Investment Opportunity

Future Infrastructure of
Renewable Asset Management:
Turbit AI

Berlin, 20.05.2023

Executive Summary

Turbit is technology and market leader in AI monitoring for wind in Europe and monitors more than 1700 turbines. There are uncapped risks of each wind turbine asset owner when turbines have a downtime due to e.g. a gearbox failure. Each year 26.000€ per MW is lost due to unplanned downtime. This is where Turbit comes in and detects these risks with it's AI.

Turbit is a team of 11 industry experts with highly efficient unit economics and a growth rate beyond 3.5x YoY, currently at 600k€ ARR, with the strong sales pipeline to move ARR to 1 Mio. € in the next 6 months. To speed up growth in Europe and the world and expand failure coverage Turbit is raising 2 Mio. € in a wind turbine market that will double within the next 6 years to 15 B. €.

Turbit is on the mission to become the center solution in renewables: From predicting 70% of all failures and automating 90% of processes to optimizing stock price driven energy production in real-time by 8% and extending the life-time of assets by minimum 2 years (10%).

Turbit

About Turbit

5+
Years AI Development

11
Employees in a diverse Team of Experts

7000+
Turbine Years of Data

1.800+
Turbines

25+
Blue Chip Customers

600k €
ARR

Client References

VSB

prokon
Energie. Gemeinsam. Leben.

Die Experten für Erneuerbare Energien!
WestfalenWIND
Service

WOOTIS
TECHNICAL OPERATION & SERVICE

WIND PUNX

enercity
erneuerbare

SAB
WindTeam

energiequelle
ENERGIE MIT ZUKUNFT

EnergieKontor

ENCAVIS

Teut
Windprojekte GmbH

BOREAS
energy unlimited

wpd
think energy

Turbit

Turbit is Growing with Exceptional Unit Economics

High margin, high growth SaaS business with exceptional cash efficiency

600 k€
ARR

16 Mio.€
ARR potential in existing customers

96%
Gross Margin

3.5 x
YoY ARR Growth

160%
NRR

24
LTV/CAC

5 months
Payback Period

> 10 years
Est. CLT
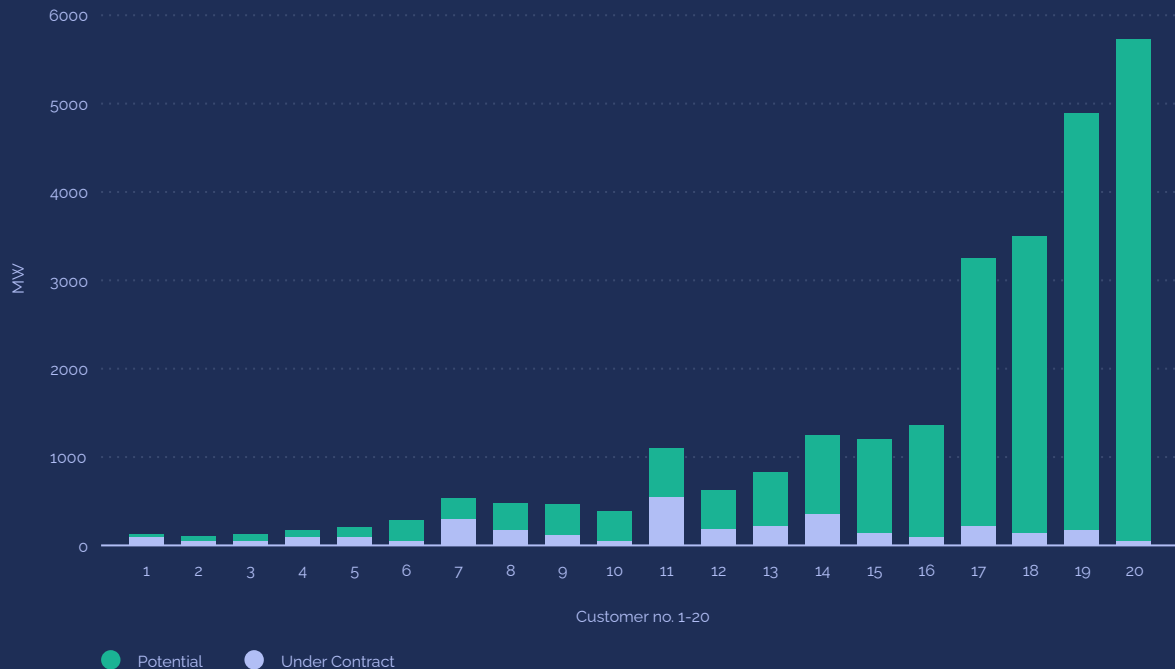
2.4
New ARR per € spent in Sales and Marketing

