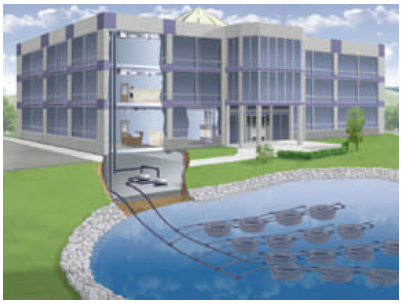
# SECTION 6-314: ENVIRONMENTAL TECHNOLOGY STANDARDS.

## A. Purpose of Environmental Technology Standards.

Environmental Technology Standards (ETS) are established to ensure that environmental and clean technologies are good neighbors to adjoining properties by controlling their appearance and site placement, and the emission of noise, glare, vibration and liquid wastes; to provide stewardship for localized energy generation; to permit the installation, construction, maintenance and use of clean technologies in the community; and to promote their safe, effective and efficient use. In addition to the purpose here stated, the Environmental Technology Standards strive to promote and accomplish the following:

1. **Promote Energy Efficiency and Conservation**. Reduce the environmental impact of energy consuming buildings and facilities through the investment in energy upgrades to building systems and infrastructure; Offset the energy draw of existing buildings from the energy utility grid; Create opportunities for net zero energy building systems;



Renewable energy technologies integrated on existing buildings. Examples from other communities. Above: Geothermal energy; Right and Below: Rooftop solar energy; Bottom Right: Wind energy;

2. **Promote Sustainable Energy Production**. Promote the production of energy from sources other than fossil fuels, nuclear fission, or any other fuel source that is not renewable; Use energy derived from the sun, closed and open loop geothermal systems, wind flows, and installations and measures taken to retrofit buildings to improve energy and resource efficiency and conservation;

3. **Conserve Resources**. Conserve the prior investment of resources and energy of existing buildings or sites; Conserve and preserve open space, monuments, landmarks, and the built and natural environments;

4. **Promote High Performance Buildings**. Provide for new and alternative methods to build high performance building facilities;

5. **Ensure or Increase Property Values**. Ensure and increase property values through continued investment in sustainable energy technologies that provide lower utility costs for residents and businesses in the Village;

6. **Promote Jobs and Economic Development**. Promote job creation and retention and general economic development through the sale, manufacturing, installation and maintenance of renewable energy and high performance systems that will in turn reduce utility costs for residents and businesses in the Village;

## B. Terms.

Definitions for the below terms can be found in Section 2-102 Definitions of the Land Development Code.

1. **Building Mounted/ Co-Location**.

2. **Environmental/ Clean Technology (ECT)**.

3. **Renewable Energy**.

4. **Renewable Energy Conversion System (RECS)**.

5. **Sustainable Development**.

## C. **Environmental Clean Technology Review and Notification Process**.

The following outlines the development review process required for installing an environmental clean technology (ECT). ECTs include but are not limited to renewable energy systems such as wind energy conversion systems (WECS), solar energy systems (SES) and geothermal energy systems (GES). See Section 2-102 Definitions for more information. Unless otherwise noted in these regulations, the following shall apply:

1. **Petition**. Petitioners seeking to construct or install an ECT must submit a complete petition to the Development Services Department and apply for building permits.

2. **Review**. The application shall be reviewed in accordance with these regulations and, if necessary, shall be deliberated at the next available meeting of the Plan Commission.

3. **ECT Review**. An ECT Review is a review at Plan Commission that requires notification of neighboring properties. There are two categories of ECT Review: Residential and Commercial. For Residential ECT projects, all residential uses within three hundred thirty (330) feet of an ECT development shall be notified. For Non-Residential ECT projects, all residential uses within five hundred (500) feet of an ECT development shall be notified. Notification shall be issued via certified mail, with return receipt requested, at least fifteen (15) to thirty (30) days in advance of the Plan Commission meeting. If no residential uses are within the stated buffers, notices are not necessary for the review at Plan Commission.

    a. The notice shall be titled “Environmental Clean Technology Review Notice”. The notice shall include the date, time and place of the Plan Commission meeting and the contact information of the Development Services Department. The notice shall describe the type of ECT system that is proposed for the property and that the intent is to, for example, generate renewable energy in the case of WECS etc.

    b. A contributing structure in the Old Orland Historic District or an Orland Park Landmark shall require a Certificate of Appropriateness (COA) review at the Historic Preservation Review Commission (HPRC) for an ECT rather than a Plan Commission review. The same notification requirements shall be under taken for a COA.

Opposite: Wind turbines integrated into existing architecture in Chicago.

## D. Wind Energy Conversion System (WECS) Regulations.

A WECS consists of a wind turbine and blades (nacelle and rotor), one tower, support system and associated controls and conversion electronics for the purpose of converting kinetic energy from the wind into electrical energy. WECS have a wide range of rated capacities from less than one (<1) kilowatt (kW) to 1.5 megawatts (MW) and can have a height of up to two-hundred fifty (250) feet.

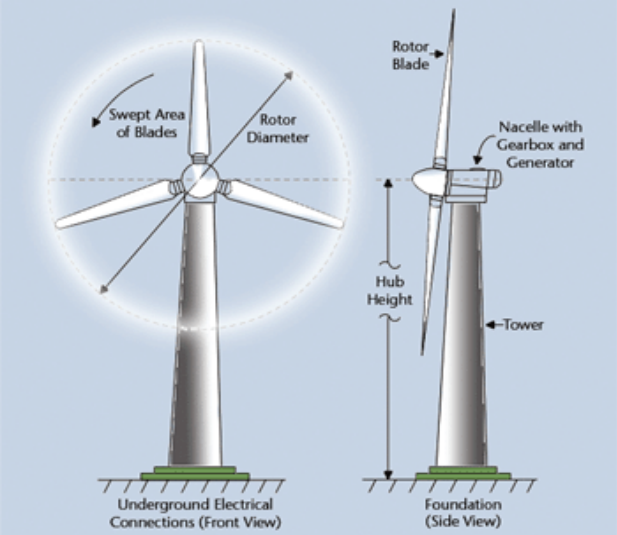


Image Source: European Commission http://ec.europa.eu

The following regulations apply to the four classes of WECS recognized by the Land Development Code:

RESWECS,
MINIWECS,
SWECS, and
UWECS.

Lattice or guyed WECS towers are not permitted for any WECS type or in any zoning district. The exception to this rule includes lattice towers under thirty (30') feet, towers with a rotor diameter of five (5') feet or less, and towers that generate power for pond aerators or farm well pumps.

