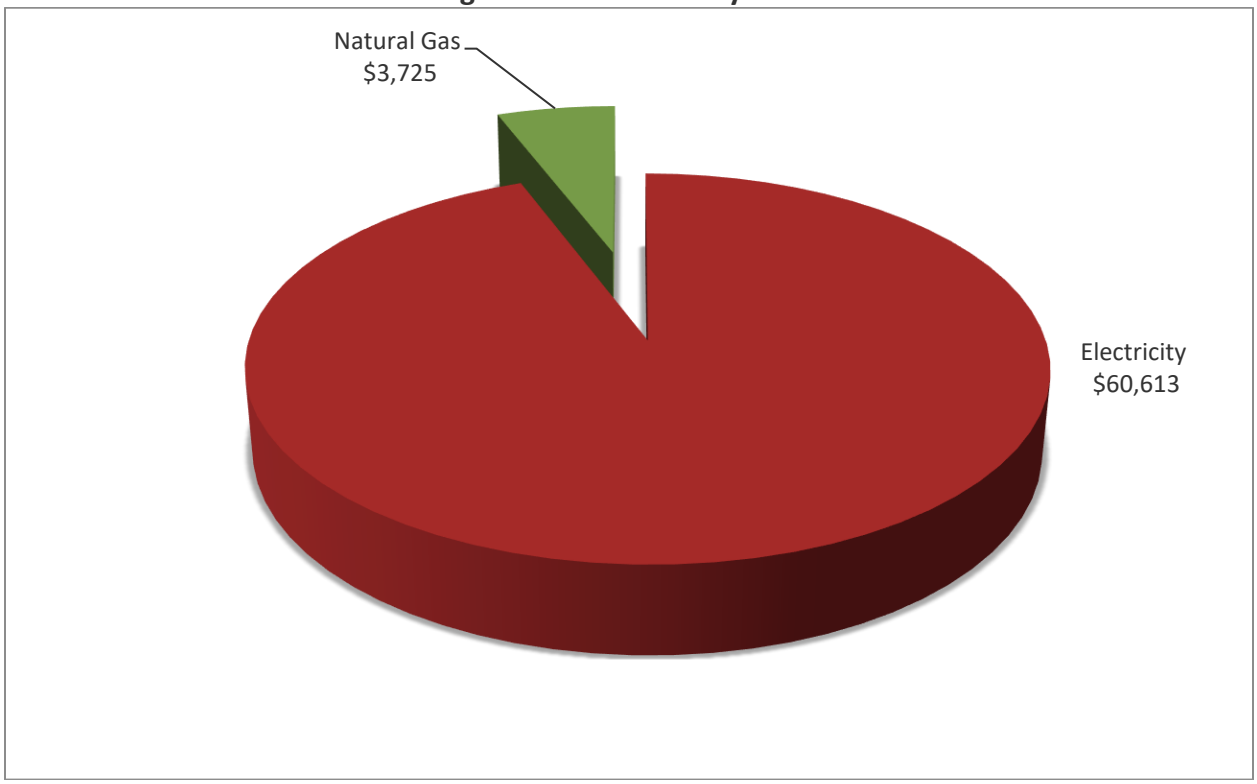
The County currently spends **$64,338** annually on utilities for the Joseph G. Cannon Building

Table 4 and ***Figure 2*** summarize the energy cost allocated to electricity and natural gas consumption for the buildings included in the IGA for the baseline period of January 2023- December 2023.

Table 4 - Annual Utility Usage & Cost Summary

Electricity		Natural Gas	
kWh/yr	**$/yr**	**Therm/yr**	**$/yr**
678,861	**$60,613**	**6,603**	**$3,725**

Figure 2: Annual Utility Costs



3.2 Utility Rate Review

Utilities and energy sources for the buildings reviewed in the County are electricity and natural gas. ***Table 5*** lists the utilities and energy sources and the current supplier of each source.

Table 5 - Utility/Energy Sources

Building	Electric Utility	Natural Gas Utility	Water Utility
Joseph G. Cannon Building	**Ameren**	**Ameren**	**Aqua Illinois**

To determine the cost savings potential for a reduction in energy usage the incremental cost of the utility was determined. Electricity and natural gas costs are based on the average for billing during the 2022/2023 baseline period. The rates used to calculate savings are summarized in ***Table 6***.

Table 6 - Utility Savings Rates Summary

Building	Blended Electric Rate ($/kWh)	Natural Gas Utility ($/therm)
Joseph G. Cannon Building	$0.0893	$0.564

3.3 Baseline Annual Energy Usage

This section summarizes the baseline period energy usage for the buildings audited. ***Table 7*** presents a summary of the average utility consumption for the County Office Building by energy source for the baseline year (2022/2023). A detailed month by month view of the baseline period usage data is provided in ***Appendix A*** for each usage type by building.

Table 7 - Baseline Utility Usage Summary

Building	Electric Usage (kWh/yr)	Natural Gas Usage (therm/yr)
Joseph G. Cannon Building	678,861	6,603

Figure 3: Baseline Electrical Usage

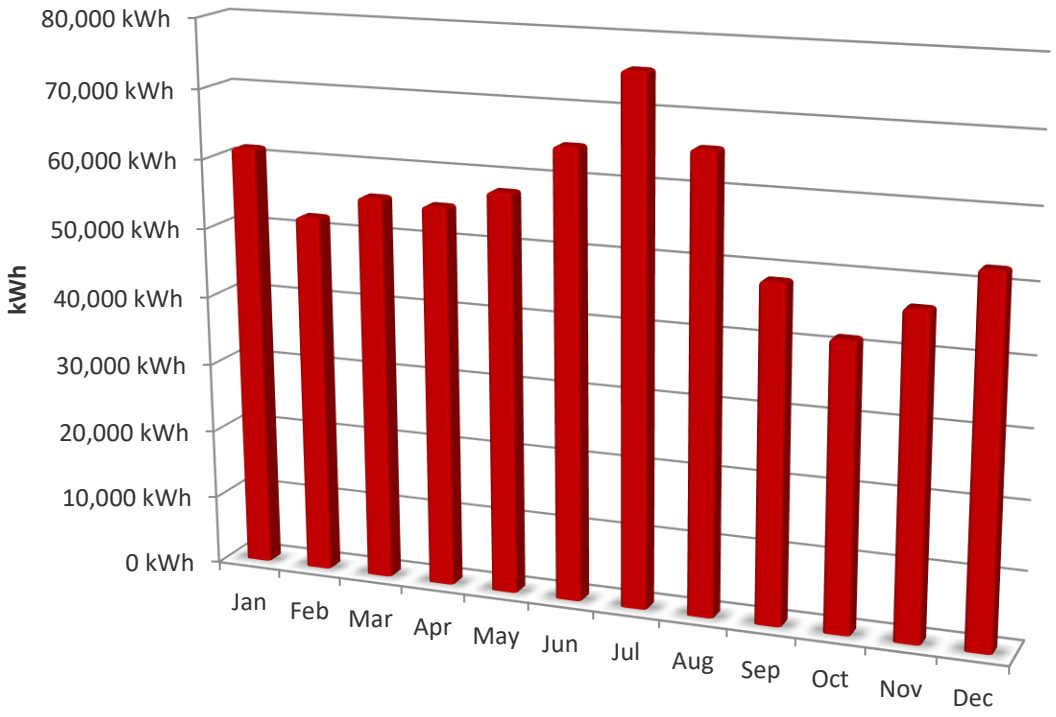
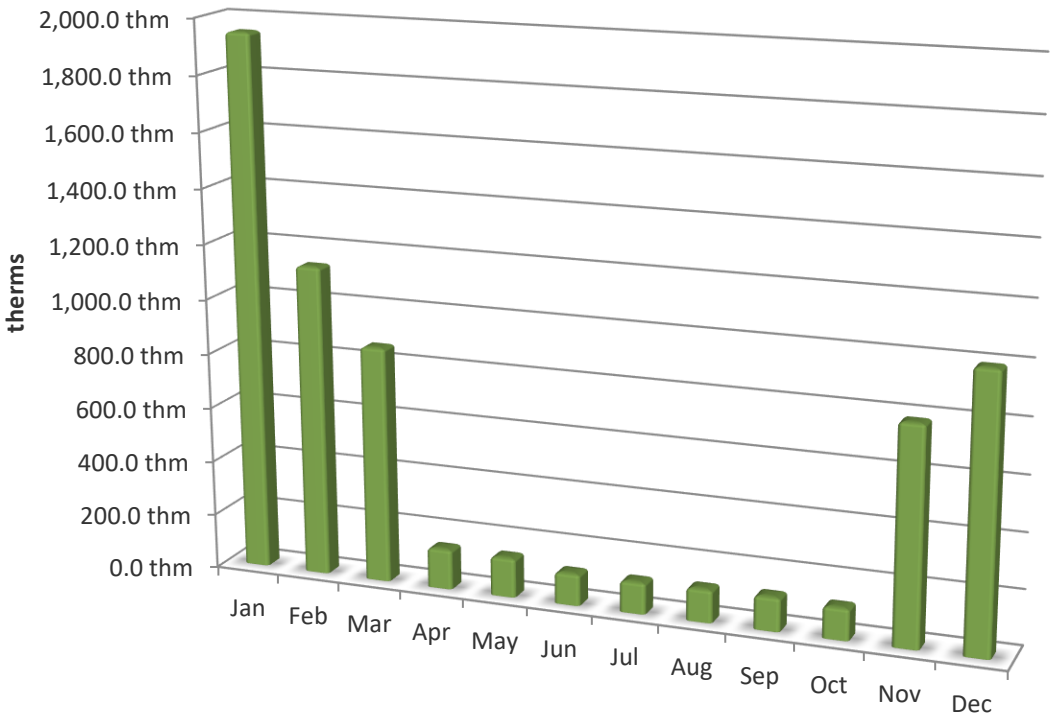


Figure 4: Baseline Natural Gas Usage



3.4 Reconciliation of Usage to Baseline

The data used for the energy baselines have been reviewed and there were no unusual findings. The meter readings were based on actual readings during the baseline period of January 2023 to December 2023.

3.5 Utility Benchmarking – Energy Utilization Index

The Energy Utilization Index (EUI) provides a summary of a building's energy intensity. Tracking your EUI over time provides insight into the energy usage behavior of your facility.

Table 8 summarizes the annual average energy usage and energy intensity for the baseline period.

