



RELIABILITY ON BANKABILITY

CONSERVATIVE,
NOT NECESSARILY
QUALITY

PV MODULE
RELIABILITY
WORKSHOP

FEBRUARY 2015

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WHY PROJECT FINANCE?

CASH REQUIRED

- LOW Capital
- INCREASE number of projects
- LOWER risk through portfolios

TERM

- Solar life-expectancy challenge for equity investors @ scale
- Spread equity across several projects

NON-RECOURSE

- Equity shares technical and economic risks
- LIMIT downside

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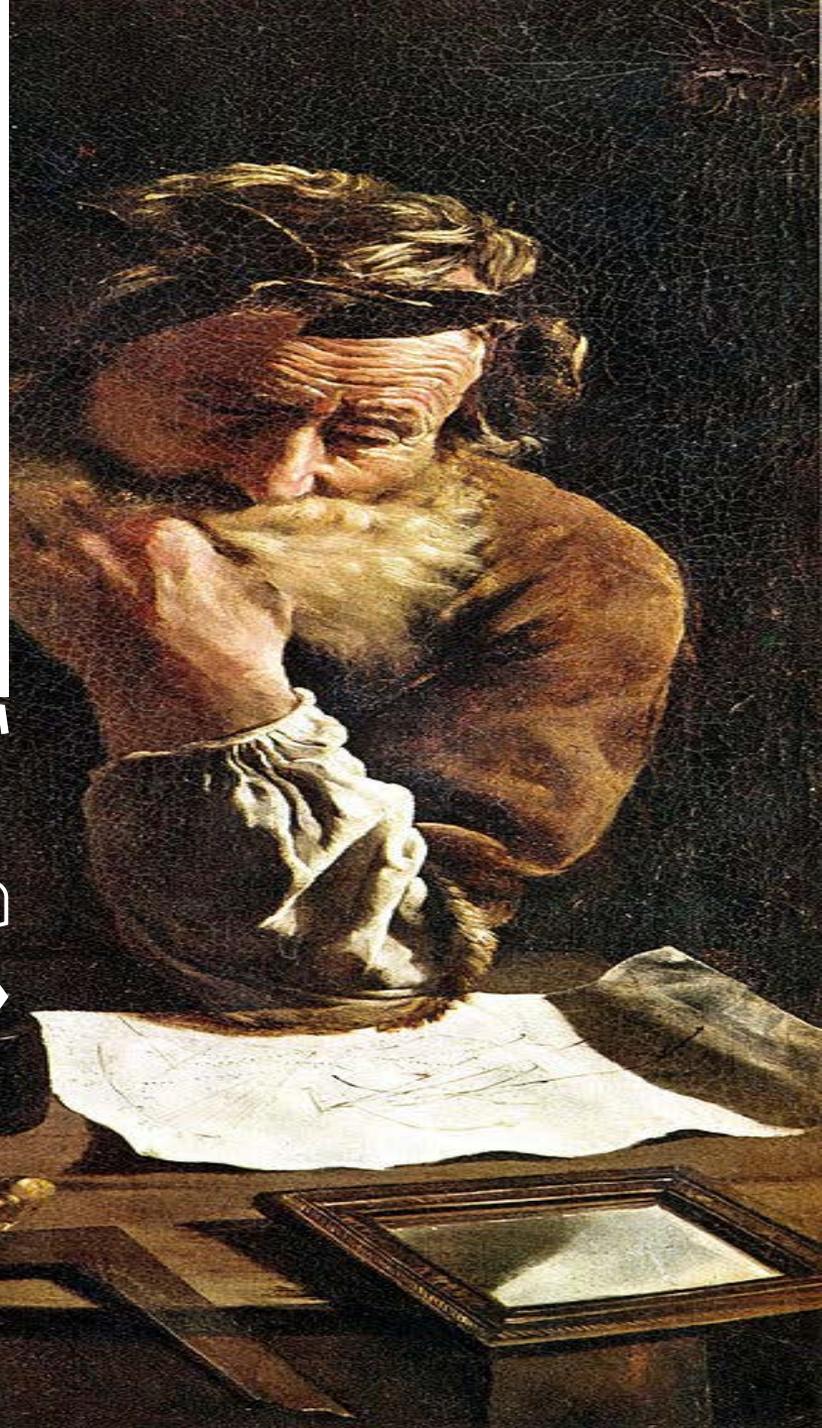
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POWER OF LEVERAGE

