Onshore Renewable Energy

20/01/16
Andy Bazley
Senior Underwriter

HSB Engineering Insurance

Risk Solutions

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Agenda

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1. Financial incentives: ROC & FITs
2. Wind Turbines
3. Solar Energy
4. Hydroelectric
5. Biomass & Biogas
6. Anaerobic Digestion (AD)
7. Insurance Solutions

What is renewable energy?

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Renewable energy doesn't consume fossil fuel and is environmentally friendly. Solar energy panels rely on the sunlight, turbines rely on the wind, geothermal energy relies on heat from the earth, hydroelectric power is produced by tides & waves and biomass by organic material.

Climate change, CO2 Emissions, rising energy costs, 2020 European target, financial Incentives and the planets' rising population and dwindling resources are all **Drivers for Change**

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The rising Global demand for Renewable Energy

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The world installed more renewable energy capacity over the past three years than nuclear and fossil fuels combined

59%

of installed capacity in 2014 was renewable

$12.2 trillion

will be invested in power plants by 2040 in the US

66%

of this investment will be made up of renewables

1 Financial incentives: ROC & FITs

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Renewable Obligation

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- Aimed at large energy providers
- Introduced in 2002
- 11.1% of electricity from renewables in 2010/11
- 15.4% in 2015/16
- Runs to 2037
- Renewable Obligation Certificates (ROCs)
- Buy-out option

Feed In Tariff (FIT)

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What are FITs and what are the benefits?

1. FITs are aimed at small scale producers < 5MW
2. Applies to Wind, Hydro, PV, Anaerobic Digestion and Micro CHP
3. Financial benefits: Generation tariff, export tariff, reduced electricity bills
4. Fixed for 20-25 years with a reduced payback time on investments

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Renewable Heat Technologies

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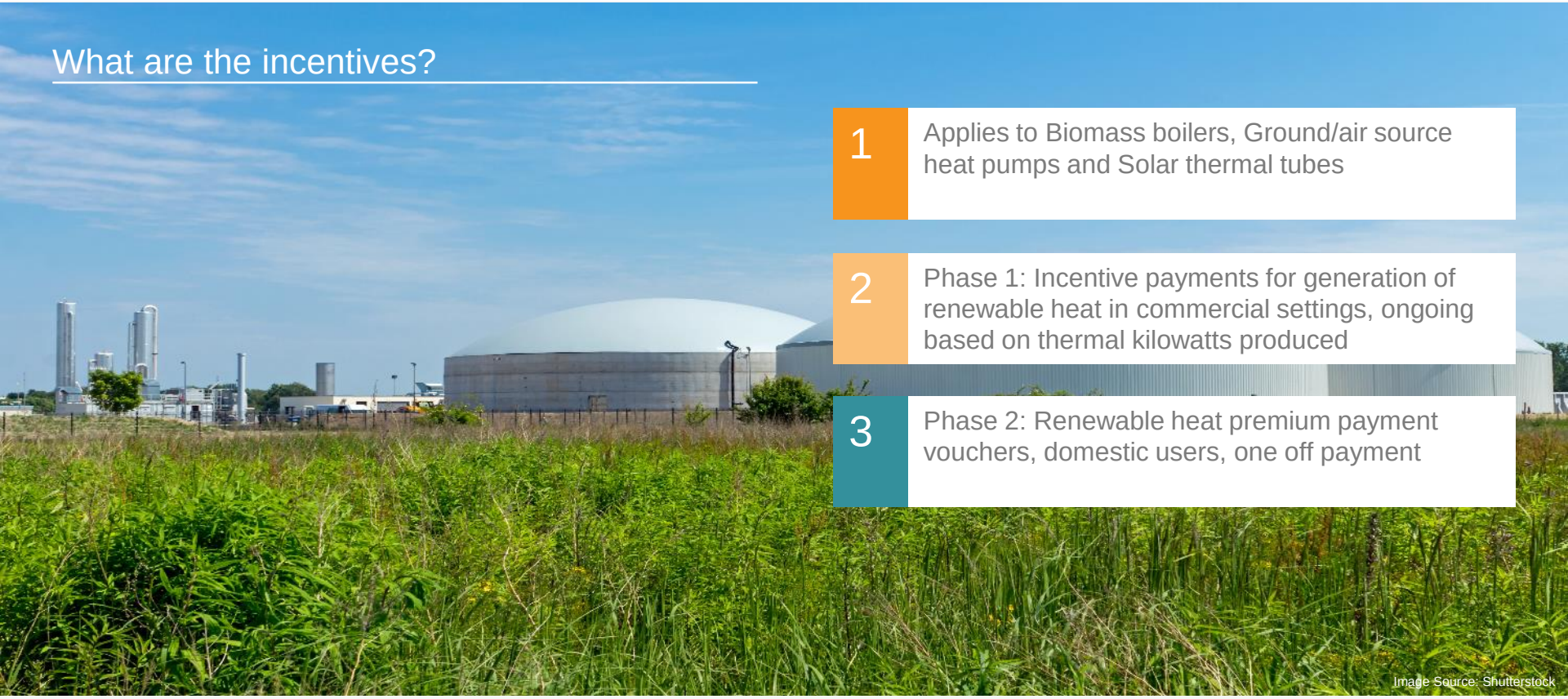
What are the incentives?

1. Applies to Biomass boilers, Ground/air source heat pumps and Solar thermal tubes
2. Phase 1: Incentive payments for generation of renewable heat in commercial settings, ongoing based on thermal kilowatts produced
3. Phase 2: Renewable heat premium payment vouchers, domestic users, one off payment



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Different types of Renewable Energy…

