

WIND ENERGY CONVERSION SYSTEM

Field of the Invention

- 5 The present invention relates to a wind energy conversion system for a building.

Background of the Invention

- 10 It is well known to use wind to drive a rotor or turbine to convert wind power into alternate forms of power and/or otherwise drive various machines. It is also known to use wind driven turbines on a roof of a building for providing electricity to the building. An example of such a system
15 is disclosed in International publication no. WO 01/57397. This document discloses an elongated wind turbine having an axis of rotation which appears to extend for the entire length of the roof and in a direction transverse to a direction of airflow through the turbine.

- 20 It is to be understood that, if any prior art publication is referred to herein, such reference does not constitute an admission that the publication forms a part of the common general knowledge in the art, in Australia or any
25 other country.

Summary of the Invention

- According to one aspect of the present invention there is
30 provided a wind energy conversion system for a building comprising:

one or more wind driven rotors configured to convert wind energy to an alternate form of energy;

- a pitched roof structure having a first pitch on which
35 the or each rotor is mounted; and,

a cover supported by the pitched roof structure above the or each rotor, the cover having a second pitch less than the first pitch.

- 5 In one embodiment, the pitched roof structure comprises a ridge region in which the or each rotor is mounted, and wherein the cover extends to opposite sides of the ridge region.
- 10 The or each rotor may have an axis of rotation parallel to a direction of flow wind through each rotor. The wind energy conversion system may further comprise a cowling for each rotor, each cowling surrounding a corresponding rotor and having open opposite ends directing air flowing up the
- 15 pitched roof structure to flow through the rotor.

The wind energy conversion system may further comprise a gutter supported by the pitch roof structure and beneath the rotors.

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- The wind energy conversion system may further comprise two electrical generators coupled with each rotor wherein respective generators are driven by opposite ends of a drive shaft rotated by the rotor, each generator producing
- 25 electrical energy when the rotor is caused to rotate by the action of air flowing through the rotor.

Brief Description of the Drawings

- 30 An embodiment of the present invention will now be described by way of example only with reference to the accompanying drawings in which:

Figure 1 is an end view of a wind energy conversion system in accordance with a first embodiment of the present invention; and,

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Figure 2 is a partial side view of the system shown in Figure 1.

Detailed Description of Preferred Embodiment

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Referring to the accompanying drawings, a wind energy conversion system 10 for a building comprises one or more wind powered turbines 12, a pitched roof structure 14 having a first pitch on which the turbines 12 are mounted, and, a cover 16 supported on the pitched roof structure 14 above the turbines 12. The cover 16 has a second pitch that is less than the first pitch, i.e. less than the pitch of the pitched roof structure 14.

15 The pitched roof structure 14 has two sloping sides 18 and 20 that converge toward each other in an upward direction. The turbines 12 are supported on the structure 14 in a ridge region 22 created by and between the converging sides 18 and 20. Other than leaving the crest or ridge region 22 of the structure 14 open for the mounting of the turbines 12, the roof structure 14 is of generally conventional form and configuration and thus will comprise a plurality of roof beams 24 together with rafters, joists and battens (not shown).

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The cover 16 overlies an upper portion 26 of the roof structure 14 and extends to opposite sides of the ridge region 22. In effect, the cover 16 and the upper portion 26 of the roof structure 14 create or act as a wind tunnel 28 that directs wind W flowing upwardly on the sides 18 and 20 through the turbines 12.

As previously mentioned, the pitch of the cover 16 is less than the pitch of the roof structure 14 so that the perpendicular distance D between the cover 16 and the upper portion 26 of the first structure 14 decreases in a direction toward the ridge region 22. Thus, the wind

tunnel 28 reduces in cross section area toward the ridge region 22. This has the effect of increasing air pressure and thus air speed through the turbines 12. It will be appreciated that the configuration of the wind tunnel 28
5 has the effect of directing wind from opposite sides of the structure 14 to flow through the turbines 12.

Each turbine 12 comprises a wind rotor 30 coupled to a drive shaft 32 passing through an axis of rotation of the
10 wind rotor 30. The drive shaft 32, and thus the axis of rotation of the propeller 30 is perpendicular or transverse to a line or direction of extent of the ridge region 22. Thus, the drive shaft 32 is substantially parallel to the direction of air flow through the turbine 12.