1. **RESWECS**. Residential Scale Wind Energy Conversion Systems (0 kW to 10 kW) are accessory uses mounted directly on residential rooftops and are permitted via an ECT Review in the E-1, R-1, R-2, R-2A, R-3, R-3A and R-4 zoning districts, subject to these regulations. In OOH a Certificate of Appropriateness is required per Sections 5-110 and 6-209. Freestanding WECS are prohibited in residential districts.

   a. **Height**. RESWECS shall not increase the height of a building by more than twelve (12') feet from the roofline. They shall not be attached to chimneys.

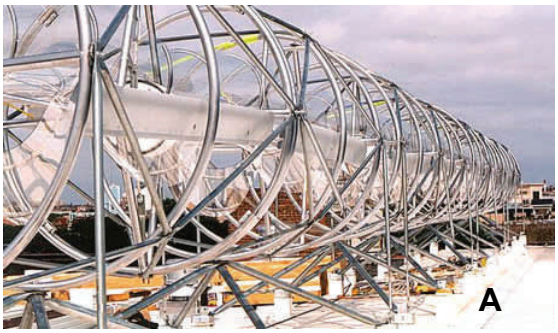
**Table 6-314.D.1.a**

| Zoning | Height Permitted w/ RESWECS |
|---|---|
| **E-1 & R-1** | 47 feet |
| **R-2 thru R-3A** | 42 feet |
| **R-4** | 64 feet |
| **OOH** | 47 feet |

Top: Wind turbine diagram;
Top right: Rendering with residential rooftop turbine from Honeywell;
Bottom: Wall-mounted and roof mounted monopole rooftop turbines;

2. **MINIWECS**. Mini Wind Energy Conversion Systems (0 kW to 10 kW) are accessory uses mounted directly on buildings or are freestanding towers and are permitted via an ECT Review if applicable, or otherwise an appearance review, in the BIZ, COR, MFG, and ORI zoning districts, subject to these regulations. Only MINIWECS mounted on buildings are permitted in the VC district.

   a. **Height**. The maximum height of a MINIWECS shall not exceed fifty-five (55) feet from ground level to the top of the rotor blade.


A


B


C


D

E

*MINIWECS are intended to provide a small scale application of wind technologies on non-residential properties in the Village. They are adaptable systems that can easily be retro-fitted onto existing infrastructure and provide opportunities for distributed energy generation without large monopoles, turbines, new infrastructure or much visual or acoustic impact.*

*MINIWECS such as those in Figures A and B at left demonstrate rooftop turbines for non-residential and mixed-use buildings. Figure A is a horizontal "aeroturbine" that lays on rooftops. Such turbines usually require a minimum amount of rooftop square footage to obtain the necessary capacity. They also need open spaces that are not blocked by rooftop mechanicals, parapets or other potential wind obstructions. Large, wide and tall rooftops are appropriate locations for these. Figure B is a stand-up roof-mounted turbine that extends higher than the roofline. This turbine is more adaptable as it can be raised vertically to access wind above any potential obstructions.*

*MINIWECS can also on occasion be freestanding renewable energy systems as depicted in Figure C. Mixed-use districts are often diverse areas that can accommodate infrastructure that is typically not found in single-use districts. In Figure C, the monopole stands among mixed-use and multi-family residential structures.*

*Figures D and E demonstrate concepts to utilize existing vertical infrastructure for MINIWECS distribution. Mounted on parking lot or street light poles, MINIWECS can take advantage of height and wide-open spaces. Such infrastructure can offset the energy used to light parking lots or streets at night or to generate power to sell back to the utility and reduce peak energy demand.*

*In some cases, existing light poles may not structurally accommodate wind turbines. Such light poles will have to be re-built to accommodate the extra height and wind loads associated with turbines. The re-built systems would be MINIWECS with parking lot or street lights rather than street lights with MINIWECS. Such a conversion would be a co-location since the new infrastructure would replace similar infrastructure.*

3. **SWECS**. Small Scale Wind Energy Conversion Systems (10 kW to 100 kW) can be accessory uses. They are free standing towers and are permitted via a site plan and elevation review in the E-1 and VC— for institutional uses only— and BIZ, COR, MFG and ORI zoning districts, subject to these regulations. A special use is required when a SWECS is within five hundred (500') feet of a residential use. All residential uses within 500 feet must be notified.

   a. **Height**. The maximum height of a SWECS shall not exceed one-hundred twenty (120') feet to the top of the rotor blade. The Development Services De-

*SWECS are more intense than MINIWECS. They are intended for a higher capacity of energy output. SWECS tend to be larger in scale and can often be incorporated into site plans and building designs. In Figures F and G, below left, SWECS with parallel rotation to the ground are spread across parking lots and green spaces.*


*In Figure H, below, an onsite SWEC is shown in the more familiar and traditional wind turbine appearance. SWECS like these are typically associated with a higher rated energy output. These systems are for onsite energy production and are usually net-metered with the utility. They are not recommended in dense settings. Appropriate locations for such SWECS are in MFG or ORI districts where there is an industrial scope and scale.*

*SWECS like Figures F and G are recommended in more commercial areas and open places like, parking lots, plazas, and common areas.*

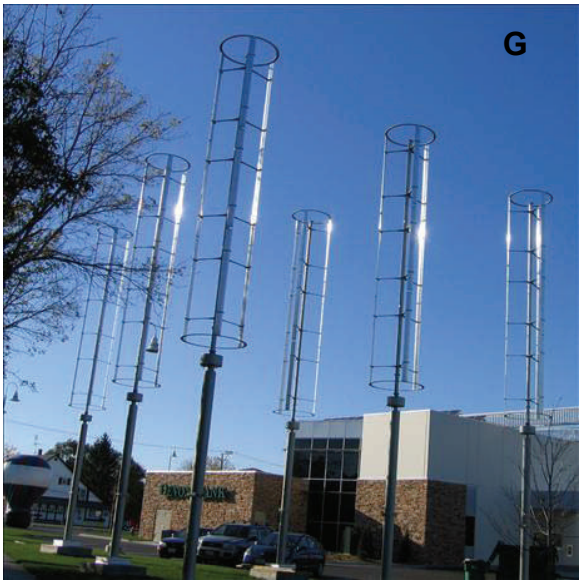



Image Source: Devon Bank - Chicago, Illinois (Western and Devon).


Image Source: Great Lakes Science Center - Cleveland, Ohio.

4. **UWECS**. Utility Scale Wind Energy Conversions Systems (100 kW to 1.5 MW) are free standing utility-owned towers and permitted via special use in the MFG and ORI zoning districts, subject to these regulations. UWECS may locate with a special use within one-hundred fifty feet (150') of Interstate 80. UWECS are not permitted in OS, OOH, E-1, R-1, R-2, R-2A, R-3, R-3A, R-4, VC, BIZ, and COR zoning districts or within five hundred (500') feet of a residential use.

   a. **Height**. The maximum height of a UWECS shall not exceed 200 feet from ground level to the top of the rotor blade. The Development Services Department may grant additional height subject to the findings of a wind energy analysis.