10 MW
\$20 MILLION
20 YEARS
\$0.17/KWH

7% DEBT
13 YEARS

ALL EQUITY

- ✓ CASH: \$20million
- ✓ IRR: 12%
- ✓ 20-year NPV: ~\$0

- ★ ALL risk on equity
- ★ REASONABLE returns
- ★ LARGE capital commitment

50/50

- ✓ CASH: \$10million
- ✓ IRR: 15%
- ✓ 20-year NPV: \$2.3 mln

- ★ LIMIT risk on equity
- ★ Medium capital commitment

20/80

- ✓ CASH: \$4 million
- ✓ IRR: 20%
- ✓ 20-year NPV: \$3.6 mln

- ★ LITTLE risk on equity
- ★ SMALL capital commitment
- ★ HIGH IRR
- ★ HIGH NPV

TECHNOLOGY VERSUS LEVERAGE

NOBEL WORK



⊙ *DOUBLE ENERGY !!*

- ⊙ TECHNOLOGY RISK: HIGH
- ⊙ LIMITED WARRANTY

- ✓ DEBT: DECLINED
- ✓ EQUITY IRR: 26%
- ✓ CASH: \$20 million

- ★ HIGH Capital Commitment
- ★ BROADEN Geo-market
- ★ HIGH Risk (20 years)
- ★ SHRUNK Investor Pool

20/80

7% DEBT
13 YEARS

⊙ STANDARD PROJECT

- ✓ DEBT: STANDARD
- ✓ CASH: \$4 million
- ✓ EQUITY IRR: 20%
- ✓ 20year NPV: \$3.6 mln

- ★ HIGH returns
- ★ MEDIUM risk on equity
- ★ SMALL capital commitment

MODEST

7% DEBT
20 YEARS

- ⊙ STANDARD PROJECT
- ⊙ ACCEPTANCE OF WARRANTY

- ✓ DEBT: EXTENDED 20 YRS
- ✓ CASH: \$4 million
- ✓ EQUITY IRR: 26%
- ✓ 20 year NPV: \$4.6 mln

- ★ EXCEPTIONAL returns
- ★ INCREASED value
- ★ IDENTICAL capital
- ★ IDENTICAL technical risk

CERTAINTY

TECHNOLOGY

- ✓ MOST of revenue to service bank debt
- ✓ Technology needs to be consistently performing for life of bank debt
- ✓ Equity makes most money years AFTER debt is paid (year 15 on)
- ✓ Technology needs to be consistent reliable income – Toll Bridge

