POTENTIAL WIND TURBINE RELIABILITY AFFECTS ON A PROJECT PRO FORMA

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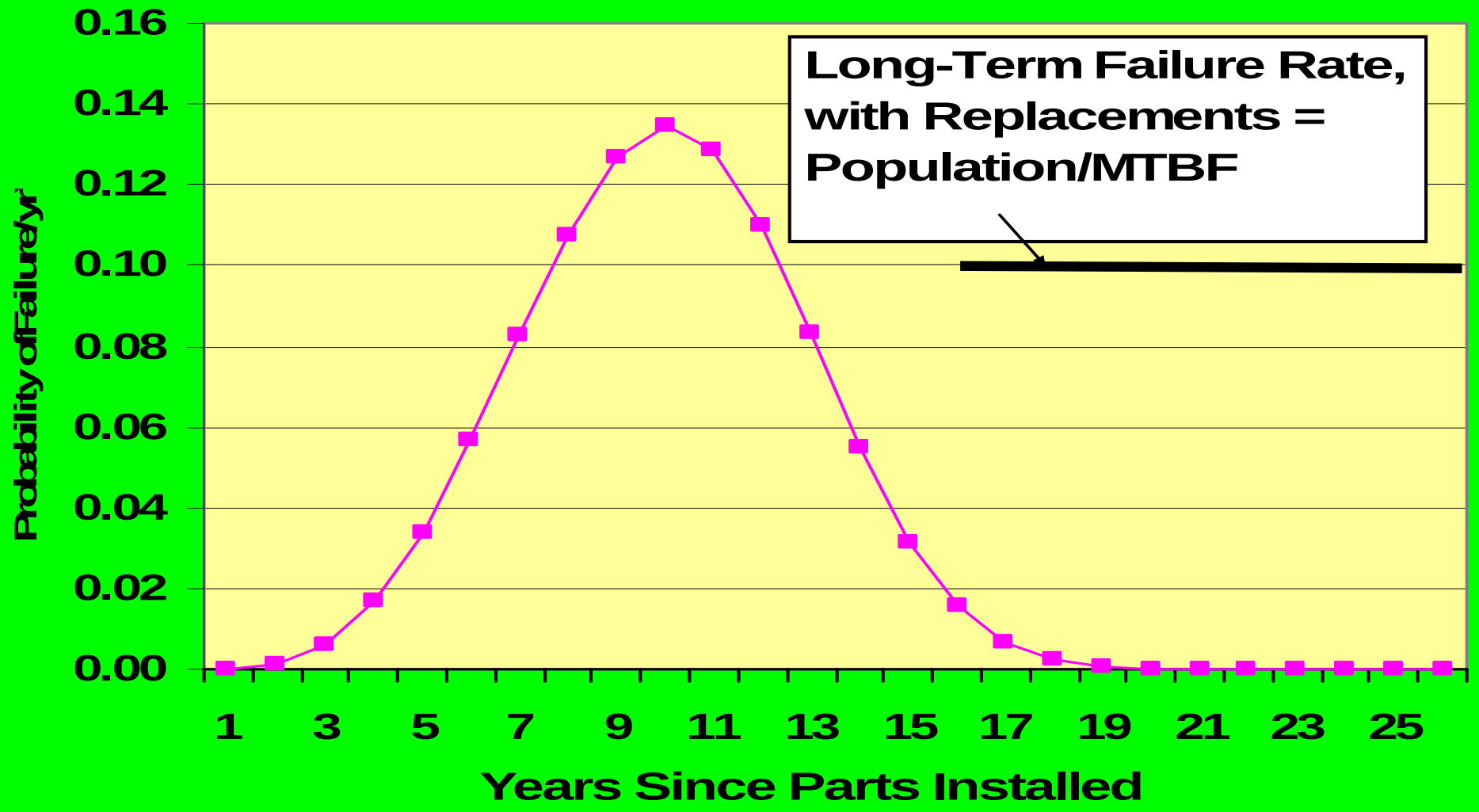
Portion of Pro Forma

