



Munich Re Green Tech Solutions

Forum on Business Models for Energy Efficient Public Lighting

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1. Munich Re Green Tech Solutions -- the risk carrier for LED based technologies within Munich Re (Group)
2. LED global market trends
3. Risk transfer solutions
4. Q & A

Green Tech Solutions within Munich Re

The world's largest reinsurer's financial strength at your side



Munich Re (Group)

- World's largest reinsurer by premium volume
- Founded in 1880
- Group Result 2015: €3.3bn
- Approx. 43,000 employees

Rating

A.M Best	A+ (Superior)
Fitch	AA (Very Strong)
Moody's	Aa3 (Excellent)
S&P	AA- (Very Strong)





Which are potential risk situation?

How can these various risks be handled?

Risk situations

- Technological risk & impact
- Financial risk & impact
- Operational risk & impact
- Market risk & impact

Actions

- Assume risks  Keep various risks on own balance sheet
- Mitigate risks  Transfer risks from own balance sheet to 3rd party balance sheet

What is insurance?

Why does business require risk transfer?

Insurance is not only ...

“... a contract between the insured and the insurer agreeing to the terms of an insurance policy”

“... a requirement by law in some industries”

“... a promise of indemnification for specific potential future loss in exchange for periodic payment”

... but also helps to ...

Identify
risks



“... identify and understand potential risks and their impact”

Transfer
risks



“... provide solutions ensuring a continuous business development”

Enable
business



“... protect project returns and attract investors”

Munich Re Green Tech Solutions

Proof Points in the Market

Green Tech Solution's track record

Green Tech Solutions insured **80 renewable energy projects** in **16 countries** and **4 continents**

"The insurance enabled the bond to achieve investment grade rating that delivered up to 30% savings in finance costs!"

Over **130 photovoltaic module manufactures** audited in extensive factory visits **globally**

"If it weren't for Munich Re, winning the 96 MW solar project in South Africa would not be possible..."
– CEO of solar module manufacturer

More than **€1 billion exposure** in support of over **€12 billion capital** in global **"green" technologies** since 2010

World-class partnerships with research and certification institutes, e.g. **DEKRA, Fraunhofer Institutes**

Strong collaboration with Munich Re's network of financial & technical experts, e.g. **Cyber Solutions**

Green Tech Solutions within Munich Re

...pushing the limits of insurability

Innovative industries require tailor-made solutions for risks that cannot be covered traditionally