1.0
Burn Multiple

1.1
Hype Ratio (raised capital by ARR)

Turbit is bootstrapped from 2017 till 2021, where we got a small investment and a second tranche in 2022.

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Growth Potential within existing customers

Chart: MW (y-axis, 0–6000) vs Customer no. 1–20 (x-axis)

Legend: ● Potential   ● Under Contract

> 10 years
Expected Customer Lifetime

95%
Logo Retention

12 months
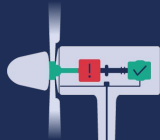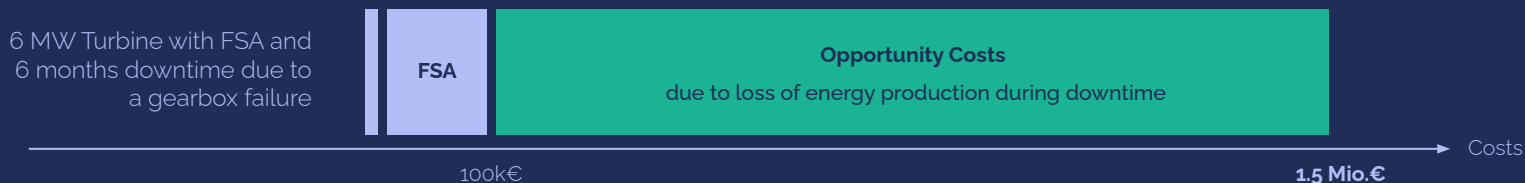Avg. time till rollout

60k €
Avg. ARR upsell dealsize

5 out of 20
Customers are rolling out. only 1 churned.

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Full Service Agreements (FSA) have an uncapped risk

Downtimes are no longer remunerated and availability guarantees decrease, resulting in very high opportunity costs.
With higher rated power per WTG and change in FSA contracts operators and owners take more and more risks.

6 MW Turbine with FSA and
6 months downtime due to
a gearbox failure

FSA

Opportunity Costs
due to loss of energy production during downtime

100k€

1.5 Mio.€

Costs

26,000€
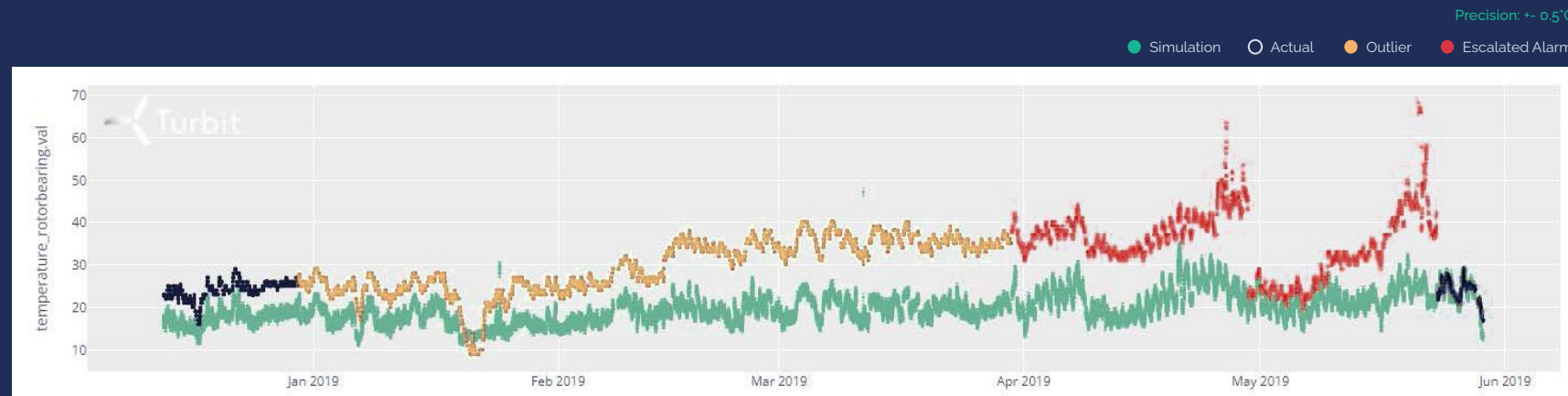Avg. opportunity costs
of unplanned downtime
per MW per year