Table 8 - Average Energy Intensity Summary

Facility	Square Footage	Annual Energy Usage (kBtu/yr)	EUI (kBtu/ft2)
Joseph G. Cannon Building	54,000	2,976,574	55

4.0 Energy Conservation Measures (ECMs)

4.1 ECM 1- Window Replacement

Table 9- Window Replacement Cost and Savings

Annual Cost Savings	Implementation Cost	Incentives
$1,261	**$3,297,246**	**$2,850**

Facilities Affected

This ECM will be completed in the following facilities:

- Joseph G. Cannon Building

Observation

The Joseph G. Cannon building was transferred to Vermilion County from the federal government via the Historic Surplus Property Program. The preservation of this historic building is overseen by the National Parks Service (NPS) and the Illinois State Historic Preservation Office (ILSHPO). There are 98 existing window openings on the Joseph G. Cannon Building.

Recommendation

Centrica will restore or replace windows for the 98 total window openings at the Joseph G. Cannon Building.

In accordance with ILSHPO and NPS guidance, Centrica will replace the existing “non-historic” windows with aluminum clad wood, low E, Argon filled windows. The existing “historic” windows will be restored, retrofit with insulated glass, and reinstalled into the existing frames.

All modifications to the windows will be approved by the ILSHPO and the NPS.

Many of the existing windows are not original to the building, as they were replaced in the 1970s. These windows are now in very poor condition and must be replaced. Centrica will replace windows for a total of 65 window openings.

An evaluation was performed to determine the existing windows believed to be original to the building. Centrica observed and will restore original windows in eighteen (18) window openings. Additionally, fifteen (15) window openings on the first floor were found to have original transom windows with the lower sashes having been replace. Centrica will restore transom windows and replace the lower sashes in these fifteen (15) windows openings.

In summary, a total of (98) window openings will be either replaced, restored, or a combination of the two.

Work will include:

Windows to be Replaced:

- Interior trim will be repaired as needed with stain matching the existing mill work.
- Damage to interior plaster will be repaired as needed.
- New exterior sills and perimeter trim will be applied.
- Architectural renderings, application processing, and iterations to the design are expected to be part of the bid.
- New windows will meet or exceed U value of 0.35.
- New windows will be low-e/argon filled.
- Remove and replace any interior window treatments as needed.
- Furnish and install new windows and insulate perimeter.
- Furnish and install new brickmould to match new window finish.
- Caulk both interior and exterior of the new windows.
- Clean windows following installation.
- Obtain any necessary permits.
- Instruct owner's designated operators on the operation and maintenance of the new windows.
- Work for these Items can be assumed to be conducted during normal working hours.

Windows to be Restored:

- Sashes will be stripped, epoxy repair where needed, and refinished.
- Insulated glass will be used in restored sashes.
- Weatherstripping will be applied.
- Brickmould will be restored and reinstalled for each of these window openings.
- Remove window board up.
- Refinish window frames prior to reinstallation.
- Repair sills as needed.
- Interior trim will be repaired as needed with stain matching the existing mill work.
- Coordinate paint for new windows to ensure restored and new window paint match.
- Remove and replace any interior window treatments as needed.
- Receive and install refurbished and new sashes and insulate perimeter.
- Caulk both interior and exterior of the installed windows.
- Clean windows following installation.
- Obtain any necessary permits.

Excluded Work:

- Removal of hazardous materials including asbestos and lead
- Revision requests from ILSHPO final review. Significant changes from ILSHPO or NPS may be subject to a change order.

Savings Summary

A spreadsheet model was developed to determine energy savings. The spreadsheet model results are presented in ***Appendix B***.

Baseline Usage and Cost

The energy baseline for the windows to be replaced is defined in the table below. These are based on the results of the spreadsheet savings model located in *Appendix B*.

Table 10- Baseline Window Energy Usage and Cost

Baseline Electric Usage (kWh/yr)	Baseline Electric Cost ($/yr)	Baseline Gas Usage (therm/yr)	Baseline Gas Cost ($/yr)	Baseline Total Annual Cost ($/yr)
30,455	**$2,719**	**2,923**	**$1,649**	**$4,368**

Post Retrofit Energy Use and Cost

Table 11- Proposed Window Energy Usage and Cost

Proposed Electric Usage (kWh/yr)	Proposed Electric Cost ($/yr)	Proposed Gas Usage (therm/yr)	Proposed Gas Cost ($/yr)	Proposed Total Annual Cost ($/yr)
22,643	**$2,022**	**1,924**	**$1,085**	**$3,107**

Energy And Cost Savings

The savings are the difference between the Baseline and the Proposed energy usage and cost.

Table 12- Annual Usage and Cost Savings

Electric Usage Savings (kWh/yr)	Electric Cost Savings ($/yr)	Gas Usage Savings (therm/yr)	Gas Cost Savings ($/yr)	Total Annual Cost Savings ($/yr)
7,812	**$697**	**999**	**$564**	**$1,261**

Utility Incentives

Utility Incentives for this measure are available and estimated at $2,850. The Owner will retain all incentives.

Avoided Capital Cost

An annual Avoided Capital Cost Savings of $122,500 is applied in Year 1 and escalated at 3% for each year of the term. The Avoided Capital Cost Savings are associated with replacing the windows at the Joseph G. Cannon Building.

4.2 ECM 2- Building Envelope Improvements

Table 13- Building Envelope Cost and Savings

Annual Cost Savings	Implementation Cost
$1,153	**$123,677**

Facilities Affected

This ECM will be completed in the following facilities:

- Joseph G. Cannon Building

Observation

During the on-site audit, it was found that the attic space is not insulated to the outside. This causes the HVAC equipment to lose energy to the unconditioned space in the attic.

Recommendation

Centrica will make improvements to the building's attic insulation by applying spray foam insulation to the underside of the roof deck and parapet walls. Doing this will bring the attic HVAC equipment into the building envelope, resulting in a reduction of energy loss to the unconditioned space.

Work will include:

- Insulate the roof deck with 2'' Hybrid spray foam insulation, 8,636 board feet.
- Insulate the parapet walls and the dormers with 2'' hybrid spray foam insulation, 24,300 board feet.
- Insulate the exterior wall at the 2-story section of the attic by the entrance, 2,640 board feet.
- All spray foam insulation will be R-4.3 per inch or better.
- Apply intumescent paint as required by local code.

Excluded Work:

- Removal of hazardous materials including asbestos and lead

Savings Summary

A spreadsheet model was developed to determine energy savings. The spreadsheet model results are presented in ***Appendix B***.

Baseline Usage and Cost

The energy baseline for the building envelope upgrades is defined in the table below. These are based on the results of the spreadsheet savings model located in *Appendix B*.

Table 14- Baseline Building Envelope Energy Usage and Cost

Baseline Electric Usage (kWh/yr)	Baseline Electric Cost ($/yr)	Baseline Gas Usage (therm/yr)	Baseline Gas Cost ($/yr)	Baseline Total Annual Cost ($/yr)
678,861	**$60,613**	**6,603**	**$3,725**	**$64,338**

Post Retrofit Energy Use and Cost

Table 15- Proposed Building Envelope Energy Usage and Cost

Proposed Electric Usage (kWh/yr)	Proposed Electric Cost ($/yr)	Proposed Gas Usage (therm/yr)	Proposed Gas Cost ($/yr)	Proposed Total Annual Cost ($/yr)
675,930	**$60,351**	**5,023**	**$2,834**	**$63,185**

Energy And Cost Savings

The savings are the difference between the Baseline and the Proposed energy usage and cost.

Table 16- Annual Usage and Cost Savings

Electric Usage Savings (kWh/yr)	Electric Cost Savings ($/yr)	Gas Usage Savings (therm/yr)	Gas Cost Savings ($/yr)	Total Annual Cost Savings ($/yr)
2,931	**$262**	**1,580**	**$891**	**$1,153**

Utility Incentives

No incentives are available for this measure.

Maintenance Savings

No maintenance savings are claimed for this measure.

5.0 Summary

5.1 Financial Summary

The County will complete improvements valued at **$3,420,922**. ***Table 15*** provides an overview of the project costs and savings.

Table 17- Cost and Savings Summary

Description	Amount
Project Total Investment	**$3,420,922**
Year 1 Electric Savings	**$959**
Year 1 Natural Gas Savings	**$1,455**
Year 1 Avoided Capital Cost Savings	**$122,500**
Incentives	**$2,850**

5.2 Project Management Schedule

Our Centrica Project Manager, David Jurek, will have the overall responsibility for managing and executing the construction phase of this project. A detailed Work Breakdown Schedule will be provided as part of the Project Management Plan presented during the construction phase.

Appendix A – Baseline Utility Data

Baseline Year (January 2023-December 2023) Usage Summary

Facility	Electric Usage (kWh/yr)	Natural Gas Usage (Therm/yr)	Water Usage (kgal/yr)
Joseph G. Cannon Building	**678,861**	**6,603**	**382**

Baseline Year (January 2023- December 2023) Electric Usage Summary

Month	Total kWh	Billed Demand kW	Usage Cost	Demand Cost	Total Cost
Jan	61,516	120	$ 4,255	$ 988	$5,243
Feb	52,255	128	$ 3,493	$ 1,150	$4,643
Mar	55,769	120	$ 3,737	$ 1,081	$4,818
Apr	55,240	146	$ 3,701	$ 1,325	$5,026
May	57,933	142	$ 3,891	$ 1,292	$5,183
Jun	64,941	145	$ 4,360	$ 1,314	$5,674
Jul	75,791	172	$ 5,066	$ 1,540	$6,606
Aug	65,823	165	$ 4,432	$ 1,483	$5,914
Sep	48,664	140	$ 3,277	$ 1,273	$4,550
Oct	41,621	107	$ 2,806	$ 993	$3,799
Nov	46,630	143	$ 3,152	$ 1,295	$4,447
Dec	52,677	122	$ 3,680	$ 1,030	$4,710
TOTALS	**678,861**	**1,653**	**$45,849**	**$14,764**	**$60,613**

Baseline Year (January 2023- December 2023) Natural Gas Usage Summary

Month	Total Therms	Delivery Cost	Supply Cost	Total Cost
Jan	1,948	$ 347.69	$ 1,090.88	$1,439
Feb	1,134	$ 260.47	$ 430.92	$691
Mar	862	$ 204.25	$ 219.38	$424
Apr	146	$ -	$ 33.99	$34
May	143	$ 43.06	$ 32.20	$75
Jun	115	$ 37.20	$ 27.03	$64
Jul	114	$ -	$ 28.50	$29
Aug	119	$ -	$ 29.16	$29
Sep	122	$ -	$ 29.89	$30
Oct	115	$ -	$ 28.75	$29
Nov	788	$ -	$ 208.82	$209
Dec	997	$ 418.92	$ 254.02	$673
TOTALS	**6,603**	**$1,312**	**$2,414**	**$3,725**

Appendix B- ECM Calculations

FIM #: 1A1
Title: Window Replacement
Project: Vermilion County
Site: Joseph G. Canon Building (Admin Building)

Description:

Replace all windows at the Joseph G. Cannon Building and implement insulated, low E, Argon filled glass.