*UWECS are intended only for utility companies like ComEd. UWECS are the familiar wind turbines that are often found in farmlands or in distant locations. They are most recognizable when grouped together in clusters that can stretch from a few acres to multiple square miles. These are known as wind farms (as seen at right).*

*There are only a few areas that may be suitable for a UWECS in Orland Park and they must locate near transmission lines to be effective.*

*UWECS are not permitted to locate within 500 feet of residential uses due to their scale. Height is often determined by surrounding obstructions and prevailing wind patterns. The height of these turbines, however, is often no greater than some existing wireless communication/ cell towers, water towers and radio antennas.*

*Setbacks from specific land uses typically mitigate visual and acoustic impacts of turbines. They tend to be no more of a nuisance than wireless communication towers.*


I


J

5. **General Requirements**.

a. **Setbacks**. A WECS must be located a minimum distance equal to 1.1 times the total height from any property line in a non-residential zoning district. In a residential zoning district, a WECS must locate according to the established building setbacks and cannot locate between the front or corner side building façade and the street.

b. **Spacing Parameters and Wind Accessibility**. The following are spacing parameters and requirements for freestanding WECS towers and co-located WECS equipment.

1. A WECS tower must be located a minimum distance of twenty (20) feet from any principal structure(s) on a parcel.

2. Co-located WECS equipment must be located a minimum distance of five (5) rotor lengths from non-WECS mechanical, electronic, telecommunication or other equipment on a tower, building or other structure.

3. Multiple WECS on a site must be spaced a minimum distance equal to five (5) rotor lengths, based upon the size of the largest rotor, from adjacent WECS.

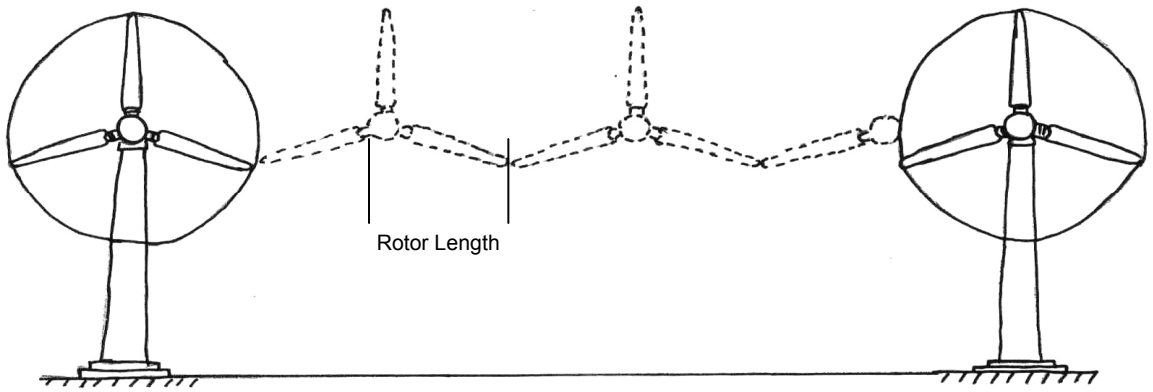



Figure 6-314.D.6: Five rotor lengths. This general diagram depicts a rotor length measured as the length of the blade plus the diameter of the nacelle or nose of the turbine. This type of measurement should be used for all wind turbine types.

c. **Safety**. The following are minimum safety requirements for WECS.

1. All WECS must have a manual and automatic braking system device capable of halting operation to prevent damage in high winds.

2. For freestanding towers, the structural engineer shall prescribe at a minimum two (2) 5/8 inch diameter ground rods installed to a depth of eight (8) feet.

3. Non-RESWECS must be designed to withstand a minimum wind velocity of one hundred (100) miles per hour, with an impact pressure of forty (40) pounds per square foot.

4. All WECS structures including towers, buildings and their related foundations, footings, anchors and electrical connections must meet the requirements of the Village Building Code and be engineered by a licensed structural engineer and meet all necessary engineering code related requirements.

5. The minimum distance between the ground and any protruding blades utilized on a WECS shall be twenty (20') feet as measured at the lowest point of the arc of the blades.

6. Wind turbines must meet the most recent AWEA Small Wind Turbine Performance and Safety Standards and the International Electrotechnical Commission IED 61400 standards. Turbines must be certified by the Small Wind Certification Council or other certification program recognized by the American Wind Energy Association.

d. **Security**. All WECS ground equipment (e.g. batteries, boxes etc.) shall be en closed within a lockable six (6) foot high fence enclosure constructed of either wood or non-white vinyl material, or in a masonry utility building. All climbing apparatuses affixed to a WECS must terminate twelve (12) feet above the ground.

e. **Electromagnetic Interference**. No WECS shall cause electromagnetic degradation or radio frequency interference in performance of other electromagnetic radiators or receptors of quality and proper design.

1. The determination of degradation of performance, quality and proper design shall be made in accordance with best engineering practices as defined in the latest principles and standards of the American Institute of Electrical Engineers (AIEE), the Institute of Radio Engineers (IRE) and Electrical Industries Association (EIA). In case of conflict between these standards, precedence is given to the AIEE.

2. WECS shall use non-metallic rotor blades unless documentation is supplied from an appropriate testing laboratory certifying that a proposed metallic blade rotor will not cause electromagnetic interference.

3. Any ordinance that grants a WECS operation, whether special use or otherwise, may be repealed or revoked whenever electromagnetic interference from a WECS is evident.

f. **Interconnectivity and Transmission**. SWECS and UWECS may connect to the electric transmission grid using the public right-of-way following the necessary permission from ComEd and compliance with the Village Code. Transmission conduits/lines providing connections to the grid or to buildings/batteries must be installed underground. RESWECS and MINIWECS shall provide power to the property on which it is located and shall not be used for the sale of energy to other users offsite. Excess power generated by these may be sold to the grid. ComEd shall determine grid interconnection and net metering policies. Transmission lines and appurtenances may locate on public right-of-way or on any other real property provided the necessary licenses, easements, leases, rights-of-way or other similar land rights for access and maintenance are obtained.

g. **Sounds and Vibrations**. A WECS shall be installed and operated such that sound pressure levels do not exceed the definitions of nuisance "noise" and "vibrations" as established by the Village Code. During short term events such as storms and utility outages, when WECS equipment can potentially create nuisance "noise" and "vibrations", a WECS may exceed the Village Code nuisance requirements if it cannot be manually shut down by the owner. In the event a full battery bank is causing a WECS to exceed Code noise and vibration requirements, the WECS must be shut off until the battery bank is depleted.

h. **Decommissioning**. The Village, through proper legal procedures, may require the owner of a non-residential WECS or owner of the land where the non-residential WECS is located to remove the WECS upon occurrence of any of the following events:

