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Bankability

Konstanz, 26.10.2017, André Richter, Meyer Burger Technology AG



Overall cost & process optimization

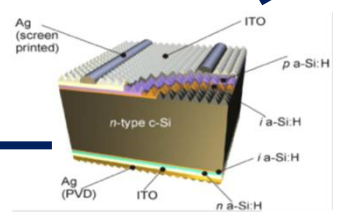
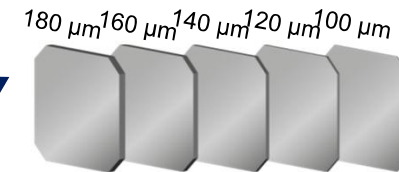
- 1** High efficiency cell
- lower system cost (BOS)
 - Thin > high efficiency
- Only 6 process steps
- low COO
- Temperature coefficient
- higher energy yield
 - Bifacial -> higher energy Yield
- High upside potential
- In future technology will follow improvement path of PV

- 7** PV-System:
- High performante
 - Lower Capex
 - High stability

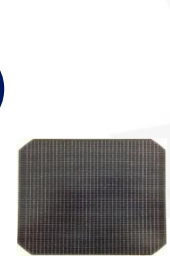


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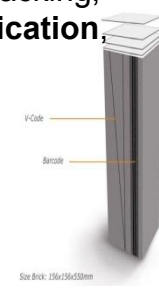
- 2** Diamond wire wafering
- thinner wafer -> lower costs



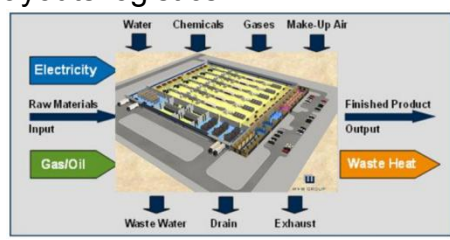
- 3** TCO layer and wafer thickness suitable for SmartWire
- 80% less silver,
 - higher energy yield
 - higher efficiency
 - longevity
 - microcrack resistant
 - less sand / dust sensitive



- 5** Material quality and tracking, **certification**, MES
- Adapted test metrology
- high cap cells
 - BB0
 - DragonBack
 - PED (Chipping)



- 6** Improved facility
- Low energy consumption opens door for new facility concepts, layouts logistics



thin cells (thin wafers)

High capacity, busbarless measurement

Mono wafers

Quality & performance control

Definition of bankability



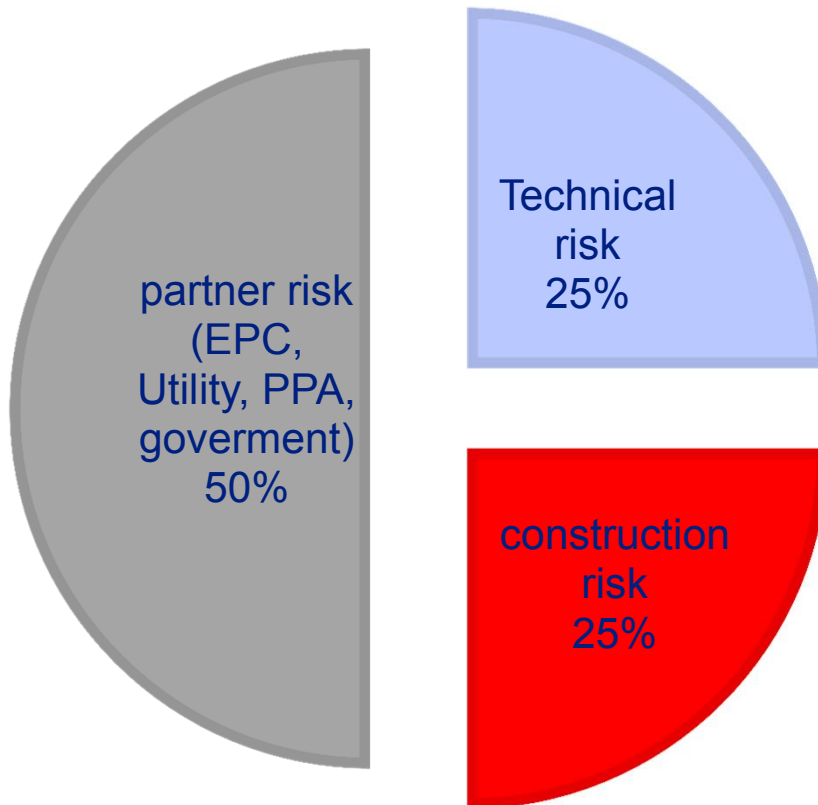
**If a bank finances your project,
your project is **bankable****