Project Year>>>>>>>>>>	1	2	3
Energy Generation and Revenue			
Net Energy Production, MWh	3,942	4,041	4,142
Gross Revenue from sales, k$	256	263	269
Production Tax Credit (PTC), k$	75	77	79
Renewable Energy Credits (RECs), k$	29	29	30
Interest income, k$	0	0	0
Total Revenues, k$	360	369	378
Expenses, k$			
Operator Fee	25.0	25.6	26.3
Operations & Maint. of WTG + Other	24.0	24.6	25.2
Utilities	2.5	2.6	2.6
Insurance (estimate)	45	46.1	47.3
Property taxes	25	25.6	26.3
Other	10.0	10.3	10.5
Total Expenses, k$	131.5	134.8	138.2
Net Revenue before DS and other	228	234	240
Debt Service and amortization...etc.			

Motivation to Lower O&M Risk

- Levelized O&M cost estimates can be 1.1 to 1.6 cents per kWh over 20 years
- O&M costs represent a significant portion of cost of energy (approx. 20 to 25%)
- Besides wind resource, O&M costs may be greatest pro forma uncertainty and risk
- Newer generations of wind turbines means less experience with risky components

TYPICAL RATE OF COMPONENT FAILURE - WEIBULL FAILURE-RATE PROJECTIONS (For a fixed population, no replacements, Characteristic life = 10 years)



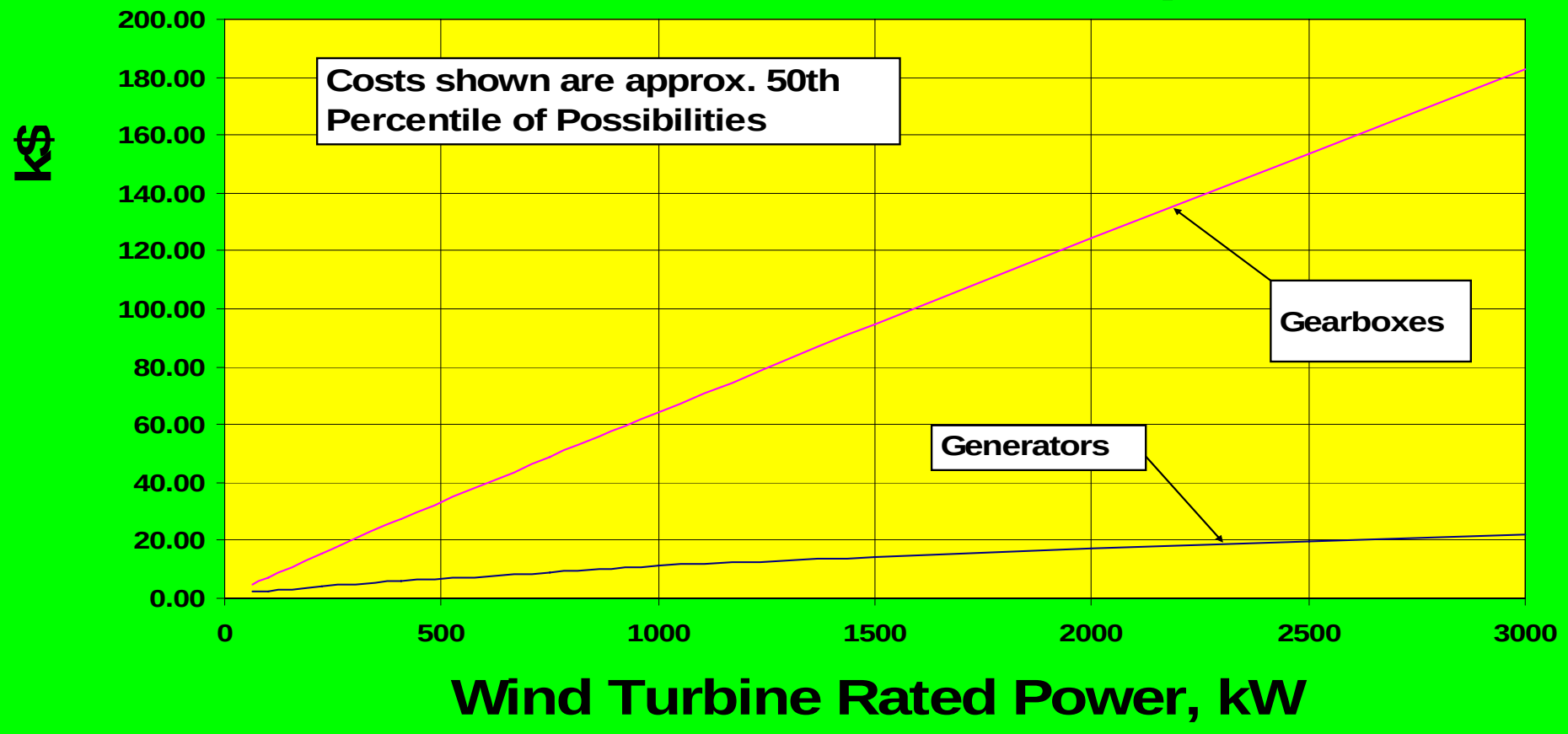
Estimated Mean Time Between Failures (MTBF) for Key Mechanical Components