Energy production

Photovoltaic

Concentrated Solar Power

On-/Offshore Wind

Biomass/Waste to Energy

Fuel Cells



Energy Efficiency

LED Module

LED Full Luminaire

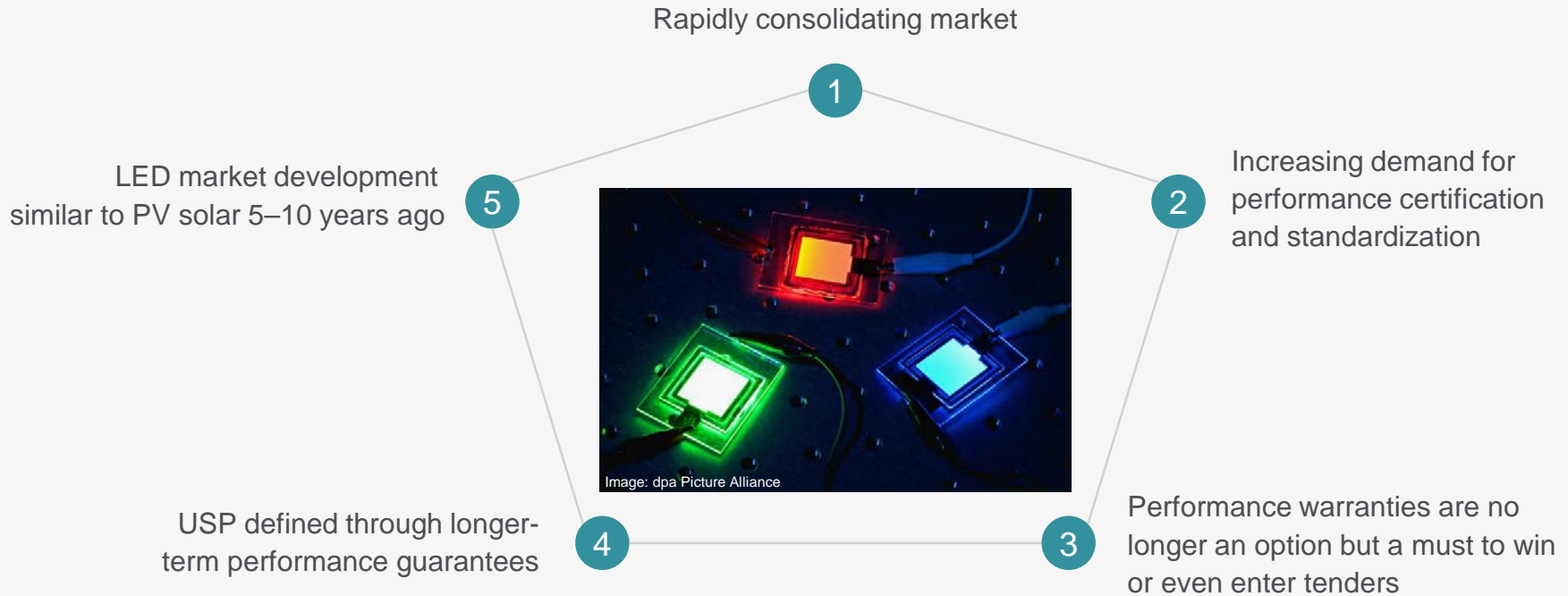
Energy Savings/Performance

Energy Storage

Batteries

Trends and challenges

... and how they affect you as a manufacturer



LED Risk Transfer

Solutions for manufacturers and large investment projects

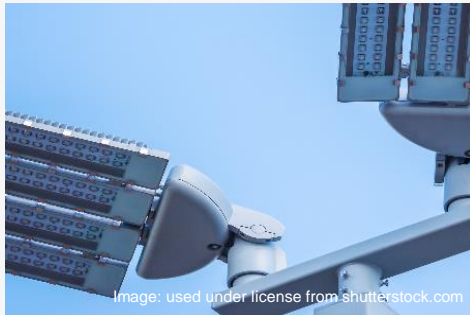


Insurance of entire LED production

Warranties for all LED products of a certain product line are covered:

- LED Module
- LED Full Luminaire

Insured: LED Manufacturer



Insurance of LED investment projects

Products tailored for large projects (e.g., cars parks, airports, industrial lighting, municipal street light) are covered, in case:

- Manufacturer is unable to fulfill warranty obligations
- Energy efficiency targets are not met due to tech. underperformance

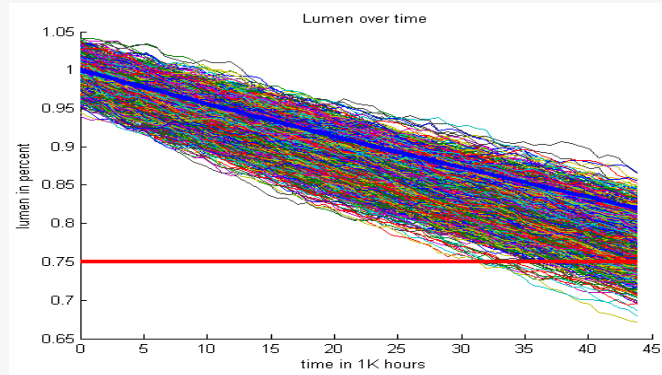
Insured: Project Owner/ESCO

Risk transfer solutions for manufacturers

Two insurance cover examples

Lumen Maintenance

- Back up of lumen maintenance warranty
- If lumen output drops below 75% within 5 years/50,000hrs of operation, the insurance is triggered



Color Shift

- Back up of colour consistency warranty
- If in a single contiguous visual space viewable from any location within that space that differs more than 3 points in $d u'v'$ within 5 years, the insurance is triggered