SUMMARY	BASELINE	PROPOSED	SAVINGS	% SAVINGS
Cooling Load	406,061 MBtu/yr	296,425 MBtu/yr	109,637 MBtu/yr	
Heating Load	292,340 MBtu/yr	187,097 MBtu/yr	105,242	
Cooling Energy	30,455 kWh/yr	22,232 kWh/yr	8,223	27.0%
Cooling Energy Cost	$2,719/yr	$1,985/yr	$734/yr	
Heating Energy, therms/yr	2,923	1,871	1,052	36.0%
Heating Energy Cost	$1,649/yr	$1,056/yr	$593/yr	
Total Energy Cost	$4,368/yr	$3,041/yr	$1,327/yr	30.4%

INPUTS	
Fuel Billing Unit	therm
Fuel Cost per Billing Unit	$0.5641
Fuel Cost per Therm	$0.5641
Electric Energy Cost	$0.0893/kWh
Heating Set Point	69.0˚F
Existing Window U Factor	0.50 Btu/(h·ft²·˚F)
Proposed Window U Factor	0.32 Btu/(h·ft²·˚F)
Window Solar Radiation Rejection Factor	27%

Cooling Conversion Factor	12 MBtu/h per ton
Heating Btu Conversion Factor	100.000
Heating Btu Conversion Unit	MBtu/therm

Overall Heating System Efficiency	100.0%
Chiller Efficiency	0.90 kW/ton

UNITS CHART				
Mcf	1,030,000 Btu/Mcf	MBtu/Mcf	1,030 MBtu/Mcf	10.30 therm/Mcf
ccf	103,000 Btu/ccf	MBtu/ccf	103.0 MBtu/ccf	1.03 therm/ccf
cf	1,030 Btu/cf	MBtu/cf	1.030 MBtu/cf	0.0103 therm/cf
therm	100,000 Btu/therm	MBtu/therm	100 MBtu/therm	1 therm
MBtu	1,000 Btu/MBtu	Btu/MBtu	1 MBtu	0.010 therm/MBtu
MMBtu	1,000,000 Btu/MMBtu	MBtu/MMBtu	1,000 MBtu/MMBtu	10 therm/MMBtu
gal (LP Gas)	91,500 Btu/gal	MBtu/gal	91.5 MBtu/gal	0.9150 therm/gal
gal (Fuel Oil #2)	139,000 Btu/gal	MBtu/gal	139 MBtu/gal	1.3900 therm/gal
lbm (Steam)	975 Btu/lbm	MBtu/lbm	0.975 MBtu/lbm	0.00975 therm/lbm
kWh	3,412 Btu/kWh	MBtu/kWh	3.412 MBtu/kWh	0.03412 therm/kWh

Average Daily Transmitted Solar Radiation for Double Glazing				
U.S. Weather Station City:		Springfield, IL	Link to Solar Radiation Data by U.S. station	
Month	East	South	West	North
January	310 Btu/ft²/day	800 Btu/ft²/day	310 Btu/ft²/day	140 Btu/ft²/day
February	410 Btu/ft²/day	830 Btu/ft²/day	410 Btu/ft²/day	190 Btu/ft²/day
March	510 Btu/ft²/day	720 Btu/ft²/day	500 Btu/ft²/day	250 Btu/ft²/day
April	660 Btu/ft²/day	640 Btu/ft²/day	650 Btu/ft²/day	300 Btu/ft²/day
May	770 Btu/ft²/day	530 Btu/ft²/day	750 Btu/ft²/day	360 Btu/ft²/day
June	820 Btu/ft²/day	490 Btu/ft²/day	810 Btu/ft²/day	410 Btu/ft²/day
July	810 Btu/ft²/day	510 Btu/ft²/day	820 Btu/ft²/day	390 Btu/ft²/day
August	740 Btu/ft²/day	620 Btu/ft²/day	760 Btu/ft²/day	320 Btu/ft²/day
September	630 Btu/ft²/day	770 Btu/ft²/day	630 Btu/ft²/day	260 Btu/ft²/day
October	490 Btu/ft²/day	890 Btu/ft²/day	490 Btu/ft²/day	200 Btu/ft²/day
November	310 Btu/ft²/day	740 Btu/ft²/day	320 Btu/ft²/day	150 Btu/ft²/day
December	250 Btu/ft²/day	680 Btu/ft²/day	250 Btu/ft²/day	120 Btu/ft²/day

Average Transmitted Solar Radiation (Btu/ft²/day) for Double Glazing, Uncertainty ±9%

Orientation		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Horizontal	Unshaded	430	620	830	1130	1370	1510	1480	1310	1040	750	450	350	940
North	Unshaded	140	190	250	300	360	410	390	320	260	200	150	120	260
	Shaded	120	170	220	270	320	360	350	290	230	180	130	110	230
East	Unshaded	310	410	510	660	770	820	810	740	630	490	310	250	560
	Shaded	280	370	450	570	660	700	690	640	540	440	280	230	490
South	Unshaded	800	830	720	640	530	490	510	620	770	890	740	680	680
	Shaded	780	770	570	420	350	350	360	390	560	780	710	660	560
West	Unshaded	310	410	500	650	750	810	820	760	630	490	320	250	560
	Shaded	280	370	440	560	640	690	700	660	550	430	280	220	490

East Facing Windows			
Floor Location	Quantity	Window RO Size	Total Window Area
1	1	75.00 ft²	75.00 ft²
1	5	104.13 ft²	520.63 ft²
2	1	47.50 ft²	47.50 ft²
2	1	18.65 ft²	18.65 ft²
2	1	47.50 ft²	47.50 ft²
2	5	20.50 ft²	102.50 ft²
3	1	34.00 ft²	34.00 ft²
3	1	6.53 ft²	6.53 ft²
3	2	34.00 ft²	68.00 ft²
3	5	25.50 ft²	127.50 ft²
			0.00 ft²
			0.00 ft²
			0.00 ft²
			0.00 ft²

			0.00 ft²
			0.00 ft²
			0.00 ft²
EAST FACING SUBTOTALS	**23**		**1,047.81 ft²**
South Facing Windows			
Floor Location	**Quantity**	**Window RO Size**	**Total Window Area**
1	1	23.96 ft²	23.96 ft²
1	3	75.00 ft²	225.00 ft²
1	1	69.89 ft²	69.89 ft²
1	1	6.19 ft²	6.19 ft²
2	5	43.50 ft²	217.50 ft²
2	1	20.50 ft²	20.50 ft²
3	5	34.00 ft²	170.00 ft²
3	1	6.67 ft²	6.67 ft²
3	1	25.50 ft²	25.50 ft²
B	1	12.28 ft²	12.28 ft²
B	2	26.67 ft²	53.33 ft²
4	2	7.97 ft²	15.94 ft²
			0.00 ft²
			0.00 ft²
			0.00 ft²
			0.00 ft²
			0.00 ft²
			0.00 ft²
			0.00 ft²
			0.00 ft²
SOUTH FACING SUBTOTALS	**24**		**846.76 ft²**
West Facing Windows			
Floor Location	**Quantity**	**Window RO Size**	**Total Window Area**
B	6	13.78 ft²	82.67 ft²
1	2	17.73 ft²	35.46 ft²
1	7	53.67 ft²	375.67 ft²
2	2	65.63 ft²	131.25 ft²
2	7	43.50 ft²	304.50 ft²
3	2	51.00 ft²	102.00 ft²
3	7	34.00 ft²	238.00 ft²
4	2	7.97 ft²	15.93 ft²
			0.00 ft²
			0.00 ft²
			0.00 ft²
			0.00 ft²
			0.00 ft²
			0.00 ft²
			0.00 ft²
			0.00 ft²
WEST FACING SUBTOTALS	**35**		**1,285.47 ft²**
North Facing Windows			
Floor Location	**Quantity**	**Window RO Size**	**Total Window Area**
B	3	11.67 ft²	35.00 ft²
1	3	75.25 ft²	225.75 ft²
1	1	69.89 ft²	69.89 ft²
1	1	23.96 ft²	23.96 ft²
2	2	43.50 ft²	87.00 ft²
2	2	20.50 ft²	41.00 ft²
3	2	34.00 ft²	68.00 ft²
3	1	5.88 ft²	5.88 ft²
3	1	24.75 ft²	24.75 ft²
			0.00 ft²
			0.00 ft²
			0.00 ft²
			0.00 ft²
			0.00 ft²
			0.00 ft²
			0.00 ft²
			0.00 ft²
			0.00 ft²

			0.00 ft²
			0.00 ft²
NORTH FACING SUBTOTALS	**16**		**581.22 ft²**
TOTALS	**98**		**3,761.26 ft²**

FORMULAS

Baseline Monthly Cooling Load (MBtu/month) = Total Window Area (ft²) × Average Daily Transmitted Solar Radiation (Btu/ft²/day) × Number of Cooling Days (per month) ÷ 1,000 Btu/MBtu
Proposed Monthly Cooling Load (MBtu/month) = [1 - Solar Radiation Rejection Factor (%)] × Total Window Area (ft²) × Average Daily Transmitted Solar Radiation (Btu/ft²/day) × Number of Cooling Days (per month) ÷ 1,000 Btu/MBtu

Baseline Window Heat Loss (MBtu/yr) = Total Window Area (ft²) × Baseline Window U-Value (Btu/h·ft²·˚F) × [Inside Air Temperature (°F) - Outside Air Temperature (°F)] × Hours in Bin ÷ 1,000 Btu/MBtu
Proposed Window Heat Loss (MBtu/yr) = Total Window Area (ft²) × Proposed Window U-Value (Btu/h·ft²·˚F) × [Inside Air Temperature (°F) - Outside Air Temperature (°F)] × Hours in Bin ÷ 1,000 Btu/MBtu

Baseline Cooling Energy = (Baseline Cooling Load × Chiller Efficiency) ÷ Cooling Conversion Factor
Proposed Cooling Energy = (Proposed Cooling Load × Chiller Efficiency) ÷ Cooling Conversion Factor
Baseline Heating Energy = Baseline Window Heat Loss ÷ (Overall Heating System Efficiency × Heating Btu Conversion Factor)
Proposed Heating Energy = Proposed Window Heat Loss ÷ (Overall Heating System Efficiency × Heating Btu Conversion Factor)