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- Wind
- Solar

- Hydro

- Biomass

2 Wind Turbines

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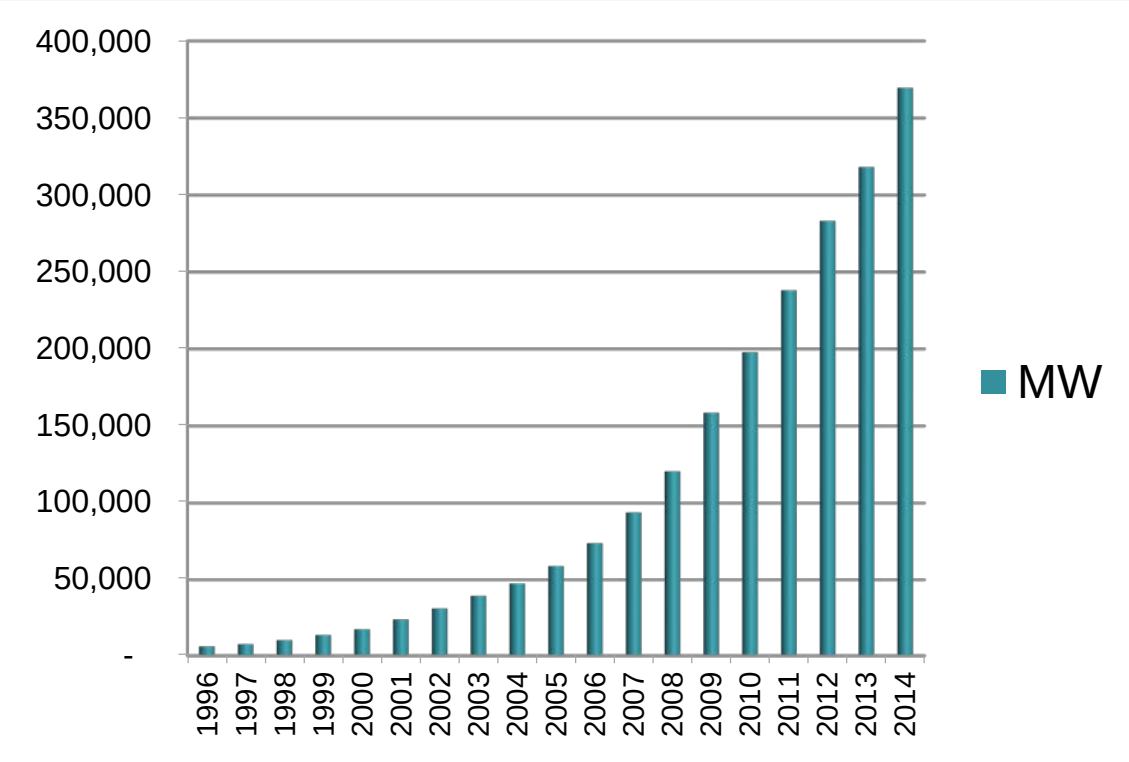
Installed Wind Capacity



- First recorded mechanical wind turbine – 200BC in China
- UK has largest wind resource in Europe
- Currently produce 9.3% of our Electricity, with the potential to provide 27%
- Small footprint
- Good rates of return

Wind Turbine Mechanics

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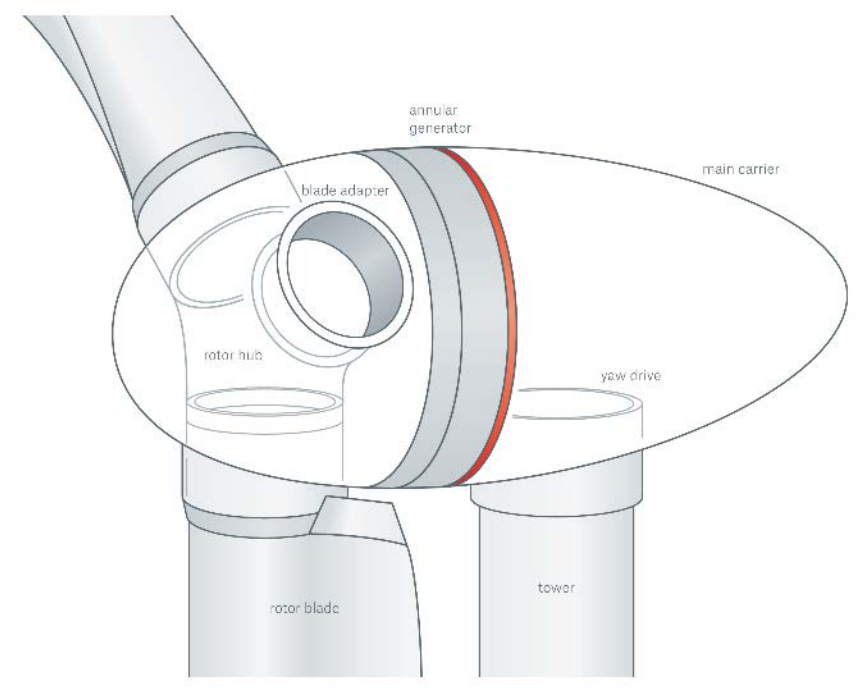
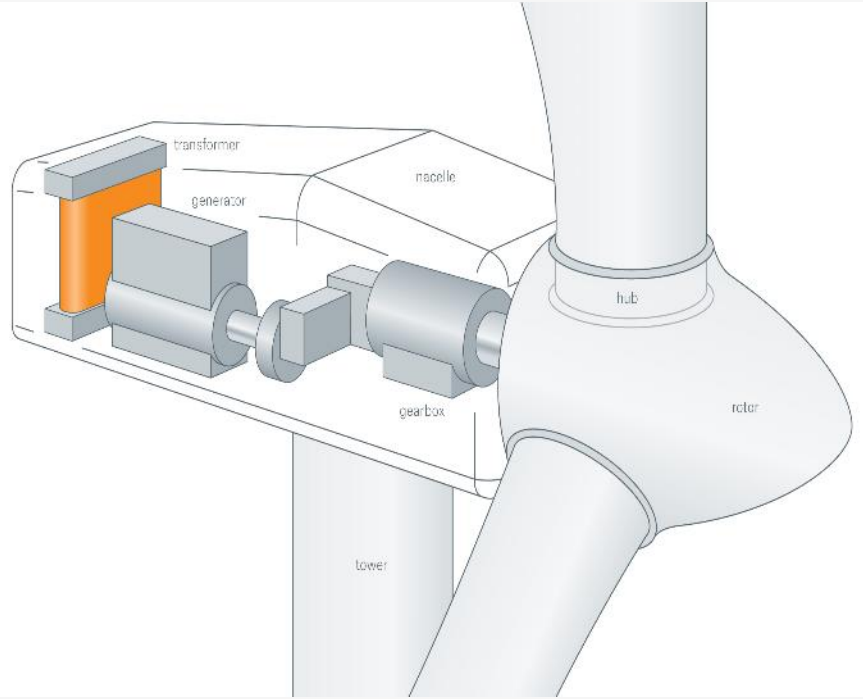
Gearless Wind Turbine



Standard Wind Turbine



Wind in Numbers

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2500	homes a 3MW wind turbine can power
8,000	parts in a turbine
268,000	wind turbines in the world
250 tons	weight of a 2Mw Turbine

