“trusted wind turbine asset management”
“independent service provider”
“technology based company”

GreenTech

WELCOME

Solutions and Services for your renewable assets…

Title Discussion

+ Who we are?
+ What we do?
+ Insurance
+ SCADA
+ Craneless Operation
+ Clientele

Who we are?

Our Purpose

Company Structure

- The company
- Vision
- Mission
- Greentech MW

Standards / Certification

Our Purpose

What to look for in a service provider

Good track record

Expertise demonstrated with thorough records
Demonstrated delivery on time and budget

Expertise to help you plan better and minimize costs

Efficient and experienced crew to minimize work time
Collaborative with planning – suggests criteria for timing
Low rate of repeat oil changes – doing it right the first time

Is flexible to your needs

Commits to delivery on yours schedule
Ensures they’re not overbooked

THE COMPANY

Company Structure

GreenTech… a company which offers complete O&M solutions across renewable energy and specifically for energy efficient wind turbine, incorporated in 2007

Robust processes, systems, practices and insights being applied across technologies to effectively and professionally offer O&M services & spare parts

Integrated approach of domain, updated technologies and business expertise

We combine our knowledge and social concern for optimal solutions to real-world problems

Team members of GreenTech have decades of rich experience in various WTG technology platforms, WTG O&M, worked Globally in different positions at WTG OEM's like Suzlon, Vestas, Gamesa, Regen Powertech, INOX Wind, etc....

THE COMPANY

Company Structure

1	Started in 2007, now operating in 9 states across India
2	Industry best practices in-line with customer requirement
3	Cost effective & quick access technology suitable for all terrains
4	One stop solution for de-erection and re-erection of wind turbine major components through our Crane-less Technology
5	Branded name in Wind Energy Sector
6	Rich experience / experts in various wind turbine technologies / wind farm project management / due diligence

VISION

Company Structure

Create a space for ourselves as a leader in wind energy solutions and services

Offer quality and affordable service to our customers, thereby leveraging them with quicker ROI

Continuous R&D to provide specialized services to customers throughout the lifespan of their renewable energy assets

MISSION

Company Structure

Deliver “**Best in class**” wind energy services to benefit our customers and our planet

Cater to optimized generation and performance needs of customers’ wind turbines and wind farms

Be a trusted wind energy service partner by leveraging our technical and strategical capabilities

OUR CORE TEAM

Who we are?

V Saibaba

Investor & Mentor

A business leader with over 34 years of experience in the corporate sector within and outside India, had held senior leadership roles in both Multinational and Indian companies, such as General Electric (GE), Vestas, Lanco, Suzlon, APV Pasilac, Hindustan Unilever.

He has started, built and grown companies in various sectors, especially renewables (wind & solar), held positions as whole›time Director, CEO with P&L responsibilities. He worked across value›chain – sourcing, processing, manufacturing, marketing & sales, engineering, procurement & construction, asset management, business development, technology transfer & international business.

In many assignments, he has conceived business ideas, developed strategic & business plans and successfully executed. Built large and effective teams through his leadership skills. He has chaired in many industrial association bodies of FICCI, CII, Global Solar Alliance, etc. and represented India successfully. He has built over 7000 MWs of both Wind and Solar projects over 20 years.

OUR CORE TEAM

Who we are?

Capt. Sundaresan Kishore

Member of Board

"Capt. Sundaresan Kishore Director in Greentech Megawatt Private Limited is a senior management professional with 40+ years of working experience out of which the last 20 years in senior management levels.

After sailing for 15 years he came ashore to join a ship management company in India. Then went on to become the "Technical Advisor" to a ship finance company based in Lugano – Switzerland, and then as Sr. V.P and Global head of sales and Marketing of a Maritime Software Company based in Singapore.

Returned back to India in 2008 as Country Head of Kongsberg – A Norwegian Company in India. Retired in 2018 as Managing Director in India of Kongsberg Digital. Since retirement, on the board of Greentech MW Pvt. Ltd.

Dilli Babu

Member of Board

Engineering Graduate & MBA in International Business with rich 27 years of experience in Power industry across the Globe, especially in South East Asia and runs multiple business in manufacturing, EPC, ISP and trading.

He owns UNIVERSAL Power Equipment [UPE], producer of a wide range of power utility equipment [Low / Medium / High / Extra High Voltage] such as Switchgear Panels, Surge Arresters, Disconnecting Switches, Isolators, Current & Voltage Transformers, Relay and Control Panels, Polymeric / Composite Insulators etc. which are all employed in High Voltage Substations for electrical power transmission and distribution equipment ranging from 415V to 245kV. He also owns other companies like Axess Seven, Axess Film Factory and many other Engineering related business enterprises

OUR CORE TEAM

Who we are?

P Mohanraj

Director – Operations

Mohanraj has more than 20 years of experience in the operation and maintenance of a wide variety of wind turbine technology. Before joining GreenTech, he worked in senior leadership roles in the O&M departments of both Vestas RRB and Suzlon Energy. In these capacities, he played an important role in the establishment and development of the business associates network as well as OEM relationships in both the domestic and foreign markets.

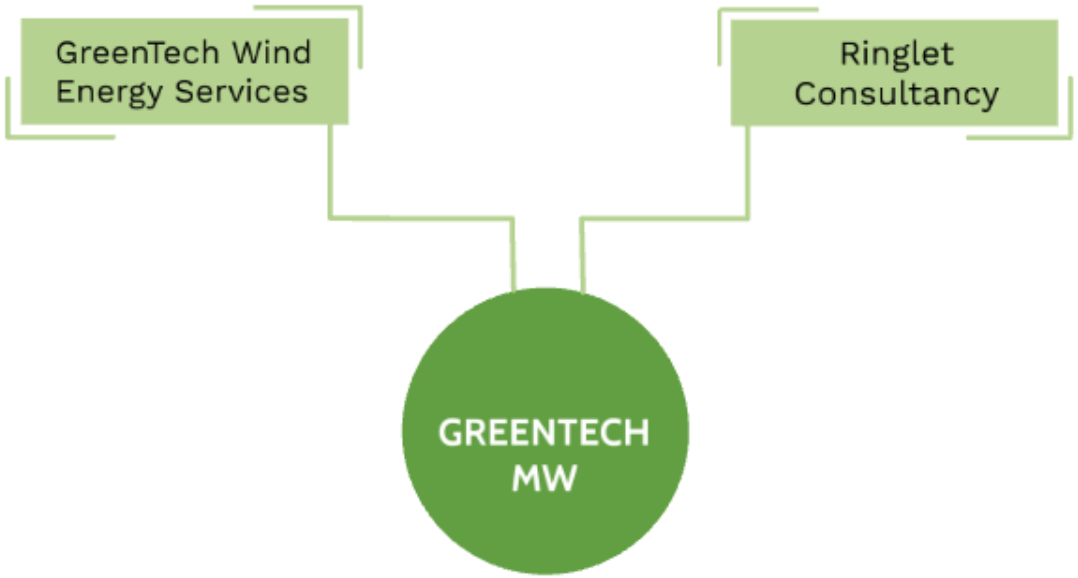
Alagu Subu

Senior Manager – Technical

Alagu Subu having 22+ yrs of experience in the Technical functions of Petrochemical and Wind Energy sectors. A Six Sigma Green Belt holder (DMAIC and 8D methodology) & Professional trainer for yellow belts of 30+ persons and successfully completed 10+ projects which saves >700,000 USD per year. A Certified trainer for all mechanical & condition monitoring and specialist in handling all major technical defects. He led Engineering›Mechanical in Suzlon for state Tamilnadu, Kerala & Srilanka til Feb’2019

GREENTWCH MW

Company Structure



Ringlet are investment partners. Board consists of corporate heads and industrialists from the Southern part of India

Combination of GreenTech wind energy services' experience in comprehensive maintenance of sub MW series and investment ability of Ringlet, is a win-win formula to take this experience forward into the MW space

The decades of experience of Corporate heads from both the entities provides necessary processes and professionalism in the operations and ensures that technology is used diligently for continuous R&D and learning

STANDARDS / CERTIFICATION

Who we are?