SAMPLE CALCULATIONS

Sample Cooling Calculations for July - East Face:
Baseline Cooling Load for July - East Face = 1047.81 ft² East Face Window Area × 810 Btu/ft²/day Average Daily Transmitted Solar Radiation for July × 31 Cooling Days in July ÷ 1,000 Btu/MBtu = 26310.4 MBtu
Proposed Cooling Load for July - East Face = [1 - 27% Window Film Solar Radiation Rejection Factor] × 1047.81 ft² East Face Window Area × 810 Btu/ft²/day Average Daily Transmitted Solar Radiation for July × 31 Cooling Days in July ÷ 1,000 Btu/MBtu = 19206.6 MBtu

Sample Heating Calculations for 32.5˚F Bin:
Baseline Window Heat Loss for 32.5˚F Bin = 3761.26 ft² Total Window Area (All Faces) × 0.5 Btu/h·ft²·˚F Baseline Window U-Value × [69°F Heating Set Point - 32.5°F Outside Air] × 448 h/yr ÷ 1,000 Btu/MBtu = 30752.1 MBtu/yr
Proposed Window Heat Loss for 32.5˚F Bin = 3761.26 ft² Total Window Area (All Faces) × 0.32 Btu/h·ft²·˚F Proposed Window U-Value × [69°F Heating Set Point - 32.5°F Outside Air] × 448 h/yr ÷ 1,000 Btu/MBtu = 19681.3 MBtu/yr

TOTALS FOR ALL MONTHS AND BINS
Baseline Cooling Energy = (406061.3 MBtu/yr Baseline Cooling Load × 0.9 kW/ton Chiller Efficiency) ÷ 12 MBtu/h per ton = 30455 kWh/yr
Proposed Cooling Energy = (296424.7 MBtu/yr Proposed Cooling Load × 0.9 kW/ton Chiller Efficiency) ÷ 12 MBtu/h per ton = 22232 kWh/yr
Baseline Heating Energy = 292339.6 MBtu/yr Baseline Window Heat Loss ÷ (100% Heating System Efficiency × 100 MBtu/therm) = 2923 therms/yr
Proposed Heating Energy = 187097.3 MBtu/yr Proposed Window Heat Loss ÷ (100% Heating System Efficiency × 100 MBtu/therm) = 1871 therms/yr

Baseline Cooling Load Calculations

Month	Number of Cooling Days	Monthly Cooling Load				
		East	South	West	North	Total
January		0.0 MBtu	0.0 MBtu	0.0 MBtu	0.0 MBtu	0.0 MBtu
February		0.0 MBtu	0.0 MBtu	0.0 MBtu	0.0 MBtu	0.0 MBtu
March		0.0 MBtu	0.0 MBtu	0.0 MBtu	0.0 MBtu	0.0 MBtu
April		0.0 MBtu	0.0 MBtu	0.0 MBtu	0.0 MBtu	0.0 MBtu
May	31 days	25,011.1 MBtu	13,912.3 MBtu	29,887.2 MBtu	6,486.4 MBtu	75,297.1 MBtu
June	30 days	25,776.0 MBtu	12,447.4 MBtu	31,237.0 MBtu	7,149.0 MBtu	76,609.5 MBtu
July	31 days	26,310.4 MBtu	13,387.3 MBtu	32,676.7 MBtu	7,027.0 MBtu	79,401.4 MBtu
August	31 days	24,036.7 MBtu	16,274.8 MBtu	30,285.7 MBtu	5,765.7 MBtu	76,362.9 MBtu
September	30 days	19,803.5 MBtu	19,560.3 MBtu	24,295.4 MBtu	4,533.5 MBtu	68,192.7 MBtu
October	15 days	7,701.4 MBtu	11,304.3 MBtu	9,448.2 MBtu	1,743.7 MBtu	30,197.6 MBtu
November		0.0 MBtu	0.0 MBtu	0.0 MBtu	0.0 MBtu	0.0 MBtu
December		0.0 MBtu	0.0 MBtu	0.0 MBtu	0.0 MBtu	0.0 MBtu
TOTALS	**168 days/yr**	**128,639.1 MBtu/yr**	**86,886.5 MBtu/yr**	**157,830.3 MBtu/yr**	**32,705.4 MBtu/yr**	**406,061.3 MBtu/yr**

Proposed Cooling Load Calculations

Month	Number of Cooling Days	Monthly Cooling Load				
		East	South	West	North	Total
January	0 days	0.0 MBtu	0.0 MBtu	0.0 MBtu	0.0 MBtu	0.0 MBtu
February	0 days	0.0 MBtu	0.0 MBtu	0.0 MBtu	0.0 MBtu	0.0 MBtu
March	0 days	0.0 MBtu	0.0 MBtu	0.0 MBtu	0.0 MBtu	0.0 MBtu
April	0 days	0.0 MBtu	0.0 MBtu	0.0 MBtu	0.0 MBtu	0.0 MBtu
May	31 days	18,258.1 MBtu	10,156.0 MBtu	21,817.7 MBtu	4,735.1 MBtu	54,966.9 MBtu
June	30 days	18,816.5 MBtu	9,086.6 MBtu	22,803.0 MBtu	5,218.8 MBtu	55,924.9 MBtu
July	31 days	19,206.6 MBtu	9,772.8 MBtu	23,854.0 MBtu	5,129.7 MBtu	57,963.0 MBtu
August	31 days	17,546.8 MBtu	11,880.6 MBtu	22,108.6 MBtu	4,209.0 MBtu	55,744.9 MBtu
September	30 days	14,456.6 MBtu	14,279.0 MBtu	17,735.7 MBtu	3,309.5 MBtu	49,780.7 MBtu
October	15 days	5,622.0 MBtu	8,252.1 MBtu	6,897.2 MBtu	1,272.9 MBtu	22,044.2 MBtu
November	0 days	0.0 MBtu	0.0 MBtu	0.0 MBtu	0.0 MBtu	0.0 MBtu
December	0 days	0.0 MBtu	0.0 MBtu	0.0 MBtu	0.0 MBtu	0.0 MBtu
TOTALS	**168 days/yr**	**93,906.5 MBtu/yr**	**63,427.2 MBtu/yr**	**115,216.1 MBtu/yr**	**23,874.9 MBtu/yr**	**296,424.7 MBtu/yr**

Heating Load Calculations

OA Bin Avg Temperature	Total Heating Hours In Bin	Baseline Window Heat Loss	Proposed Window Heat Loss

77.5˚F		0.0 MBtu	0.0 MBtu
72.5˚F		0.0 MBtu	0.0 MBtu
67.5˚F		0.0 MBtu	0.0 MBtu
62.5˚F		0.0 MBtu	0.0 MBtu
57.5˚F		0.0 MBtu	0.0 MBtu
52.5˚F	703 h	21,814.4 MBtu	13,961.2 MBtu
47.5˚F	460 h	18,599.5 MBtu	11,903.7 MBtu
42.5˚F	592 h	29,503.4 MBtu	18,882.2 MBtu
37.5˚F	566 h	33,529.8 MBtu	21,459.1 MBtu
32.5˚F	448 h	30,752.1 MBtu	19,681.3 MBtu
27.5˚F	369 h	28,799.1 MBtu	18,431.4 MBtu
22.5˚F	401 h	35,067.2 MBtu	22,443.0 MBtu
17.5˚F	345 h	33,414.1 MBtu	21,385.0 MBtu
12.5˚F	214 h	22,738.7 MBtu	14,552.8 MBtu
7.5˚F	132 h	15,267.0 MBtu	9,770.9 MBtu
2.5˚F	96 h	12,006.0 MBtu	7,683.8 MBtu
-2.5˚F	55 h	7,395.6 MBtu	4,733.2 MBtu
-7.5˚F	24 h	3,452.8 MBtu	2,209.8 MBtu
-12.5˚F	0 h	0.0 MBtu	0.0 MBtu
TOTALS	**4,405 h/yr**	**292,339.6 MBtu/yr**	**187,097.3 MBtu/yr**

ECM #2- Building Envelope Improvements

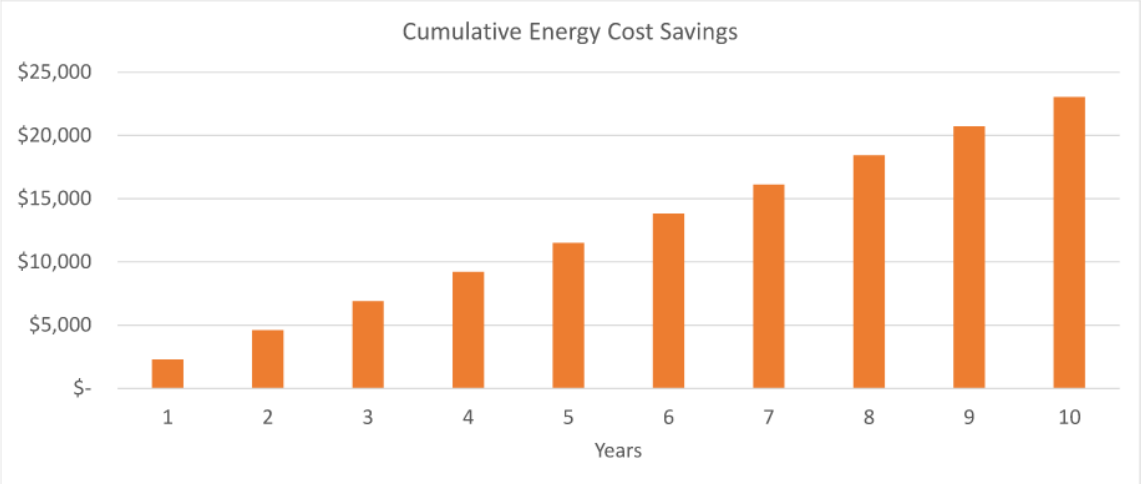
Total Impact of All Measures (see calculations on following pages)

	Energy Savings		
	mmBTU	$/mmBTU	Savings $
Heating	316	$ 5.64	$ 1,785
Cooling	20	$ 26.17	$ 520
Total	336		$ 2,305

Emissions Reductions for Total Energy Savings

Gas	Emissions Heating Fuel (kg / mmBTU)*	Emissions Heating Fuel2 (kg / mmBTU)	X Savings = (tons)	Emissions Cooling Fuel (kg / mmBTU)	X Savings = (tons)	Total Emissions Savings (tons)
CH4	0.005		0.0017	0	0.0007	0.0023
NOx	0.00011		0.00003	0.00260	0.00005	0.00009
CO2e	53		17	173	3	20

*Emission values from *Energy Star Technical Description of Greenhouse Gas Inventory*



