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AWEA WEBINAR SERIES 2020 - TECHNICAL SESSION

How AI Can Optimize Wind O&M Strategies and Boost Returns

SPEAKERS:

KASPER WALET
Maycroft and AIEnergizer

LÁSZLÓ SILLER
River Commodities and AIEnergizer

TUESDAY, 4 AUGUST 2020 - 3 PM SGT

Asia Wind Energy Association

The Asia Wind Energy Association was established in December 2016 to become the leading trade association for the wind energy sector in Asia Pacific.

The association acts as the regional platform for all wind power industry stakeholders to collectively promote the best interests of the wind power sector.

The Asia Wind Energy Association is supported by a wide variety of stakeholders from the offshore and onshore wind industry.

Information

Asia Wind Energy Association

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Asia Wind Energy Association

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Artificial Intelligence in Practice for Offshore Wind

Kasper Walet

Maycroft and AIEnergizer

Skilled and accomplished professional with over 25 years of extensive of C-level board level experience in the energy markets worldwide. Kasper has strong expertise in all the aspects of energy commodity trading markets, international sales, derivatives trading, staff training, risk management and regulatory compliance within dynamic and high- pressure environments, Kasper shares his AI and strategy expertise with non -technical energy business leadership teams of whom most do not have a formal AI background or academic training in data science.

László Siller

River Commodities and AIEnergizer

An energy commodity full supply chain professional with over 10 years of experience in Risk Management, Risk Controlling, and Portfolio Management, ranging from Mining and Oil and Gas to Power and Renewables. Member of different high-level Decision-Making Committees with a role and competence of Investments, Portfolio Management and Risk Management. Laszlo has further experience developing intelligent systems with Artificial Intelligence as well as training for different levels of the organization and interdisciplinary project management.

AI and O&M

Artificial Intelligence in Practice for Offshore Wind

The Offshore Wind Business Case

- **Upside: Revenue uncertainty**
  - (Declining) Subsidies
  - Low margins
  - PPA
  - Demand for green energy?

- **Bottom Line; Costs**
  - Every failure that leads to downtime is critical
    - Opportunity costs
    - Costs for personnel, material and spare parts
    - Logistical costs

60% Rule

- OPEX 60% of costs running a wind farm
- Unexpected breakdowns 60% of operating expenses

- So expensive because it's unscheduled
  - ~ Loss bargaining power
  - ~ Loss production in high wind season

Cutting Costs and Saving Money

- Economies of scale
  - Bigger turbines of 10 MW and more
  - Bigger offshore wind farms of 50 turbines or more
- Big data and artificial intelligence just as important
  - Data-rich environment
  - Video technology and sensors

If properly applied, AI could transform the way offshore wind is planned, constructed, operated and maintained

