

STAFF REPORT  
July 10, 2008

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**No. 08OA004 - Ordinance Amendment to add a definition of vertical axis wind turbines by amending Chapter 17.04, to add vertical axis wind turbines as a Conditional Use in the Medium Density Residential Zoning District by amending Chapter 17.12.030, and to add vertical axis wind turbines as an accessory use by amending Chapter 17.50**

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**ITEM 43**

GENERAL INFORMATION:

APPLICANT/AGENT	Kathryn Webb
REQUEST	<b>No. 08OA004 - Ordinance Amendment to add a definition of vertical axis wind turbines by amending Chapter 17.04, to add vertical axis wind turbines as a Conditional Use in the Medium Density Residential Zoning District by amending Chapter 17.12.030, and to add vertical axis wind turbines as an accessory use by amending Chapter 17.50</b>
DATE OF APPLICATION	5/30/2008
REVIEWED BY	Monica Heller / Karley Halsted

RECOMMENDATION:

Staff recommends that the Ordinance Amendments to add a definition of vertical axis wind turbines by adding Chapter 17.04.743, to add vertical axis wind turbines as a Conditional Use in the Medium Density Residential Zoning District by amending Chapter 17.12.030, and to add standards for vertical axis wind turbines as an accessory use by adding Chapter 17.50.217 be approved.

GENERAL COMMENTS:

Wind energy conversion systems are allowed as a Conditional Use in the Light Industrial Zoning District and the Mining and Earth Resources Extraction Zoning District. The applicant is requesting that the Zoning Ordinance be revised to define vertical axis wind turbines and allow them as a Conditional Use accessory to a principle Permitted or Conditional Use in the Medium Density Zoning District.

A vertical axis wind turbine is a wind energy conversion system, but as defined is more restrictive. Vertical axis wind turbines have the main rotor shaft arranged vertically. Key advantages of this arrangement are that the turbine does not need to be pointed into the wind to be effective. This is an advantage on sites where the wind direction is highly variable. Vertical axis wind turbines also have less of a flicker effect caused by sunlight and turning blades and are more bird friendly than horizontal axis wind turbines.

With a vertical axis, the generator and gearbox can be placed near the ground, so the tower doesn't need to support it, and it is more accessible for maintenance. Drawbacks are that some designs produce pulsating torque. Drag may be created when the blade rotates into the wind.

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It is difficult to mount vertical-axis turbines on towers, meaning they are often installed nearer to the base on which they rest, such as the ground or a building rooftop. The wind speed is slower at a lower altitude, so less wind energy is available for a given size turbine. Air flow near the ground and other objects can create turbulent flow, which can introduce issues of vibration, including noise and bearing wear which may increase the maintenance or shorten the service life. However, when a turbine is mounted on a rooftop, the building generally redirects wind over the roof and this can double the wind speed at the turbine. If the height of the rooftop mounted turbine tower is approximately 50% of the building height above the rooftop, this is near the optimum for maximum wind energy and minimum wind turbulence.

**STAFF REVIEW:**

Staff has reviewed the request to allow vertical axis wind turbines as a Conditional Use accessory to a principle Permitted or Conditional Use in the Medium Density Residential Zoning District by amending Chapter 17.12.030 of the Rapid City Municipal Code and the associated ordinance amendments to Chapters 17.04 and 17.50 by adding sections 17.04.743, to add a definition of vertical axis wind turbines, and 17.50.217 to address standards of vertical axis wind turbines as an accessory use.

The Medium Density Residential Zoning District is a residential district intended to provide for medium to high population density. The principal uses of land may range from single-family to multiple-family apartment uses. Certain uses which are more compatible functionally with intensive residential uses than with commercial uses are permitted. Currently, microcell wireless communications facilities are allowed as a Conditional Use in the Medium Density Residential Zoning District. By requiring a Conditional Use permit for a vertical axis wind turbine, the height, size and location can be based on a site by site analysis and stipulations may be placed on the use to limit any adverse impact on adjacent developments.

Staff recommends adding Section 17.04.743, providing a definition of vertical axis wind turbines, to the Rapid City Municipal Code as follows:

**17.04.743 Vertical Axis Wind Turbine.**

**Vertical Axis Wind Turbine.** have the main rotor shaft arranged vertically and shall be used only for the purpose of generating power for the property on which the vertical axis wind turbine is located, or for the purpose of transmitting power to the electrical grid of an electric utility company through an approved interconnection.