Existing R-value	Measure	Area ft^2	Unit	Heat Loss (BTU / hr F) Existing	Retrofit
R5 Block Wall	5ft 2" thick 1.07 pcf hybrid SPF (add R-8.6)	4318	SF	864	318
R5 Block Wall	5ft 2" thick 1.07 pcf hybrid SPF (add R-8.6)	12000	SF	2400	882
R5 Block Wall	5ft 2" thick 1.07 pcf hybrid SPF (add R-8.6)	150	SF	30	11
R5 Block Wall	5ft 2" thick 1.07 pcf hybrid SPF (add R-8.6)	1320	SF	264	97
				0	0
				0	0
				0	0

Sum of Insulation Measures in Heat Loss Intensity (BTU/hr °F)

space	*1*	*1*
	Existing, K_{EX}	Retrofit, K_{HW}
Heat Loss, K	3,558	1,308

Energy Savings (mmBtu/year)

		Heating	Cooling
T_b & W_{in}		63	64
Jan	31	56	0
Feb	28	54	0
Mar	31	47	0
Apr	30	27	0
May	31	3	1
June	30	0	6
July	31	0	7
Aug	31	0	4
Sept	30	0	2
Oct	31	8	0
Nov	30	42	0
Dec	31	59	0

Climatic Data Used In Calculations for this Project

Source http://doe2.com/Download/Weather/TMY3/Statistics_Summary_for_All_Stations.exe

Location Used in Calculations

State	City
IL	Central Illinois Rg

Data for HVAC Capacity Calculations

Latitude	40.5
T_h	0.3
T_c	92
W_c	37.6

Data for Monthly Degree Calculations

	N	T_{out}	W_{out}	E_{sol}	WS
Jan	31	31	0.003	495	10.7
Feb	28	29	0.002	634	15.0
Mar	31	36	0.003	1083	13.7
Apr	30	47	0.004	1264	12.2
May	31	62	0.006	1979	11.1
Jun	30	74	0.011	2079	8.4
Jul	31	75	0.013	2050	8.7
Aug	31	70	0.012	1698	8.8
Sep	30	63	0.007	1422	9.7
Oct	31	54	0.005	1060	11.3
Nov	30	38	0.004	442	11.3
Dec	31	29	0.003	299	13.1
Ann.	365	51	0.006	1209	11.2
	σ_{yr}	18			

Estimating Degree Days from Monthly Avg Temperatures (Erb et. al 1983)

Erbs, D.G., S.A. Klein, and W.A. Beckman. 1983. Estimation of degreedays and ambient temperature bin data from monthly-average temperatures. ASHRAE Journal 25(6):60

$$HDD = \sigma_m * N^{(3/2)} * [(h/2) + \ln(\cosh(1.698*h)) * (1/3.396) + 0.2041]$$

$$CDD = \sigma_m * N^{(3/2)} * [(h'/2) + \ln(\cosh(1.698*h')) * (1/3.396) + 0.2041]$$

$$h \equiv (T_b - T_{out}) / (\sigma_m * (N)^{0.5})$$

$$h' \equiv (T_{out} - T_b) / (\sigma_m * (N)^{0.5})$$

$$\sigma_m = 1.45 - 0.029 * T_{out} + 0.0664 * \sigma_{yr} \text{ (in metric units)}$$

Calculating solar radiation on building surfaces

Done according to Duffie, J.A.; Beckman, W.A.; Solar Engineering of Thermal Processes
Hd/H following Collares-Pereira and Rabl correlation (1979)
Assumed isotropic sky (i.e. sky diffuse radiation and ground radiation are equal, no circumsolar effects)

Nomenclature

HDD	Heating degree days (°F days)	N	Number of days in month (-)
CDD	Cooling degree days (°F days)	W_{out}	Avg monthly outdoor abs humid. (lbwater/tondry_air)
T_b	Balance temp (°F)	W_{in}	Indoor abs humidity (lbwater/tondry_air)
T_{out}	Avg. monthly outdoor temp (°F)	W_c	1% Cooling design abs humidity (lbwater/tondry_air)
T_s	Avg. setpoint temp (°F)	WS	Avg monthly wind speed (mph)
K_{tot}	Total space heat loss (Btu/hr °F)	σ_m	Std Dev of temps within month (°F)
q_{gain}	Solar and internal heat gain (Btu/hr)	σ_{yr}	Std Dev of avg monthly temps (°F)
T_h	1% Heating design temp. (°F)	E_{sol}	Avg daily horizontal solar radiation (Btu/ft^2/day)
T_c	1% Cooling design temp. (°F)	E_{dir}	Avg daily vert. solar radiation *direction* (Btu/ft^2/day)

Calculated HDD for various balance temperatures

	T_b	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74
Jan	31	488	545	604	664	724	785	846	907	969	1030	1092	1154	1216	1277	1339
Feb	28	494	547	601	656	711	766	822	877	933	989	1045	1101	1157	1213	1268
Mar	31	345	399	454	512	570	630	690	751	812	873	934	996	1058	1120	1181
Apr	30	101	132	168	209	254	304	356	410	466	523	581	639	698	758	817
May	31	6	9	13	19	28	41	58	81	110	145	187	234	285	339	395
June	30	0	0	0	1	1	2	3	4	7	11	18	28	42	63	90
July	31	0	0	0	0	1	1	2	3	5	9	14	21	33	49	72
Aug	31	1	1	2	3	4	6	10	15	23	35	52	74	103	140	182
Sept	30	4	5	8	12	19	28	41	58	82	111	147	189	236	286	340
Oct	31	29	41	57	78	105	138	176	220	269	321	376	433	491	551	611
Nov	30	280	329	381	435	491	548	606	664	723	782	841	901	961	1021	1080
Dec	31	543	602	661	721	782	843	904	966	1027	1089	1151	1213	1274	1336	1398
Total		2290	2611	2951	3310	3690	4091	4512	4957	5425	5918	6437	6982	7553	8152	8776

Calculated CDD for various balance temperatures

	T_b	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74
Jan	31	17	12	9	7	5	3	3	2	1	1	1	1	0	0	0
Feb	28	10	7	5	4	3	2	1	1	1	1	0	0	0	0	0
Mar	31	32	24	17	13	9	7	5	3	2	2	1	1	1	0	0
Apr	30	125	96	72	53	38	28	20	14	10	7	5	3	2	2	1
May	31	489	430	372	317	264	214	170	130	98	71	50	35	24	16	11
June	30	834	774	714	655	595	536	477	418	361	305	252	202	156	117	84
July	31	905	843	782	720	658	596	535	475	415	356	299	244	194	149	110
Aug	31	729	668	606	545	485	425	366	310	256	206	160	121	88	62	43
Sept	30	517	458	401	345	292	241	194	151	115	84	60	42	29	19	13
Oct	31	289	239	193	152	117	88	65	47	33	23	16	11	8	5	4
Nov	30	40	29	21	15	11	8	6	4	3	2	1	1	1	1	0
Dec	31	13	10	7	5	4	3	2	1	1	1	1	0	0	0	0
Total		4000	3591	3201	2830	2480	2150	1842	1557	1295	1058	847	662	503	371	266

Calculated (W_{in}-W_{out})*N

	T_{in}	70
	RH_{in}	50%
	W_{in}	0.0089
Jan	31	0.000
Feb	28	0.000
Mar	31	0.000
Apr	30	0.000
May	31	0.000
June	30	0.054
July	31	0.123
Aug	31	0.084
Sept	30	0.000
Oct	31	0.000
Nov	30	0.000
Dec	31	0.000

Calculated Solar on Walls

	E_N	E_{NE}	E_E	E_{SE}	E_S	E_{SW}	E_W	E_{NW}
Jan	222	242	310	390	476	390	310	242
Feb	313	354	417	474	541	474	417	354
Mar	489	603	684	722	771	722	684	603
Apr	696	810	855	832	800	832	855	810
May	1003	1192	1215	1087	954	1087	1215	1192
Jun	1123	1304	1296	1122	965	1122	1296	1304
Jul	1068	1256	1263	1107	957	1107	1263	1256
Aug	838	1008	1057	990	909	990	1057	1008
Sep	580	752	848	867	888	867	848	752
Oct	394	493	611	703	813	703	611	493
Nov	224	243	295	351	414	351	295	243
Dec	160	167	205	251	300	251	205	167
Ann.	593	702	755	741	732	741	728	702

Monthly Energy Savings Due to Air Sealing

Degree Day/Capacity Calculations: ASHRAE Handbook of Fundamentals 2013 19.17 & 18.30

Heating Energy Savings $=Q*\rho*c_p*HDD/\eta_h*60min/h*24hr/day / 1000000 Btu/mmBtu$

Cooling Energy Savings $=Q*\rho*c_p*CDD/\eta_c**60min/h*24hr/day / 1000000 Btu/mmBtu$

Dehumid. Energy Savings $=Q*\rho*h_{fg}*/[(W_{out}-W_{in})*N*\eta_c]*60min/h*24hr/day/1000000Btu/mmBtu$

Air Leakage Rate Calculation: $=Q\ (cfm) = ELA*sqrt[C_w*WS^2+C_s*TDC*|T_{out} - T_{in}|]*Exf/(Exf+Inf)$

Wind Coefficient Least Squares Fit of ASHRAE HOF 16.24 Table 5, $C_w = m*NS+b$

Class	Shelter Description	m	b
I	No obstructions or local shielding	0.0033	0.0088
II	Typical shelter for an isolated rural house	0.0026	0.0068
III	Typical shelter caused by other buildings across street	0.0018	0.0048
IV	Urban buildings with obstacles more than one building height away	0.0011	0.0029
V	Other structures closer than one building height away	0.0003	0.0009

From Sherman and Grimsrud, 1980, "Infiltration-Pressurization Correlation; Simplified Physical Modeling" Report LBL-10163

WRAC Assumptions following ASHRAE HOF 16.23 and ALCAP

R= 0.5 half the building leakage in the walls

X= 0 equal amounts of leakage in the floor and ceiling

Thermal Draft Coefficient (TDC)

NS	1-2	3-5	5+
TDC	1	0.9	0.7

Stack Coefficient, $C_s=\{[(1+R/2)/3 * (1+X^2/(2-R^2)]^{1.5} * sqrt(g*8.2*NS/(T_{in}+459.7)\}^2$

Cs={[(1+0.5/2)/3 * (1+0^2/(2-0.5^2)]^1.5 * sqrt(32.2 ft/s2 *8.2*3/(72°F+459.7)}^2= 0

Example Walk Through Calculations

Building Admin Building Wind Exposure Class IV TDC 0.9 NS 3

January

Air Leakage Reduction = 0 sqin* SQRT [0.00605*10.7mph^2+0.045*0.9*|72°F-31°F|]*0.5 = 0 cfm

Heating =0 cfm *0.075 lb/ft2 *0.24 Btu/lb °F *1123 °F days /95% *60*24/1000000 = 0 mmBtu