1. The WECS was not constructed in accordance with the Village requirements;

2. The WECS has deteriorated from lack of maintenance;

3. The WECS has been inactive for a period of at least six months and shall be considered abandoned;

4. The WECS creates irresolvable electromagnetic interference;

The Village shall be authorized to remove a WECS when the above events occur and when the WECS owner and/ or the land owner do not comply with these regulations. The WECS and all associated and ancillary equipment, batteries, devices, structures or supports for that system will be removed at the owner's and/or land owner's expense and the costs of removal shall be a lien against the property.

i. **Letter of Credit or Other Security Method**. SWECS and UWECS will require a letter of credit or other security method to assure for the proper construction of public improvements associated with the WECS. The letter of credit or other security method is determined according to Section 5-112 of these regulations.

j. **Signage, Lights, Colors and Other Advertisements**. No letters, insignia, logos, flags, banners, balloons, ribbons, tinsel, streamers, pennants, reflectors, spinners or signs shall be affixed to a WECS. WECS shall not be lit and commercial lighting fixtures shall not be attached. WECS shall be painted white, gray or another non-reflective, unobtrusive color. The only advertising sign permitted on the WECS shall be a manufacturer's label, not exceeding one square foot in size.


Far Left: WECS signage that identifies manufacturer in a small area per code requirements.

Left: WECS signage that is not permitted per the Land Development Code.

k. **Historic Preservation**. WECS permitted in OOH or on Orland Park Landmarks require a Certificate of Appropriateness per Sections 5-110 and 6-209 in addition to any other required approvals, prior to submission of a building permit.

l. **Test WECS**. A Test WECS is permitted following a site plan and elevation review at Plan Commission and with formal approval by the corporate authorities of the Village. Test WECS must be dismantled within three (3) years of installation and are subject to the requirements of Section 6-314.D.12. For the purposes of this Section, Test WECS are trial SWECS and UWECS that are designed solely to collect wind generation data and are subject to these regulations. RESWECS and MINIWECS are not permitted to have Test WECS status.

m. **Aviation Rules and Regulations**. The proposed WECS must be in compliance with all Federal Aviation Administration regulations and shall comply with the notification requirements of the FAA.










WECS are adaptable to the existing environment and can be incorporated into new developments as functional elements, stylistic statements or innovative reforms.

## E. Solar Energy System (SES) Regulations.

A SES consists of an array of collector panels that is angled toward the sun and contains photovoltaic (PV) or other solar cells (e.g. solar thermal) that capture solar energy and convert it directly to electricity or use it to heat/ cool gases, solids or liquids. Typically installed on rooftops or in large open spaces on the ground, SES energy output capacities depend on the number of solar collectors or arrays installed.

The following regulations apply to the four classes of SES recognized by the Land Development Code: PV, SLH, SAH and CSPS.

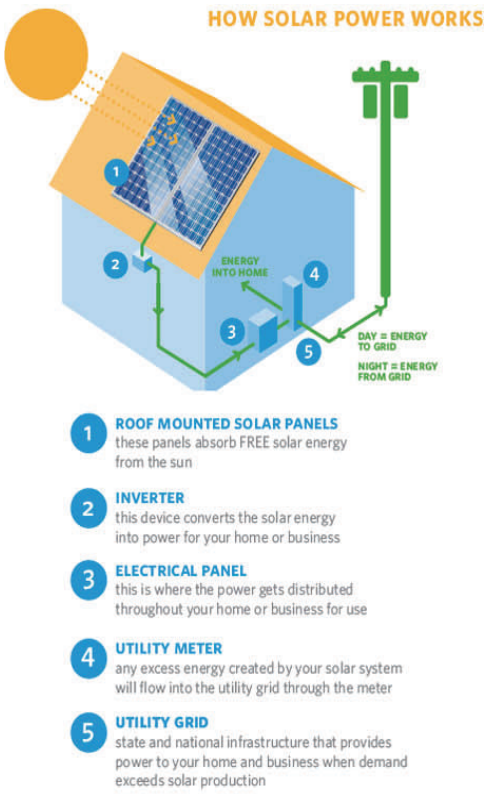



Image Source: www.freecleansolar.com

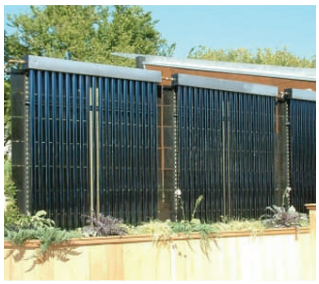
1. **Photovoltaic (PV)**. Photovoltaic solar energy systems are mounted directly on rooftops, walls or installed on the ground and are permitted in all the zoning districts via an ECT Review including for non-residential uses when the SES is wall mounted or visible from a public right-of-way, subject to these regulations.

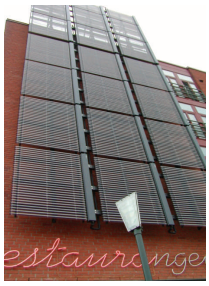
    a. **Height**. PV collector panels shall not increase the visual height of a building. In no instance shall any part of the PV extend beyond the edge of the roof or parapet. PV collector panels on residential rooftops must be in line with the plane of the roof and shall not be attached to chimneys. For flat roofs, the system shall be setback such that it is not visible from the street or neighboring property.

Top Right: Solar panels on a non-residential rooftop; solar roofing on a single family home; Mixed-use/ multi-family district equipped with solar panel systems; and solar power panels applied to parking lot lights.
Opposite Top: Wall mounted SES. The far right depicts a solar curtain preserving transparency with panels.

b. **Rooftop Coverage**. No more than seventy-five percent (75%) of a residential rooftop may be covered by PV collectors or arrays. A non-residential rooftop may be covered by as many PV collectors or arrays as may be spatially or structurally feasible.

c. **Wall Mounted Setbacks and Height**. Wall mounted PV collector panels shall not extend more than five (5') feet from the wall and shall be a minimum seven (7') feet from the ground.





2. **Solar Liquid Heating (SLH)**. Solar liquid or water heating systems are mounted on rooftops or installed on the ground and are permitted in all zoning districts via an ECT Review including for non-residential uses when the SES is wall mounted or visible from a public right-of-way, subject to these regulations.

a. **Height**. SLH solar energy systems shall not increase the visual height of a building. In no instance shall any part of the SLH extend beyond the edge of the roof or parapet. SLH collector panels on residential rooftops must be in line with the plane of the roof and shall not be attached to chimneys. For flat roofs, the system shall be setback such that it is not visible from the street or neighboring property.

b. **Liquid Storage Tank**. Upright-standing SLH systems, where the liquid storage tank is attached to the solar panel, are not permitted on residential rooftops. Tanks must be detached and stored inside the building. For non-residential buildings, SLH tanks must be behind a parapet wall, other rooftop mechanical equipment, or on the ground. Liquid storage tanks on the ground must be screened by landscaping and a fence enclosure.