> 10x
Return on invest per
year, if you work with
Turbit in 2023

Turbit

AI Monitoring Technology

How Turbit Anomaly Detection Works (Step 2)

Precision: +- 0.5˚C

● Simulation　○ Actual　● Outlier　● Escalated Alarm

1 December 2018:

Turbit detected an abnormal temperature in the rotor bearing

2 April 2019:

The semi-annual maintenance was performed in April 2019 but the cause of abnormal temperatures couldn't be solved.

3 May 2019:

Second service visit was carried out and the defective press connection in the corrugated tube was finally found and replaced.

4 End of May 2019:

Temperatures of the corrugated bearing then resumed to normal behavior.

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Turbit AI Infrastructure

The 4 steps of Turbit's fully automated and self improving preventive maintenance infrastructure

1. Data Engineering

2. Anomaly Detection

3. Classification

4. Feedback

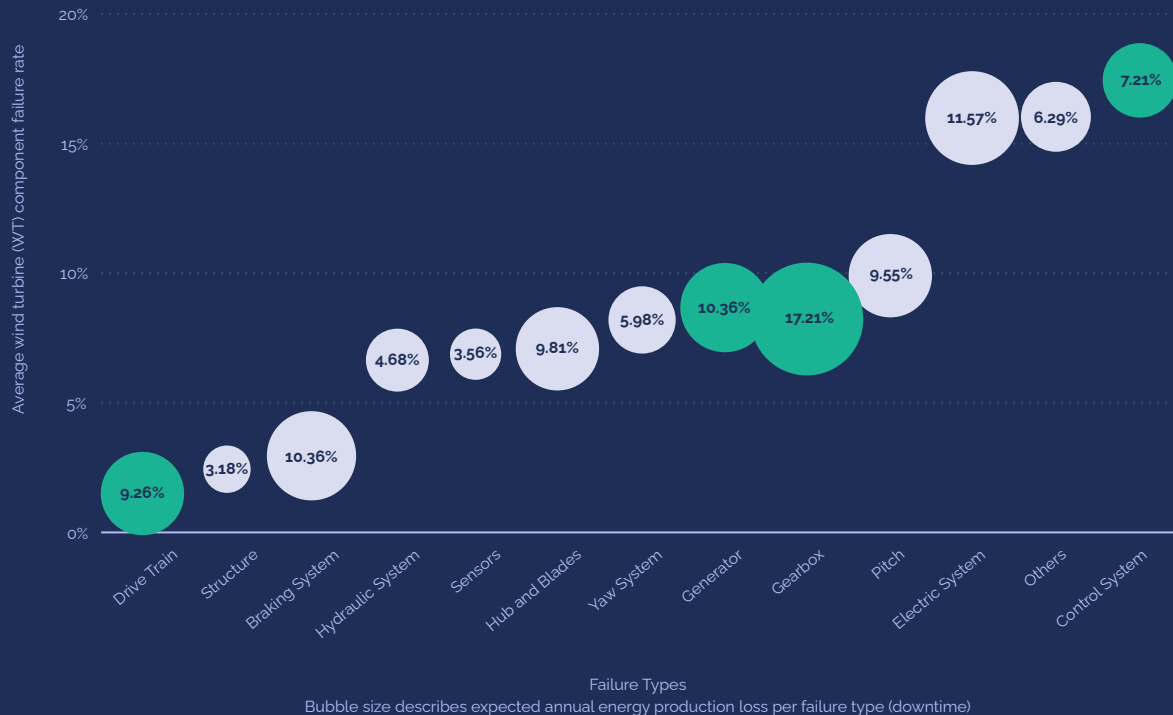|			
Raw Data Collection	Classic Deep NN* predict normal behaviour	Anomaly Classification	Customer Feedback Functionalities
Data Lake	**Outlier Detection**	**Failure Mode Prediction**	**Communication Process with OEM**
Selection of Training Sets	Transfer Learning	Relevance Prediction	Reporting & Analytic Tools