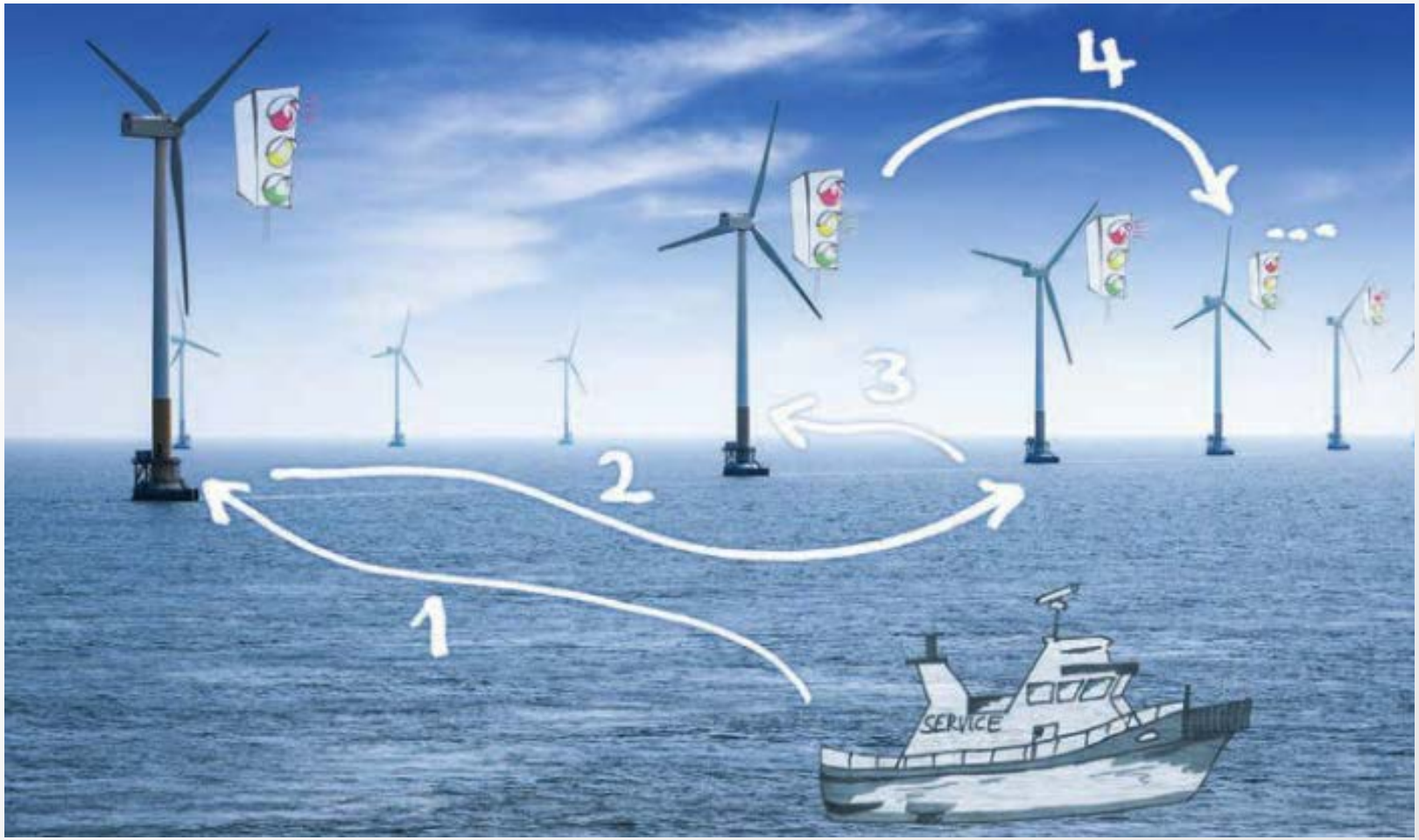
Example Artificial “dolphins”

- Developed by Scottish scientists
  - ~ Protect power supply from sabotage and stormy seas
  - ~ Special sensors — based on dolphins’ natural sonar — fitted to mobile aquatic robots
  - ~ Successfully detect faults in underwater cables
- No need for human divers in dangerous environment
- Provides critical measurements that complement AI assistant on land
  - ~ Can accurately forecast condition of power cable

Maintenance

- **Corrective maintenance**
  - Run-to-failure or reactive maintenance
  - Measures and tasks are taken after a failure
- **Preventive maintenance**
  - Avoid possible failures
- Time-based maintenance
  - Measures will be carried out after a predefined operating interval or after time-dependent intervals
    - Annual maintenance
- Condition-based maintenance
  - SCADA condition-monitoring system to observe various indicators of the system