SLH systems should be flat on rooftops or walls. Systems with attached tanks (left) should be aerodynamic and light-weight. Upright SLH, such as the one at right, is prohibited

3. **Solar Air Heating (SAH)**. Solar air heating systems are mounted on rooftops or on walls and are permitted in all zoning districts via an ECT Review including for non-residential uses when the SES is wall mounted or visible from a public right-of-way, subject to these regulations.

   a. **Height**. SAH solar energy systems shall not increase the visual height of a building. In no instance shall any part of the SAH extend beyond the edge of the roof or parapet. SAH collector panels on residential rooftops must be in line with the plane of the roof and shall not be attached to chimneys. For flat roofs, the system shall be setback such that it is not visible from the street or neighboring property.

   b. **Rooftop and Wall Coverage**. No more than seventy-five percent (75%) of a residential rooftop may be covered by SAH collectors or arrays. A non-residential rooftop may be covered by as many SAH collectors or arrays as may be spatially or structurally feasible. No more than forty percent (40%) of a non-residential building wall facing a public right-of-way, may be covered by SAH collectors or arrays.

   c. **Wall Mounted Setbacks**. Wall mounted SAH solar energy systems shall not extend more than five (5') feet from the wall.

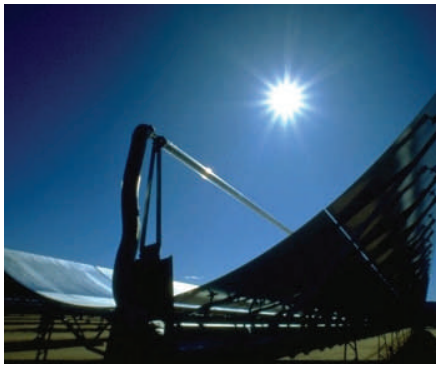
Above: Solar air heating systems attached to the façades of residential buildings. Light screening is recommended when facing public right-of-ways. Wall-mounted SAH units should face south for greatest exposure. Below: PV and SAH on a multi-family, mixed-use building.

4. **Concentrated Solar Power Systems (CSPS)**. CSPS are solar energy systems that collect solar energy in concentrated amounts through the use of concave collectors, reflectors or other similar arrays or panels with the intention of concentrating sun light to heat objects, water, gas or other substance or matter. CSPS are prohibited in the E-1, OL, LSPD, OOH, R-1, R-2, R-2A, R-3, R-3A, R-4, BIZ, COR, and VC districts. CSPS solar energy systems are typically rooftop or ground mounted systems that require a special use in MFG and ORI.

   a. **Height**. The maximum height of a CSPS shall not exceed fifty (50') feet from ground level to the top of the concave collector. In no instance shall any part of a rooftop CSPS extend beyond the edge of the roof or parapet.

   b. **Rooftop Coverage**. No more than fifty percent (50%) of a building rooftop may be covered by CSPS collectors or arrays.

   c. **Fire Protection**. A CSPS must be registered with the Village and meet the necessary fire rating and other specifications required by the Village Building Code and other governing bodies.



*Concentrated solar power systems are intended for industrial purposes. CSPS are not allowed in residential or commercial districts. The intent of this section is to encourage the use of CSPS technologies in existing industrial processes for heating or cooling systems or to promote the manufacturing of such systems in the Village.*

5. **General Requirements**.

a. **Setbacks**. A solar energy system must be located within the established building setback according to the zoning district. A SES cannot locate between the building façade and the street, unless it is wall mounted as in the case of a solar awning.

b. **Solar Access**. A solar energy system, as the sum of all panels, must be located on a property such that it is not shaded by buildings, structures or trees of southerly properties by more than fifteen percent (15%) on the Winter Solstice (December 21) between 9 a.m. and 3 p.m. (Winter Solstice Threshold). Southerly properties are properties south of true east or west that subject an SES property to shade. Solar energy systems should be sited at the northern most feasible location on a property.

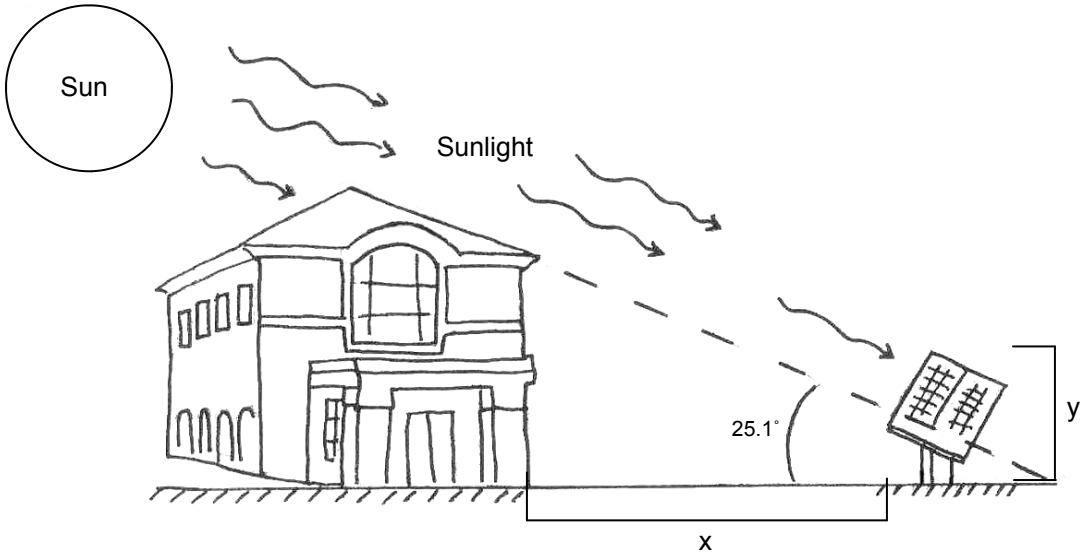



Figure 6-314.E.6: Solar shade during the Winter Solstice (Dec. 21-22) at 12 p.m. noon, where the angle of the sun is 25.1˚, "x" is the minimum distance from buildings or vegetation that will allow 85% solar exposure, and "y" is the minimum height of the SES that will allow 85% solar exposure. A SES must be positioned such that only 15% of its surface area is shaded on the Winter Solstice.

c. **Solar Access Easement**. See Land Development Code Section 6-404.E.

d. **Solar Sharing Agreement**. A solar sharing agreement may be prepared between property owners to preserve, protect and share solar energy access. Property owners may share an SES under mutual terms, conditions and agreements. Such an agreement may include: optimizing SES solar exposure between properties; relocating SES to access solar energy; provisions for shared access, transmission and use; and provisions for expanding the SES to increase capacity for the benefit of both parties.

e. **Solar Assurance**. These regulations make no assurance of solar access other than the provisions of this section. The petitioner may provide evidence of covenants, easements, agreements or similar documentation from neighboring property owners providing access to solar energy for the operation of a SES.

f. **Lot Coverage**. The surface area of a ground mounted system regardless of the mounted angle shall be calculated as part of the overall lot coverage. Ground mounted systems shall not constitute more than two percent (2%) of the allowable lot coverage, or 360 square feet, whichever is less.