Failure Database

Retraining NN

NN*: Neural Network

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Horizontal Expansion - Failure Coverage of Turbit

Turbit only covers 30% of failures, growing to 70% in the next 5 years.

Average wind turbine (WT) component failure rate

Failure Type	Value
Drive Train	9.26%
Structure	3.18%
Braking System	10.36%
Hydraulic System	4.68%
Sensors	3.56%
Hub and Blades	9.81%
Yaw System	5.98%
Generator	10.36%
Gearbox	17.21%
Pitch	9.55%
Electric System	11.57%
Others	6.29%
Control System	7.21%

Failure Types
Bubble size describes expected annual energy production loss per failure type (downtime)

Turbit only covers gearbox, generator, drivetrain and some control system errors. This means more than 70% of failures remain uncovered by Turbit. High resolution sensor data will enable Turbit to cover these failures.

https://www.mdpi.com/1996-1073/13/12/3132
https://www.mdpi.com/1996-1073/11/5/1309

Example Calculation Gearbox:

Costs of downtime in 2023 are
500kW * 0,15€/kWh * 1h = 75€

Costs for gearbox downtime are
17,21%*365*24 *75€ =~ 110.000€

Downtime probability = 8% per year

Expectation costs = 8% * 110.000€ = **8800€**

2023 Turbit costs of gearbox monitoring = **170 €/year**

ROI/year = 52x

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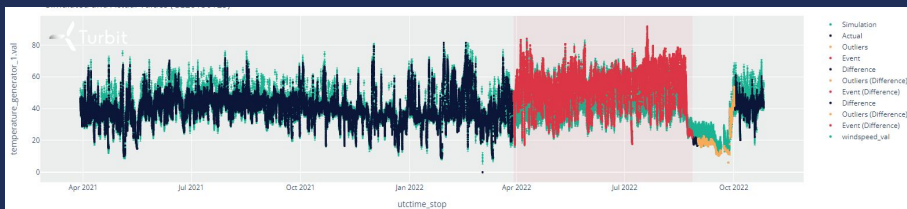
Example of Customer Value

- Detect failures months ahead
- Plan component replacements months ahead
- Save months in downtime

30x

Return on Invest for Turbit Customers in 2023

Turbit Technology KPIs

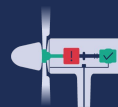## Turbit is technology leader with exceptional scalability and accuracy