MANAGEMENT SYSTEM CERTIFICATE

QUALITY SYSTEM CERTIFICATION
DNV
ISO 9001:2015

ENVIRONMENTAL SYSTEM CERTIFICATION
DNV
ISO 14001:2015

SAFETY SYSTEM CERTIFICATION
DNV
ISO 45001 : 2018

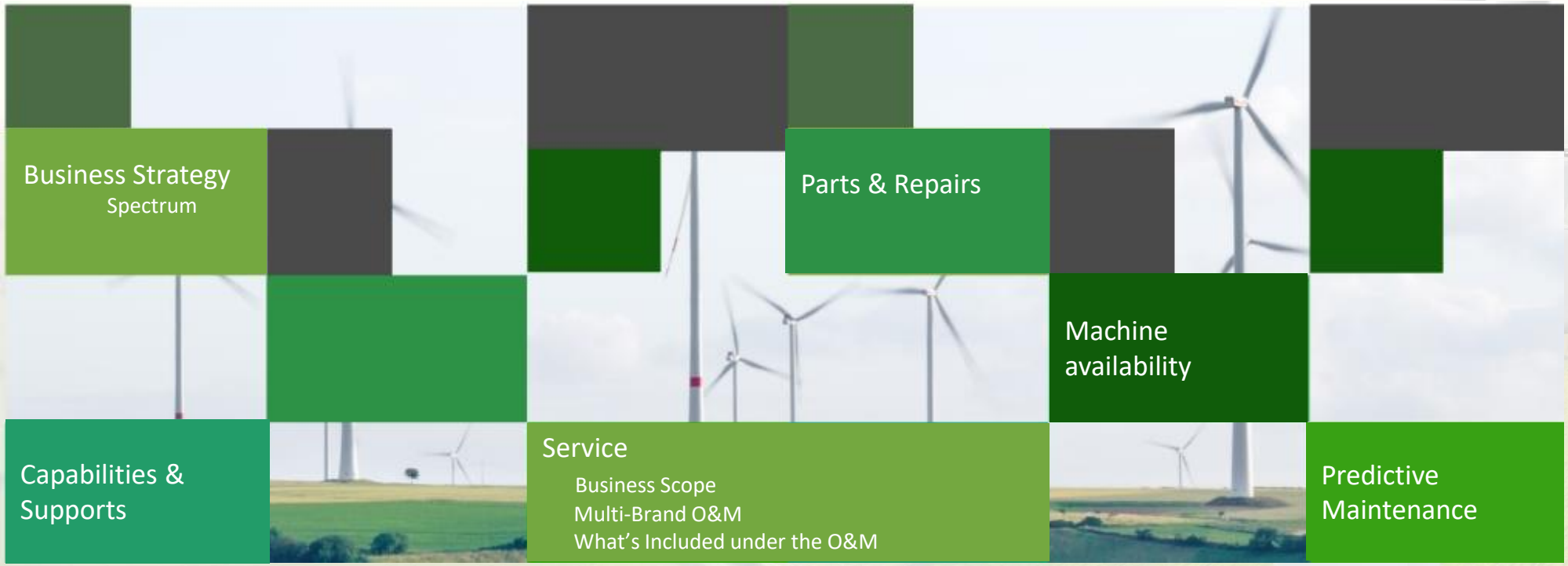
Certificate No:

10000479194-MSE-RvA-IND

These certificates are valid for the following scope:

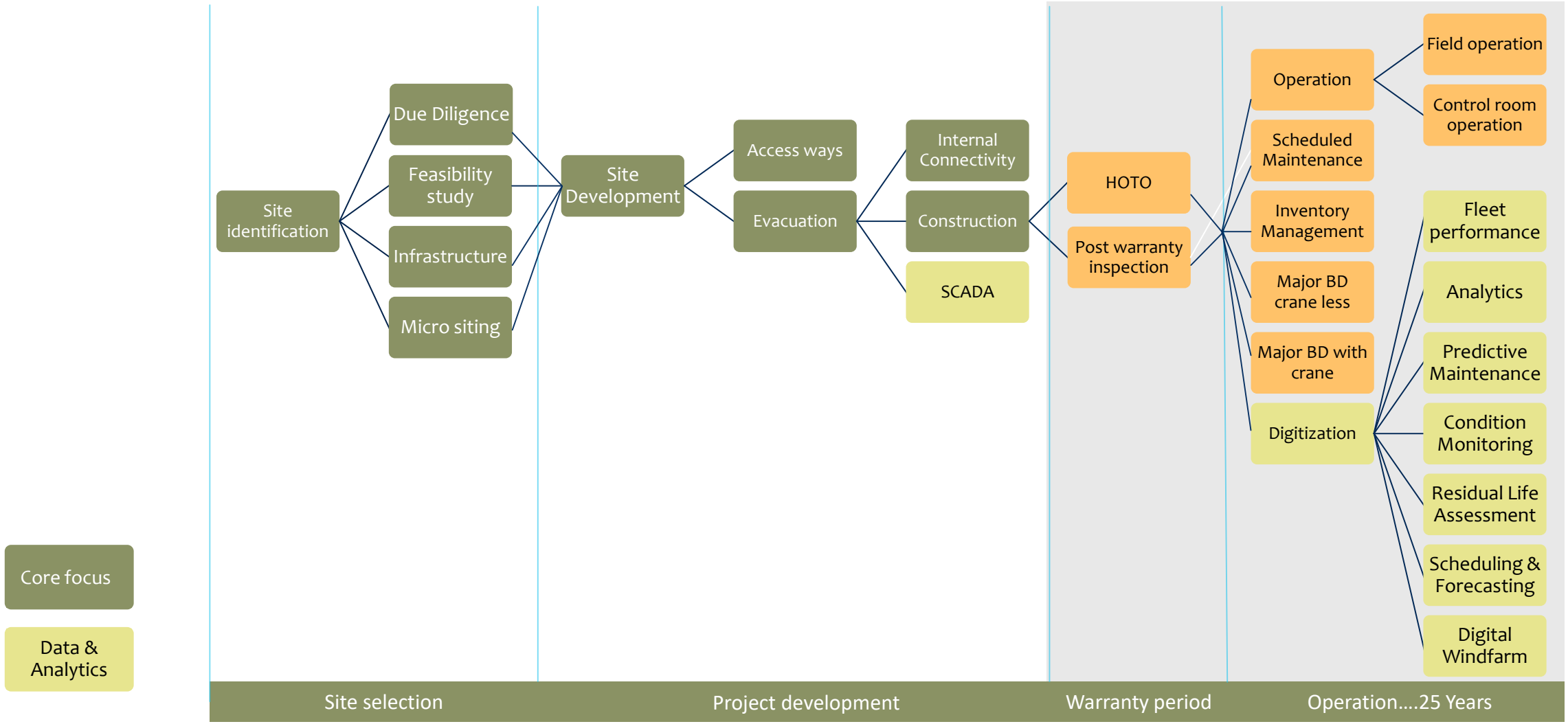
Operation and Maintenance Services of Wind mills

What we do?



BUSINESS STRATEGY

What we do?



SPECTRUM

Business Strategy

Operation & Maintenance

Multi brand service
Remote monitoring
Comprehensive / Global Service / Customized suite
Performance commitments / optimization

Technical Support Service

Retrofit & Remediation
Continual improvements & Upgradation
Quality Assurance

Asset Performance Management

Asset protection
Reliability management
Data analytical
Comprehensive reporting

Warranty & inspection service

End of warranty inspection
In›warranty inspection
Due diligence

Spare Parts

Shop spares
Service & Repair Centers

GreenTech

Operation & Maintenance — 400 + MW

Pipeline — 190+ MW

People — 100 +

Customer Base — 40 +

BUSINESS SCOPE

Service

Administration

Billing, accounting

SEB Statement & Liaison

Scheduled Maintenance

Scheduled Maintenance

Scheduled / planned

Periodic inspection / lubrication

Condition Monitoring System

Alarms Diagnostics

Condition Monitoring Systems

SCADA

Predictive Maintenance

Failure prediction

Reliability improvement

Planned exchange of major components

Cranel-Less Technology

Universal jig adaptable for al models

Ease of handling

(single heaviest components less than 500kg)

Corrective Maintenance

Unplanned or condition-based

Cover cost of major component repair

or replacement

Retrofits / upgrades

Control software

Performance enhancement through upgrade

Insurance

Business Income (loss of profit)

Equipment Protection (from breakdown)

