



DRIVING INNOVATION WHILE MANAGING RISKS : A BALANCED RISK MANAGEMENT APPROACH FOR WIND INDUSTRY

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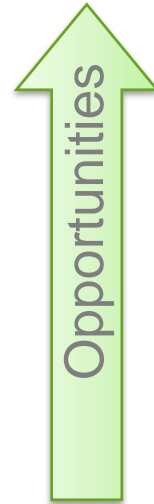
By PRANSHU SAXENA

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Innovation and Wind Industry

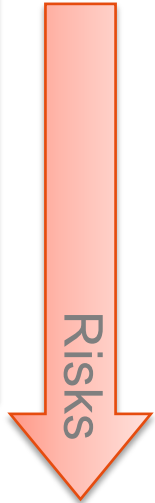
Why ?

- » Competitive Environment
- » Customer's Expectation
- » Technology leadership



- Reliable Innovative Product
- Leadership – Technology & Market
- Being Profitable
- Low Cost of Energy

- Unknown failure modes
- Operational Challenges
- Cost of Repairs
- Risk Market reputation



Technological Innovation are essentially to be designed with built-in reliability at the same time managing the risks due to uncertainties.

Risk Apportionment Method

- » Risk benchmarking - Feasibility of Objectives
- » Pragmatic approach to risk benchmarking

Complexity (C)

Criticality (Cr)

State of Art (S)

Cost (Co)

Duty Cycle (D)

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BLADE System



Blade
System

System 1

System 2

System 3

System 4

System 5

- » Proportionality factor

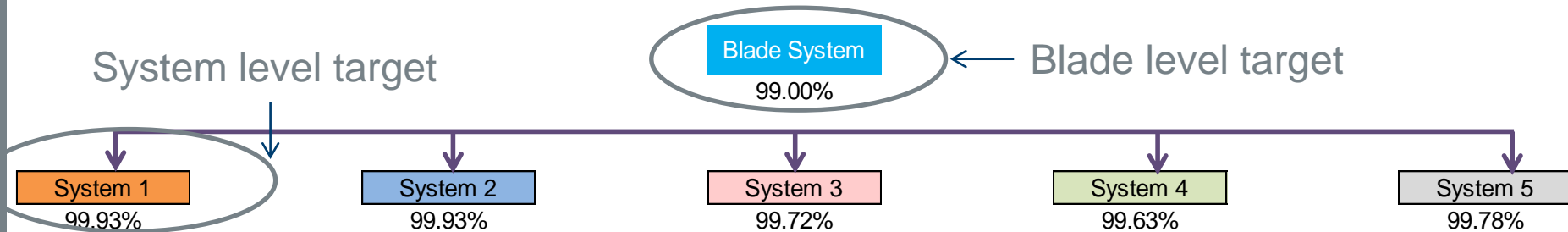
$$Z_i = \frac{C \cdot Co}{S \cdot Cr \cdot D}$$

Balanced Risk Management : Eg.

» Risk benchmark

R_t - Target Reliability for 20 yrs 99%

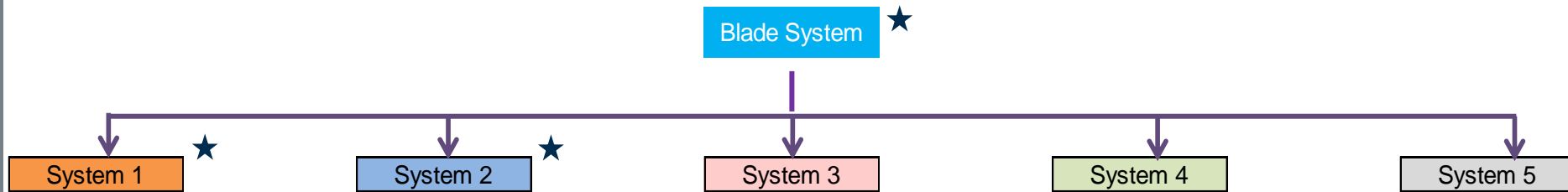
	Complexity	Criticality	State of Art	Cost	Duty Cycle	Proportionality factor	Weightage	System Reliability
	C	Cr	S	Co	D	Z_i	W_i	R_i
System 1	9	9	8	5	10	0.0625	0.0688	0.9993
System 2	7	8	7	5	10	0.0625	0.0688	0.9993
System 3	4	2	4	5	10	0.2500	0.2752	0.9972
System 4	3	5	3	5	3	0.3333	0.3670	0.9963
System 5	4	1	10	5	10	0.2000	0.2202	0.9978



Risk levels targets are established for Blade and system levels

Balanced Risk Management : Eg.

» Innovative Technologies introduced in one or more systems at time



★ - Systems at risks

» Estimate failure probability of the System due to introduction of innovative technology

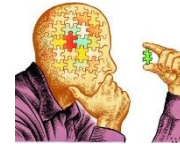
» Comparing against Risk Benchmark target.

Compare failure probability due to new technology introduced with the Benchmark Target for the system

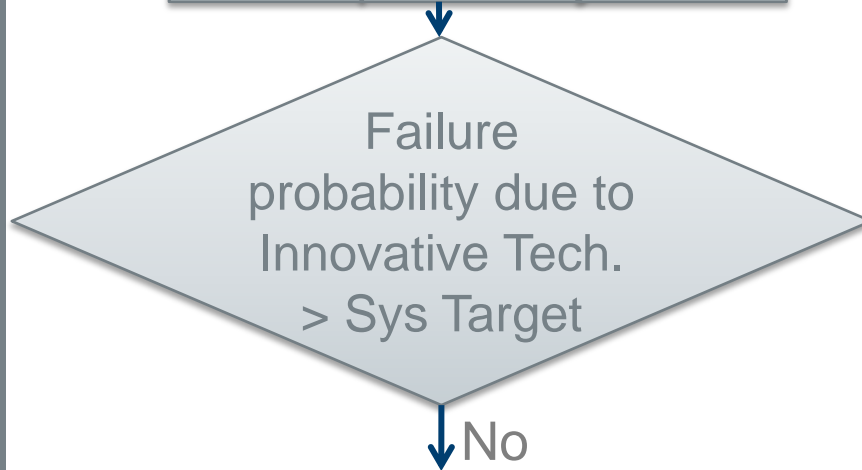
Management Decision Capability:

» Decision Scenarios

Estimate the failure probability



Improve :
Design/validate tests



Further Engineering Analysis
Decision: To bring down the risks

Low risk project –
Decision: Go Ahead



Considerations are passed on to Management for decision making

Further scope :

- » **Prioritization and long term sustainability**
- » **Easy integration with stage gate process**
- » **Developing Cost functions**
- » **Enhances Risk management capability**

Management
Decision making :
**Effective risk
management**

Thank you for your time

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