Heating Cost Savings = 0 mmBtu*$0.56/Therm * 10mmBtu / therm = $0

July

Air Leakage Reduction = 0 sqin* SQRT [0.00605*8.7mph^2+0.045*0.9*|72°F-75°F|]*0.5 = 0 cfm

Cooling =0 cfm *0.075 lb/ft2 *0.24 Btu/lb °F *355 °F days /270% *60*24/1000000 = 0 mmBtu

Dehum. =0 cfm*0.075 lb/ft3*1050 Btu/lb*0.123 lb/lb / 270%*60*24/1000000 = 0 mmBtu

Cooling Cost Savings = (0 mmBtu+0 mmBtu)*$0.09/kWh * 293mmBtu / kWh = $0

Nomenclature

HDD	Monthly heating degree days (°F days)	NS	Number of Storeys
CDD	Cooling degree days (°F days)	g	Gravitational Constant (ft/s^2)
η_h	Heating System Efficiency (-)	ρ	Density of Air (lb/ft^3)
η_c	Cooling System Efficiency (-)	c_p	Heat Capacity of Air (btu/lb °F)
T_{in}	Avg Monthly Indoor Temp (°F)	h_{fg}	Heat of Evaporation of Air (btu/lb)
Q	Air Leakage Rate (cfm)	C_w	Wind Coefficient (-)
ELA	Effective Leakage Area (in^2)	C_s	Stack Effect Coefficient (-)
Exf/Inf	Ratio of holes above and below building's neutral pressure plane		

Energy Savings Due to Thermal Insulation

Degree Day/Capacity Calculations: ASHRAE Handbook of Fundamentals 2013 19.17 & 18.30

Monthly Heating Energy Savings $=(K_{EX}-K_{HW})*A*HDD/\eta_h$ / 1000000 Btu/mmBtu

Monthly Cooling Energy Savings $=(K_{EX}-K_{HW})*A*CDD/\eta_c$ / 1000000 Btu/mmBtu

Heating Capacity Savings $=(K_{EX}-K_{HW})*A*(T_{in}-T_h)$

Cooling Capacity Savings $=(K_{EX}-K_{HW})*A*(T_c-T_{in})$

Example Walk Through Calculations Building Admin Building

Existing Heat Loss Intensity (BTU/hr °F), $K_{EX} = 1/R_{EX} * A$ = 1/3*1000 = 333 Btu/hr °F

Retrofit Heat Loss Intensity (BTU/hr °F), $K_{HW} = 1/(R_{EX} + R_{RE}) * A$ = 1/(3+5)*1000 = 125 Btu/hr °F

January

Heating Energy Savings =(333Btu/hr °F -125 Btu/hr °F)*0°F days/95%/1000000 = 0 mmBtu

Heating Cost Savings =0mmBtu * $0.564/therm * 10mmBtu / therm = $0

July

Cooling Energy Savings $=(K_{EX}-K_{HW})*CDD/\eta_c$ / 1000000 Btu/mmBtu

(333 - 125)* 1000 * 0 / 270% /1000000 = **0.00 mmBtu**

Cooling Cost Savings = (Cooling + Dehumidifcation Savings) * Fuel Cost/unit * mmBtu/unit

0.00 mmBtu * $0.09 / * **293** mmBtu / kWh = **$0**

Heating Capacity Savings $=(K_{EX}-K_{HW})*(T_{in}-T_h)$

(333 - 125)* 1000 * (72 - 0.3) = **14933** **Btu/hr**

Cooling Capacity Savings $=(K_{EX}-K_{HW})*(T_c-T_{in})$

(333 - 125)* 1000 * (92.5 - 74) = **3850** **Btu/hr**

Nomenclature		*Example*			*Example*
HDD	Heating degree days (°F days)	*0*	A	A Area (ft^2)	*1000*
CDD	Cooling degree days (°F days)	*0*	R_{EX}	Existing R-Value (hr °F ft^2/Btu)	*3*
η_h	Heating System Efficiency (-)	*95%*	R_{HW}	Insulation R-Value (hr °F ft^2/Btu)	*5*
η_c	Cooling System Efficiency (-)	*270%*	R_R	Retrofit R-Value (hr °F ft^2/Btu)	
T_h	Heating Design Temp (°F)	*0.3*	K_{EX}	Existing Intensity (BTU/hr °F)	
T_c	Cooling Design Temp (°F)	*92.5*	K_R	Retrofit Intensity (BTU/hr °F)	

For thermal insulation effects of window films see "Energy Savings Due to Thermal Insulation"

Energy Savings Due to Solar Gains Reduction by Window Films

Monthly Heating Energy Costs $=[E*A*(SHGC_E-SHGC_R)]_{H,N,NW,E,SE,S,SW,W,NW}*N*SF$

Monthly Cooling Energy Savings $=[E*A*(SHGC_E-SHGC_R)]_{H,N,NW,E,SE,S,SW,W,NW}*N*SF$

There is no effect on heating capacity requirements

Cooling Capacity Savings $=[E/6*(SHGC_E*A-SHGC_R*A)]_{H,N,NW,E,SE,S,SW,W,NW}$

Solar Utilization Factor, SF, is the portion of of solar heating affecting energy use.

Source of Solar Utilization Factor, SF, estimation model

SF Model and Coefficients from Yohanis, T., Norton, B., (1999), "Utilization factor for building solar-heat gain for use in a simplified energy model", *Applied Energy* 63, pp. 227-239.

$SF_{heating}$ $=1-exp(-k/(q_{gain}/q_{loss}-D))$

$SF_{cooling}$ $=exp(-k/(q_{gain}/q_{loss}-D))$

Thermal Mass	k	D
light	1.00	-0.02
heavy	1.03	-0.02
very heavy	1.19	-0.04

We don't know q_{gain} or q_{loss} directly but they can be calculated from balance temperature, T_b

$T_b = T_s - q_{gain}/K_{tot}$ or $K_{tot} = q_{gain}/(T_s - T_b)$

$q_{loss} = K_{tot} * (T_s - T_{out})$ so $q_{loss} = q_{gain}/(T_s - T_b) * (T_s - T_{out})$

Therefore $q_{gain}/q_{loss} = q_{gain}/ [q_{gain}/(T_s - T_b) * (T_s - T_{out})] = (T_s - T_b) / (T_s - T_{out})$

$SF_{heating}$ $=1-exp(-k/((T_s - T_b) / (T_s - T_{out})-D))$

$SF_{cooling}$ $=exp(-k/((T_s - T_b) / (T_s - T_{out})-D))$

Walk Through Example Calculation Building Admin Build Thermal Mass light

Existing East Face Window Retrofit $SHGC_R=SHGC_E*SHGC_{HW}$ 0.90 * 0.25 = 0.23

July $SF_h = exp(-k/((T_s - T_b) / (T_s - T_{out})-D))$ T_b = 64 T_{out}= 75 T_s = 74

exp [- 1.00 / ((74 - 64) / (74 - 75.2) - -0.02)] = 100%

Monthly Cooling Energy Savings $=[E*A*(SHGC_E-SHGC_R)]_E*N*SF/\eta_c/$ 1000000 Btu/mmBtu

[1263 * 1000 * (0.90 - 0.23)] * 31 100% / 270% /1000000

= **10** **mmBTU**

July Cost Savings = **10** **mmBtu** * $0.09 / * 293 mmBtu / kWh = **$256**

January $SF_c =1-exp(-k/((T_s - T_b) / (T_s - T_{out})-D))$ T_b = 67 T_{out}= 31 T_s = 74

1 - exp [- 1.00 / ((72 - 67) / (72 - 38) - -0.02)] = 100%

Monthly Heating Energy Cost $=[E*A*(SHGC_E-SHGC_R)]_E*N*SF/\eta_h/$ 1000000 Btu/mmBtu

[310 * 1000 * (0.90 - 0.23)] * 31 * 100% / 95% /1000000

= **7** **mmBTU**

January Cost Savings = **7** **mmBtu** * $0.56 /therm * 10 mmBtu / therm = **$38**

Nomenclature

		Example
T_b	Balance temp (°F)	
T_{out}	Avg. monthly outdoor temp (°F)	
T_s	Avg. setpoint temp (°F)	
K_{tot}	Total heat loss intensity (Btu/hr °F)	
q_{gain}	Solar and internal heat gain (Btu/hr)	
q_{loss}	Total heat loss (Btu/hr)	
N	Number of days in month (-)	
η_h	Heating System Efficiency (-)	
SF	Solar Utilization Factor (-)	
A	Area (ft^2)	*1000*
$SHGC_E$	Existing Solar Heat Gain Coef. (-	*0.90*
$SHGC_{HW}$	Film Solar Heat Gain Coef. (-)	*0.25*
$SHGC_R$	Retrofit Solar Heat Gain Coef. (-)	
E_{sol}	Avg daily hor. solar radiation (Btu/ft^2/day)	
E_{dir}	Avg daily vert. solar radiation (Btu/ft^2/day)	
k, D	Coefficients from Yohanis and Norton (1999)	

EXHIBIT B – CERTIFICATE OF SUBSTANTIAL COMPLETION

Project Name: _____

Date of Substantial Completion: _____

Owner Name: _____

Project Address: _____

_____

This Certificate of Substantial Completion applies to all Work under the Contract dated _____ and any Change Order or other documents subsequently executed in relation to the Contract. The Work to which this Certificate applies has been inspected by authorized representatives of Owner and Contractor and is hereby declared substantially complete in accordance with Agreement. Punch List dated ___ , attached hereto, identifies remaining Work to be completed.

Centrica Business Solutions Services, Inc.

By: _____

Date: _____

Acknowledged:

Owner: _____

By:_____

Date: _____

SCHEDULE 1
The Facilities

The following facilities are included in the scope of work:

Facility	Address
Joseph G. Cannon Building	201 N Vermilion St. Danville, IL 61832

SCHEDULE 2A
Scope of ECM Work

The following Energy Conservation Measures (ECMs) will be completed in this project. A scope of work for each ECM follows the Table below.

ECM Name
1 – Window Replacement
2 – Building Envelope Improvements

ECM #1: Window Replacement

This ECM will be completed in the following facilities:

- Joseph G. Cannon Building

The Joseph G. Cannon building was transferred to Vermilion County from the federal government via the Historic Surplus Property Program. The preservation of this historic building is overseen by the National Parks Service (NPS) and the Illinois State Historic Preservation Office (ILSHPO). Centrica will restore or replace windows for the 98 total window openings at the Joseph G. Cannon Building.