Wind Turbine Losses

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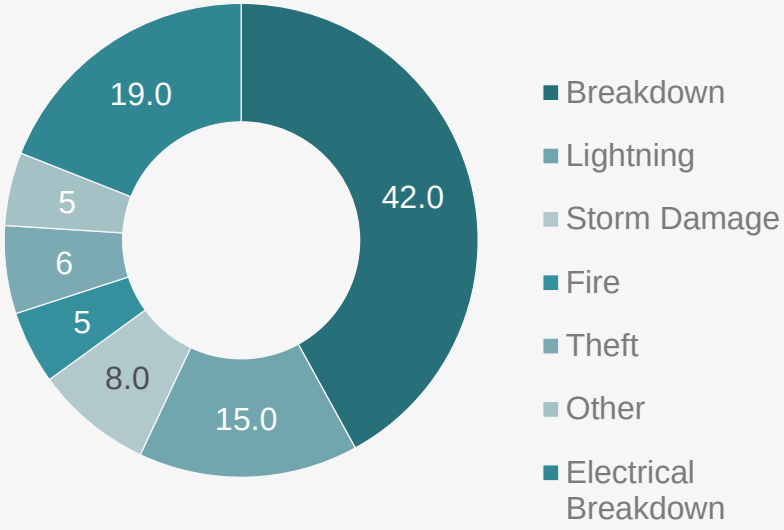
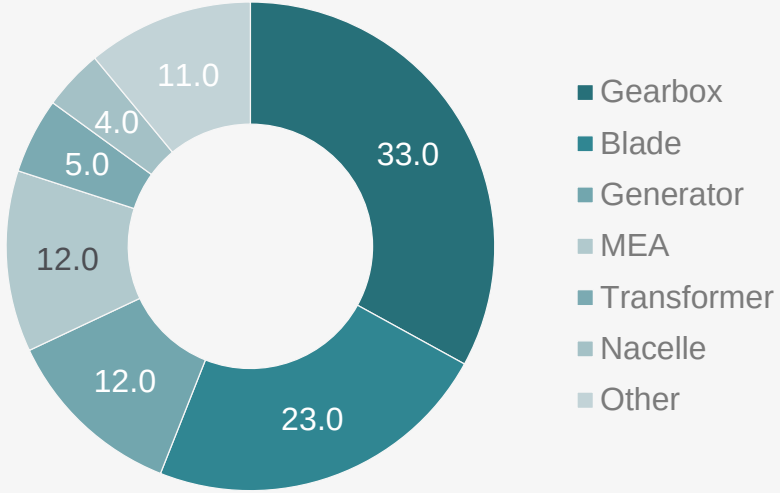
Percentage losses by exposure type

%



Percentage losses by equipment type

%



Risk Exposures

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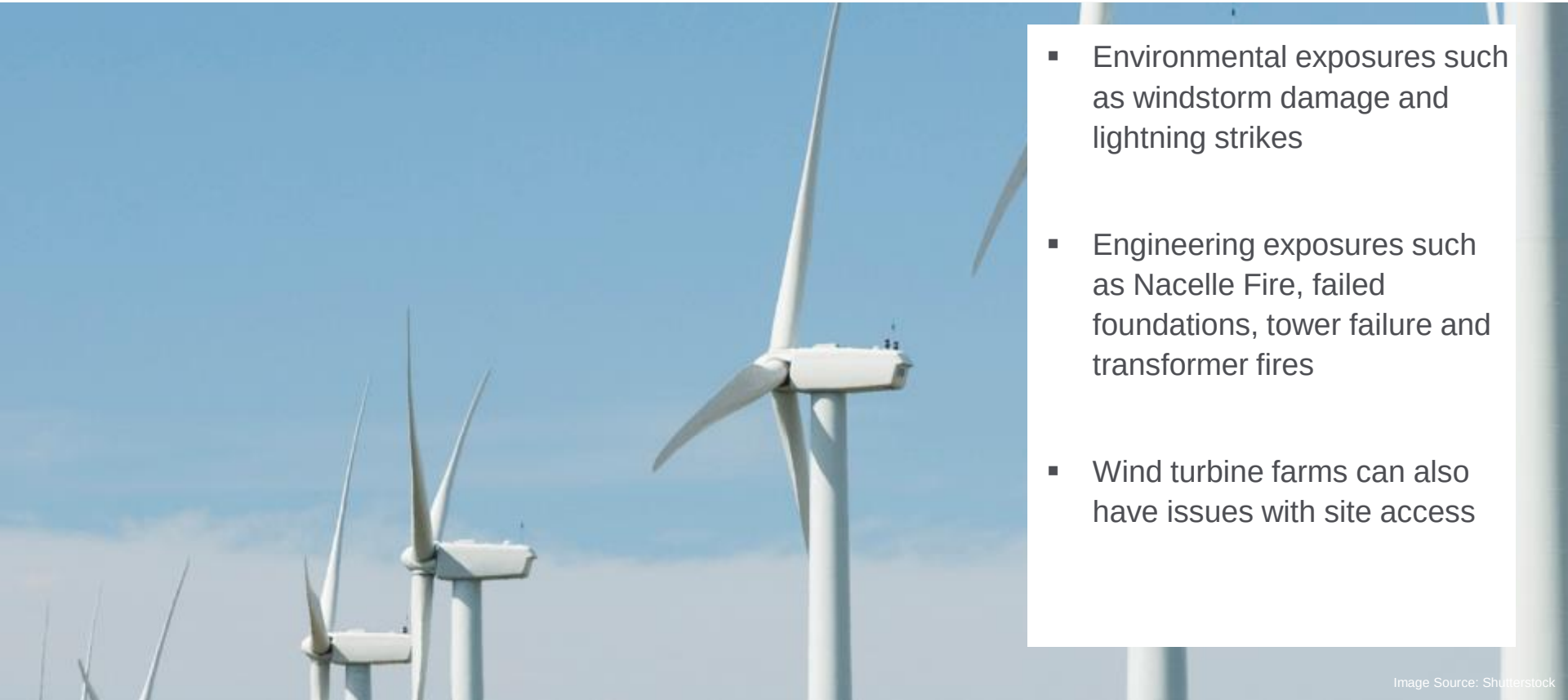

- Environmental exposures such as windstorm damage and lightning strikes
- Engineering exposures such as Nacelle Fire, failed foundations, tower failure and transformer fires
- Wind turbine farms can also have issues with site access

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Wind UW Features

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Positives

- Proven technology
- Direct drive turbines
- Good maintenance and monitoring
- Spares readily available

Negatives

- Poor ground conditions
- Poor access
- No auto shutdown
- Out of warranty
- Refurbished turbines
- Single transformer for multiple turbines

