



Renewable Energy Facilities Adverse weather risks

A guide to loss prevention



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Adverse weather conditions can have a dramatic impact on renewable energy installations. High winds, especially when combined with heavy rain, snow and hail storms, along with localised flooding have the potential to cause major disruption to energy production and distribution. The combination of initial design of equipment, site location and businesses being adequately prepared can influence the level of exposure energy facilities face.

The type of energy installation will have a direct influence on the risks posed by adverse weather conditions. External installations, such as wind and photovoltaic, are predominantly situated in more remote locations which increase their exposure to the elements.

Once a renewable energy facility has been installed it will be difficult as well as impractical to make modifications without incurring significant cost. It is therefore important that installations are designed for appropriate wind and snow loadings by a competent structural engineer and that equipment is installed in strict accordance with both design and manufacturers recommendations.

Being Prepared

Whilst the reliability of renewable energy installations in adverse weather is primarily dependant on its design with consideration to its location there are nevertheless some measures that can be undertaken to reduce such severe weather exposures.

Inspect Buildings

Any site buildings should be inspected. Particular attention should be given to the condition of the roof, ensuring that gutters and drains are clear of any vegetation and leaves to avoid the potential of water ingress into the building which could affect internal electrical equipment or critical spare parts stored on site.

Environmental conditions

Wind (preparation for high winds and storms)

- The condition of trees in the vicinity of any buildings or transmission lines should be inspected. Any suspect branches and trees should be removed to prevent any potential damage.
- Carry out pre-winter checks on foundations, towers, blades along with any other structures and equipment on site
- Monitor the tower for the effects of turbulence from other wind turbines or structures nearby
- Ensure that the automatic shut-down mechanism for high wind speeds and braking systems are working
- Dual axis photovoltaic plants have a higher exposure from wind damage than ground mounted installations due to their elevation and the overall size of the panels. The operation of the 'fail-safe' control which aligns the panels in the horizontal position in the event of high winds should be checked to ensure they are fully operational.

Flood (resulting from heavy rain or thaw after heavy snow fall)

Site drainage should be inspected regularly along with any debris screens to ensure they are clear especially at locations where culverts and drains are specifically provided. Flooding could result in water ingress into transformer and inverter housings together with site buildings.

Any site drainage pumps should be inspected regularly and tested to ensure they are in working order.

The condition of seals in underground cable ducts should be inspected to prevent water ingress into critical areas due to flooding and/or rise in the water table.

Always anticipate flooding in severe and cold weather conditions and move susceptible equipment or stock to an alternative location, where it will not be affected by water. In anticipation of severe rain storms and adverse weather conditions ensure that any temporary flood barriers are installed on doorways and entry points if appropriate.

Site Access

Site access particularly on larger wind farms can be affected by rainstorms and snow.

- In the event of a transmission line failure renewable energy may be off-line for an extended period. Although this is normally only a few days, site attendance may be required to reinstate the equipment.
- The condition of the access roads and adjacent areas should be inspected at least annually to minimise their exposure from landslip or extensive surface damage from rainstorm.
- Where sites are located on agriculture land and have internal gates. If possible and where security is not affected, these gates should be left open if heavy snow is expected as this facilitates clearing of the access tracks.



Failure of Power Supply

High winds, rain and snowstorms can affect not only the outgoing transmission lines but also the incoming electrical supply.

Due to the start-up procedures incorporated in control systems, in the event of a power failure, all installations will require a power supply to return the plant to service.

UPS systems and standby power generators are designed for short term trips in grid supply where no damage to the transmission lines has occurred.

– Where a standby generator is provided it should be tested regularly to ensure its availability in the event of a power failure. If the generator does not have an automatic start capability then the comments regarding site access should be taken into consideration.

Prior to adverse weather the quantity of fuel held on site should also be checked, together with a contingency plan for refuelling where necessary.

– Photovoltaic plants have a high exposure to cable theft and sites will therefore have security systems installed. Should an extended power failure occur (unless a standby power facility is available), the security system on site could be affected. If security systems are affected, contingency plans should include the placing of static or patrolling security guards on site until full power has been restored.

– When power is restored to wind turbines after an extended outage in low temperature conditions this can affect electrical equipment and/or gearbox. Electrical equipment such as generators, yaw drive motors and transformer windings can be damaged by moisture ingress and thermal shock.

Gearboxes can suffer from long exposure to cold weather from viscosity of the oil. Damage to gears will occur in the very first seconds of operation where oil is very thick and cannot freely circulate.

Permanent thermostatically controlled heaters can be installed to reduce the potential for condensation/moisture ingress to the windings and additional heaters could be provided prior to the restart of turbines to minimise thermal shocks and improve the viscosity of the oil.

– For all energy plant types, where electricity is restored, the sudden surge of power can damage modems and high-tech equipment associated with control and monitoring systems. Vulnerable equipment can be protected by installing surge protection.

– Extended outages can further expose site equipment and systems to freeze conditions so all pipework containing water should be insulated. Prior to potential adverse weather the insulation should be inspected and any damaged insulation repaired or replaced.