Scheduling Condition Based



Predictive Maintenance

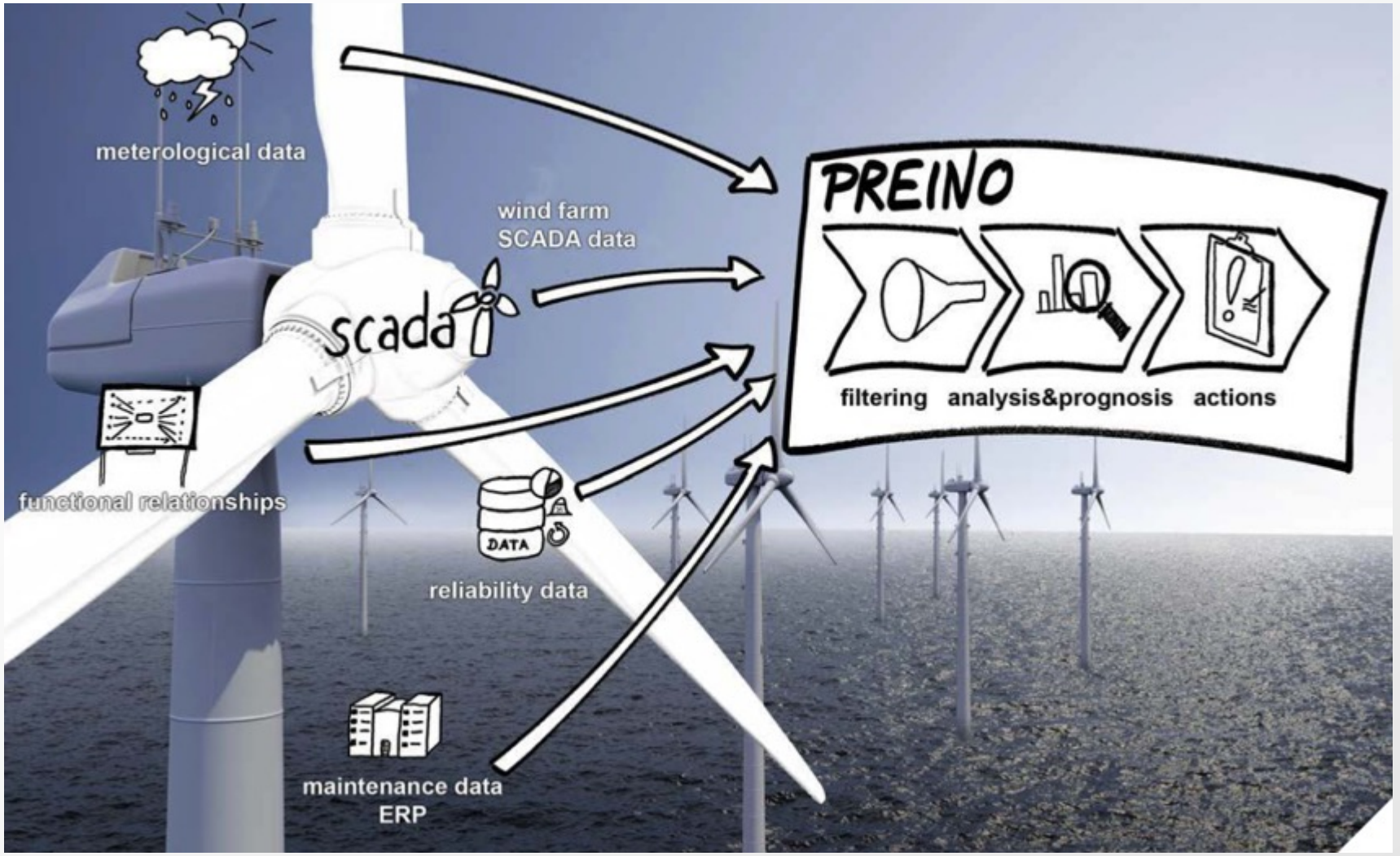
- Turbines fitted with Condition Monitoring Systems
  - Big data feeds
  - Improving O&M practices
- Reducing breakdowns lowers wind costs
  - Reducing length and frequency of breakdowns
  - Getting extra years of service from older turbines
  - Shadow monitoring

Predictive maintenance can help operators fulfill PPAs by reducing their downtime

Role AI/ML

- Abundance of data from turbines
- Better Analytics
  - ~ Machine learning and Artificial intelligence
  - ~ Data should be well structured to find trends or clusters
- Speed and more powerful computing
- Data Access Challenge
  - ~ Who owns the data and who gets access to it?
  - ~ Is operator allowed access to data?