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Staff recommends that Chapter 17.12.030 to allow vertical axis wind turbines as a Conditional Use in the Medium Density Residential Zoning District be revised as follows:

**17.12.030 Conditional uses.**

The following uses may be allowed as a conditional use permit by the City Council in accordance with provisions contained in § 17.54.030:

- A. Any conditional use in an LDR low density residential district;
- B. Fraternities, sororities and denominational student headquarters;
- C. Mobile home parks, subject to the requirements set forth in § 17.50.110;
- D. Nursing home or home for the aged;
- E. Child care centers;
- F. A planned residential development as regulated in §§ 17.50.020, 17.50.030 and 17.50.040;
- G. Single-family attached dwellings and single-family semidetached dwellings as regulated in §§ 17.50.050 through 17.50.100;
- H. Motel complexes, existing as of the date of the ordinance codified in this title, subject to the requirements set forth in § 17.50.180;
- I. Group homes, subject to the following:
  1. Provide a detailed program and services plan at time of application;
  2. Must meet fire, building and health requirements;
  3. The Council may or may not wish to add the following conditions:
    - a. Standard hours of operation, i.e., standard;
    - b. Supervision, i.e., type and extent;
    - c. Services and program to be provided;
    - d. Number of persons;
    - e. Proximity to other group homes; and
    - f. Any other condition the Council may deem appropriate.
  4. Any significant modification in the program and services plan will require a new application.
- J. Retail business may be conducted in apartment buildings only, for the convenience of the occupants of the building, provided there shall be no entrance to the place of business except from the inside of the building.
  1. The retail business type shall be limited to those which are listed in § 17.50.350;
  2. The Building Inspection Department will be consulted with regard to code requirements; and
  3. No outdoor signage shall be allowed.
- K. Townhouses as regulated in §§ 17.50.020, 17.50.030 and 17.50.040;
- L. Planned residential developments as regulated in §§ 17.50.050 through 17.50.100;

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- M. Planned unit developments as regulated in §§ 17.50.050 through 17.50.100;
- N. Hotel apartment;
- O. Drop-off centers for household recyclables; such centers do not involve processing;
- P. Microcell wireless communications facilities on poles as defined in § 17.50.400B; and
- Q. Adult day care center.
- R. Vertical Axis Wind Turbines as defined in § 17.50.217

Staff recommends adding Section 17.50.217 to add standards for vertical axis wind turbines as an accessory use to the Rapid City Municipal Code be approved as follows:

**17.50.217 Vertical Axis Wind Turbines.**

- A. General. Vertical Axis Wind Turbines shall be allowed as a Conditional Use accessory to principle Permitted or Conditional Uses in certain zoning districts. In addition to the standards set forth in Chapter 17.54.030 regarding all conditional use permits, all vertical axis wind turbines also meet all requirements of § 17.50.217 herein.
- B. Commercial sale of power prohibited. Any vertical axis wind turbine shall be used only for the purpose of generating power for the property on which the vertical axis wind turbine is located, or for the purpose of transmitting power to the electrical grid of an electric utility company through an approved interconnection.
- C. Utility interconnections. Any vertical axis wind turbine shall be constructed and operated, and any interconnection between a vertical axis wind turbine and an electric utility company shall be allowed only in accordance with all local, state, and federal regulations including regulations issued by the Public Utilities Commission and the Federal Aviation Administration. Additionally, electrical interconnections shall be allowed only in accordance with the applicable standards of the electric utility company.
- D. Required setbacks. A minimum setback of one times the height of the vertical axis wind turbine as measured from the ground or rooftop if mounted on a rooftop, shall be maintained between the vertical axis wind turbine system and any property line, overhead utility line or other tower support base.
- E. Tower height. In no event shall the height of a vertical axis wind turbine exceed 60 feet as measured from the ground to the center of the rotor hub. Further, there shall be no less than 30 feet between the vertical axis wind turbine and the ground.