WARRANTY

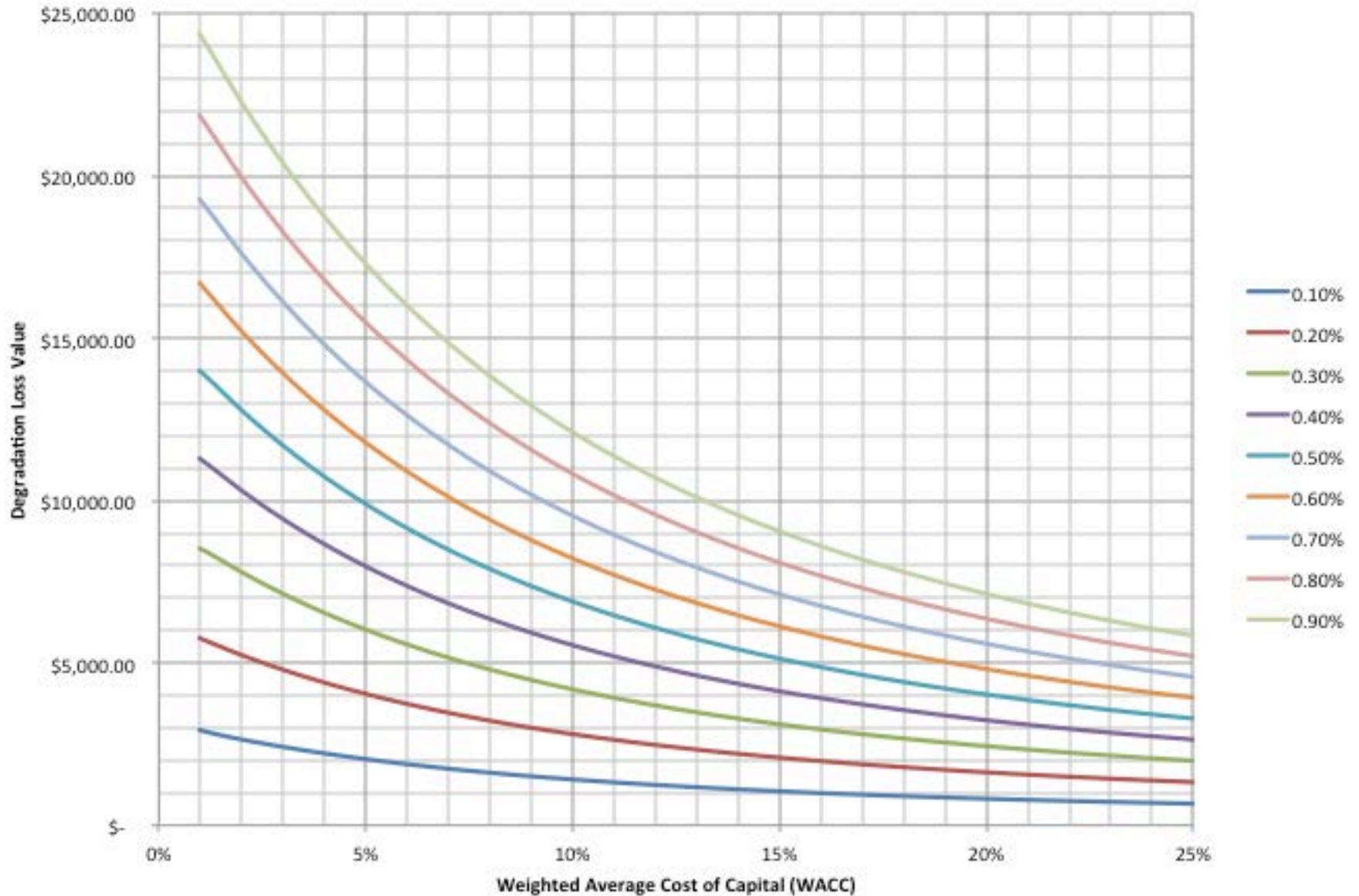
- ✓ Problems with Technology fall to warranties
 - ✓ FIRST, identifying a problem. Centralized architecture means identifying individual module claims is difficult
 - ✓ SECOND, claiming a warranty has manufacture discrepancy
 - ✓ THIRD, an awarded claim and a paid claim are not the same