3 Solar Energy

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Solar Technology

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Facts and figures…

- In just 1 second the sun produces enough energy to meet the current global power needs for 500,000 years
- 40GW of PV was installed Globally last year
- Total Global capacity is around 177GW
- The largest PV installation is Solar Star in California at 578Mw, this site covers 13 square km and can power 255,000 homes

Concentrated

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Thermal Tubes

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Photovoltaic

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Risk Exposures

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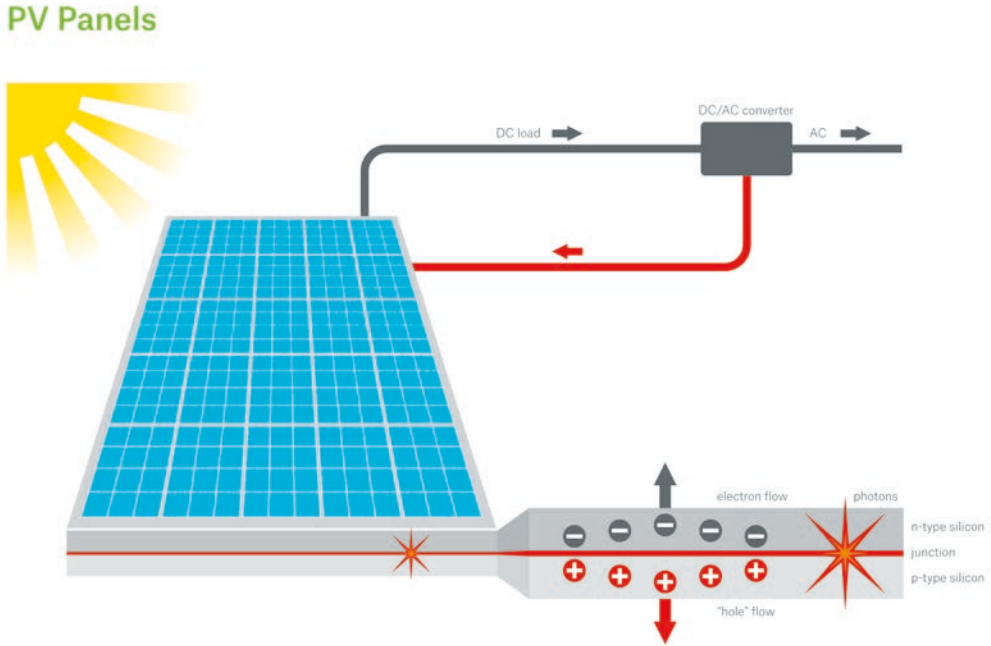

- Theft or attempted theft
- Flood, windstorm and hail damage
- Fire
- Impact damage
- Failure of substation equipment
- Failure of trackers
- Poor site maintenance
- Accumulation of material during construction

Underwriting Features

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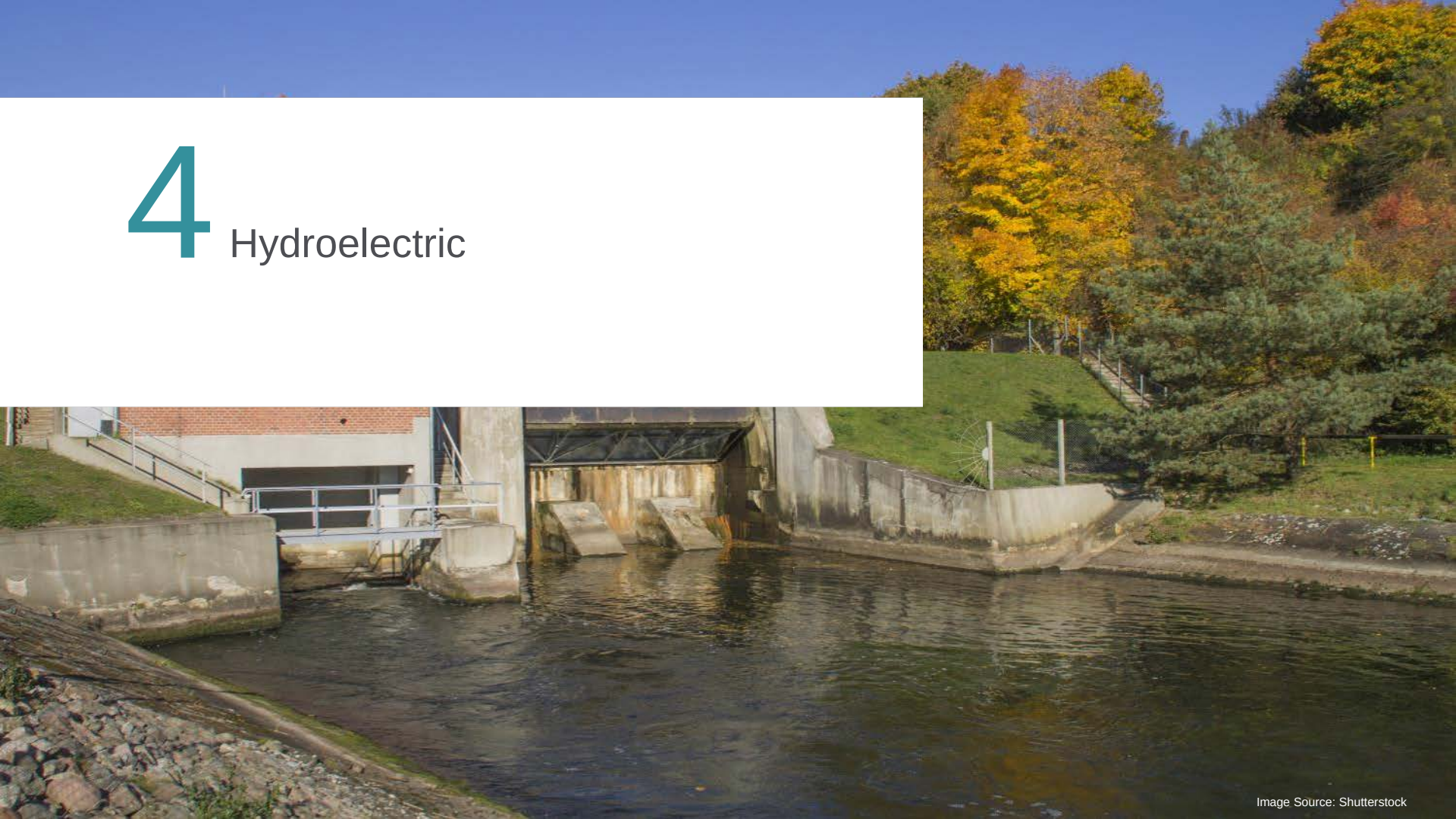
Positive