Making the most of AI



Making the most of AI

Collect data and know how to use it

Best Practices

- Have a clear data management strategy
- Use of multiple data streams
- Combining data and engineering expertise

Potential Savings

- Combination of maintenance strategies
  - ~ Preventive maintenance
    - * Replace components just before they break
  - ~ Optimization
    - * Combining work
    - * Rearranging scope based on fundamental decision support

10-15% costs savings realistic

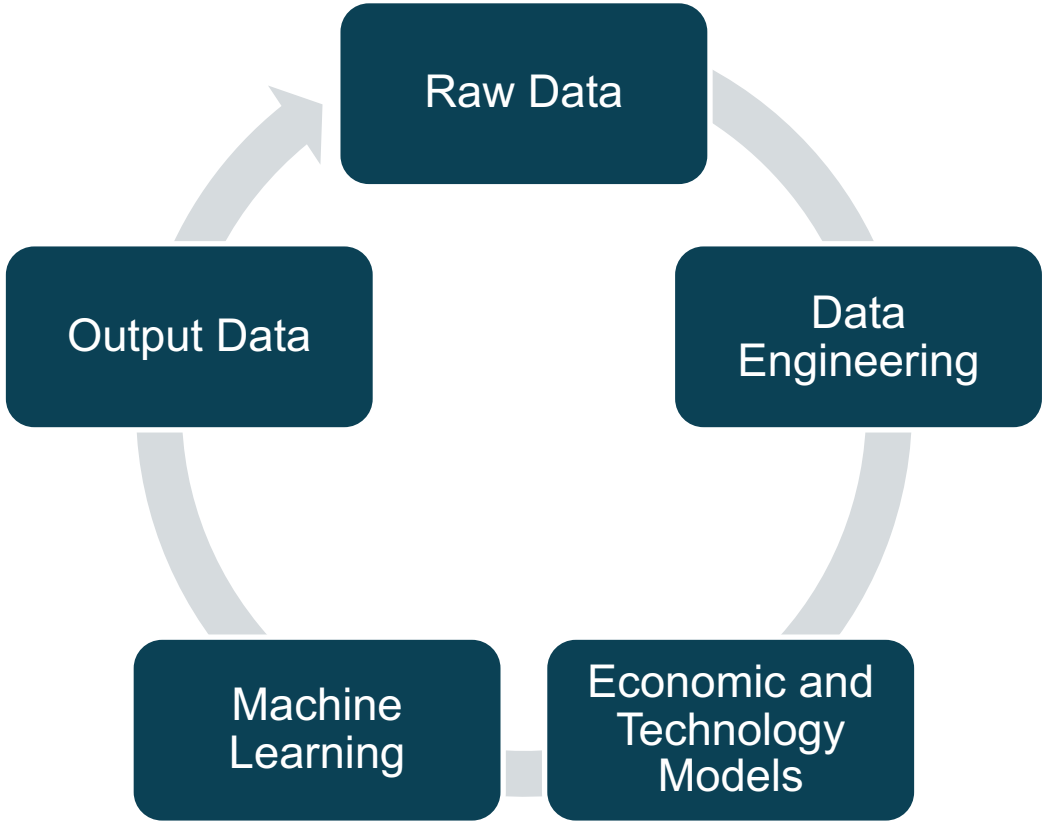
AI and O&M

Artificial Intelligence in Practice for Offshore Wind

Speaker: Laszlo Siller

04.08.2020

Process of Building an AI Model



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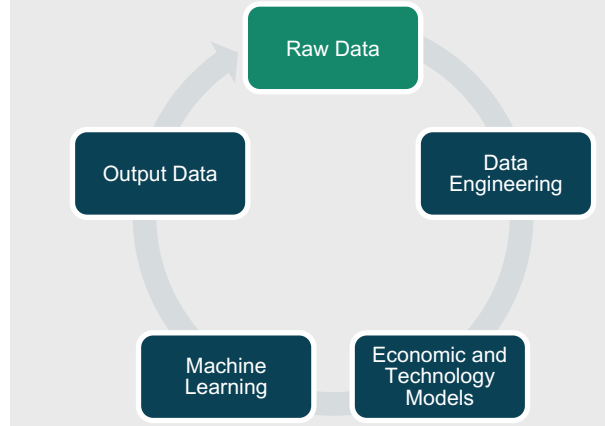
Raw Data