Component	Components Per Turbine	MTBF (Years)
Gearbox	1	18
Generator	1	15
Blade	3	40+
Yaw Drive Motor	2-4	22
Yaw Drive Pinions	2-4	13
Yaw Bearing Sliders	1	25
Hydr. Pwr Units & Actuators	1-3 (Actuators)	14

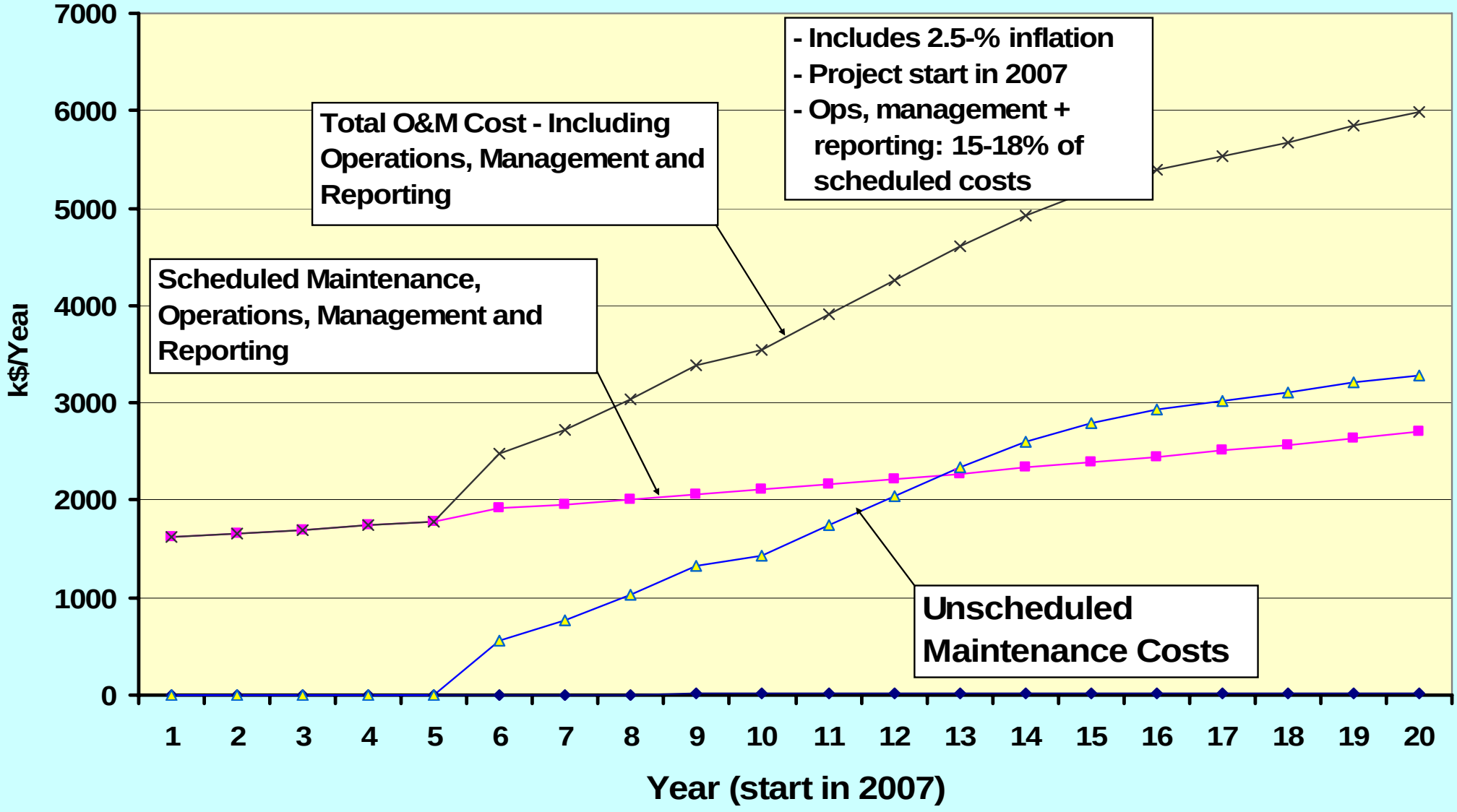
* MTBF is when 50% of original components have failed. MTBF values are assumed to be invariant with wind turbine size or location.