- Good site security
- Outside of any known flood areas
- Fixed Frame
- Preventative maintenance program

Negative

- Flood exposed site
- Poor plant / site maintenance
- Poor security
- Located on combustible buildings

4 Hydroelectric



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Facts and figures

- Hydroelectric is the worlds leading renewable energy source and the oldest method of harnessing clean power
- The Largest hydro power station is 3 Gorges dam in /china at 22,500 Mw
- Hydro power is installed in over 150 countries
- 60% of Canada’s electricity comes from hydro
- A modern hydro turbine can convert 90% of the energy in the available water into electricity

Hydroelectric Power

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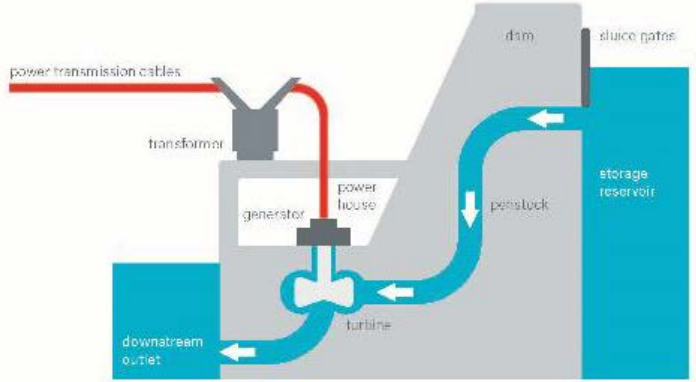

- **Dam Hydro Plant:**
  The movement of water as it flows downstream creates kinetic energy that can be converted into electricity. This is converted into electricity by forcing water, often held at a dam, through a hydraulic turbine that is connected to a generator
- **Archimedes Screw Hydro:**
  A Hydroelectric Turbine design based on the Greek Archimedes Screw principles that converts the potential energy of flowing water into usable electricity

Loss examples

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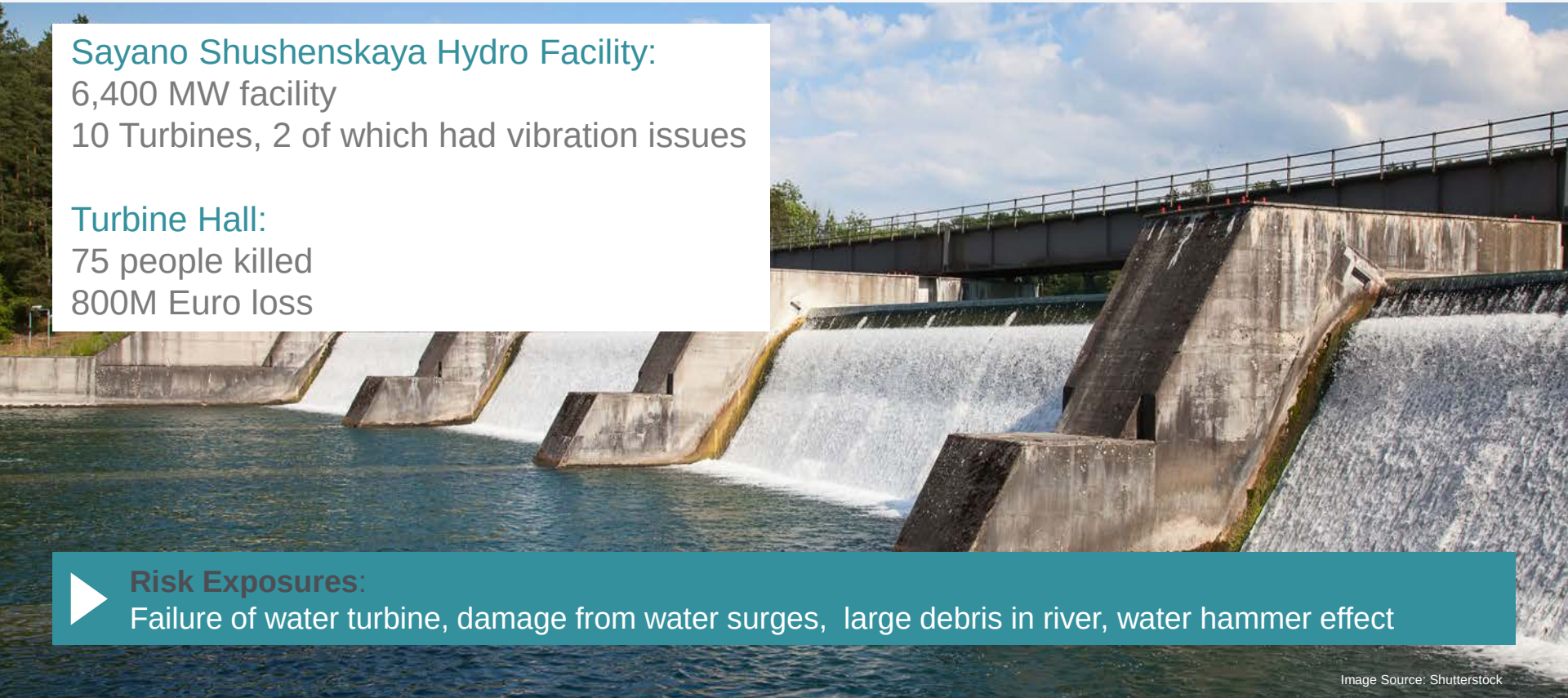

Sayano Shushenskaya Hydro Facility:

6,400 MW facility

10 Turbines, 2 of which had vibration issues

Turbine Hall:

75 people killed

800M Euro loss

Risk Exposures:

Failure of water turbine, damage from water surges, large debris in river, water hammer effect

Image Source: Shutterstock

Hydro Electric UW Features

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Positives

- Proven technology
- Good maintenance
- Remote monitoring
- Well positioned power house

Negatives

- Older installations
- Area prone to flash flooding
- Excessive civils/pipelines