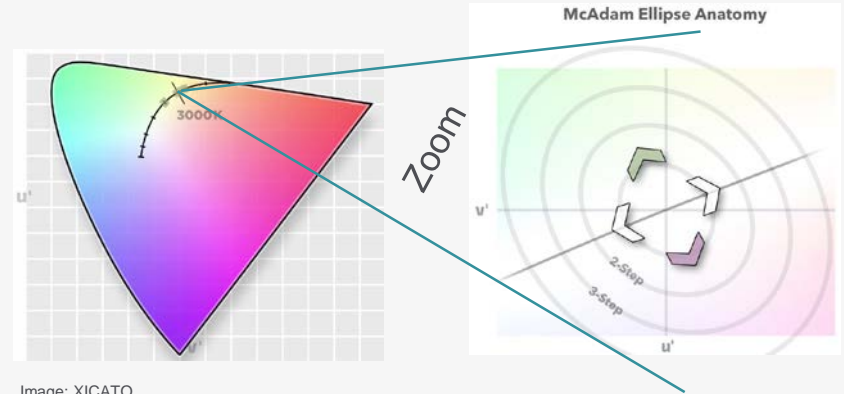
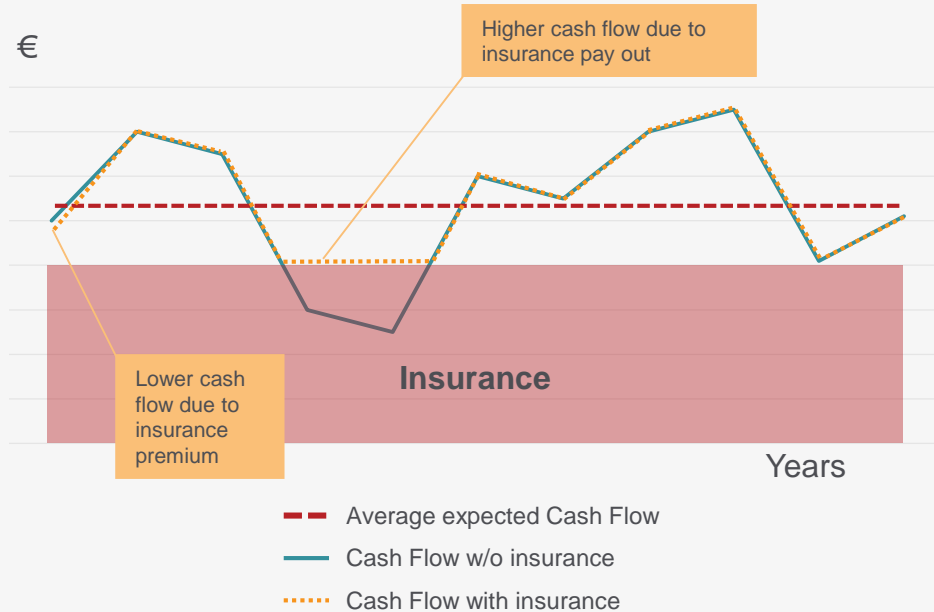


Image: XICATO

Munich Re GTS' Value Proposition

Protecting business development

Cash Flow Stability



Investment and Project Reliability

Investment Grade	↑	'AAA'	Extremely strong capacity to meet financial commitments. Highest rating
		'AA'	Very strong capacity to meet financial commitments
		'A'	Strong capacity to meet financial commitments, but somewhat susceptible to adverse economic conditions and changes in circumstances
Speculative Grade		'BBB'	Adequate capacity to meet financial commitments, but more subject to adverse economic conditions
		'BBB-'	Considered lowest investment grade by market participants
		'BB+'	Considered highest speculative grade by market participants
		'BB'	Less vulnerable in the near-term but faces major ongoing uncertainties to adverse business, financial and economic conditions
		'B'	More vulnerable to adverse business, financial and economic conditions but currently has the capacity to meet financial commitments
	'CCC'	Currently vulnerable and dependent on favorable business, financial and economic conditions to meet financial commitments	
	'CC'	Currently highly vulnerable	
	'C'	A bankruptcy petition has been filed or similar action taken, but payments of financial commitments are continued	
		'D'	Payment default on financial commitments