Site Maintenance

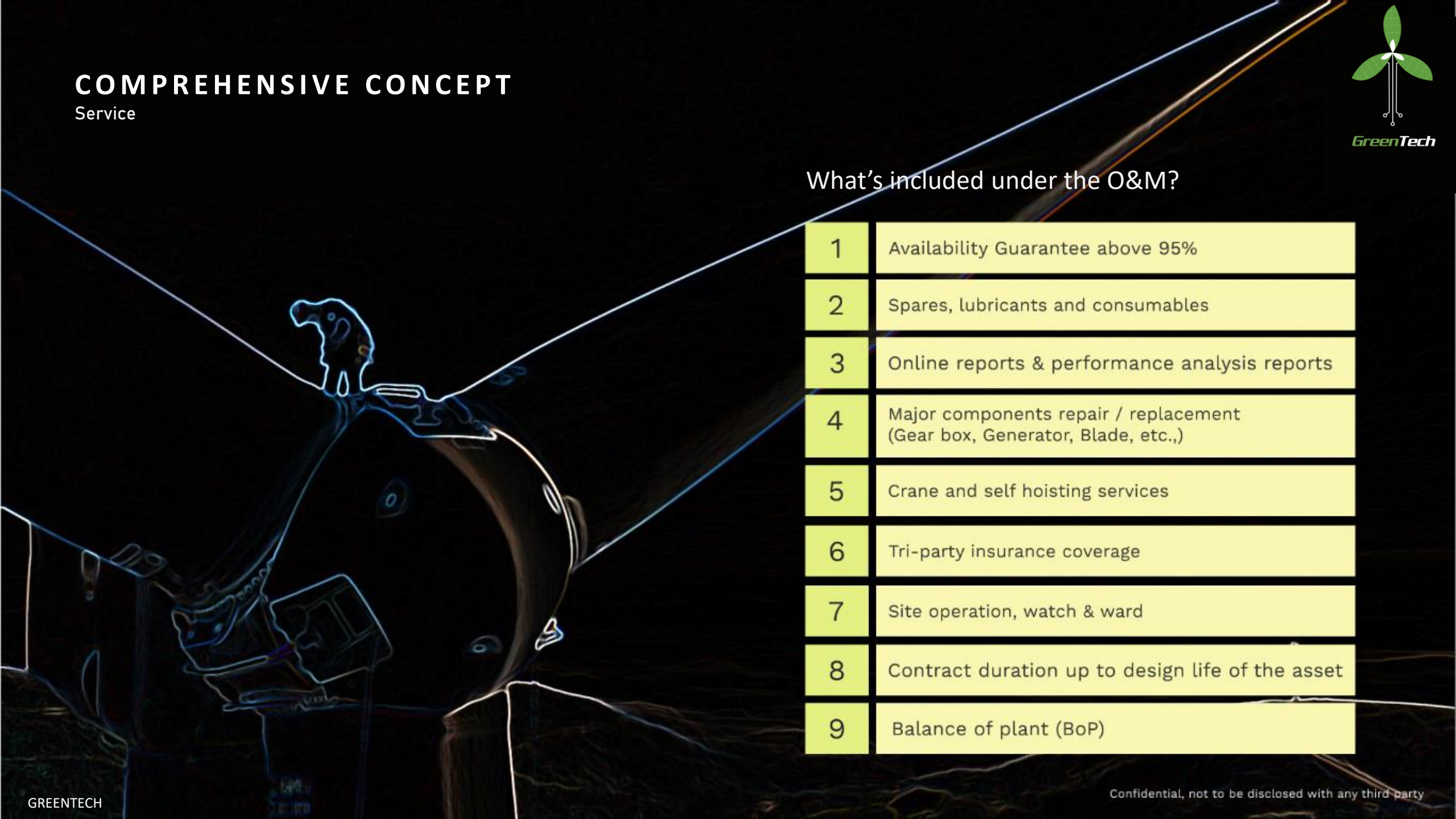
MULTIBRAND O&M

Service

Vestas	NM54	› 0.95 MW
	NM48	› 0.75 MW
	V82	› 1.65 MW
SUZLON	S64/S66	› 1.25 MW
	S82	› 1.75 MW
	S88	› 2.10 MW
ReGen POWERTECH	V77	› 1.50 MW
	V82	› 1.50 MW
	V87	› 1.50 MW
INOXWIND	WT96	› 2.00 MW
	WT100	› 2.00 MW
	WT113	› 2.00 MW
SIEMENS Gamesa RENEWABLE ENERGY	G58	› 0.85 MW
	G9X	› 2.00 MW
KENERSYS | KALYANI	K82	› 2.00 MW

COMPREHENSIVE CONCEPT

Service

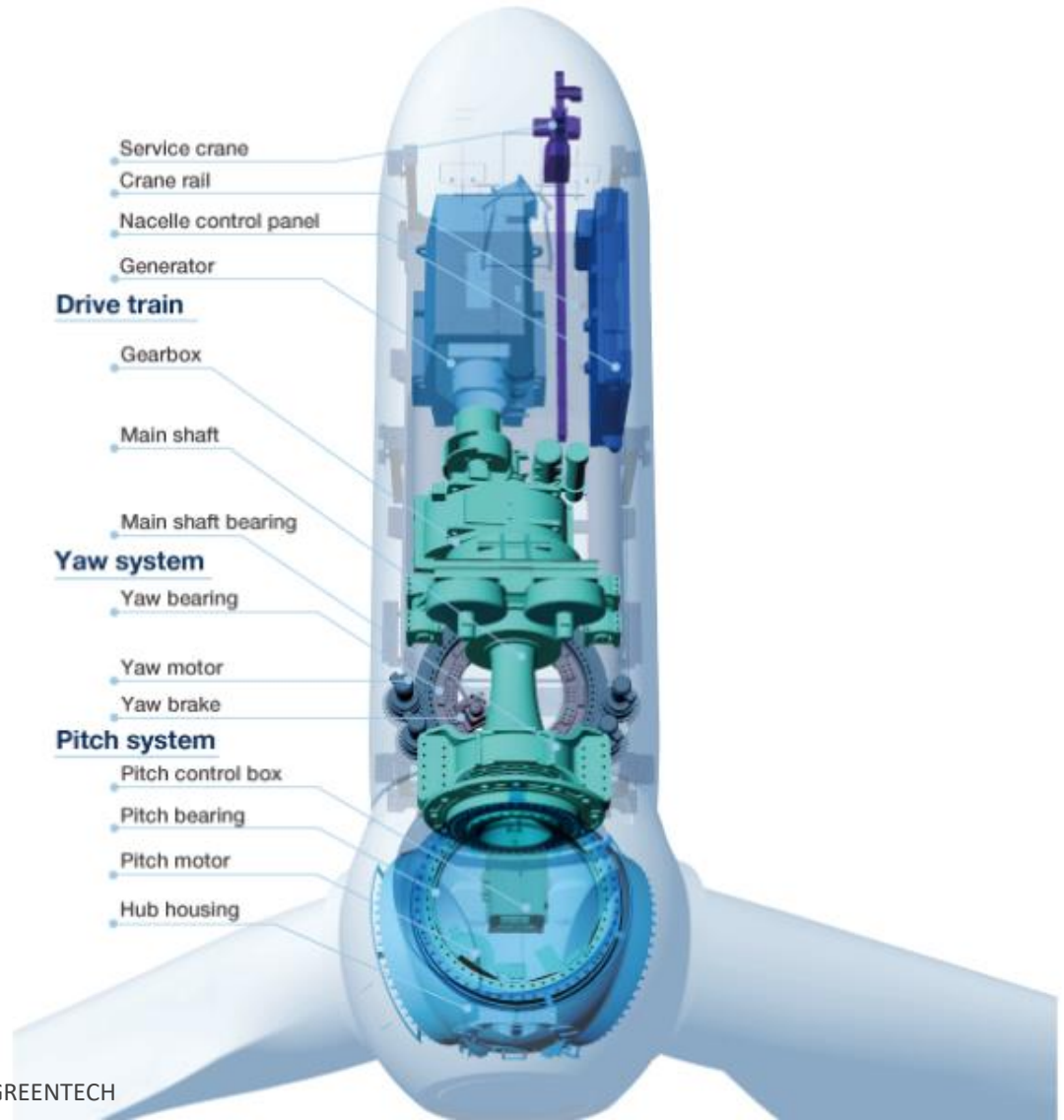


What's included under the O&M?

1	Availability Guarantee above 95%
2	Spares, lubricants and consumables
3	Online reports & performance analysis reports
4	Major components repair / replacement (Gear box, Generator, Blade, etc.,)
5	Crane and self hoisting services
6	Tri-party insurance coverage
7	Site operation, watch & ward
8	Contract duration up to design life of the asset
9	Balance of plant (BoP)

PARTS & REPAIRS

What we do?



STRONG SUPPLY-CHAIN NETWORK FOR ALL COMPONENTS THROUGH GLOBAL & DOMESTIC SUPPLIER

5+ repair partner across India for major components

10+ repair loops for minor components

100+ Global and local suppliers

1000+ different parts in stock

In-house Electronic & mechanical component repair facility

Reverse engineering for obsolete components

External repairs

Generator	Coral Rewinding
Gear box	ZF / Flender / Elecon / Shanthi Gears
Transformer	Various

In-house repairs

Blade in situ repair

Hydraulic system / Accumulator

Yaw gears / motors

Main bearing

Brake caliper

Power & control panel

Electronic cards

CAPABILITIES & SUPPORT

What we do?

Spare Parts

+ Major and minor components sources for
  Generator
  Gearbox
+ Control cards
+ Blades
+ All propriety items

Specialized repair of Major components

+ Support from Winergy, ZF and Shanti Gears for the faster repair of Gearbox
+ Support and comprehend for Generator repair by Siemens authorized service centre's