In accordance with ILSHPO and NPS guidance, Centrica will replace the existing "non-historic" windows with aluminum clad wood, low E, Argon filled windows. The existing "historic" windows will be restored, retrofit with insulated glass, and reinstalled into the existing frames.

All modifications to the windows will be approved by the ILSHPO and the NPS.

Many of the existing windows are not original to the building, as they were replaced in the 1970s. These windows are now in very poor condition and must be replaced. Centrica will replace windows for a total of 65 window openings.

An evaluation was performed to determine the existing windows believed to be original to the building. Centrica observed and will restore original windows in eighteen (18) window openings. Additionally, fifteen (15) window openings on the first floor were found to have original transom windows with the lower sashes having been replace. Centrica will restore transom windows and replace the lower sashes in these fifteen (15) windows openings.

In summary, a total of (98) window openings will be either replaced, restored, or a combination of the two.

Work will include:
Windows to be Replaced:

- Interior trim will be repaired as needed with stain matching the existing mill work.
- Damage to interior plaster will be repaired as needed.
- New exterior sills and perimeter trim will be applied.
- Architectural renderings, application processing, and iterations to the design are expected to be part of the bid.
- New windows will meet or exceed U value of 0.35.
- New windows will be low-e/argon filled.
- Remove and replace any interior window treatments as needed.
- Furnish and install new windows and insulate perimeter.
- Furnish and install new brickmold to match new window finish.
- Caulk both interior and exterior of the new windows.

- Clean windows following installation.
- Obtain any necessary permits.
- Instruct owner's designated operators on the operation and maintenance of the new windows.
- Work for these Items can be assumed to be conducted during normal working hours.

Windows to be Restored:

- Sashes will be stripped, epoxy repair where needed, and refinished.
- Insulated glass will be used in restored sashes.
- Weatherstripping will be applied.
- Brickmould will be restored and reinstalled for each of these window openings.
- Remove window board up.
- Refinish window frames prior to reinstallation.
- Repair sills as needed.
- Interior trim will be repaired as needed with stain matching the existing mill work.
- Coordinate paint for new windows to ensure restored and new window paint match.
- Remove and replace any interior window treatments as needed.
- Receive and install refurbished and new sashes and insulate perimeter.
- Caulk both interior and exterior of the installed windows.
- Clean windows following installation.
- Obtain any necessary permits.

Excluded Work:

- Removal of hazardous materials including asbestos and lead
- Revision requests from ILSHPO final review. Significant changes from ILSHPO or NPS may be subject to a change order.

ECM #2: Building Envelope Improvements

This ECM will be completed in the following facilities:

- Joseph G. Cannon Building

Centrica will make improvements to the building's attic insulation by applying spray foam insulation to the underside of the roof deck and parapet walls. Doing this will bring the attic HVAC equipment into the building envelope, resulting in a reduction of energy loss to the unconditioned space.

Work will include:

- Insulate the roof deck with 2'' Hybrid spray foam insulation, 8,636 board feet.
- Insulate the parapet walls and the dormers with 2'' hybrid spray foam insulation, 24,300 board feet.
- Insulate the exterior wall at the 2-story section of the attic by the attic entrance with 2'' hybrid spray foam insulation, 2,640 board feet.
- All spray foam insulation will be R-4.3 per inch or better.
- Apply intumescent paint as required by local code.

Excluded Work:

- Removal of hazardous materials including asbestos and lead

SCHEDULE 2B
Scope of Services

Measurement and Verification Services

Centrica will provide energy savings Measurement and Verification services for eight (8) years. Centrica shall provide Owner with an annual energy savings report that calculates annual energy savings according to the Energy Savings Methodologies defined in Schedule 5.

The first report will be due one year and 60 days after the Substantial Completion Date, which coincides with the end of the implementation period, and the subsequent reports will be due one year and 60 days thereafter for seven (7) additional years.

Operation and Maintenance Services

During the term of this Agreement, the Owner will be responsible for the operation and maintenance on all equipment and systems as per manufacturer's recommendations. Centrica will provide maintenance training to the Owner's designated personnel and will supply supporting documents for maintenance functions. Centrica will provide a one-year workmanship warranty on equipment associated with the Scope of ECM Work provided in Schedule 2A.

During the term of this agreement, the Owner will be responsible for warranty claim administration and replacement of failed components.

SCHEDULE 3

ECM Work Schedule

Task Name	Duration (Days)	Start	Finish
Contract Execution		**7-Oct-24**	
1 – Window Replacement	120	4-Jan-24	6-June-25
2 – Building Envelope Improvements	45	4-Nov-24	21-Dec-24
Expected Substantial Completion			**30-June-25**

* Material lead times have been estimated by each vendor to build this schedule, however, (consistent with standard industry practice for projects of a similar nature) certain lead times may be extended for reason's outside of Centrica's control. Based on latest lead times, Centrica expects to reach substantial completion for the ECM Works by June 30, 2025. Centrica will keep Owner informed of any changes to expected lead times that are likely to impact schedule. In all cases, Centrica anticipates the ECM Works being complete by and no later than December, 31st, 2025.

SCHEDULE 4
As-Built Drawing Requirement

The as-built requirements for each ECM are provided below:

ECM #1: Window Replacement

At the end of the installation Centrica will supply an electronic PDF of the window cutsheets, as-built shop drawings, and O&M material.

ECM #1: Building Envelope Improvements

At the end of the installation Centrica will supply an electronic PDF of the installed building envelope improvements.

SCHEDULE 5
Energy Savings Schedule

Section 1: Summary of Energy Savings

The energy reduction in Year 1 for each ECM is summarized in Table 1.

Table 1 - Year 1 Energy Usage Savings by ECM

ECM	Electric Usage Savings (kWh/yr)	Natural Gas Usage Savings (therm/yr)
1 – Window Replacement	7,812	999
2 – Building Envelope Improvements	2,931	1,580
Total	**10,743**	**2,579**

Annual Energy Cost Savings
The annual savings are calculated for each year by applying an annual energy cost escalation rate of 3% as shown in Table 2. The energy cost savings are calculated by multiplying the energy usage savings by the baseline rates shown in Table 3.

Avoided Capital Cost Savings
An annual Avoided Capital Cost Savings of $122,500 is applied in Year 1 and escalated at 3% for each year of the term as described in Table 2. The Avoided Capital Cost Savings are associated with replacing the windows at the Joseph G. Cannon Building. The stipulated Avoided Capital Cost Savings will not be measured or verified during the term.

Table 2 - Annual Cost Savings

Annual Period	Electricity Cost Savings	Natural Gas Cost Savings	Avoided Capital Cost Savings	Total Savings
Year 1	$959	$1,455	$122,500	$124,914
Year 2	$988	$1,499	$126,175	$128,662
Year 3	$1,018	$1,544	$129,960	$132,522
Year 4	$1,048	$1,590	$133,859	$136,497
Year 5	$1,080	$1,638	$137,875	$140,593
Year 6	$1,112	$1,687	$142,011	$144,810
Year 7	$1,145	$1,738	$146,271	$149,154
Year 8	$1,180	$1,790	$150,660	$153,630

Table 3 – Utility Rates Summary

Building	Electric Blended Rate ($/kWh)	Natural Gas Rate ($/therm)
Joseph G. Cannon Building	$0.0893	$0.564

Section 2: Measurement and Verification Options

Measurement and verification of energy savings will be based on the International Performance Measurement and Verification Protocol (IPMVP). This plan was developed by Steve Rickels, Certified Measurement & Verification Professional (CMVP).

Option A - Retrofit Isolation: Key Parameter Measurement. Savings are determined by field measurement of the key performance parameter(s) which define the energy use of the ECMs affected system(s) and/or the success of the Project. Measurement frequency ranges from short-term to continuous, depending on the expected variations in the measured parameter and the length of the reporting period. Parameters not selected for field measurement are estimated.

Option B – Retrofit Isolation or System Level Approach: All Parameter Measurement. Savings are determined by field measurement of all parameters affected by the ECM. No parameter estimations will be made to determine the energy savings of the ECM. Measurements can be short-term or continuous, depending on the expected variations in the measured parameters and the length of the reporting period.

Option C – Whole Facility: Savings are determined by measuring energy use at the whole facility or sub-facility level. Continuous measurements of the entire facility's energy use are taken annually throughout the reporting period. All changes that occur in the facility or sub-facility are captured in this measurement. Periodic inspections of the facility may be required to document the operating conditions and any changes that occur in the facility.

Option D – Calibrated Simulation: Savings are determined by modeling a ECM in computer software that has been calibrated to the facilities conditions. Simulations can be done for an entire facility affected by multiple ECMs or it can be done for a single ECM. Simulations will require calibration to the facilities utility bills or metering data to ensure accuracy. All assumptions and inputs for the model will need to be carefully documented.

Stipulation – This approach is intended for ECMs where end use capacity or operational efficiency; demand, energy consumption or power level; or manufacturer's measurements, industry standard efficiencies or operating hours are assumed and are used in a calculation or analysis method that has stipulated the savings outcome.

Table 4 provides an overview of the key parameters to be analyzed and their frequency. The M&V schedule is broken down into two frequency types:

1. First Year Measurements - to be completed in the first M&V period only
2. Annual Measurements - to be conducted in every year of the M&V term

Table 4: M&V Key Parameters Option and Frequency

Energy Conservation Measure	M&V Option	Key Parameter(s)	First Year	Annual
1 – Window Replacement	A	Visual Inspection	Yes	No
2 – Building Envelope Improvements	A	Insulation Thickness	Yes	No

Section 3: Measurement and Verification Plan (Energy Savings Methodology)
The purpose of the Measurement and Verification (M&V) Plan is to identify the methods, measurements, and procedures and tools that will be used to calculate the Savings for each ECM. Savings are determined by comparing baseline usage and cost against the post implementation usage and costs.

Baseline Operating Conditions: Baseline operating conditions provide a summary of the building use, equipment and operating modes during the baseline period. No significant changes are expected related to these conditions; however, if a change occurs in these conditions, the baseline energy usage may be adjusted (permanently or temporarily). Table 5 provides a summary of the baseline operating conditions.

Table 5 - Baseline Operating Conditions Summary

Building	Building Weekday Occupancy	Building Weekend Occupancy	Square Footage
Joseph G. Cannon Building	8AM – 4:30 PM	Closed	54,000

Independent Variables:

Independent variables include factors that can affect the facility's energy consumption. The largest independent variable is typically weather. For example, an abnormally cold winter will result in additional heating fuel (e.g. natural gas or propane) consumption. A safety factor has been applied to the calculations to minimize the impact of abnormal weather conditions but if a change occurs outside the range of the safety factor, a routine adjustment to the baseline energy usage may be done to fairly represent this.