5 Biomass & Biogas

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Biomass

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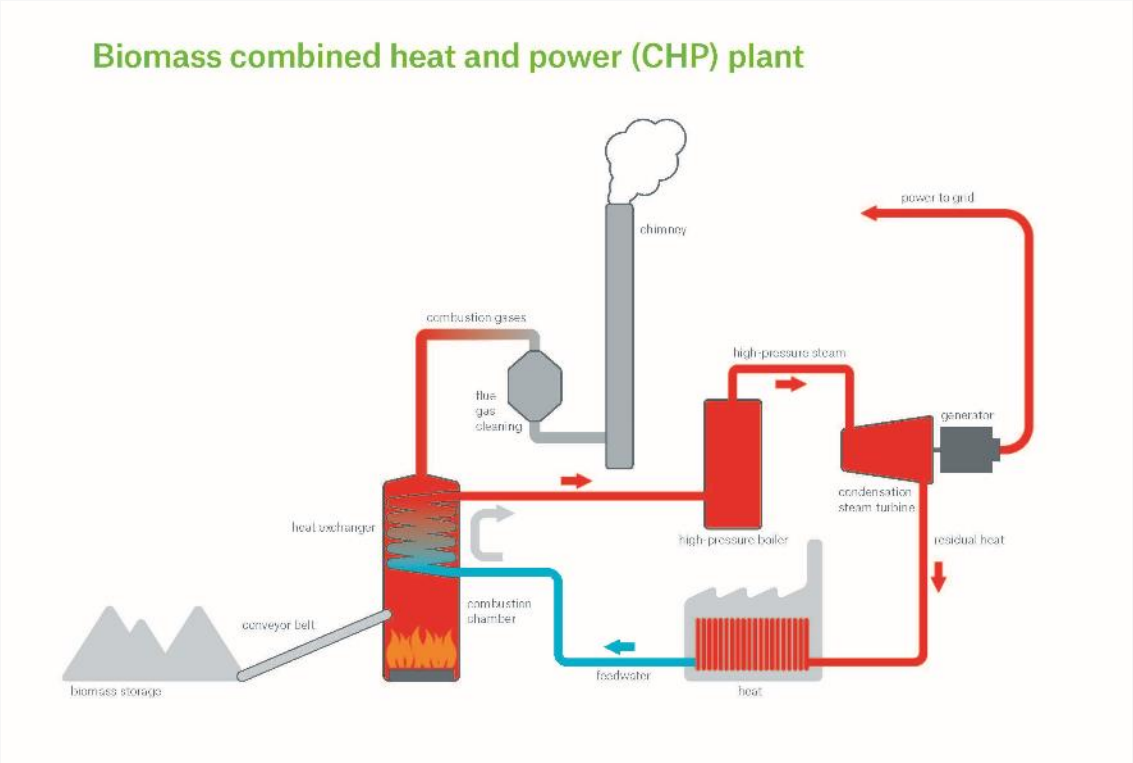

- Burning of wood chip / waste
- Small scale used to heat water
- Large scale used to Power steam turbines

Direct burn boilers

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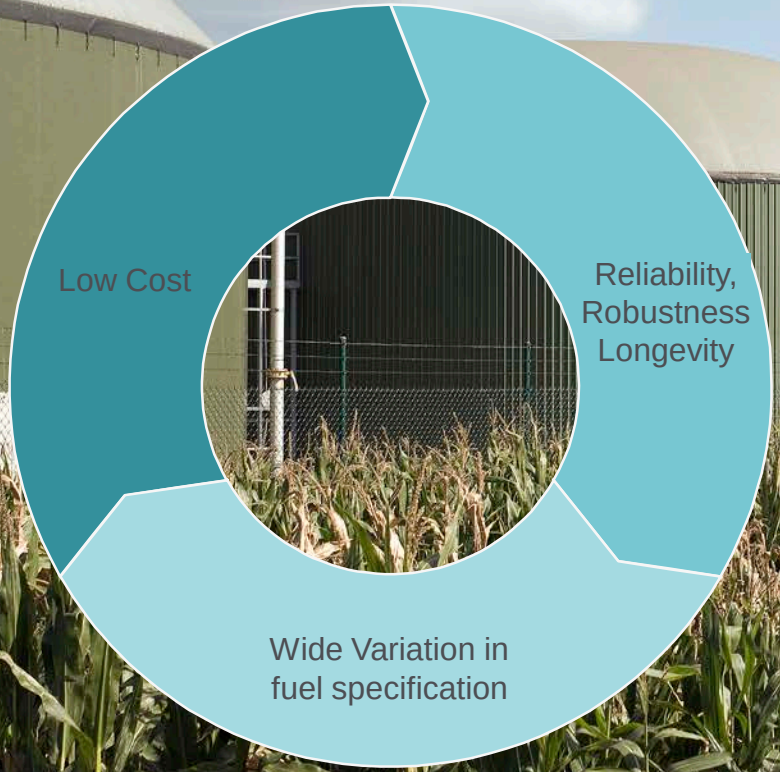

Pro’s and con’s

1. Small boilers have a separate boiler house and fuel store, they run on a different fuel to domestic boilers and are fixed, not mobile

2. Large boilers have their own fuel storage and fuel feed. Main issues are around auger, fuel delivery, separation, availability of parts and fire suppression.

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Biomass: Direct Burn

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Small

- Separate boiler house
- Separate fuel store
- Similar to domestic boiler but different fuel
- Fixed not mobile

Large

- Any obvious problems?
- Fuel storage
- Fuel feed – auger issues
- Fuel delivery
- Separation
- Fire Suppression
- Safety valves
- Availability of parts

Risk Exposures

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- **Large Boilers:**
  - Fine if separated from processing area
  - Separate fuel store
  - Regular maintenance
  - Fire suppression
- **Fuel Issues:**
  - Spontaneous combustion
  - Highly inflammable
  - Straw can be even more difficult

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Positive underwriting features

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Small

- Single Fuel
- Separate Fuel supply
- Maintenance programme to manufacturers standards
- Not in processing area

Large installations

- Adequate separation
- Cut off on fuel supply
- Fire detection and suppression
- Damping down facility – dust
- Class A & B wood only
- Experienced staff