ESTIMATED REBUILD COSTS FOR GEARBOXES AND GENERATORS

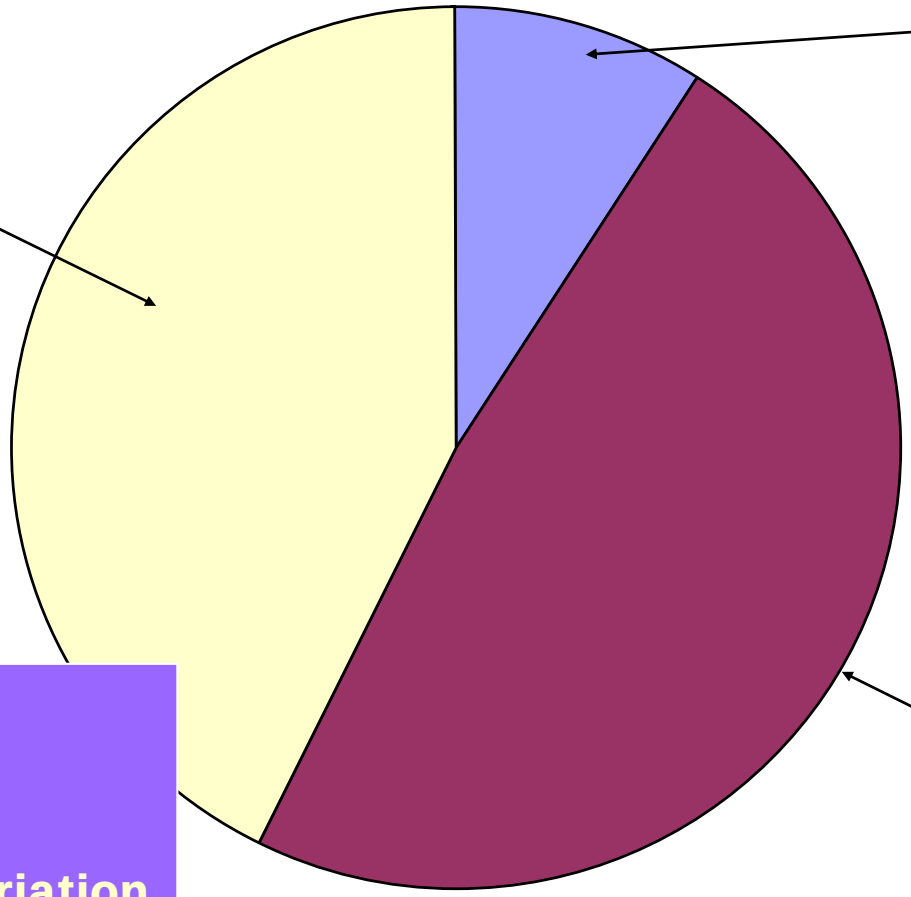
(2006 costs. No costs for removal, shipping, taxes and re-installation included)



Estimated O&M Costs Over 20-Years for 100-MW Project, (2-MW WTGs, 5-year warranty, 2.5 %Inflation)



20-YEAR WIND PROJECT O&M COSTS BY MAJOR CATEGORY, 100-MW Project, 2-MW WTGs



- 5-year warranty
- Start project in '07
- Broad averages
- Large geographic variation