Electrical & Electronics

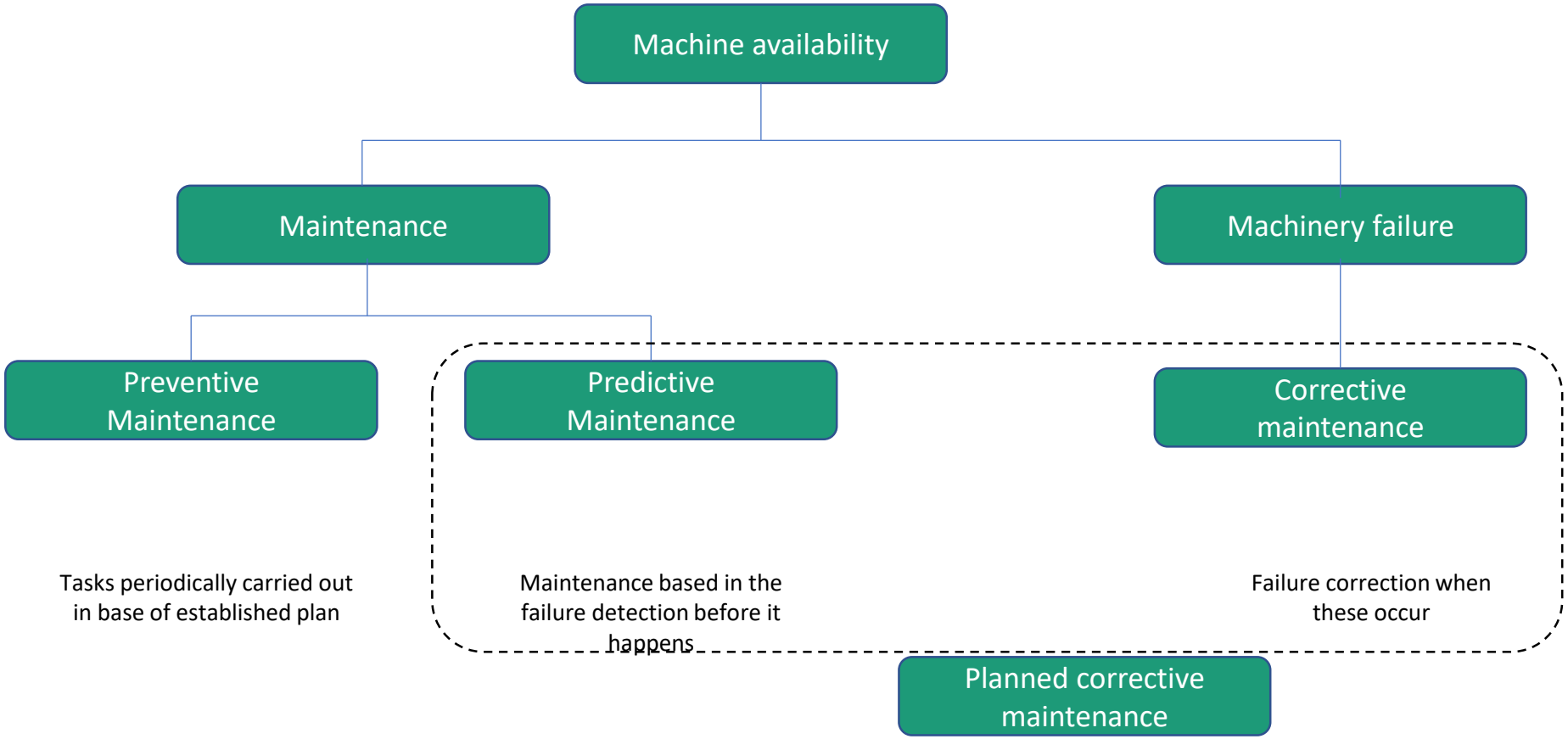
+ Extensive component level repairs
+ Repair of components through OEM authorized agencies
+ Testing ICs, EPROMs, PALs, GALs, surface mounted components, etc..
+ Re-engineering for any obsolete circuit boards
+ All kind of motors

In-situ repair

+ Blade repairs
+ Mechanical components repairs.

MACHINE AVAILABILITY & MAINTENANCE

What we do?



MAINTENANCE

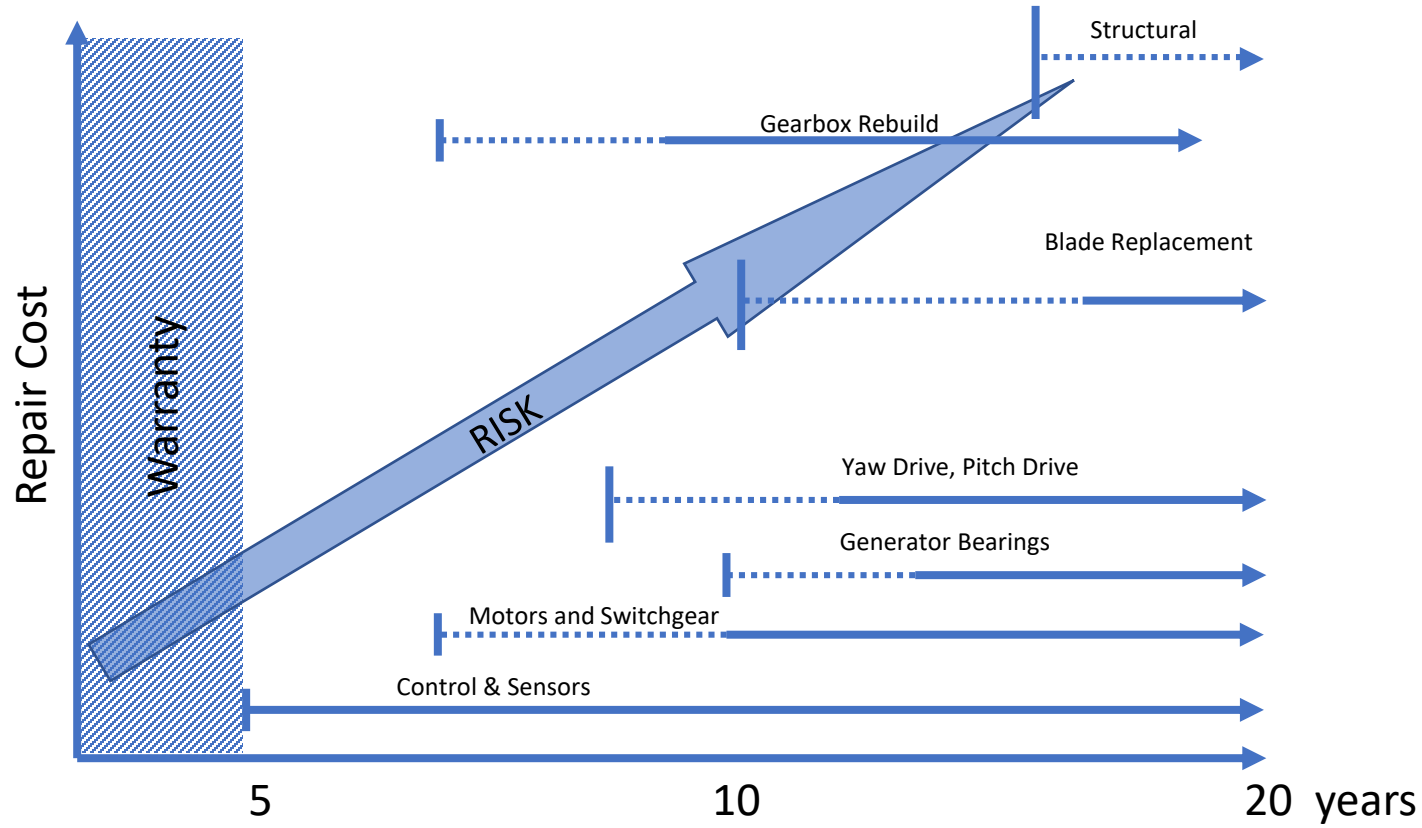
What we do?

	Benefits	Challenges
Corrective Maintenance	**No special advantages**, it should be avoided through the use of the other phases of maintenance.	Risk of long inactive periods of time. **Risk of big collateral damages**. Cost of cranes request an adequate working program.
Preventive Maintenance	A small investment is required to establish the model of intervention. Afterwards is simple and neither advanced resources or personal qualification is required.	**Risk of frequent** interventions, with large costs. Risk of **late interventions** with a **complete failure development**, and therefore with same disadvantages as corrective maintenance.
Predictive Maintenance	**Prevent future failures in advance** in order to activate the intervention program, with low costs on resources and small periods of inactivity	**Low risk** of **collateral damages**. Medium-high complexity. Advanced resources and personal qualification are required, which involves costs.

MAJOR COMPONENTS AT RISK

What we do?

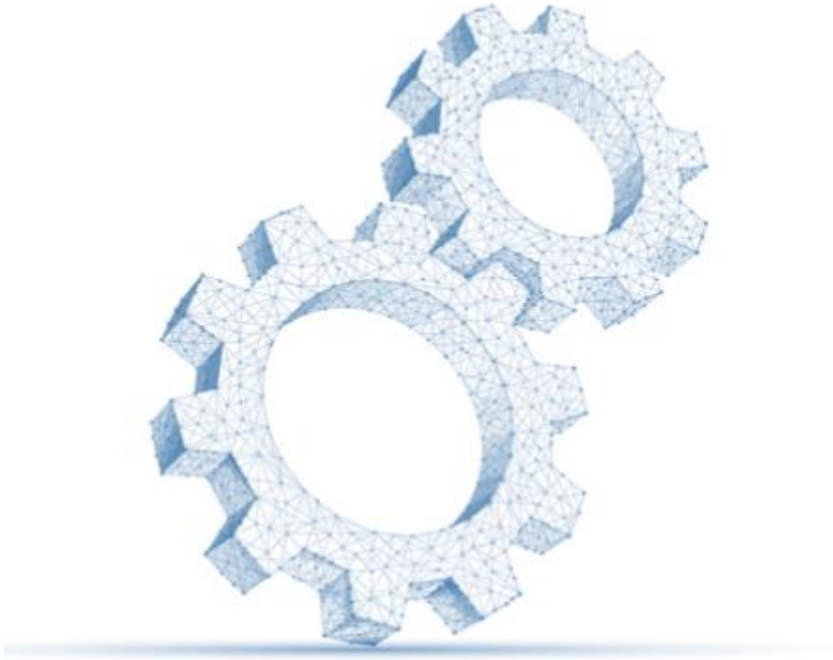
Equipment breaks-usually after the warranty expires



PREDICTIVE MAINTENANCE

What we do?

- Due Diligence
- Root Cause Analysis
- Vibration Analysis › Drive Train
- SCADA data analysis
- Endoscopy inspection
- Oil & Grease sampling and analysis
- Thermography
- Blade Inspection



Combination of technical expertise and database, GreenTech Predicts component failures & optimizes maintenance cycle.