Static Factors:

Static factors are components of the energy savings calculations that are not subject to change during the measurement and verification period. Within this document they are referred to as "Stipulated Parameters". An example of a stipulated parameter is often equipment and/or facility operating hours. These parameters were either measured or assumed during the investment grade audit and are non-variable from the baseline to the proposed energy consumption periods. If changes to the stipulated parameters are reported by the Owner to have occurred, a non-routine savings adjustment may be performed to represent this. If the change in the stipulated parameter cannot be adequately quantified, or the adjusted savings impacts the total project savings such that a savings shortfall were to occur, Centrica may return the parameter to its stipulated value outlined in this document and calculate the actual energy savings with said value.

ECM #1: Window Replacement

Centrica will replace existing windows at the Joseph G. Cannon Building as indicated in Schedule 2A.

Facilities Affected

This FIM will be accomplished at the following facilities:

- Joseph G. Cannon Building

M&V Option

Option A was selected to provide a cost-effective means to evaluate savings.

Overview of M&V Activities

The key parameter to be verified post-implementation will be the average installed window U-Factor as listed in final construction as-builts, as well as installed window sizes and quantities. M&V services for this measure will be performed in Year 1 only, after which the savings will be stipulated and agreed upon by the Owner for the remaining term of the contract.

Baseline FIM Measurements

1. Survey of existing window sizes and quantities (Appendix B of Exhibit A)

Post Installation FIM Measurements

1. Visual inspection of installed window U-Factor from manufacturer cutsheets
2. Visual inspection of installed window sizes and quantities

Stipulated FIM Parameters

Stipulated parameters were based on current equipment nameplates, drawings, and engineering estimates as defined in the table that follows:

Window Replacement	
Heating Efficiency	100%
Cooling Efficiency	0.90 kW/ton
Heating Temperature Setpoint	69.0˚F
Outside Air Temperature	BIN Maker Pro for Lafayette, IN
Heating Season Hours	BIN Maker Pro for Lafayette, IN
Average Daily Transmitted Solar Radiation	NREL Weather Data for Springfield, IL
Number of Cooling Days Per Month	Appendix B of the IGA
Post-Implementation Window Solar Radiation Rejection Factor	27%
Baseline Average Window U-Factor	0.50 Btu/(h·ft²·˚F)

Savings Calculation Method

Savings associated with the window replacements occur as a result of reduced thermal conduction and solar radiation through the new windows. Thermal conduction savings are determined by improving the U value of the windows. Solar radiation savings are associated with improved solar

heat rejection with the new windows. By reducing thermal conduction and radiation through the new windows, the rate of heat transfer is reduced, resulting in energy savings. To estimate energy savings, a spreadsheet model was developed to determine thermal losses and energy savings. The calculations used to determine the savings are as follows:

$$Annual\ Natural\ Gas\ Savings\left(\frac{therms}{yr}\right) =$$
$$= Baseline\ Heating\ Conduction\left(\frac{therms}{yr}\right)$$
$$- Post\ Implementation\ Heating\ Conduction\left(\frac{therms}{yr}\right)$$

$$Annual\ kWh\ Savings\left(\frac{kWh}{yr}\right)$$
$$= Baseline\ Cooling\ Energy\left(\frac{kWh}{yr}\right)$$
$$- Post\ Implementation\ Cooling\ Energy\left(\frac{kWh}{yr}\right)$$

$$Baseline\ Heating\ Conduction\ (therm/yr)$$
$$= \sum bin\ [Baseline\ U\ Factor\ \times\ Window\ Area\ (sqft.)$$
$$\times\ (Heating\ Setpoint - OAT)\ \times\ Annual\ Bin\ hours\ \times\ Heating\ Efficiency$$
$$/\ 100{,}000\ Btu/therm]$$

$$Post\ Implementation\ Heating\ Conduction\ (therm/yr)$$
$$= \sum bin\ [Post\ Implementation\ U\ Factor\ \times\ Window\ Area(sqft.)$$
$$\times\ (Heating\ Setpoint - OAT)\ \times\ Annual\ Bin\ hours\ \times\ Heating\ Efficiency$$
$$/\ 100{,}000\ Btu/therm]$$

$$Baseline\ Cooling\ Energy\ \left(\frac{kWh}{yr}\right)$$
$$= \sum[Baseline\ Monthly\ Cooling\ Load(MBtu/month)]$$
$$\times Cooling\ Efficiency\ /\ (12\ MBH/ton)$$

$$Baseline\ Monthly\ Cooling\ Load\ (MBtu/month)$$
$$= \sum building\ face\ [Window\ Area(sqft.)$$
$$\times\ Average\ Daily\ Transmitted\ Solar\ Radiation$$
$$\times Number\ of\ Cooling\ Days\ /\ 1{,}000\ Btu/MBtu]$$

$$Post\ Implementation\ Cooling\ Energy\ \left(\frac{kWh}{yr}\right)$$
$$= \sum[Post\ Implementation\ Monthly\ Cooling\ Load(MBtu/month)$$
$$\times Cooling\ Efficiency] / (12\ MBH/ton)$$

$$
\begin{aligned}
&Post\ Implementation\ Monthly\ Cooling\ Load\ (MBtu/month) \\
&\quad = \sum building\ face\ [(1 \\
&\quad - Solar\ Radiation\ Rejection\ Factor) \times Window\ Area(sqft.) \\
&\quad \times\ Average\ Daily\ Transmitted\ Solar\ Radiation \\
&\quad \times Number\ of\ Cooling\ Days\ /\ 1{,}000\ Btu/MBtu]
\end{aligned}
$$

$$
\begin{aligned}
&Annual\ Cost\ Savings\ \left(\frac{\$}{yr}\right) \\
&\quad = Annual\ Natural\ Gas\ Savings\ \left(\frac{therms}{yr}\right) \\
&\quad \times\ Annual\ Natural\ Gas\ Rate\ \left(\frac{\$}{therm}\right) \\
&\quad +\ Electric\ Savings\ \left(\frac{kWh}{yr}\right) \times Electric\ Blended\ Rate\ \left(\frac{\$}{kWh}\right)
\end{aligned}
$$

ECM #2: Building Envelope Improvements

Centrica will implement building envelope improvements as indicated in Schedule 2A.

Facilities Affected

This ECM will be accomplished at the following facilities:

- Joseph G. Cannon Building

M&V Option

Option A was selected to provide a cost-effective means to evaluate savings.

Overview of M&V Activities

The key parameter to be measured post-implementation will be the thickness of the spray foam insulation at various locations for the affected areas. M&V services for this measure will be performed in Year 1 only, after which the savings will be stipulated and agreed upon by the Owner for the remaining M&V term.

Baseline ECM Measurements

1. Survey of existing attic insulation.

Post Installation ECM Measurements

1. Spray foam insulation thickness at 10 locations along the roof deck
2. Spray foam insulation thickness at 10 locations along the parapet walls
3. Spray foam insulation thickness at 10 locations along the dormers
4. Spray foam insulation thickness at 10 locations along the exterior wall at the 2-story section of the attic by the attic entrance.

Stipulated ECM Parameters

The parameters in the tables below have been stipulated and agreed to by the Owner. These parameters are based on equipment nameplates, drawings and engineering estimates.

Parameter	Value
Wind Velocity	Appendix B of Exhibit A
Size of Air Gap	Appendix B of Exhibit A
Gap Size	Appendix B of Exhibit A
Air Leakage Rate	Appendix B of Exhibit A
Heating Efficiency	95%

Parameter	Value
Cooling Efficiency	Appendix B of Exhibit A
Space Heating Temperature	Appendix B of Exhibit A
Space Cooling Temperature	Appendix B of Exhibit A
Outside Air Temperature	BinMaker Pro for Lafayette, IN
Heating and Cooling Season Hours	BinMaker Pro for Lafayette, IN
Supply Air Enthalpy	Psychometric Chart
Outside Air Enthalpy	BinMaker Pro for Lafayette, IN
Stack Coefficient	Appendix B of Exhibit A
Wind Coefficient	Appendix B of Exhibit A
Shielding Class	Appendix B of Exhibit A

Savings Calculation Method

Savings associated with the building envelope improvements will be based on reduced building infiltration and thermal losses. Calculations used to determine the savings are as follows (detailed calculations can be found in Appendix B of Exhibit A):

$$Annual\ Natural\ Gas\ Savings\ \left(\frac{therms}{yr}\right) = Baseline\ Natural\ Gas\ Energy\ Loss\ \left(\frac{therms}{yr}\right) - Post\ Implementation\ Natural\ Gas\ Energy\ Loss\ \left(\frac{therms}{yr}\right)$$

$$Annual\ kWh\ \ Savings\ \left(\frac{kWh}{yr}\right) = Baseline\ Electric\ Energy\ Loss\ \left(\frac{kWh}{yr}\right) - Post\ Implementation\ Electric\ Energy\ Loss\ \left(\frac{kWh}{yr}\right)$$

$$Annual\ Cost\ Savings\ \left(\frac{\$}{yr}\right)$$
$$= Annual\ Natural\ Gas\ Savings\ \left(\frac{therms}{yr}\right)$$
$$\times\ Annual\ Natural\ Gas\ Rate\ \left(\frac{\$}{therm}\right)$$
$$+\ Electric\ Savings\ \left(\frac{kWh}{yr}\right) \times Electric\ Blended\ Rate\ \left(\frac{\$}{kWh}\right)$$

*Complete set of calculations can be found in Appendix B of Exhibit A.

Section 4: Incentives and Rebates

ECM Name	Incentive Amount
1 – Window Replacement	$2,850
2 – Building Envelope Improvements	$0
Total	**$2,850**

The incentives are estimated at $2,850. The customer will retain all incentives and be responsible for shortfalls as well as receive any upside.

SCHEDULE 6A
ECM Work Schedule of Values

Item	Work Item	Value
1	Material Ordering and Engineering	$684,184
2	Window Replacement	$2,308,072
3	Building Envelope Improvements	$86,574
4	Final Closeout	$342,092
Total Project Value		$3,420,922

Each value/ECM may be invoiced upon monthly progress billing, including 20% Material Ordering & Engineering and 10% Closeout.

SCHEDULE 6B
Services Schedule of Values

Measurement & Verification Services

Item	Work Item	Value
1	Year 1 M&V	$ 2,384
2	Year 2 M&V	$ 818
3	Year 3 M&V	$ 842
4	Year 4 M&V	$ 868
5	Year 5 M&V	$ 893
6	Year 6 M&V	$920
7	Year 7 M&V	$ 946
8	Year 8 M&V	$ 975

The Owner may elect to sever M&V services at the beginning of each reporting period. Further, the Owner may elect to negotiate to extend service beyond year 8.