– Where trace heating is provided it should be checked to ensure it remains in working order and that it is energised. Contingency plans should be in place to provide back-up power if necessary.

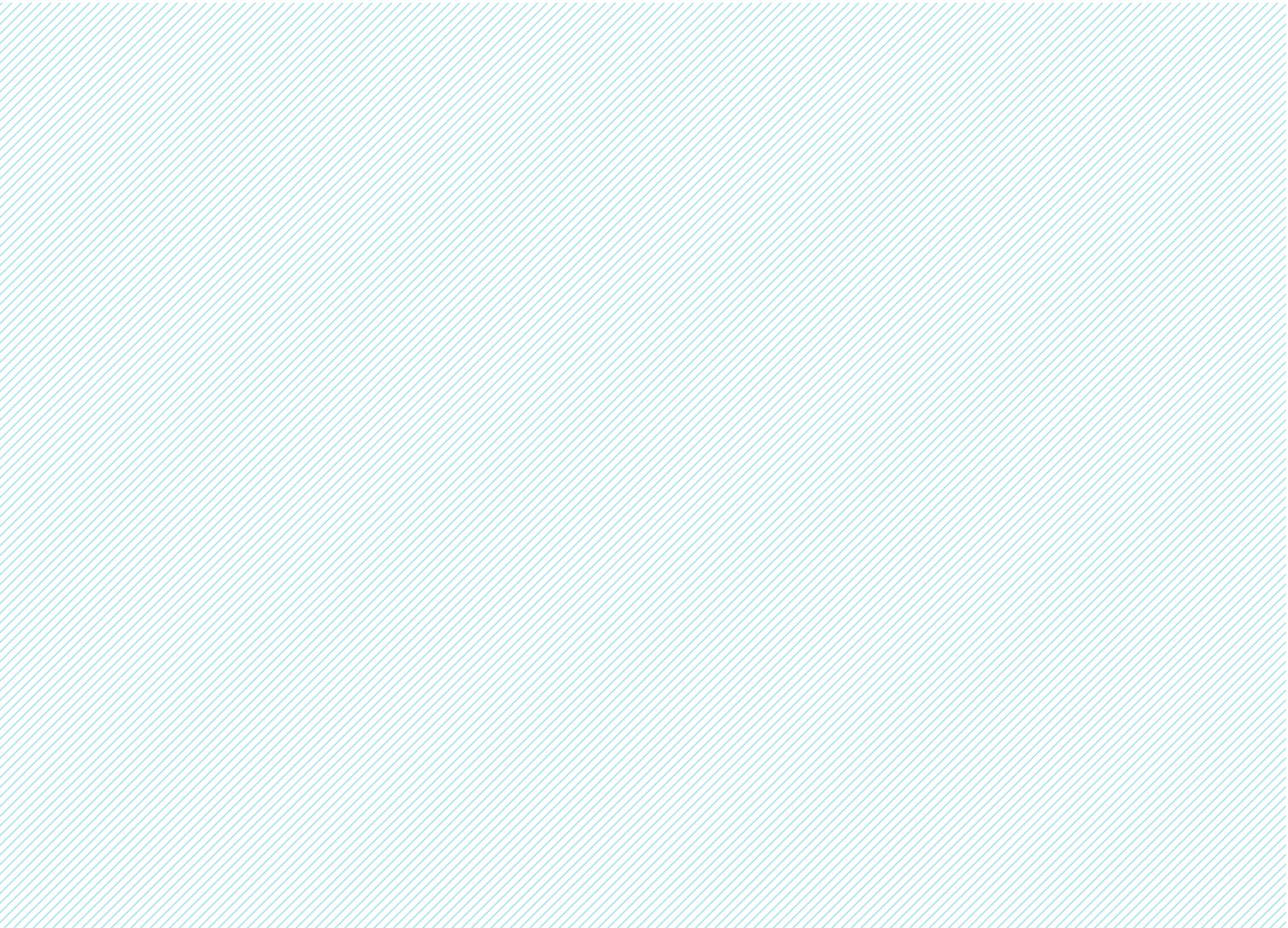
Key Loss Prevention Tips

- Ensure installations are designed and installed to appropriate wind & snow loadings
- Ensure adequate UPS and Surge protection systems are installed

Be prepared

- Inspect buildings (roofs & gutters)
- Inspect foundations and bolts annually
- Remove suspect trees /branches over transmission lines
- Maintain site drainage (inc culverts) and clear debris screens
- Install any available flood prevention measures prior to adverse weather conditions
- Test emergency pumps & generators
- Maintain adequate quantities of fuel
- Check auto shut down and braking systems annually
- Maintain access roads
- Inspect all pipework insulations

Disclaimer: The guidance in this document refers to industry best practice loss control advice. Adoption of the advice contained within this document does not imply compliance with industry, statutory or HSEI guidelines, nor does it guarantee that related losses will not occur.



HSB Engineering Insurance Limited

Registered in England and Wales: 02396114,
New London House, 6 London Street,
London EC3R 7LP.

Registered as a branch in Ireland: 906020.

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NOT IF, BUT HOW