*Ground mounted SES lot coverage is measured by the surface area of the panels, even if the system stands on a post or pedestal. The surface area cannot exceed 2% of the lot size (or 360 square feet, whichever is less) and is counted toward the total permitted lot coverage in the zoning district.*

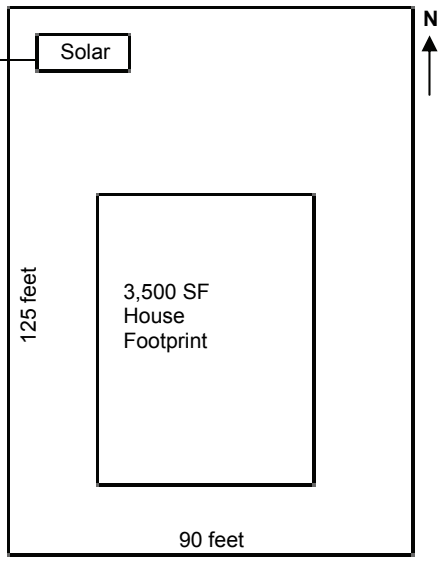



Figure 6-314.E.11 (above): Diagram of solar lot coverage in a typical R-3 10,000 square foot lot.

Right: Non-residential lot coverage example. SES carports do not count toward total lot coverage because the land is already covered by the pavement of the parking lot.

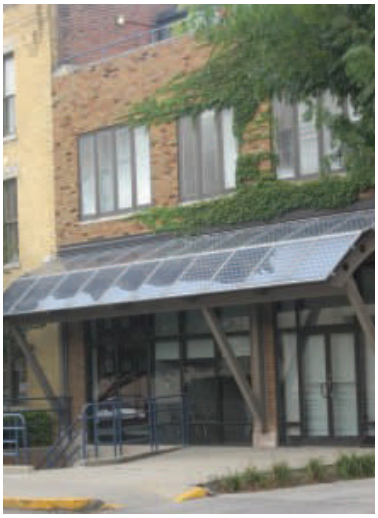
g. **Solar Glare and Concentration**. SES collector panels shall be placed such that concentrated solar radiation or glare shall not be directed onto nearby properties, roadways or public right-of-ways.

h. **Interconnectivity and Transmission**. A SES shall provide power for the principal and/or accessory use of the property on which it is located and shall not be used for the generation of power for the sale of energy to other users. Excess power generated by a SES may, however, be sold to Commonwealth Edison (ComEd). ComEd shall be contacted to determine grid interconnection and net metering policies. Cables, wires and other transmission conduits or lines providing connections to the electric transmission grid or to buildings or batteries must be installed indoors or underground when applicable.

i. **Design and Permitting**. The design of the SES shall conform to applicable industry standards. The necessary building permits shall be obtained for a SES per the Village Building Code (e.g. electrical, plumbing, mechanical etc.). All wiring shall comply with the latest applicable version of the National Electric Code (NEC) as amended by the Village. See Section 6-314.C for further required information.

j. **Accessory Use**. Solar energy systems are accessory uses to the primary or principle use on a property in all zoning districts.

k. **Transparency**. Wall-mounted solar energy systems cannot replace or be substituted for street-level windows, multi-story windows, clerestory windows or other type of fenestration or transparency.



*While south facing walls may receive optimal sunlight for a SES, building transparency should be preserved as much as possible both at street level and elsewhere. SES should be installed at the next best locations, particularly on rooftops or non-fenestrated walls. The image at left demonstrates "solar awnings" over existing street level windows and doors. The image at right demonstrates rooftop mounted solar panels, preserving window/ transparent area on the building façade.*

l. **Decommissioning**. The Village, through proper legal procedures, may require the owner of a non-residential SES or owner of the land where the non-residential SES is located to remove the SES upon occurrence of any of the following events:

1. The SES was not constructed in accordance with the Village requirements;

2. The SES has deteriorated from lack of maintenance;

3. The SES has been inactive for a period of at least six months and shall be considered abandoned;

4. The SES creates irresolvable glare, solar radiation or concentration on neighboring properties;

The Village shall be authorized to remove a SES when the above events occur and when the SES owner and/ or the land owner do not comply with these regulations. The SES will be removed at the owner's and/or land owner's expense and the costs of removal shall be a lien against the property.

m. **Signage, Lights, Colors and Other Advertisements**. No letters, insignia, logos, flags, banners, balloons, ribbons, tinsel, streamers, pennants, reflectors, spinners, signs or similar materials shall be affixed to a SES. SES colors shall be colored to match existing roof materials (e.g. shingles) or a color that camouflages it with surrounding building colors. The only advertising sign permitted on the SES shall be a manufacturer's label, not exceeding one-half square foot in size.

n. **Historic Preservation**. Solar energy systems are permitted in historic districts as long as they are in line with the plane of the roof, treated as architectural features, colored to match roof shingles, or ground mounted. SES permitted in the Old Orland Historic District or on Orland Park Landmarks require a Certificate of Appropriateness per Sections 5-110 and 6-209 in addition to any other required approvals, prior to submission of a building permit.

*Solar roofs, such as the one at left, can be retrofitted on historic buildings such that the SES appear as if they were asphalt shingles. Section 6-209 Old Orland Historic District permits asphalt shingles as an appropriate roofing materials in the historic district.*

## F. Geothermal Energy System (GES) Regulations.

A GES is a central renewable heating and cooling exchange system that uses heat generated beneath the earth's surface to heat or cool buildings via underground or underwater systems that pump heat energy into a building or visa versa. Geothermal energy systems use the earth as a heat source in the winter or a heat sink in the summer.

The following regulations apply to the small scale GES recognized by the Land Development Code: GHPS.