- Meteorological data
- Reliability data
- Functional relationships
- Maintenance data ERP
- Wind farm SCADA data

SCADA examples:

- Wind data (speed and deviation)
- Performance data (power output, rotor speed, blade pitch)
- Vibration data (tower acceleration, drive train acceleration)
- Temperature data (bearing temperature, gearbox temperature)



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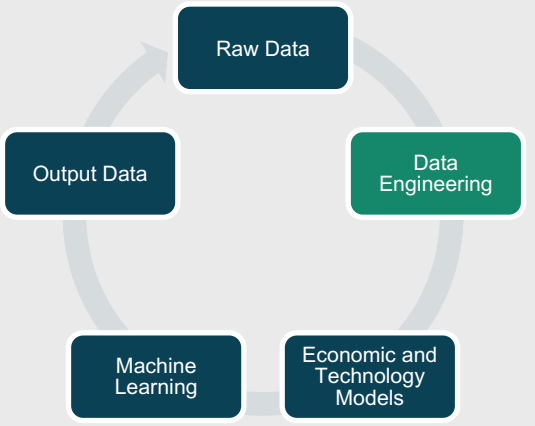
Data Engineering

During Data Engineering process technical financial and IT professionals working hand in hand to understand, clean, structure and prepare the information for further modelling.

Data Engineering or Information Processing is about:

- Data models
- Relational and non-relational database design
- Information flow
- Query execution and optimization
- Comparative analysis of data stores
- Logical operations



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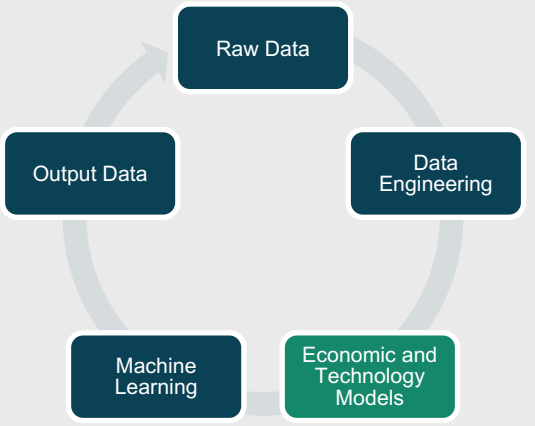
O&M Economic and Technology Models



Building Technological and Economic models for an Offshore Wind Farm O&M is about simulating the real-life systems in a digital (algorithmic) form.

It is about:

- Rule based Programing
- Simulation
- Visualization
- If necessary, highly complex models (AI and Machine Learning)

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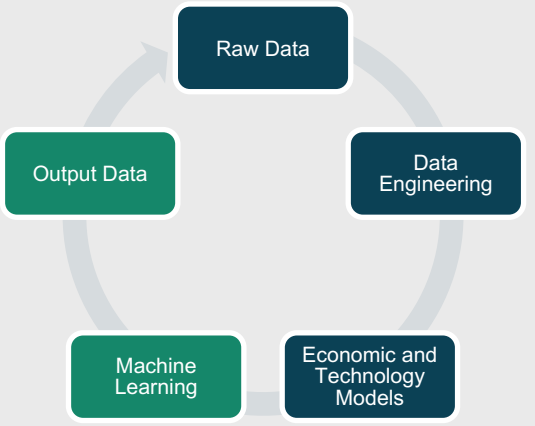
Machine Learning or Artificial Intelligence



Machine learning and Artificial Intelligence is useful for several aspects of building O&M systems:

1. Understanding Data and Models
2. Finding new questions
3. Finding answers

Machine Learning and AI Algorithms Outputs are the result of a model, but it can be an input data for another model or a next layer of the same model.