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- F. Rotor size/operation. The maximum size of the vertical axis wind turbine shall be reviewed upon application for a Conditional Use. In determining the appropriate size, the city shall consider such factors as noise, proximity to surrounding residences, safety and aesthetic issues. All systems shall be equipped with appropriate braking devices or similar protective devices to slow down or stop the rotors if the wind exceeds the capacity of the system.
- G. Noise. No vertical axis wind turbine shall produce more than 60 decibels of sound measured at the closest point on the closest property line from the base of the system. Information from the manufacturer shall be submitted at the time of the submittal of the Conditional Use, ensuring that this requirement can be met once the system is operational. The owner may be required to submit independent noise studies to verify that the noise standard is met during actual operations.
- H. Electromagnetic interference. No vertical axis wind turbine shall produce electromagnetic interference so as to disrupt transmissions such as those from radio, television or microwave towers. At the time of application for the Conditional Use, the petitioner must submit information from the manufacturer indicating that, once operational, the vertical axis wind turbine will not adversely affect the transmissions. If necessary, generators and alternators shall be filtered, shielded or both so as to prevent the interference of radio and television signals.
- I. Tower access. Appropriate safety measures must be undertaken to discourage unauthorized climbing of a vertical axis wind turbine. Appropriate measures shall include either:
1. The construction of a 6-foot tall chain link fence with locking gate around the tower;
  2. The tower shall be constructed so that the lowest climbing access shall be at least 12 feet above the ground; or
  3. A locked anti-climb device shall be installed on the tower.
- J. Warning information. Information related to the maximum power output, nominal voltage and maximum current, and emergency shut-down procedures for the vertical axis wind turbine shall be posted near the base of the tower in a visible location.
- K. Lighting. Unless required by a more restrictive regulation, no lighting shall be installed on a vertical axis wind turbine.

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- L. Tower color and design. The tower and turbine shall be a neutral color and shall have a non-reflective finish. In reviewing the Conditional Use for a vertical axis wind turbine, the City shall also consider the design of the tower to ensure that no significant adverse impacts are occurring to neighboring property owners, including, but not limited to, infringement into natural and urban viewsheds, historic property, major community entryways, parks, schools, churches, playgrounds or similar public and recreational uses.
- M. Manufacturer warranty/maintenance information. Upon application for a Conditional Use for a vertical axis wind turbine, the petitioner shall submit a manufacturer's statement documenting that the system has been successfully and safely operated in atmospheric conditions that are similar to conditions in Rapid City. Further, the petitioner shall provide a copy of the manufacturer's warranty indicating that the system is warranted against any system failures reasonably expected during severe weather conditions. Further, the petitioner shall submit system specifications including maximum power output and a maintenance schedule for the system.
- N. Construction standards. Any vertical axis wind turbine shall be constructed in accordance with all applicable life, safety, building and fire codes including but not limited to the following:
1. An applicant for a building permit for a vertical axis wind turbine shall submit plans and specifications stamped by a registered engineer.
  2. Lightning Protection. Any vertical axis wind turbine shall have appropriate lightning protection to sufficiently protect all connected and adjacent equipment and structures from damage. The lightning protection system shall effectively discharge lightning energy from the structure to the ground through the application of shielding, lightning arresters and deep earth grounding.
- O. Abandonment/removal.
1. Any vertical axis wind turbine which has not been used for a period of 6 months or more shall be declared abandoned. Upon abandonment of the system, the City shall revoke the Conditional Use and the system shall be removed at the expense of the property owner. The City shall determine that a vertical axis wind turbine has not been used if the following criteria apply:
    - a. The vertical axis wind turbine has not been operating for a substantial period of time and the owner of the system is unable to provide documentation demonstrating that the system has

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- produced a minimum of 25% of the power output as stated in the system specifications over the past 6 months;
- b. The vertical axis wind turbine has fallen into obvious disrepair and/or has been deemed unsafe by the City of Rapid City.
  - c. The vertical axis wind turbine has become violative of some other local, state or federal law and the owner of the system has not taken appropriate actions to remedy the problem.
2. If deemed appropriate, the City may stipulate through the conditional use that the vertical axis wind turbine shall be removed at the owner's expense, upon the rezoning of the subject property to a zoning district classification in which the vertical axis wind turbines are not allowed as either a Permitted use or Conditional Use.