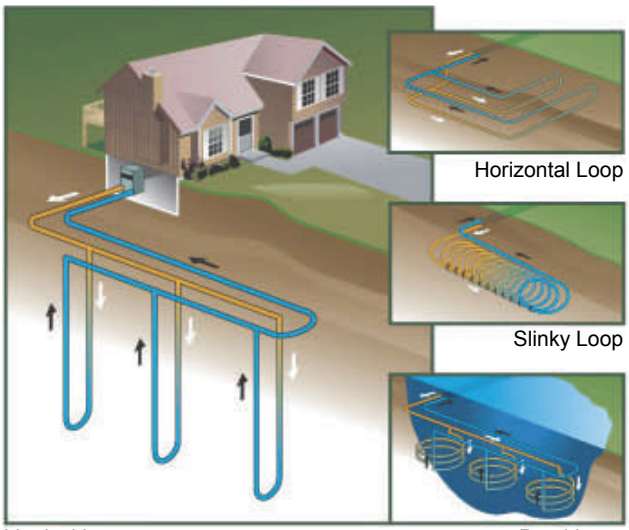



Image Source: www.engineer.gvsu.edu/house/altenergy.html

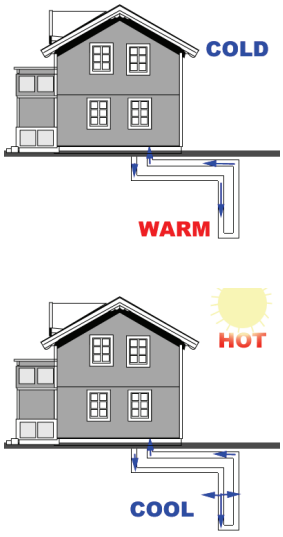



Image Source: www.singletonheatandair.com

Above Left: Types of Geothermal Energy Systems. There are four types of GES: vertical loop systems that reach deep into the earth; horizontal loop systems that stay near the surface but are below the frost line; slinky loop systems that maintain a moderate depth and increase the length/ capacity of the system on a compact lot; pond loop systems that sink geothermal cables into detention ponds; and open loop systems (not pictured) that are cables in the ground. Above Right: Demonstration images indicating the use of GES during winter months (top: using the earth as a heat source) and summer months (bottom: using the earth as a heat sink).

1. **Geothermal Heat Pump System (GHPS)**. Geothermal heat pump energy systems, or ground source heat pumps, are installed indoors and underground via a system of looped coils or piping and invisible after installation and are permitted in all zoning districts via an ECT Review, subject to these regulations.

   a. **Depth**. GHPS loop fields, coils, piping or other similar and associated underground infrastructure must be below the frost line. A geotechnical and engineering study is required to determine appropriateness and depth on a case by case basis.

Image Source: www.altdotenergy.com

GHPS Diagram and infrastructure.

b. **Setbacks**. GHPS loop fields, coils, piping or other similar underground infrastructure shall not encroach into public right-of-ways, ComEd transmission easements and right-of-ways, access roads, natural gas, fuel and other pipeline easements, floodplains, wildlife habitats and navigable waters of the United States. GHPS may be built up to the property line and, upon acquiring a geothermal access easement or similar agreement, encroach under neighboring properties to acquire an efficient scale or tonnage for heating and cooling in a building or site. GHPS must maintain a minimum distance of ten (10') feet from existing storm water, sewer and water main utilities, and twenty (20') feet from neighboring buildings or structures (except parking lots).

c. **Ground Source Subsidence**. Geothermal heat pump systems shall not cause underground subsidence to the subject or neighboring properties during installation or any time thereafter. Subsidence is the process of pit or sag formations in the earth's crust due to undermining or trenching and filling of the surface and sub-surface. Correction of subsidence is the responsibility of the GHPS owner.

2. **Irrigated Geothermal Heat Pump Systems**. Irrigated geothermal heat pump systems consist of any system which uses a thermal exchange using ground water, surface water, heat pipes or tubes and are installed in and access underground aquifers (ground water) or storm water detention/ retention basins (surface water) and are permitted in the BIZ, COR, MFG, ORI, R-4 and VC zoning districts via an ECT Review, subject to these regulations.

a. **Depth**. Loop fields, coils, pipes or other similar and associated underground/ underwater infrastructure must be below the frost line and a minimum of eight (8') feet below the normal water line of a detention/ retention basin. Also, see Section 6-314.F.1.a.

b. **Width and Setbacks**. Loop fields, coils, piping, tubing or other similar underwater system shall not extend above the surface of the normal water line of a storm water detention/ retention basin. Such systems must maintain a minimum distance of ten (10') feet from existing storm water infrastructure, such as culverts, and sewer utilities.

c. **Detention/ Retention Basin Volume Displacement**. Loop fields, coils, pipes or other similar underwater infrastructure shall not displace the volume of a storm water detention/ retention basin without providing necessary compensational storage.

3. **Small Scale Geothermal District Heating**. Geothermal district heating technology may be used in non-residential and multi-family home developments to heat multiple buildings on a single site, such as office campuses and condo and town home developments and between building owners.

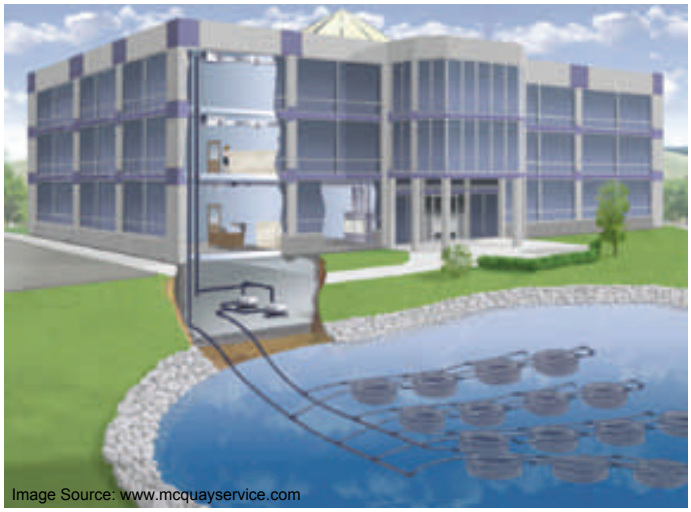
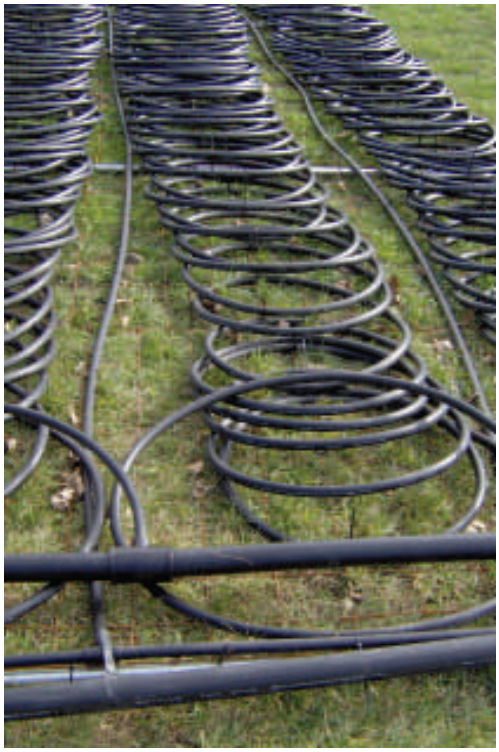


Image Source: www.mcquayservice.com


Image Source: www.hydronmodule.com



Left: Renderings that show residential and non-residential applications of hydrothermal heat pump systems using detention ponds. Above: Pond loop coils prior to being submerged into a pond. Orland Park has many residential and non-residential detention ponds that can be used as heat sources and sinks for improved energy efficiency.

