



HACK THE WIND 2018

EDP Challenge Presentation
Wind Turbine Failures Detection



#innovationatedp



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Sofia Ganilha
Technology Analyst @ EDP Innovation



EDP WHO?!

CHALLENGE
IMPORTANCE

EXPECTATIONS ON
YOU

EVALUATION METHOD

WHERE IS THE DATA?

FINAL ADVICES



"(...) We believe that our industry is moving from capital-intensive to knowledge-intensive, and EDP is betting on an Open Innovation Model – which allows EDP to leverage on external talent. (...) We expect to have the possibility to team up, in the near future, with some of the competitors."

António Vidigal, CEO EDP Innovation and Jury HTW 2017

WE'RE AN ENERGY COMPANY



EDP Conventional + Renewables



EDP Renewables

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15
Countries



26,8 GW*
Installed Capacity



39 %*
Wind Capacity



MAINTENANCE ACCOUNT 13-17% OF LCOE

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Continuous monitoring of wind turbines may be a cost-effective method to detect early warnings of failures



We challenge you to develop a global solution focused on predictive capabilities to detect early stage failures of a wind farm and reduce maintenance costs!



HOW MANY FAILURES CAN YOU ANTICIPATE?

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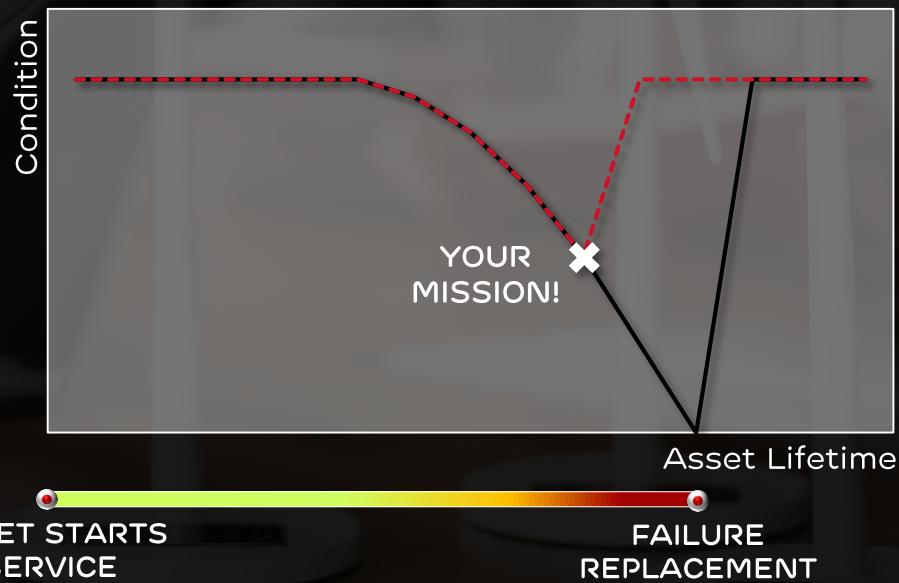
EVALUATION METHOD

WHERE IS THE DATA?

FINAL ADVICES

Develop an innovative and reliable solution to reduce the overall maintenance costs by anticipating the failures of some of the major wind turbine components.

- Detects/Predicts early stage failures
- Reduces the maintenance costs of wind assets
- Proposes a maintenance strategy



HOW MANY FAILURES CAN YOU ANTICIPATE?

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EXPECTATIONS ON YOU

EVALUATION METHOD

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During your mission, you shall focus on the subassemblies having failures with higher downtimes (higher fault severity) and elevated repair/replacement costs



- 1 Generator (inc. bearing)
- 2 Gearbox

- 3 Transformer
- 4 Hydraulic Group



DEVELOP MORE THAN JUST A PREDICTIVE ALGORITHM!

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EXPECTATIONS ON
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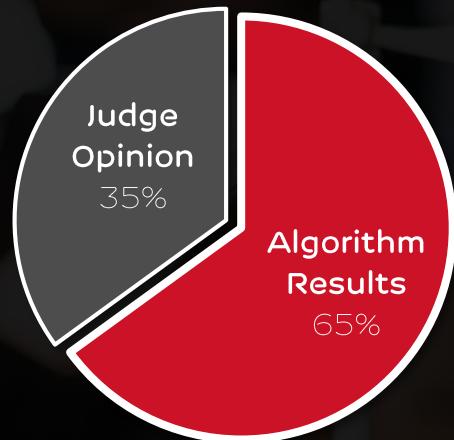
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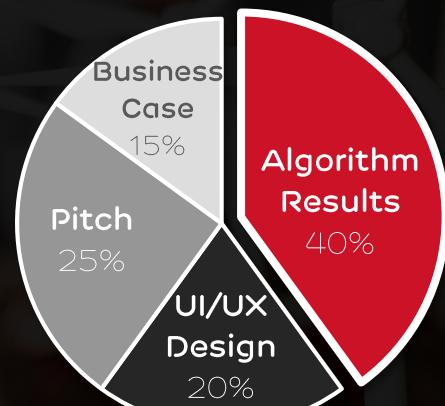
FINAL ADVICES