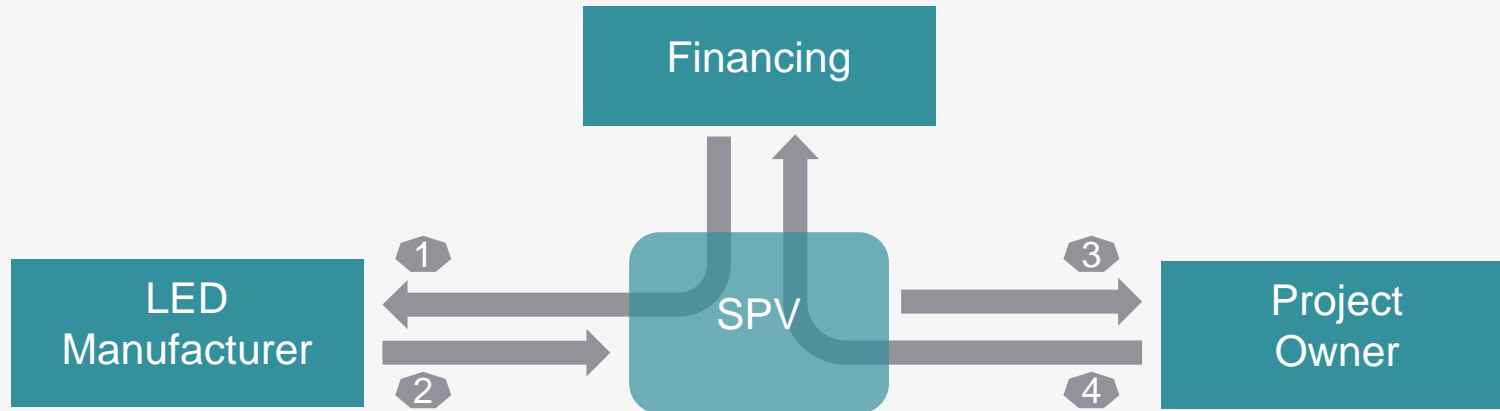
Risk Transfer

► Insurance can enhance ratings and reduce financing costs

Risk Transfer Solutions

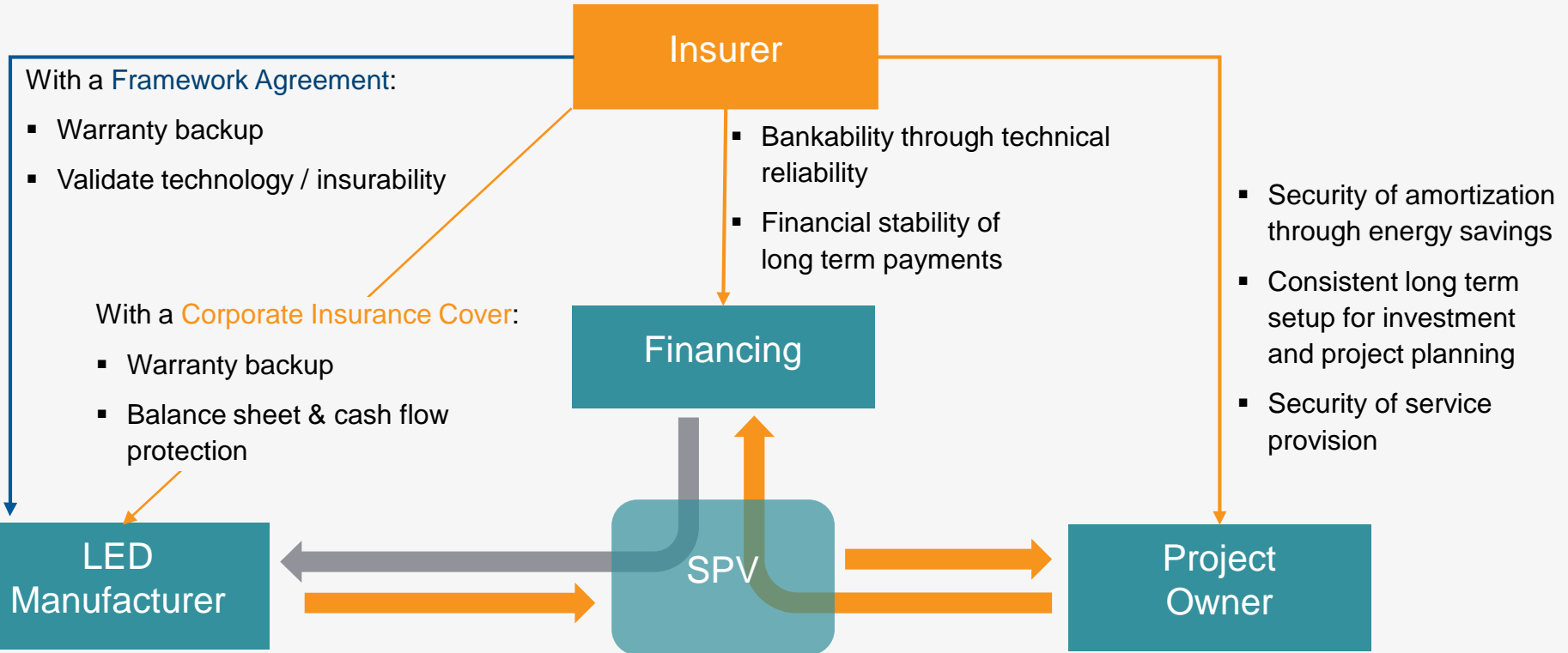
Energy Savings Project *without* performance cover

- 1 Financier purchases / finances LED technology via a SPV
- 2 LED manufacturer provides equipment (including long term warranty!)
- 3 SPV provides lighting service to project owner (optionally including guaranteed energy savings)
- 4 Project realizes savings through LED technology and remunerates SPV/Investor accordingly.