6 Anaerobic Digestion (AD)

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Anaerobic Digestion

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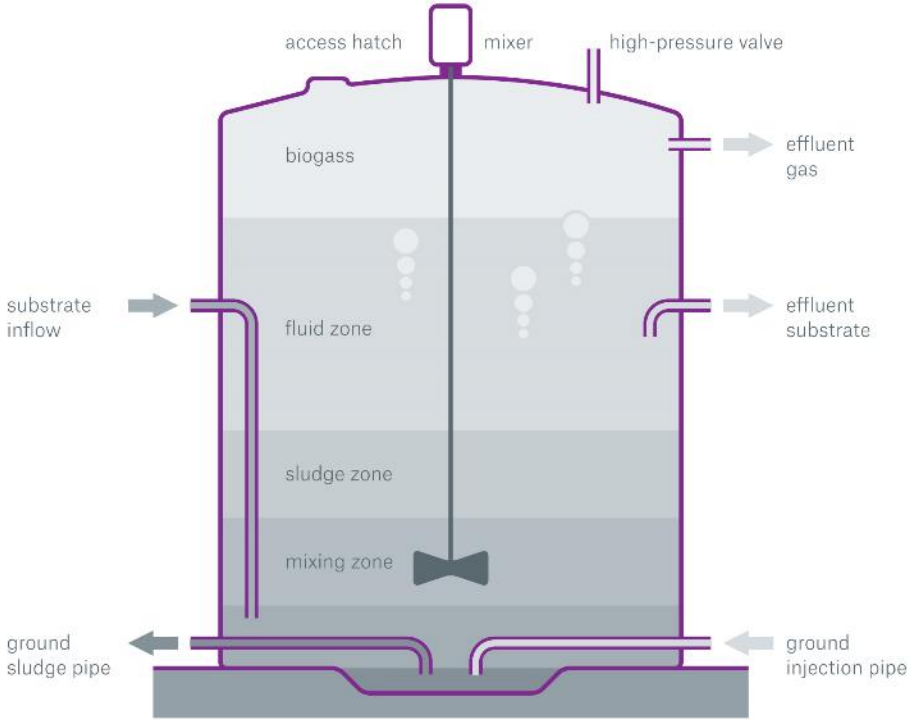

- The breakdown of organic material using bacteria
- Animal waste, sewage, feed crops

Anaerobic Digestion Technologies

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Fire Suppression – Combined Heat and Power

- Large site with several containerised CHP units
- Vents need to close automatically
- No oxygen – no fire

Positive underwriting features

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- Modern well constructed plant
- Good maintenance
- Well trained staff
- Fire Suppression
- Well run site
- Distance from main fuel supply if dry system
- Secure sites

7 Insurance Solutions

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Construction

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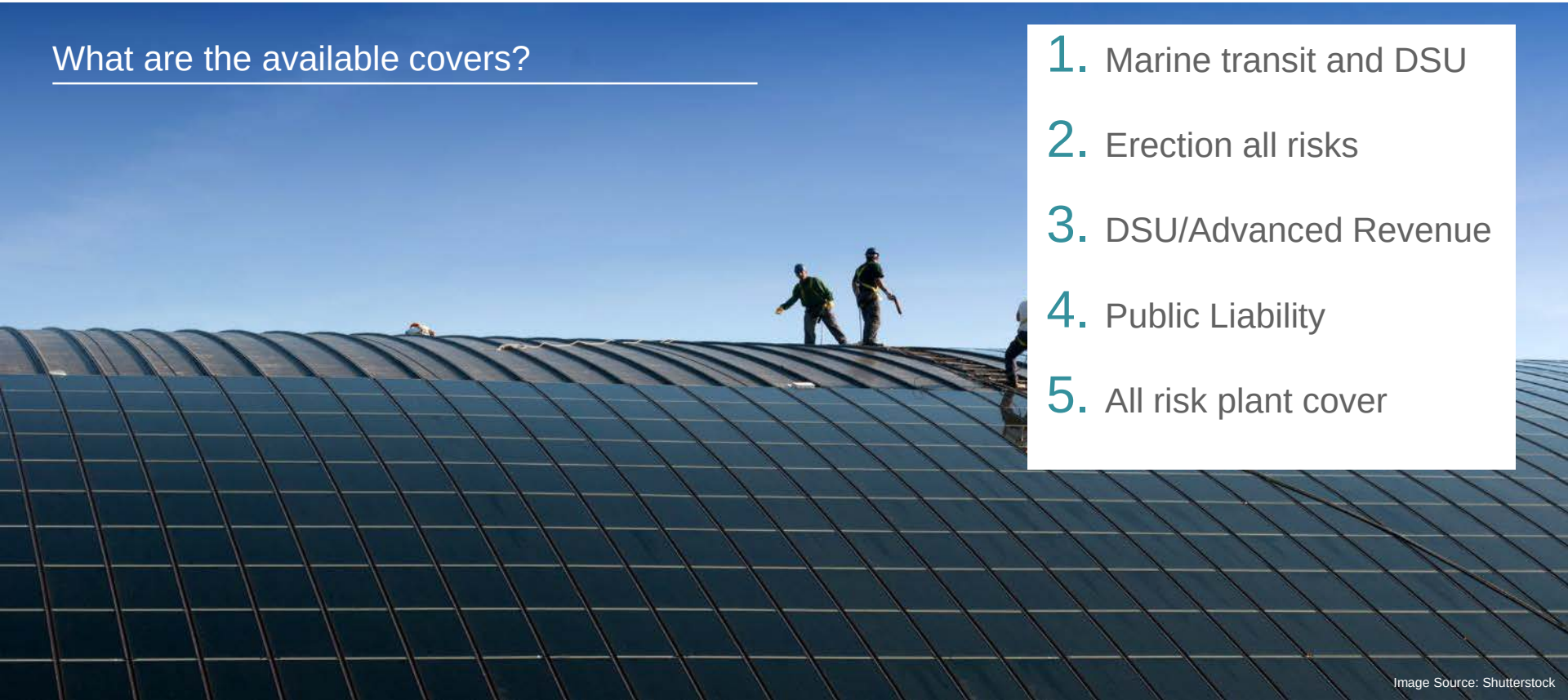
What are the available covers?