You will have two evaluation moments during the hackathon:

1ST PHASE Science Fair Judging



2ND PHASE Pitching Session



We will have 2 teams awarded as follows:



Grand Prize



Best Technical Solution

DEVELOP MORE THAN JUST A PREDICTIVE ALGORITHM!

Your predictions (or lack of them) will be classified as:

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EVALUATION METHOD

WHERE IS THE DATA?

FINAL ADVICES

True positives – your prediction is 2-60 days ahead of the failure in the correct wind turbine's subsystem. It will imply repair costs.

$$TP_{savings} = \sum_{i=\#TP} \left(Replacement[\text{€}] - \left(Repair[\text{€}] + (Replacement[\text{€}] - Repair[\text{€}]) \left(1 - \frac{\Delta t_i}{60} \right) \right) \right)$$

False positives – you predict a failure that will not happen in the next 60 days. It will imply inspection costs.

$$FP_{cost} = \#FP \times Inspection[\text{€}]$$

False negatives – you couldn't predict the real failure. It will imply replacement costs.

$$FN_{cost} = \#FN \times Replacement[\text{€}]$$



$$Prediction\ Savings = TP_{savings} - FN_{cost} - FP_{cost}$$



DEVELOP MORE THAN JUST A PREDICTIVE ALGORITHM!

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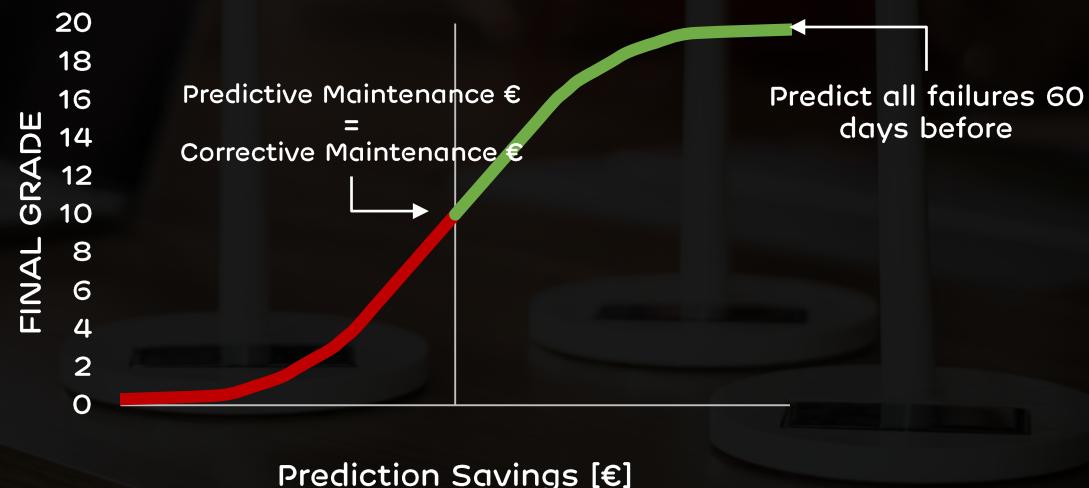
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EVALUATION METHOD

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Component	Replacement Cost (RP)	Repair Cost (RC)	Inspection Cost (IC)
Gearbox	100 000 €	20 000 €	5 000 €
Generator	60 000 €	15 000 €	5 000 €
Transformer	50 000 €	3 500 €	1 500 €
Generator Bearing	30 000 €	12 500 €	4 500 €
Hydraulic Group	20 000 €	3 000 €	2 000 €





IN EDP OPEN DATA PLATFORM!

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CHALLENGE
IMPORTANCE

EXPECTATIONS ON
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EVALUATION METHOD

WHERE IS THE DATA?

FINAL ADVICES

We provide 2 years (2016 and 2017) of SCADA records with a sampling rate of 10 minutes, including:

- Operational conditions of 5 wind turbines (datasheet available in EDP Open Data)
- Environmental conditions from the meteorological mast
- 1 year (2016) composed of historical failure logs

2016 → Develop and train your model

2017 → Test your model and discover 2017 failure logbook

Your model output

WTG	Component	Timestamp	Remarks
1	GEARBOX	30-12-2016 23:59	*Opcional
7	GENERATOR	30-12-2016 23:59	*Opcional
6	TRANSFORMER_FAN	30-12-2016 23:59	*Opcional
9	GENERATOR_BEARING	30-12-2016 23:59	*Opcional
11	TRANSFORMER	30-12-2016 23:59	*Opcional



3 SUBMISSIONS PER DAY



IN EDP OPEN DATA PLATFORM!