Risk Transfer Solutions

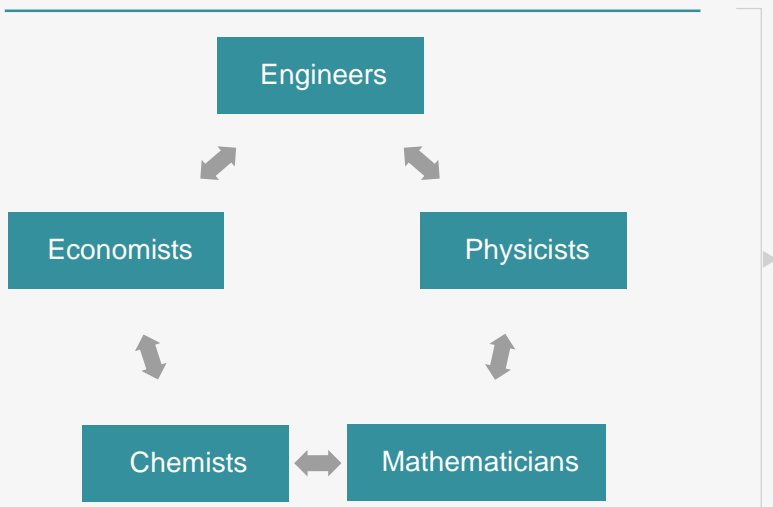
Energy Savings Project *with* performance cover



Financing for Infrastructure Investments

Collaboration of GTS and MEAG

Green Tech Solutions



MEAG

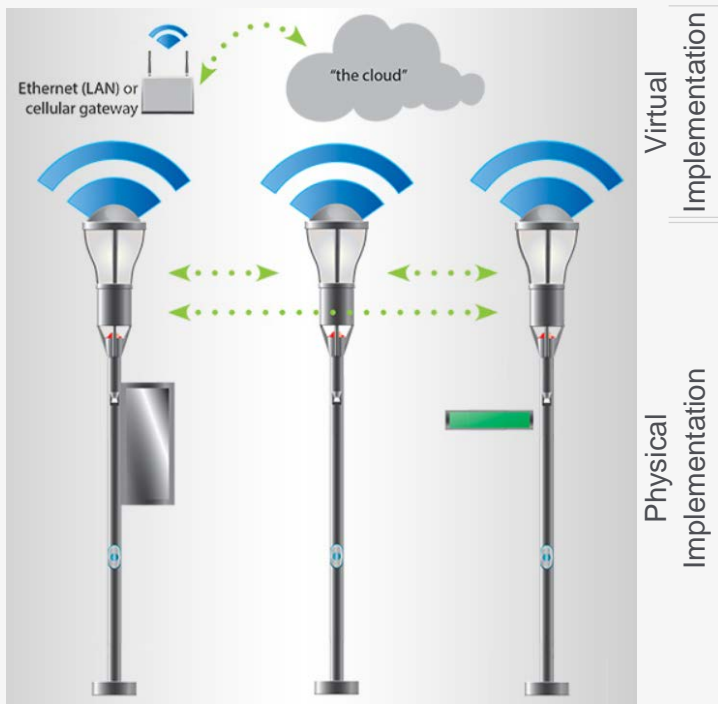
- Munich Ergo Asset Management
- Assets under management: € 256 billion (2015)
- Expertise in renewable/ green investment projects

Investment Preferences

- Global long term infrastructure investments
- Equity investment desired, currency indifference
- Debt financing possible, currencies GBP, USD, EUR
- Ticket size: ~30 Mio EUR

Risk Transfer Solutions for Smart Lighting

Technology and cyber risk situation



Possible IoT risk transfer solutions can cover

- Damage to or loss of data caused by computer malicious act, computer malware or human error
- Theft of data
- Denial of service targeting the insured system
- Physical damage
- Unavailability of data = business interruption of alternative revenue

LED technology risk transfer solution available

- Color consistency → material defects / ageing
- Lumen maintenance → faulty manufacturing
- Energy Savings → amortization of investment

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