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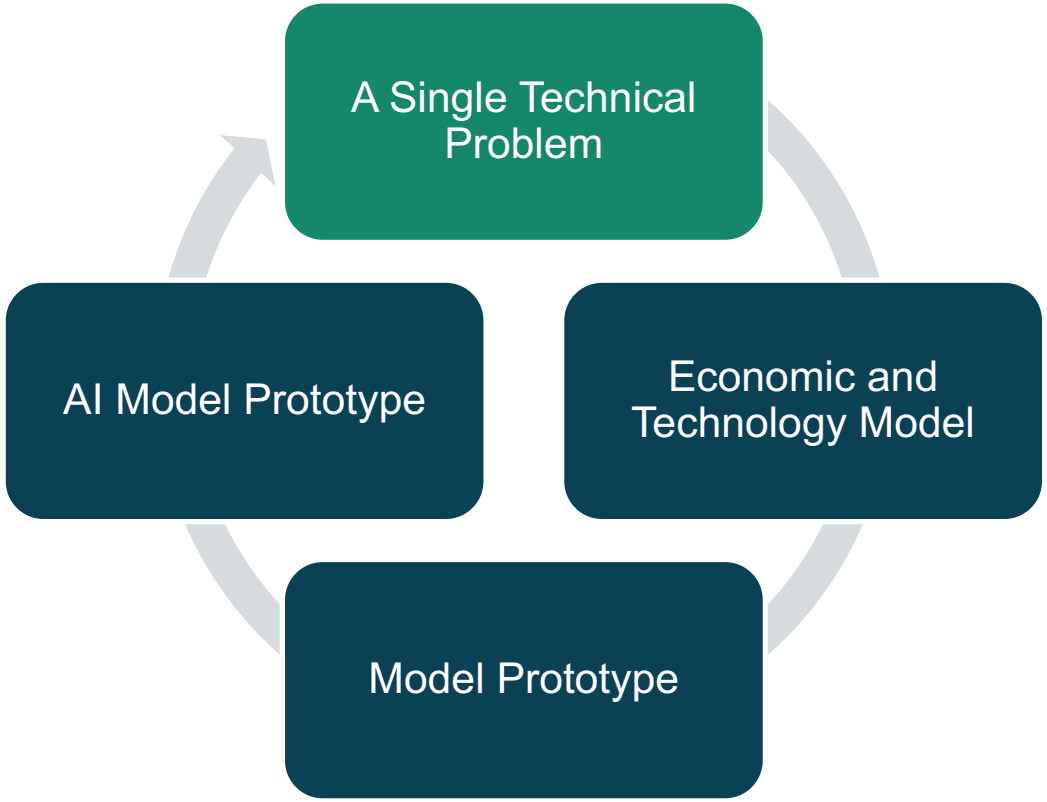