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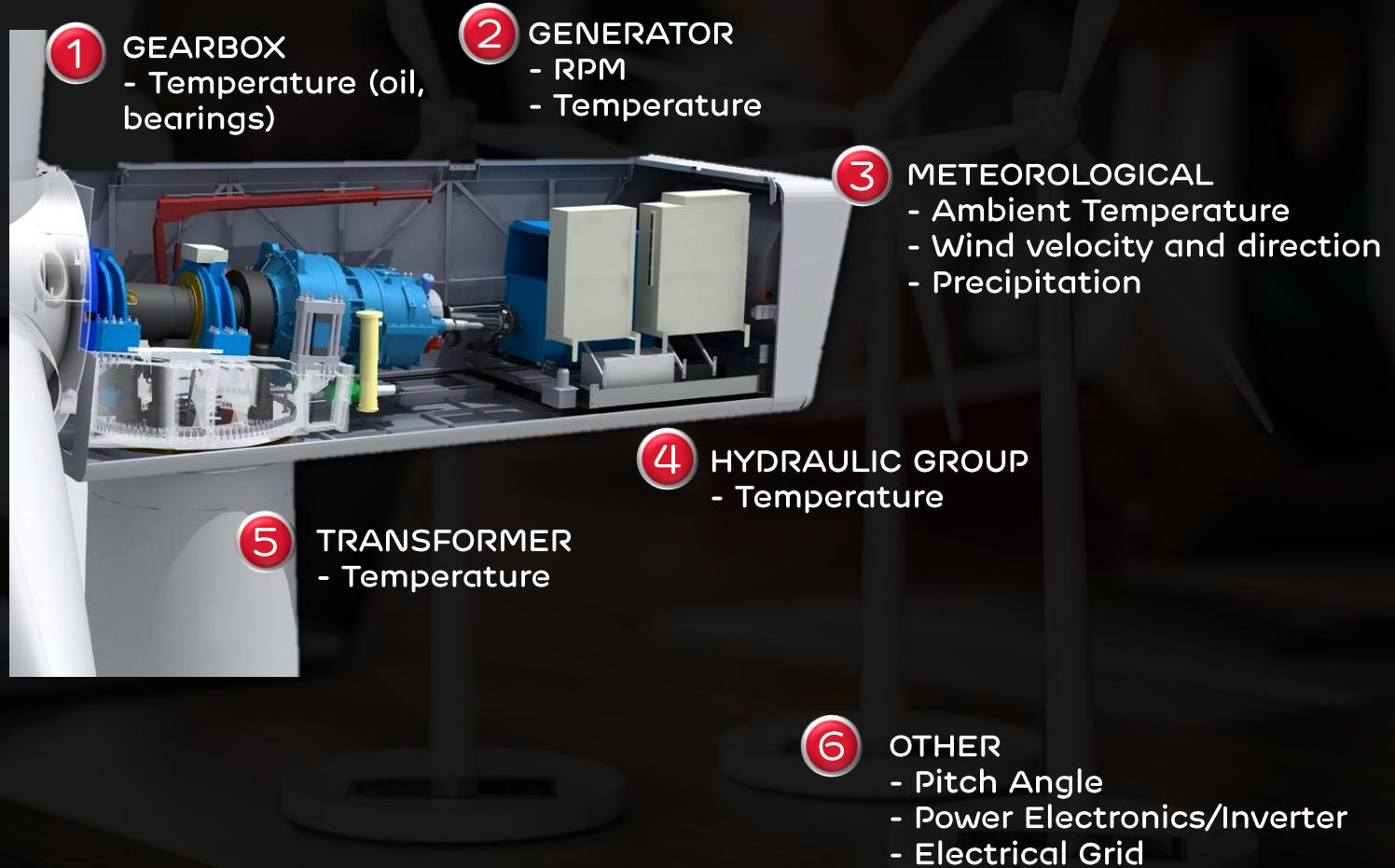
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IMPORTANCE

EXPECTATIONS ON
YOU

EVALUATION METHOD

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IN EDP OPEN DATA PLATFORM!