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To further assist in concentrating the air flow through the turbine 12 the system 10 further comprises a respective cowling 34 for each of the turbines 12. Each cowling 34 surrounds an upper portion of a corresponding turbine 12
20 extending above the beams 24 and has open opposite ends directing air flowing up the roof structure 14 through the turbine 12. The cowlings 34 are ideally aerodynamically shaped and configured to concentrate air flow across or through the wind rotor 30. In this regard, for example, an
25 inside surface of the cowling 34 may be configured to progressively taper from the opposite openings to a central region in which the wind rotor 30 rotates. Each cowling 34 extends in the vertical direction between an inner surface of the cover 16 and an outer surface of the roof structure
30 14.

Opposite ends of the drive shaft 32 are coupled to respective generators 38 for generating electricity. The generators 38 can be configured or driven to produce
35 electric current of the same phase which in turn is provided to a power management system (not shown) via electrical cables 39. The power management system can

distribute electrical power provided by the generators 38 selectively to a storage device such as batteries (not shown), appliances within a building supporting the roof structure 14 or to a power grid.

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It will be appreciated that wind passing through the turbines 12 in opposite directions cause the wind rotors 30 to rotate in opposite directions. Depending on the type of generators 38 incorporated in the system 10, it may be
10 important to maintain the phase of the electric current produced by the generators 38 irrespective of the direction of rotation of the propeller 30. This can be achieved by the provision of gear boxes between the shaft 32 and the generators 38 so that irrespective of the direction of
15 rotation of the propeller 30 and drive shaft 32, the direction of rotation of the rotors (not shown) of the generators 38 remains the same.

A gutter 40 is provided that runs along the ridge region 22
20 beneath the turbines 12 for catching any water that may be blown through the tunnel 28. The gutter 40 may be plumbed into the rainwater gutter system (not shown) for the roof structure 14.

25 Now that an embodiment of the present invention has been described in detail it will apparent to those skilled in the relevant arts that numerous modifications and variations may be made without departing from the basic inventive concepts. For example, the turbines 12 are
30 illustrated as being disposed along a ridge region 22 of the roof structure 14. However in an alternate configuration, the turbines 12 may be disposed along either one or both of the sides 18 or 20 of the roof structure 14 and provided with separate covers 16 each of which has a
35 pitch less than the pitch of the roof structure 14, or more particularly, the pitch of the respective side 18 or 20 on which it is supported. All such modifications and

variations together with others that would be obvious to a person of ordinary skill in the art are deemed to be within the scope of the present invention the nature of which is to be determined from the above description.

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In the claims of this application and in the description of the invention, except where the context requires otherwise due to express language or necessary implication, the words
10 "comprise" or variations such as "comprises" or
"comprising" are used in an inclusive sense, i.e. to specify the presence of the stated features but not to preclude the presence or addition of further features in various embodiments of the invention.

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Claims:

1. A wind energy conversion system for a building comprising:
one or more wind driven turbines configured to convert
5 wind energy to an alternate form of energy;
a pitched roof structure having a first pitch and a ridge
region wherein the or each turbine is mounted in the ridge
region; and a cover which covers the or each turbine and is
supported by the pitched roof structure above the or each
10 turbine, the cover having a second pitch less than the first
pitch and comprising two planar surfaces that converge and meet
above the ridge region of the pitched roof structure, the cover
extending to opposite sides of the ridge region and wherein a
perpendicular distance (D) between the cover and an upper
15 portion of the roof structure decreases in a direction of the
ridge region.
2. The system according to claim 1 wherein the or each
20 turbine has an axis of rotation parallel to a direction of flow
wind through each turbine.
3. The system according to claim 1 or 2 comprising a
cowling for each turbine, each cowling surrounding a
corresponding turbine and having open opposite ends directing
25 air flowing up the pitched roof structure to flow through the
turbine.
4. The system according to claim 3 wherein the or each
cowling progressively tapers from the open opposite ends to a
30 central region in which a rotor of a respective turbine rotates.
5. The system according to claim 3 or 4 wherein the or each
cowling extends in a vertical direction between an inner surface
of the cover and an outer surface of the roof structure.
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6. The system according to any one of claims 1 - 5 further
comprising a gutter supported by the pitch roof structure and
beneath the turbines.
- 40 7. The system according to any one of claims 1 - 6 comprising
two electrical generators coupled with each turbine wherein
respective generators are driven by opposite ends of a drive
shaft rotated by the turbine, each generator producing
electrical energy when the turbine is caused to rotate by the
45 action of air flowing through the turbine.