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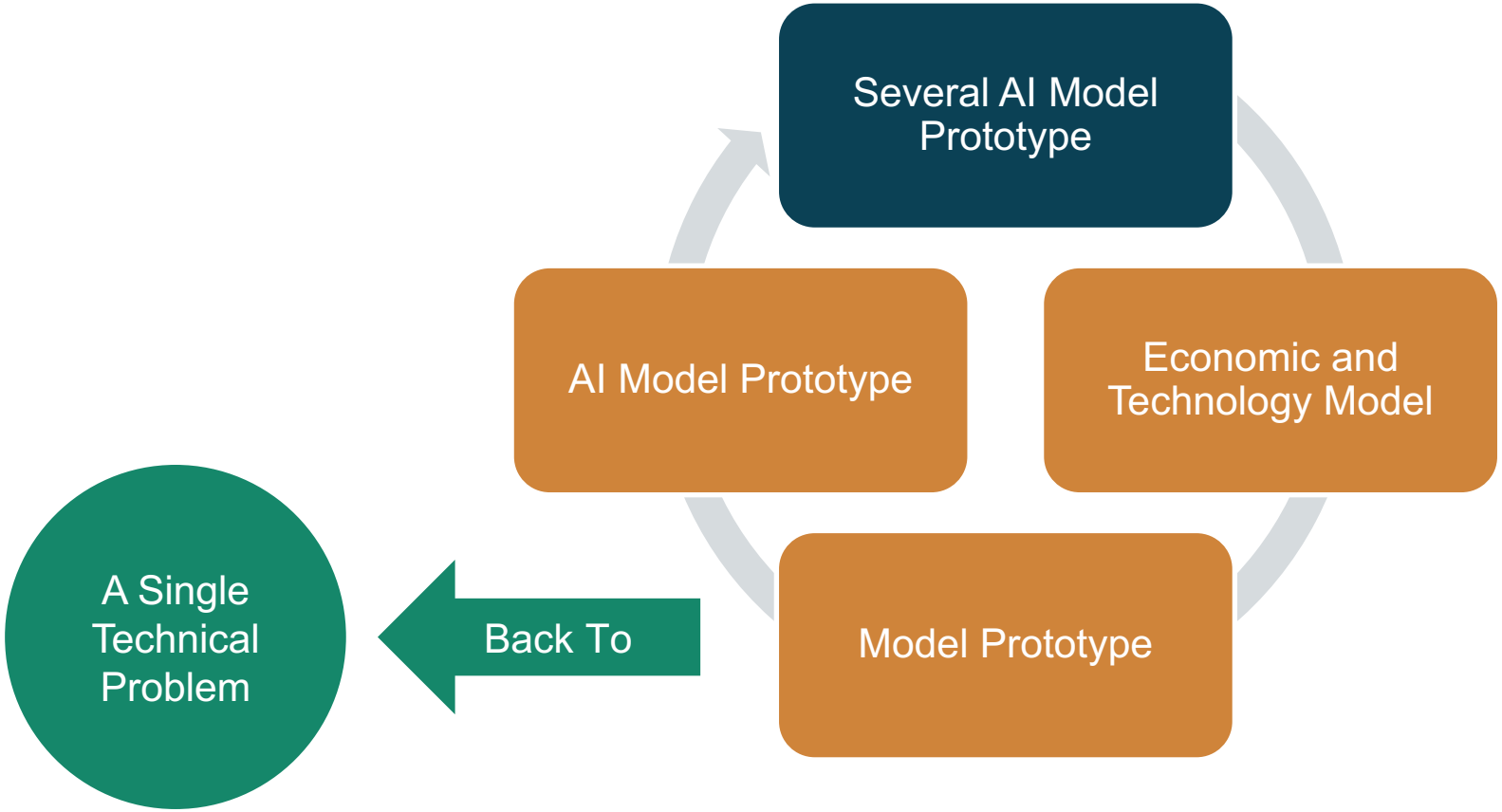
Building Models Based on Several AI Protype Model

Summarizing different AI models into a Sophisticated Systems



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Q & A Session

Question 1

How do you see the future developments of AI in O&M for offshore wind?

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Question 2

How can I found out whether my MS Excel is ready for AI?

Question 3

Who within the company should be involved in the roll out of AI within the company?

Question 4

Are the turbine manufacturers looking into using AI?

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Question 5

In your presentation you show many different parts of an OFW project can use AI. How can you combine AI efforts in all these different parts?

Question 6

How does AI help to improve construction efficiency, as well as reducing construction risk?

Question 7

Is there any tracked record of cost reduction using AI for O&M?

Question 8

How do you approach remaining useful time of critical failing components like high speed shaft bearing using physics and AI?

Question 9

Is AI useful in the project development stage?

Question 10

Do we need a certain amount of issue (ex. Gearbox failure) to occurred from a Project for the machine learning/ AI to learn from?

Question 11

What specific use cases has AI been successfully applied for Wind O&M ?

Question 12

Do you foresee AI playing a role in forecasts on how big turbine sizes/ foundation sizes will become to reduce costs?

Question 13

How do you see the future of AI in the offshore wind sector? Are we only at the start of this AI revolution?


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Closing

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Upcoming Webinar

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