BALANCE

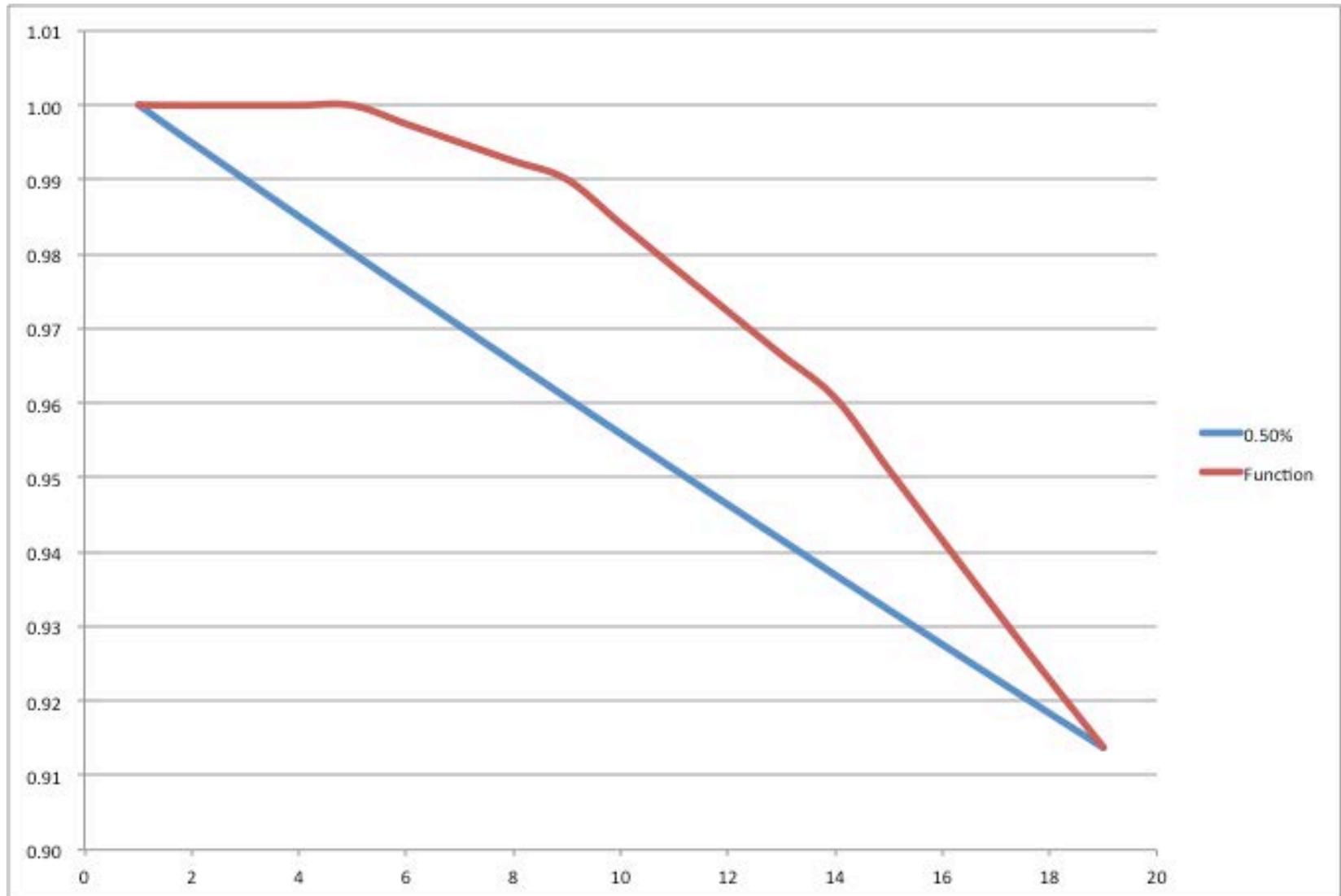
SHEET

- ✓ Volatile manufactures
- ✓ Life-expectancy shrinking for large companies
- ✓ Cultural influence: Chinese industrial project debt