< 36h
Notification Delay

35
Failure Types
Detected

2.400
Total Confirmed
Alarms

10%
False Positive
Rate

120+
Labeled Alarms
Per Week
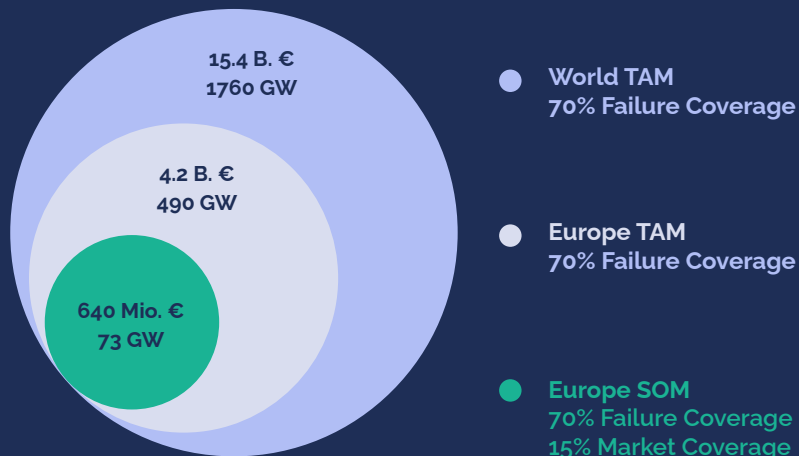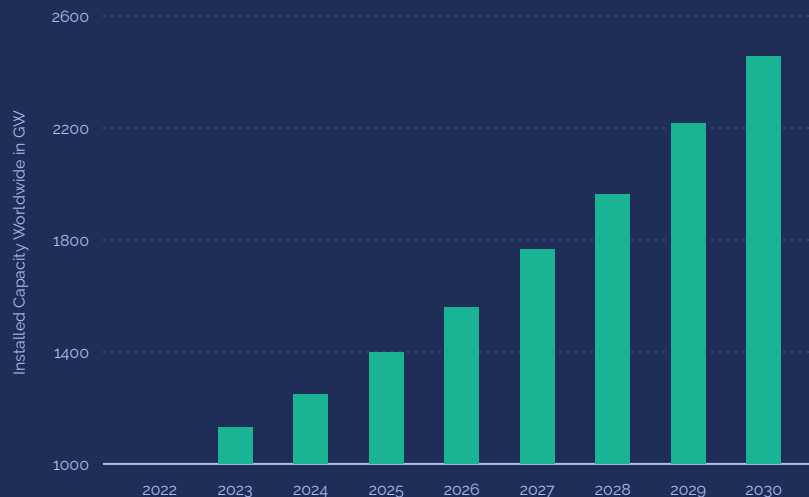
4000+
Neural Networks in
Production

> 80%
F1 Score of Failure
Classification

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2027 Wind Market for Turbit

Based on 2x ROI or 13000€/MW/Year

15.4 B. €
1760 GW

4.2 B. €
490 GW

640 Mio. €
73 GW

● **World TAM**
70% Failure Coverage

● **Europe TAM**
70% Failure Coverage

● **Europe SOM**
70% Failure Coverage
15% Market Coverage

12% CAGR for next 10 years (double in 6 Years)

Installed Capacity Worldwide in GW

	2600								
2200									
1800									
1400									
1000									

2022 2023 2024 2025 2026 2027 2028 2029 2030

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Competitors

"Turbit is leading the pack"

Company	Focus on AI	Focus on Wind	Process Automation with AI	Markets	Funding (est.)
Turbit	yes	yes	yes	Europe	550 k. €
I4see	yes		no	Europe	4. Mio. €
JungleAI	yes	no	no	Europe	10 Mio. €
Annea		yes		Europe + India	2 Mio. €
Kavaken		yes	no	Turkey + Europe	500 k€
Bitbloom	no?	no	no	UK	0? €
Clir	no	Also solar		US, Canada	> 35 Mio. €

Turbit

USP Turbit

- **Real-time ->** Events are sent out immediately and not monthly
- **Transparency and Integration** → All KPIs are transparent and thus risks measurable, Turbit can be integrated easily into existing processes, software and contracts
- **Intelligence and scalability through AI** → The domain intelligence comes from AI and is thus massively scalable.

Turbit

Founders

Michael Tegtmeier
Founder and CEO

- Background in physics and economics
- Coming from big OEM in the wind industry (Senvion)
- Strong background in data science, AI and software development

Christian Fontius
Co-Founder and CCO

- Background economics and sales
- Strong strategy BizDev and startup experience
- Formerly working at StackFuel bringing revenue from 0 to 1 Mio. € ARR

Team Highlights

Arnaud Guillemin
Account Executive

Europe Wind Network. Formerly sales at Sereema. Closed 9k MRR after 8 months at Turbit.