PREDICTIVE MAINTENANCE

What we do?

Due Diligence

On Site Inspection

› Walk through inspection from tower bottom to Blade tip.
› Data capturing on findings

Predictive analytic from SCADA data

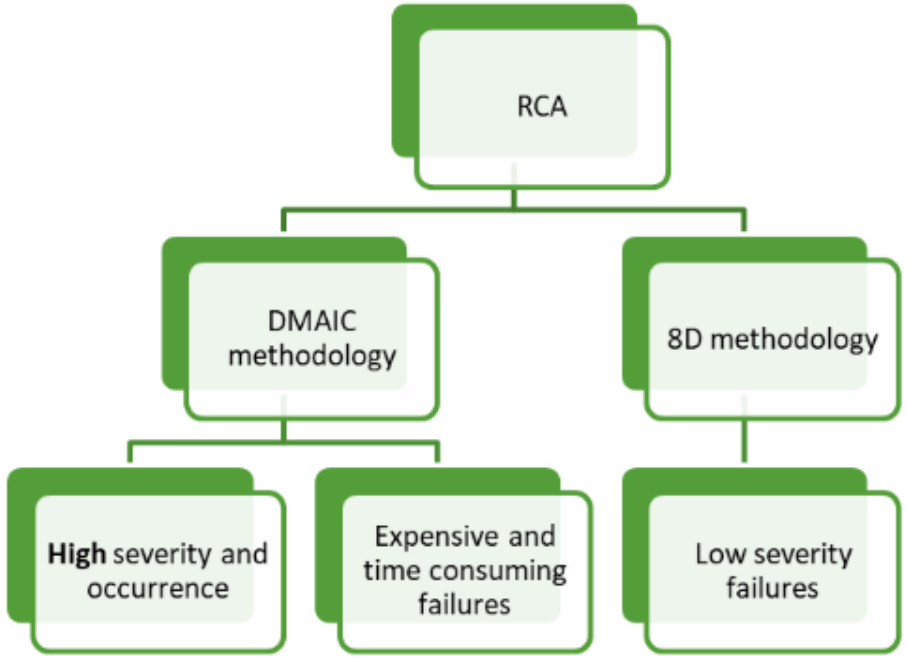
› Scrutinizing 6 months SCADA data
› Fishing out the anomalies
› Matching the failures with observed anomalies

Recommendation of control measures

› Defining the CAPA for anomalies
› Addition/deletion of points in PM checklist
› Monitoring plan

PREDICTIVE MAINTENANCE

What we do?



Root Cause Analysis

Hands on Experience

Adapting Six-Sigma techniques to Wind turbine O&M is very rare, but Greentech team has this combination.

Greenbelt holders in Six Sigma methodology.

20+ projects of DMAIC and 8D methodology experience

Major Components covered

Slew rings
Main bearings
Yaw drives
Generator bearings
Blades
Towers etc.

PREDICTIVE MAINTENANCE

What we do?

Vibration Analysis - Drive Train

Components	Vibration Parameter
Generator and Gearbox	High Acceleration (500 to 10000Hz)
Drive train	High Velocity
Tower Yaw system Main Bearings	Low frequency vibration Monitor (Generally installed in wind turbine itself)

>50% of the mechanical failures predictable by vibration data analysis. Collaboration with KK Solutions (earstwhile Gram & Juhl, Denmark), Mita-Teknik for Online condition monitoring systems

PREDICTIVE MAINTENANCE

What we do?

Global Control Center Coimbatore

SCADA data analysis

Millions of data is being generated from turbines SCADA system everyday. Greentech is innovative to use it for predictive maintenances with the help of appropriate analytical tools.

Temperature data

- Generator bearings
- Gearbox bearings & Oil sump
- Main bearing and Panels
- Generator winding temp

Vibration Data from SCADA

Generator / Motor Electrical data

Hydraulic / Pitch system data

Wind rose

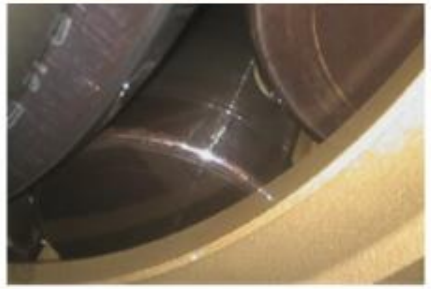
Operational data

PREDICTIVE MAINTENANCE

What we do?

Endoscopy inspection

Based on the criticality of the observation, Endoscopy is carried out in Gearbox, Main bearings, teeth, internals etc...

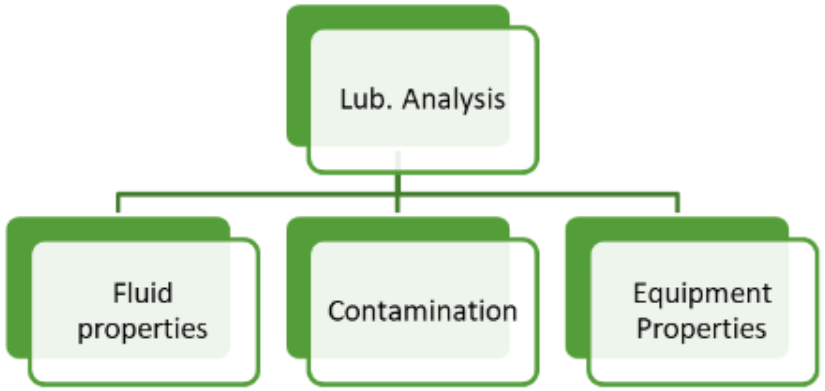


Category	Bearing
Bearing	High speed shaft Generator side
Bearing Sub Component	Roller
Components	Heavy corrosion

Category	Bearing
Bearing	High speed shaft Rotor side
Bearing Sub Component	Roller
Components	Ok

PREDICTIVE MAINTENANCE

What we do?



Oil & Grease sampling and analysis

Oil analysis is being carried out in Gear boxes every year.
Based on the oil analysis results, corrective actions are being initiated.

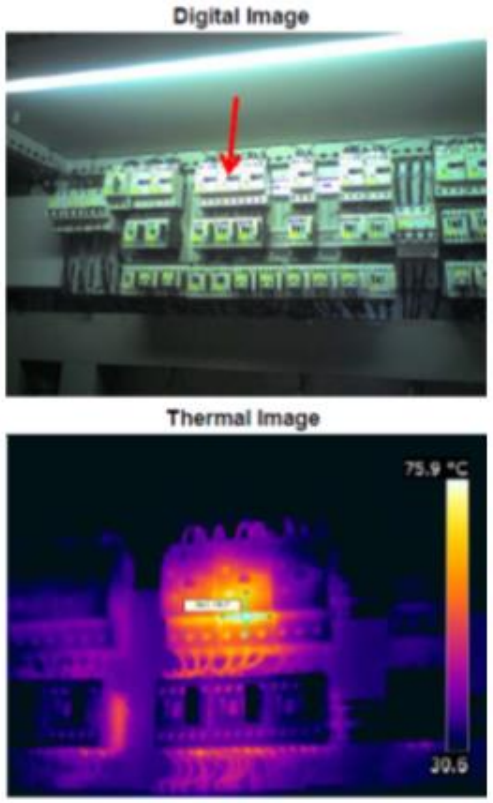
Recommended oil cleanliness in GB as per

OEM is 17/15/12. It means

4 micron particles	-	640 to 1300 counts/ml
6 micron particles	-	160-320 counts/ml
12 micron particles-	-	20-40 counts /ml

PREDICTIVE MAINTENANCE

What we do?



Thermography

Thermography is regularly used by GreenTech which helps to achieve almost Zero Panel related failures.

Before starting of the high wind season, the thermographic inspections are being done in all the WTGs and the results are analyzed and appropriate corrective actions are taken.

Summary:
Recorded ambient: 25ºC
Recorded reference: 34ºC
Recorded Anomaly: 84ºC

Observation notes:
An area of heating can be seen on add-on units.
This to be rectified

PREDICTIVE MAINTENANCE

What we do?