▪



Something about the “if”

PV risk categories for a typical PV system



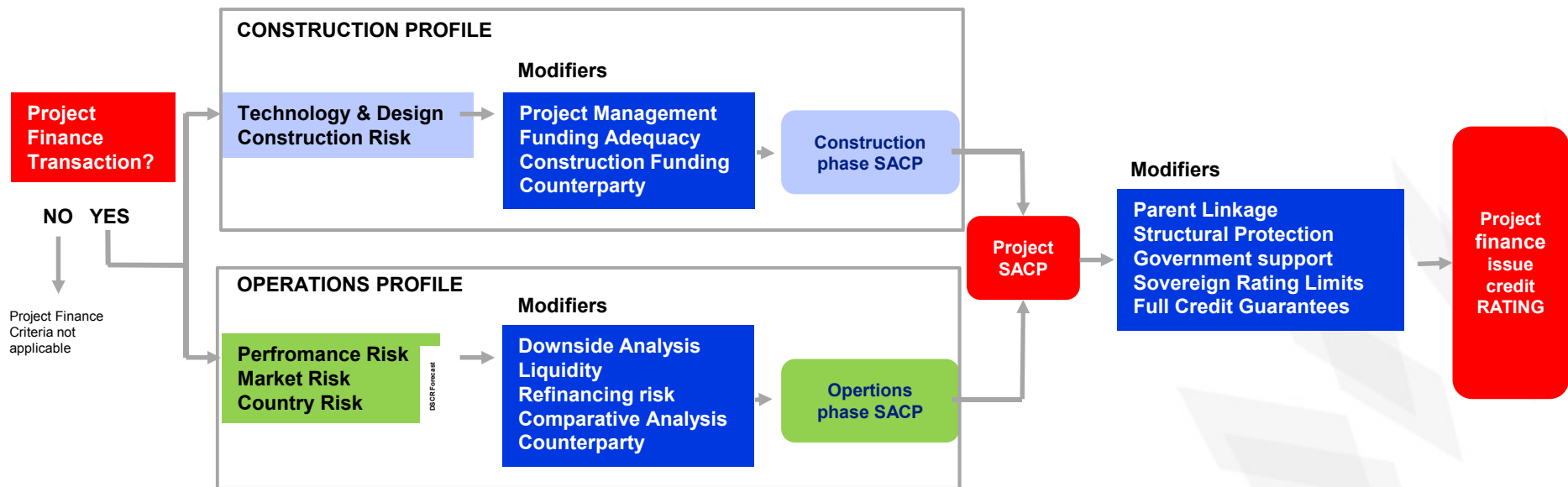
Your project gets a risk assessment:

- **Partners** are creating most of the risks
- Risks during commissioning or technical risks have same relevance