1. Marine transit and DSU
2. Erection all risks
3. DSU/Advanced Revenue
4. Public Liability
5. All risk plant cover



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Operational

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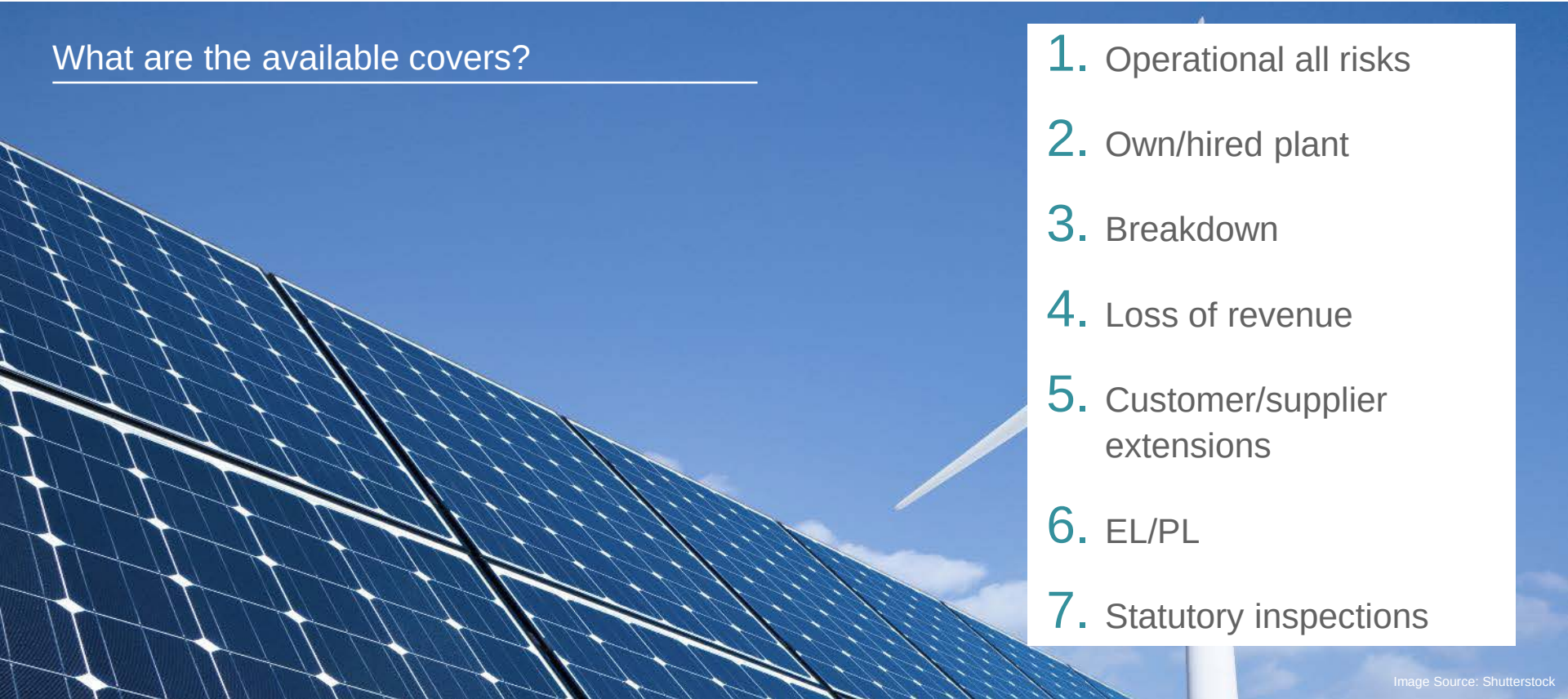
What are the available covers?

1. Operational all risks
2. Own/hired plant
3. Breakdown
4. Loss of revenue
5. Customer/supplier extensions
6. EL/PL
7. Statutory inspections



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Other covers

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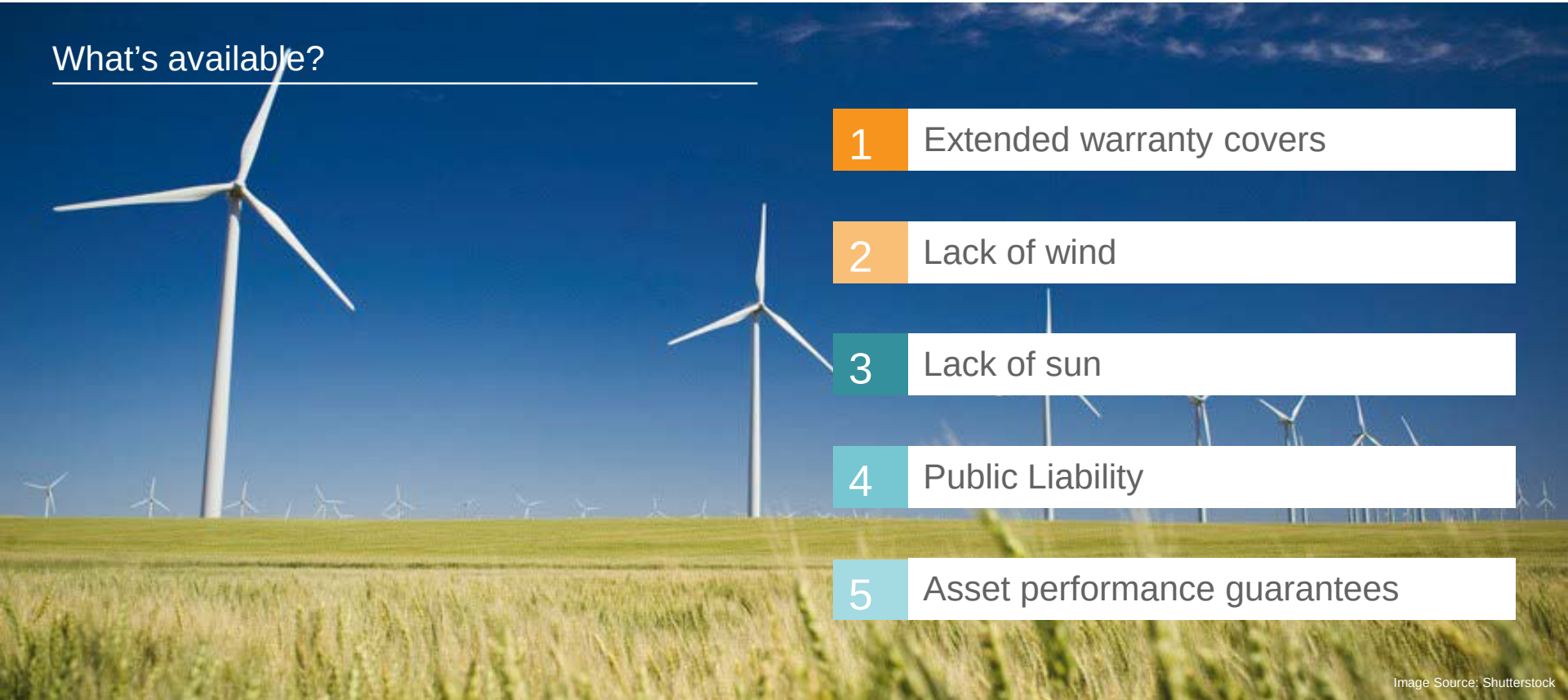
What's available?

1. Extended warranty covers
2. Lack of wind
3. Lack of sun
4. Public Liability
5. Asset performance guarantees



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Thank you for your attention. Any questions?

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