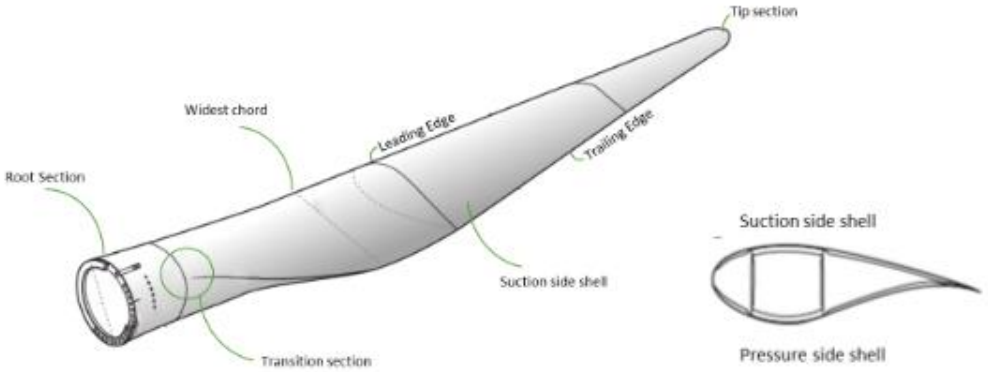
Blade Inspection

Visual and noise inspection from 100m while operation

Binocular & drone inspection from ground

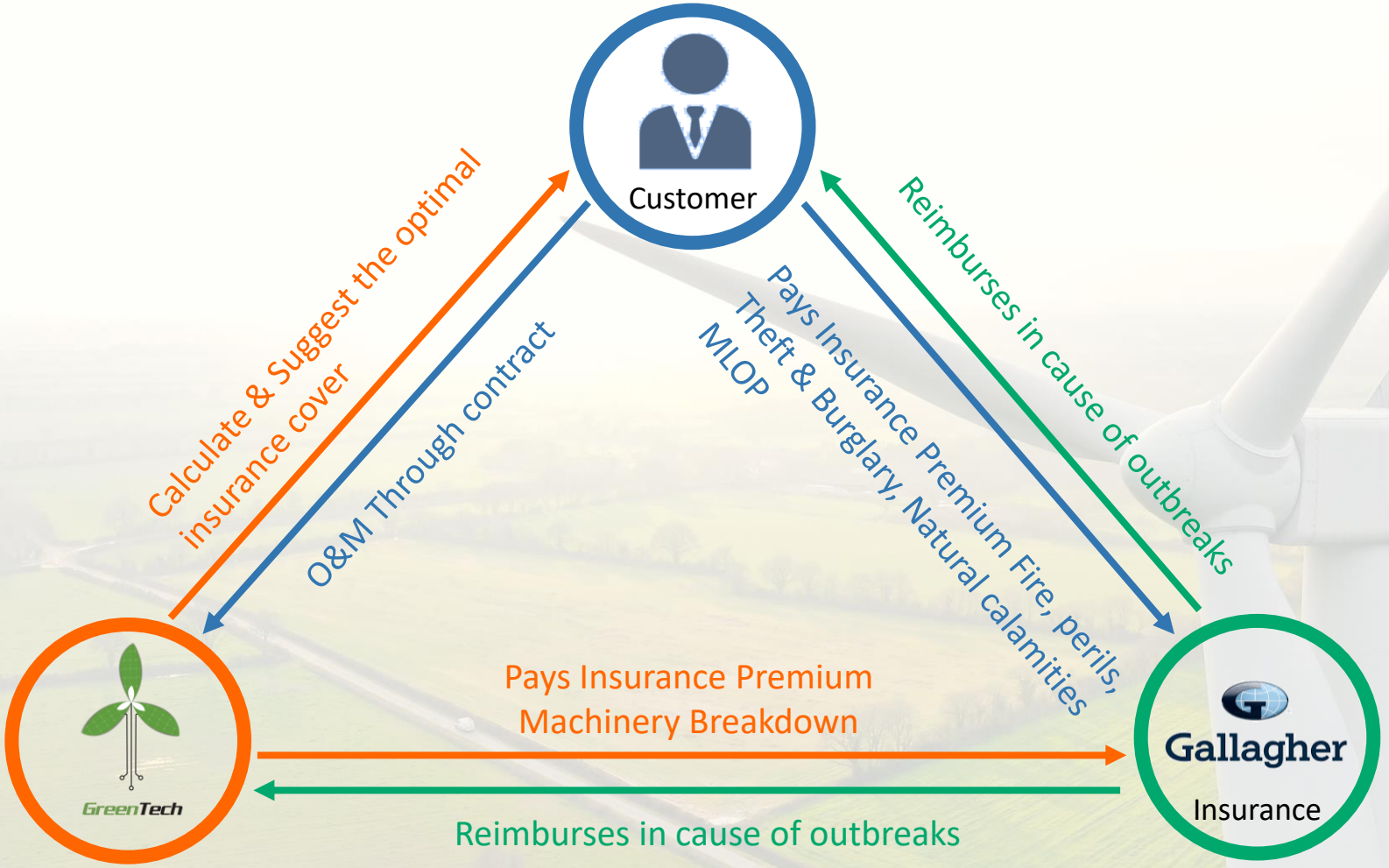
Tapping test up to 10m from root at blade inside

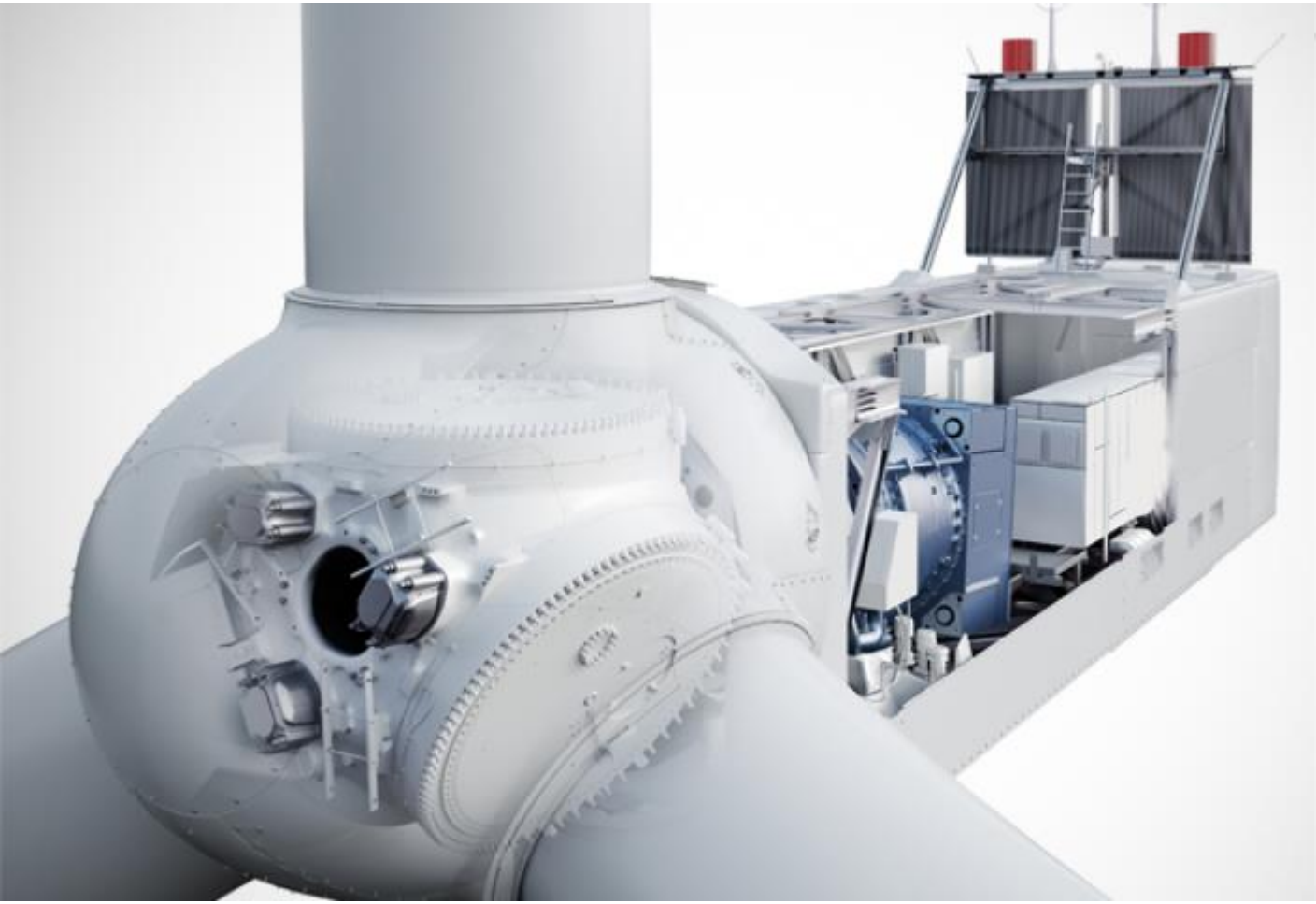
Findings in standard format



INSURANCE & RISK MANAGEMENT

Gallagher in one of the world's largest insurance brokerage, risk management and consulting firms. Assets are covered through Tir-party comprehensive insurance under operation and maintenance. Risk management solutions with global knowledge and expertise, various schemes available, including compensation for loss of generation