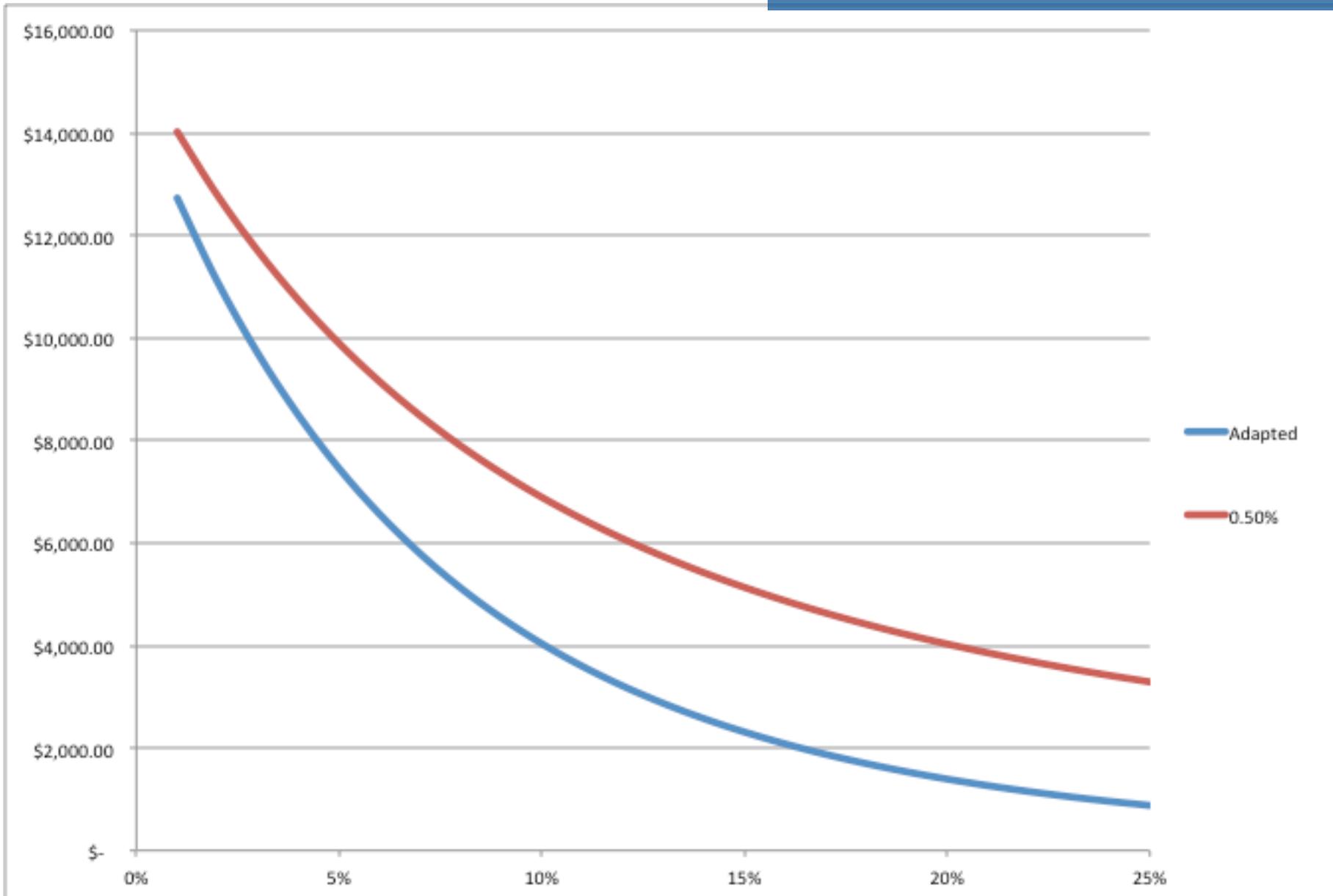
DEGRADATION



FUNCTION VS. COEFFICIENT



FUNCTION VS. COEFFICIENT



CONSERVATISM VERSUS QUALITY

SPONSOR

- ✓ A – B – C, A Always, B Be, C Closing
- ✓ Sponsors make NO money without funded project
- ✓ Development fee is at risk with no project
- ✓ COST

LENDER

- ✓ Acceptable portfolio performance possibly attributed to underestimation
- ✓ NEW technologies increase transaction costs from Independent Engineers
- ✓ Insufficient time for latent defects
- ✓ 'TOP TIER' eases credit committee discussion

OUTCOME

- ✓ Lender leads conservative stakeholder
- ✓ NEW technology upsets program
- ✓ Evolutionary changes "Just like the last one"
- ✓ Conservative performance estimation
- ✓ Warranties important but underlying technology

RESEARCH
SCIENCE TO COMMERCIAL
VIABILITY

Hope is NOT lost.

Advances in applied science are critical for the successful adoption of solar in new markets, broaden investor pools, and lowering conservative assumptions

- Understand role of debt
- Parallel advances with finance
- Understand warranty implications and power of decades of leverage
- Reliability, quality, and consistency may have dramatic impact on economics
- NEW technology must have a commercialization plan including project finance.

Conclusions

ALIGNING 'CONSERVATIVE'
& Quality

Knowledge of Quality Over conservative assumptions

- Project Finance is here to STAY
- Stakeholders will tend to levered project structures which require consistent and reliable economics
- Projects will tend to use comfortable technology because of a sense of reliability and comfort
- Paradigms will be questioned with continual technology failures, companies dissolving, and manifesting latent defects
- Consistent independent standards will provide a platform for comparison of features and long-term reliability standards
- Quality requires stakeholders to be informed, create desire, and facilitate Demand.