Andrea Bilbao
Customer Success Engineer

Formerly in Aviation Industry.

Dr. Richard Kunert
Head of Data Science

Formerly Head Data Scientist at Secret Escapes and StackFuel.

Clemens Edler
Head of Data Engineering

Physics and Software Background from Car Industry.

Turbit

Value Vision 2027

- **Reduce OPEX of existing assets by 30% -**
  Turbit Insurance

- **Increase annual energy production (AEP) by 8% and lifetime by more than 2 years**
  Turbit Swarm

- **Automate 90% of processes in operations by AI**
  Turbit AI Infrastructure

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Future Infrastructure of Renewable Asset Management:
Turbit AI

Contact

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Michael Tegtmeier
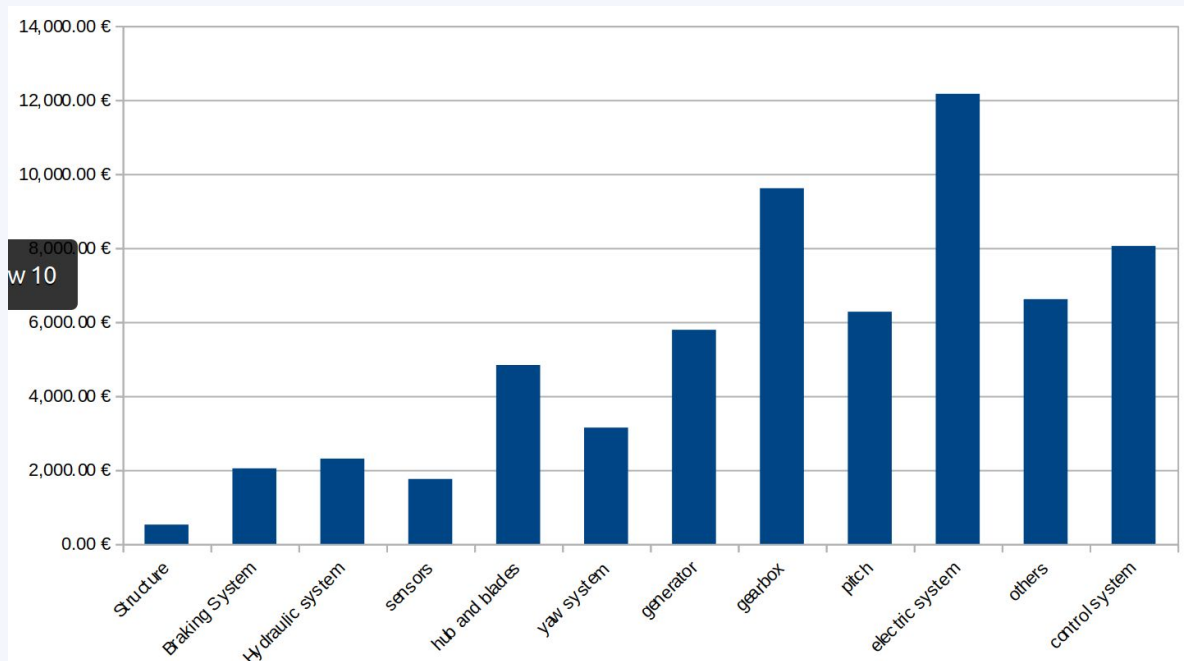m.tegtmeier@turbit.de

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Failure Statistics and Customer Value

Expected AEP loss

Costs of downtime per year for a average 2.3 MW turbine.

Total of opportunity costs from downtime per avg. turbine per year: 63.000€

= 26.000€/year/MW

Potential Turbit ROI share= 50% = **13.000€/MW/Year**

Maximum Market 2027 for Turbit World wide 1760 GW = **22 billion €!**

Technical Availability Calculation

Total Expected Availability 90.3%

Failure Downtime 9.7%