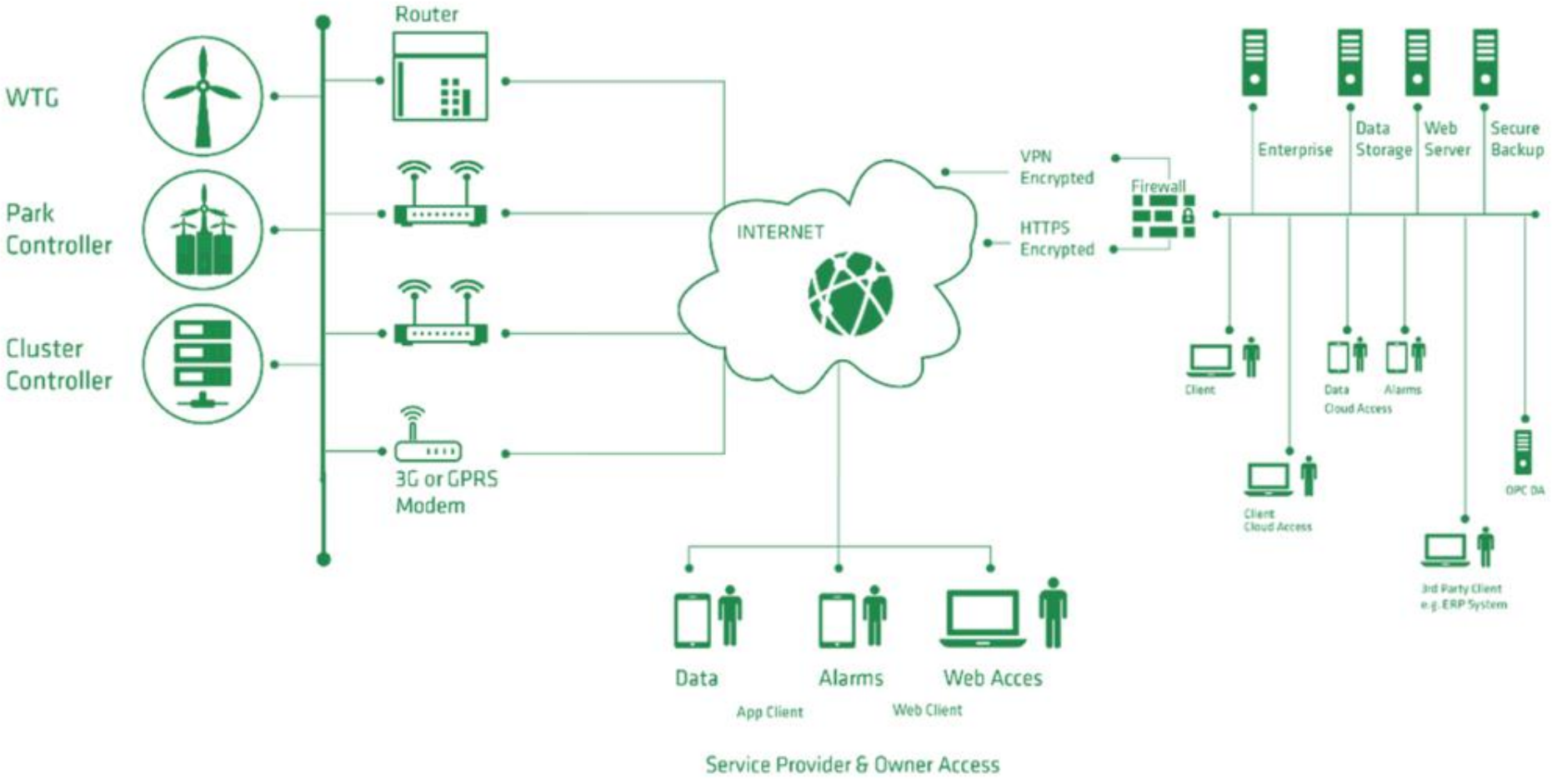


SCADA

Supervisory Control and Data Acquisition

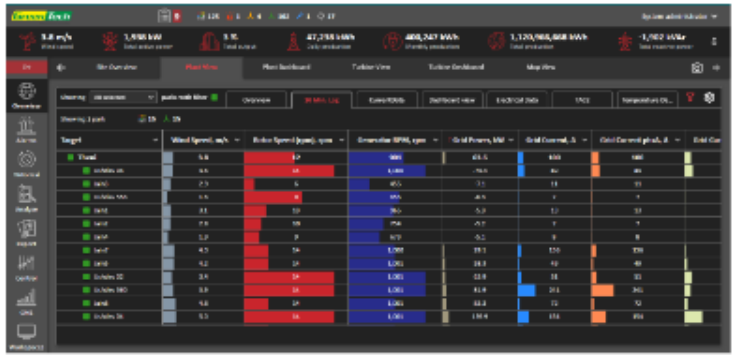
SCADA ARCHITECTURE

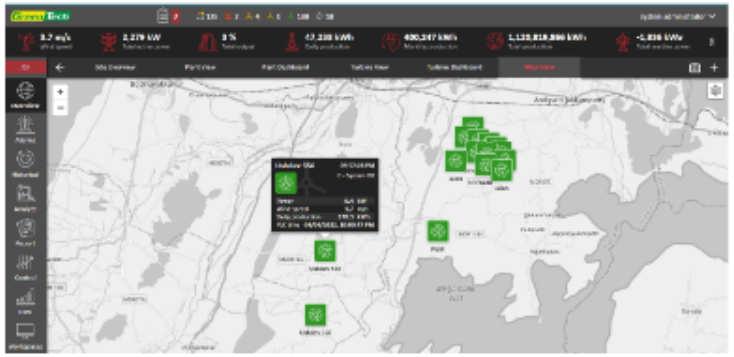
SCADA

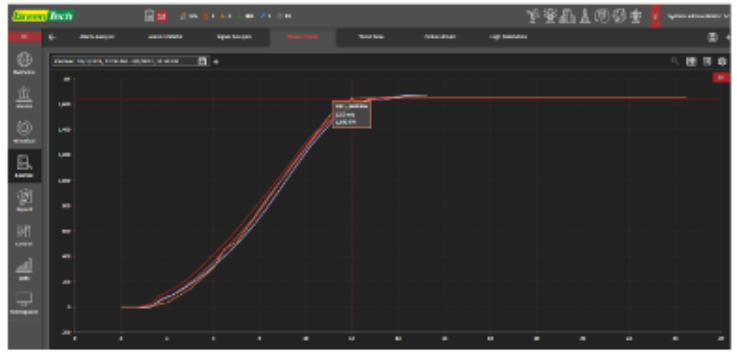


SCADA

GREENTECH







Easy comparison of variables & their relations to each other

Easy comparison of variables across turbines

Easy access to on-the-fly changes like changing line types, colors, line
dots, binary graphs, show/hide

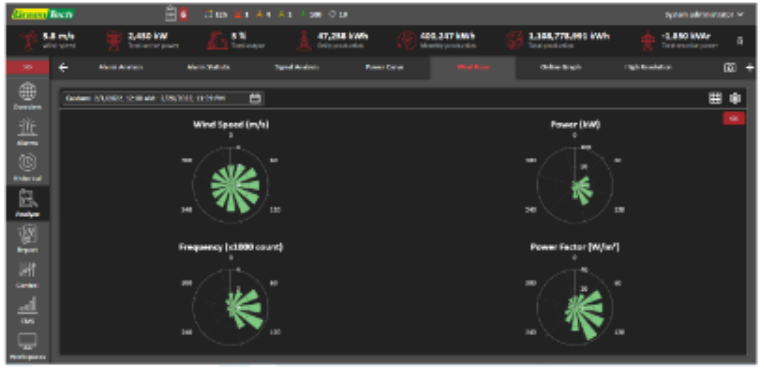
Easy export of the data to excel, csv and other formats

Complete overview from single turbine to large park

Drill down to the turbine or the individual park

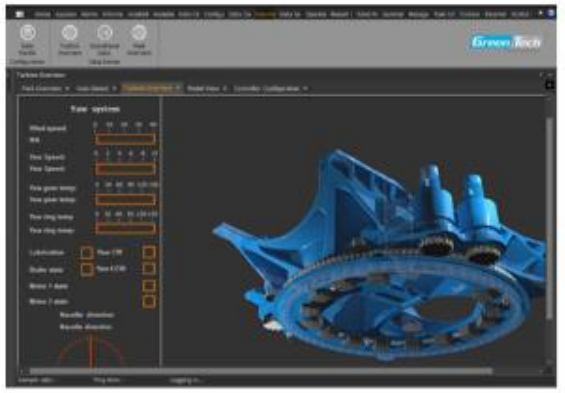
Quick and customizable overview

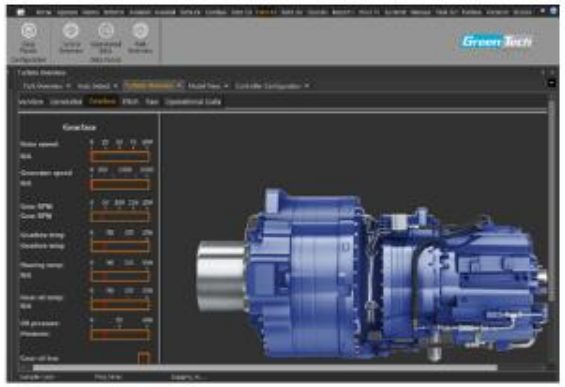
Smart sort and filtering options



Advanced

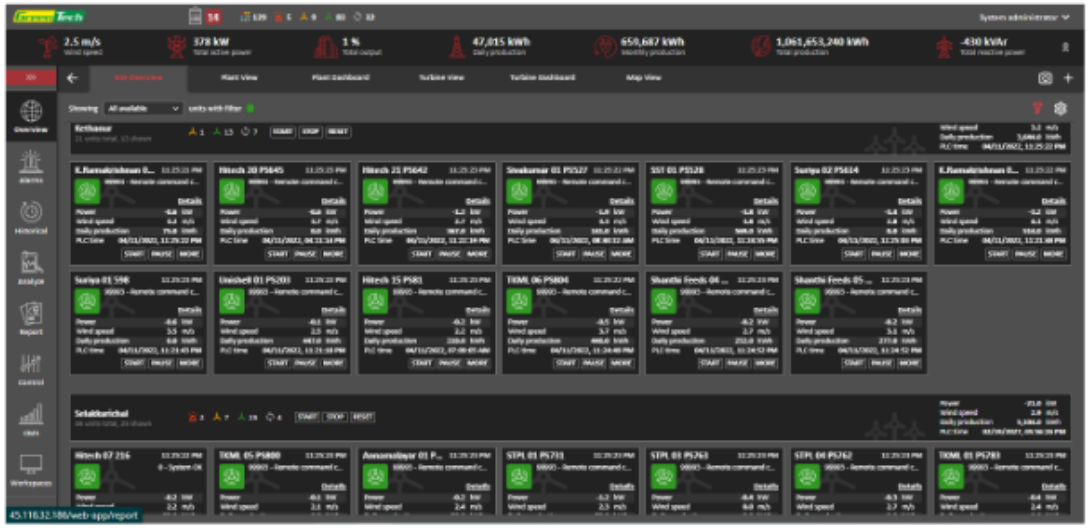
Historical data analysis and comparison
Reporting - generate and dispatch reports
Receive and generate alarms on deviations
Third-party systems integrations
Extensive service features
Turbine components maintenance
Custom data panels