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IMPORTANCE

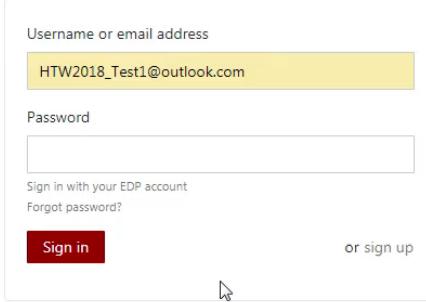
EXPECTATIONS ON
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WHERE IS THE DATA?

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Online platform (<https://opendata.edp.com>) that gathers real datasets from EDP's operating assets and makes them available to all the parties interested in the energy sector.



The image shows a screenshot of the "Sign in to EDP Open Data" page. At the top right is the EDP logo. Below it, the title "Sign in to EDP Open Data" is centered. There are two input fields: "Username or email address" containing "HTW2018_Test1@outlook.com" and "Password". Below these fields are links for "Sign in with your EDP account" and "Forgot password?". At the bottom are two buttons: a red "Sign in" button and a smaller "or sign up" link.



IN EDP OPEN DATA PLATFORM!

EDP WHO?!

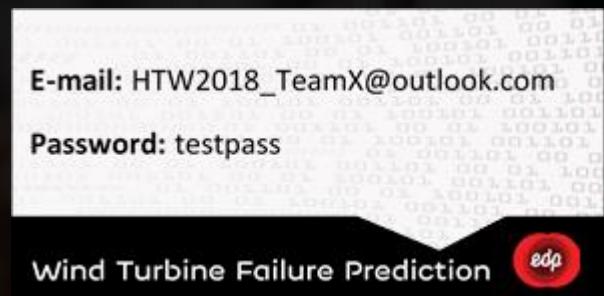
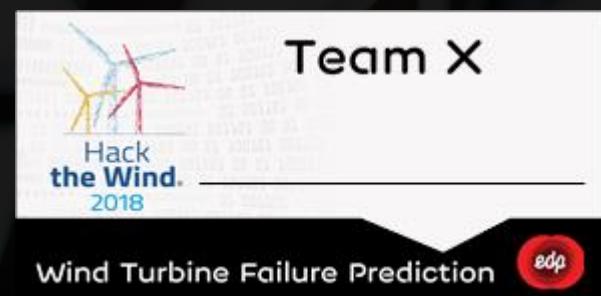
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IMPORTANCE

EXPECTATIONS ON
YOU

EVALUATION METHOD

WHERE IS THE DATA?

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To access the platform and submit your results, you will be given specific credentials after the teams' formation



HOW WELL ARE YOU DOING?

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IMPORTANCE

EXPECTATIONS ON
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EVALUATION METHOD

WHERE IS THE DATA?

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Once you submit your results, you will immediately know your score and position in the general ranking (via e-mail), but ...

Dear João Neves:

Your submission for Hack The Wind 2018 on behalf of team EDP, from September 5th, got a score of **40583.333** and a grade of **15.76**!

This is your best result so far! You are currently in **1st place** with 1 teams in the ranking.

Here's how you did, broken down by component:

Gearbox	11.06
Generator	5.05
Generator Bearing	10.00
Transformer	18.79
Hydraulic Group	11.13

You have **4 submissions left**. Keep improving your solution!

[Tell us how you did it!](#)

... You will only have access to the general ranking on 25-Sep 24PM and 26-Sep 12PM and 24PM (via EDP Open Data)

#	Team Name	Last Entry	Number of Entries	Grade (0-20)	Prediction Savings €
1	FCUL	July 20, 2018 11:20 AM	1	0.5299	-
2	EDP Insider	July 20, 2018 11:56 AM	1	0.5299	-
3	EDP	August 8, 2018 6:07 PM	9	0.5299	-
4	TMD	June 21, 2018 12:23 PM	2	0.53	-



3 SUBMISSIONS PER DAY
BEST SUBMISSION



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IMPORTANCE

EXPECTATIONS ON
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EVALUATION METHOD

WHERE IS THE DATA?

FINAL ADVICES

- ➡ We expect great things from you! Do great predictions, build innovative business cases and pitch your solution enthusiastically!
- ➡ You can find all the data and information to solve the challenge in EDP Open Data platform.
- ➡ You will have a pre-defined e-mail and password to access EDP Open Data and submit your results. They will be given to you during the teams' formation.

GOOD LUCK!

JURY



António Vidigal
CEO EDP Inovação

MENTOR



Hugo Virgós
Predictive Diagnosis
Analyst

MENTOR



Ivan Almirante
Performance Analyst

MENTOR



Pedro Valverde
Manager Cleaner
Energy Group

MENTOR



Sofia Ganilha
Analyst Cleaner
Energy Group



edp

Q&A