3. **General Requirements**.

a. **Access**. A GES shall access the earth's thermal energy below grade and shall not be visible from the public right-of-way or neighboring properties. Access to neighboring properties may be granted by property owners via Geothermal Access Easements and Geothermal Sharing Agreements.

1. **Tree Removal**. Tree removal for a GES is not permitted. GES technology permits vertical thermal systems that can avoid trees and other planted areas.

b. **New Construction Mitigation**. New construction that impacts a GES must move the GES to a new location not impacted or bury it deeper than the impacted depth, subject to these regulations.

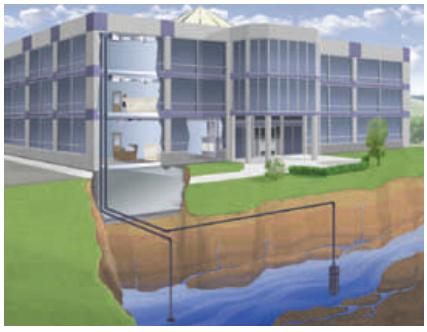
c. **Geothermal Access Easement**. See Land Development Code Section 6-404.F.

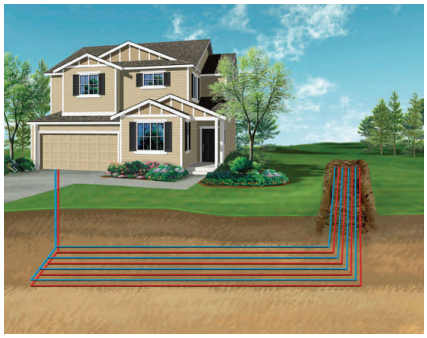
d. **Geothermal Sharing Agreement**. A geothermal sharing agreement may be prepared between property owners to preserve and protect geothermal energy access. Property owners may share a GES under mutual terms, conditions and agreements. Such an agreement may include: optimizing GES field sizes and well depths; provisions for shared access, transmission and use; provisions for heat and coolant exchange and transmission rates; relocating a GES; expanding a GES to increase capacity for multi-building district heating; and provisions for subsidence control.

e. **Geothermal Assurance**. These regulations make no assurance of geothermal access other than the provisions of this section. The petitioner must provide evidence of covenants, easements, agreements or similar documentation from property owners and neighboring property owners providing access to geothermal energy or geotechnical studies indicating feasibility for the operation of a GES.

f. **Design and Permitting**. The design of the GES shall conform to applicable industry standards. The necessary building permits shall be obtained for a GES per the Village Building Code (e.g. electrical, plumbing, mechanical etc.). All wiring and heating components shall comply with the latest applicable version of the National Electric Code (NEC) and the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) as amended by the Village. See Section 6-314.C for further required information.

g. **Accessory Use**. Geothermal energy systems are accessory uses to the primary or principle use on a property or district in all zoning districts.





Above: Other geothermal options: geothermal use of underground aquifers and buried geothermal systems.

## G. **Biomass: Waste to Energy Strategies**.

1. **Onsite Commercial Composting**. An onsite commercial composting facility is the portion of a site or facility that is used for composting of food scrap or food waste and is permitted in non-residential areas of the BIZ, COR, MFG, ORI and VC zoning districts provided that they do not locate within 300 feet of a residential property, hospitals, primary and secondary school properties, and daycare centers.

   a. **Setbacks**. Onsite commercial composting facilities must locate within the established building setbacks within the local zoning district.

   b. **Enclosure and Screening**. Onsite commercial composting facilities shall be co-located within existing onsite waste collection enclosures and shall be screened by a fence constructed of either solid masonry, wooden or non-white vinyl fence materials and screened by native landscaping following the requirements of Section 6-302.D of the Land Development Code. A composting container shall not exceed the size of the largest waste collection dumpster or container within the waste collection enclosure or an eight (8) yard container whichever is less.

   c. **Composting Rules**.

      1. All food scrap or food waste must, by the end of each operating day, be processed and placed into an enclosed vessel in which air flow and temperature are controlled pursuant to Illinois Public Act 096-0418 (415 ILCS 5/3.330).

      2. All food scrap or food waste must be covered in a manner that prevents scavenging by birds and animals and that prevents a visual, odor or other nuisance(s) at all times.

      3. Onsite commercial composting facilities shall not be located in storm water detention or stream setbacks.

      4. Onsite commercial composting facilities must be flood-proofed.

      5. A regular schedule of onsite composting collection must be maintained. Compost cannot remain on site more than one week.

   d. **Sale of Biomass and Biofuel**. Commercial composting may be sold to biomass and or biofuel energy plants, biomass facilities, agricultural industries, distributors etc. as a commodity.

**Definitions for Section 2-102**.

1. **Building Mounted/ Co-Location**. A system or device that is located on an existing structure including buildings, monopoles, lattice towers, light poles etc.

2. **Environmental/ Clean Technology (ECT)**. The application of the environmental sciences to conserve the natural environment and resources, and to curb the negative impacts of human involvement and development; Includes renewable energy (wind, solar, hydro, geo, and biomass), information technology, sustainable transportation, electric motors, lighting and other appliances and systems such as devices that are sustainable and part of or accessory to a building or site as a feature, and/or a utility that serves multiple economic and environmental purposes including, but not limited to, green roofs, white roofs, green walls, above and below ground storm water cisterns, ground source heat pumps, smart lighting systems, pervious surface pavements, recyclable collection facilities, bio-swales, bioretention areas etc.; Technology that helps make buildings energy efficient and environmentally benign; A diverse range of products, services and processes that harness renewable materials and energy sources, reduce the use of natural resources and cut or eliminate emissions and wastes.

3. **Renewable Energy**. Refers to energy derived from existing flows of energy generated by on-going natural processes, including, but not limited to, energy generated from the sun, flowing water, wind flows, and geothermal heat flows. The term shall not include energy generated from fossil fuels, nuclear fission, or any derivative of those energy sources.

4. **Renewable Energy Conversion System (RECS)**. Any device associated with the conversion of solar, wind or geothermal and non-fossil fuel energy, such as, but not limited to, a wind charger, windmill, wind turbine, solar panel, solar array, geothermal cables etc., into electrical or other form of usable kinetic energy.

5. **Sustainable Development**. Construction that can be maintained over time without damaging the environment; Development that meets the needs of the present without compromising the ability of future generations to meet future needs.