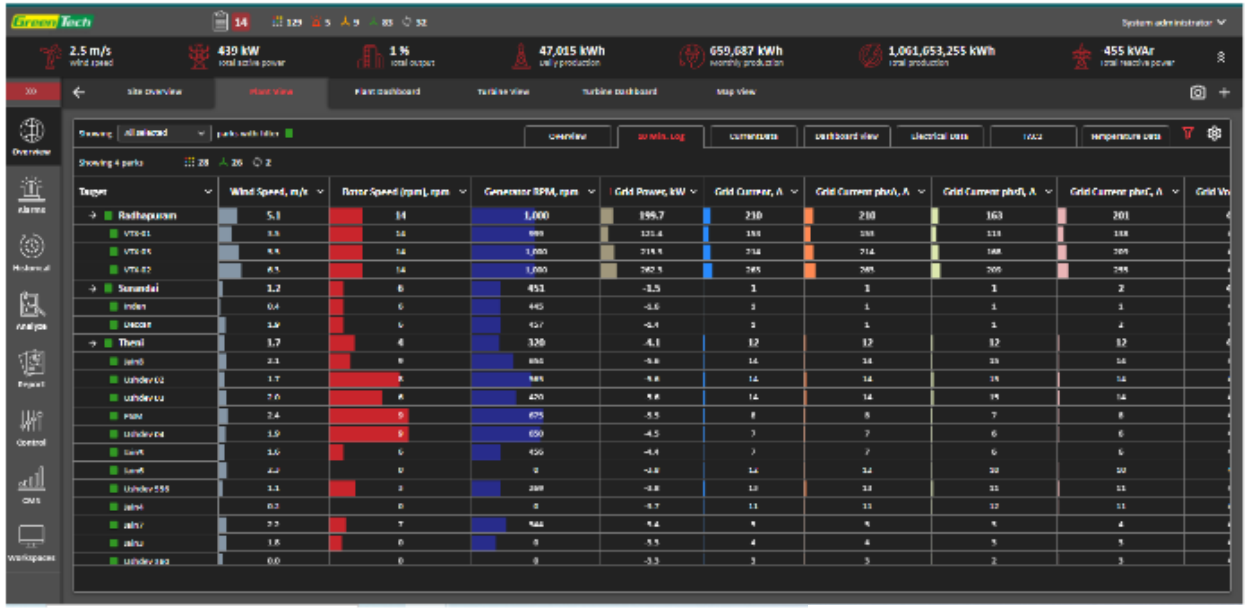


SCADA

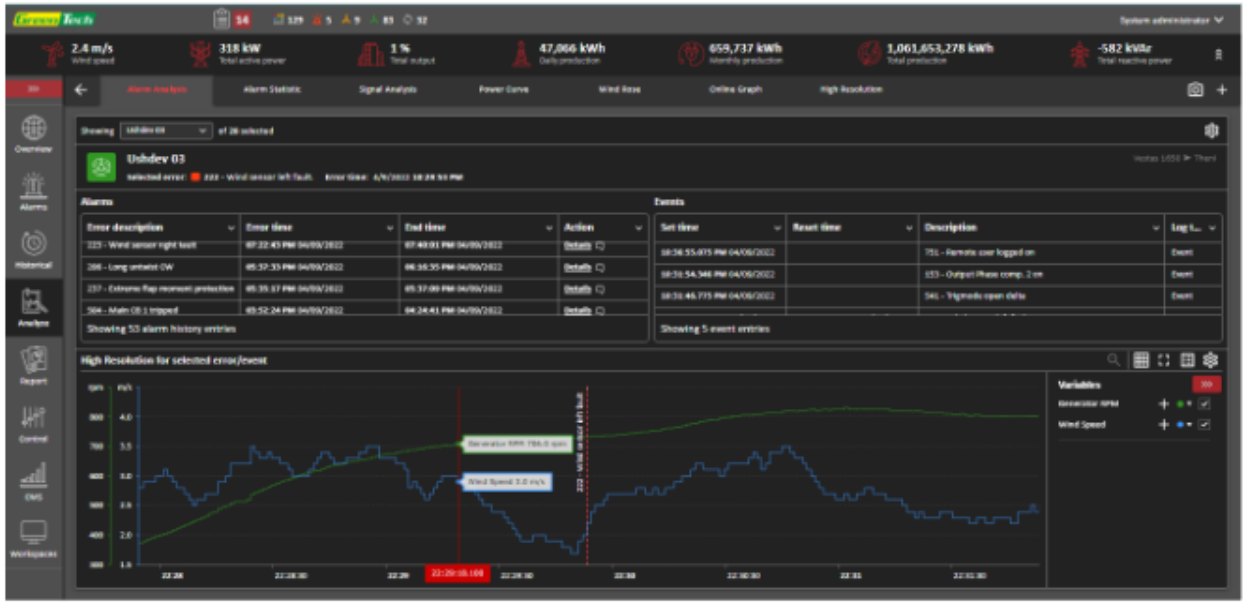
GREENTECH



SCADA
Data Analytic



SCADA
GREENTECH



SCADA
Data Analytic

SCADA

GREENTECH

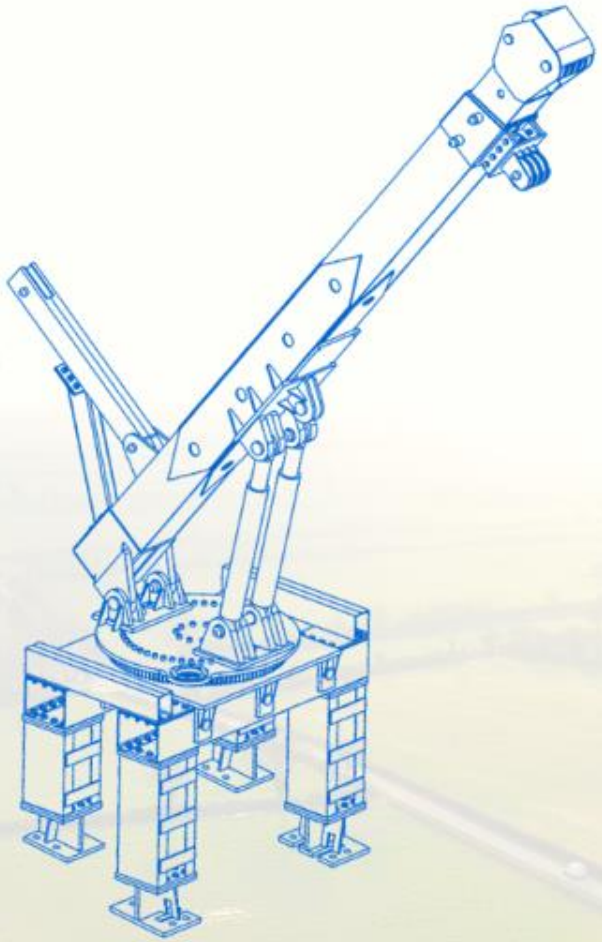
SCADA

Data Analytic

SCADA
GREENTECH

SCADA
Data Analytic

CRANELESS OPERATION



SELF HOISTING CRANE

SELF HOISTING CRANE

CRANELESS OPERATION

Wind Turbine major component replacement has challenges...

Cost & availability of cranes

Mobilization difficulties

The capacity and the hiring cost of the crane goes up drastically with increased hub height, affecting operation cost

Challenges in erecting components at the higher hub height [> 80 mtrs.]

SELF HOISTING CRANE

CRANELESS OPERATION

Components possible to lowered & erect are

- Gearbox
- Generator
- Rotor
- Single blade

Max. Lifting and lowering capacity : 45 ton
Tower height : 100 mtr

CLIENTELE

CRANELESS OPERATION

GreenTech

Leap Green Energy
We Partner Your Tomorrow

USHDEV INTERNATIONAL LIMITED

swelect
ENERGY SYSTEMS LTD

CRI C.R.I. PUMPS
Pumping trust. Worldwide.

SUGUNA PUMPS & MOTORS

enel
Green Power

KG worldwide
a tradition of trust since 1932

PSG
PSG Institutions, Coimbatore

SNR SONS TRUST

VIKING
wear your pride

ELLEN

K.RAMAKRISHNAN
COLLEGE OF ENGINEERING
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