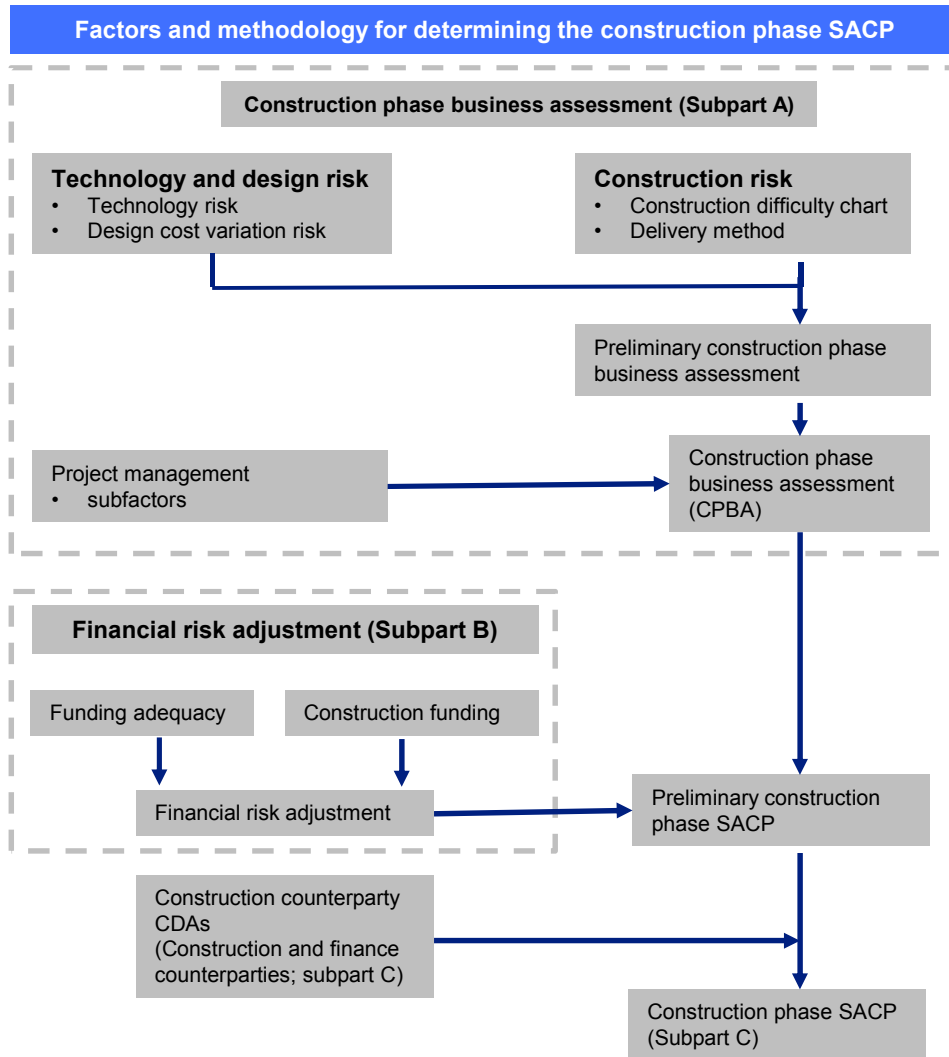
Standard & Poor's (S&P) Rating scheme for construction and operations



Rating agencies have a very clear scheme to evaluate a project



S&P: construction phase



- SACP = Stand alone credit profile
- CAD = Counterparty Dependency Assessment
- DSCR= Debt Service coverage ratio

S&P: Calculation of Technology & design risks

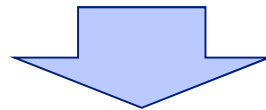


Technological risk

Technological track record	Exceeds	matches all	falls short or minor	falls short of materials
Commercially proven	very strong	strong	weak	very weak
Proven	strong	adequate	weak	very weak
Proven but not in this application or arrangement	adequate	weak	very weak	*
New or unproven technology	weak	very weak	very weak	*

Design cost variation risk

degree of design completion and costing	proven design	modified proven design	established	simple first of a kind	soplex first of a kind
			design modified for site conditions		
very advanced	very low	low	modest	moderate	high
advanced	very low	modest	moderate	high	high
moderate	low	moderate	high	high	*
preliminary	moderate	high	*	*	*



Technology and design risks

design cost variation risk	very strong	strong	adequate	weak	very weak
very low	1	2	3	4	5
low	2	2	3	4	5
modest	2	3	4	5	5
moderate	3	4	5	*	*
high	4	5	*	*	*

S&P: Calculation Construction risk & project RATING

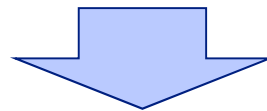
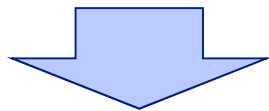


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**Technology
&
design
risks**

Construction risks

delivery method	simple building task	moderately complex building or simple civil engineering task	civil or heavy engineering task	heavy engineering-to-industrial tasks	industrial task simplex building task
very strong	1	1	1	2	3
strong	1	2	3	4	4
adequate	2	3	4	5	*
weak	4	4	5	*	*
very weak	5	5	*	*	*



Preliminary Construction Phase Business Assessment (CPBA)

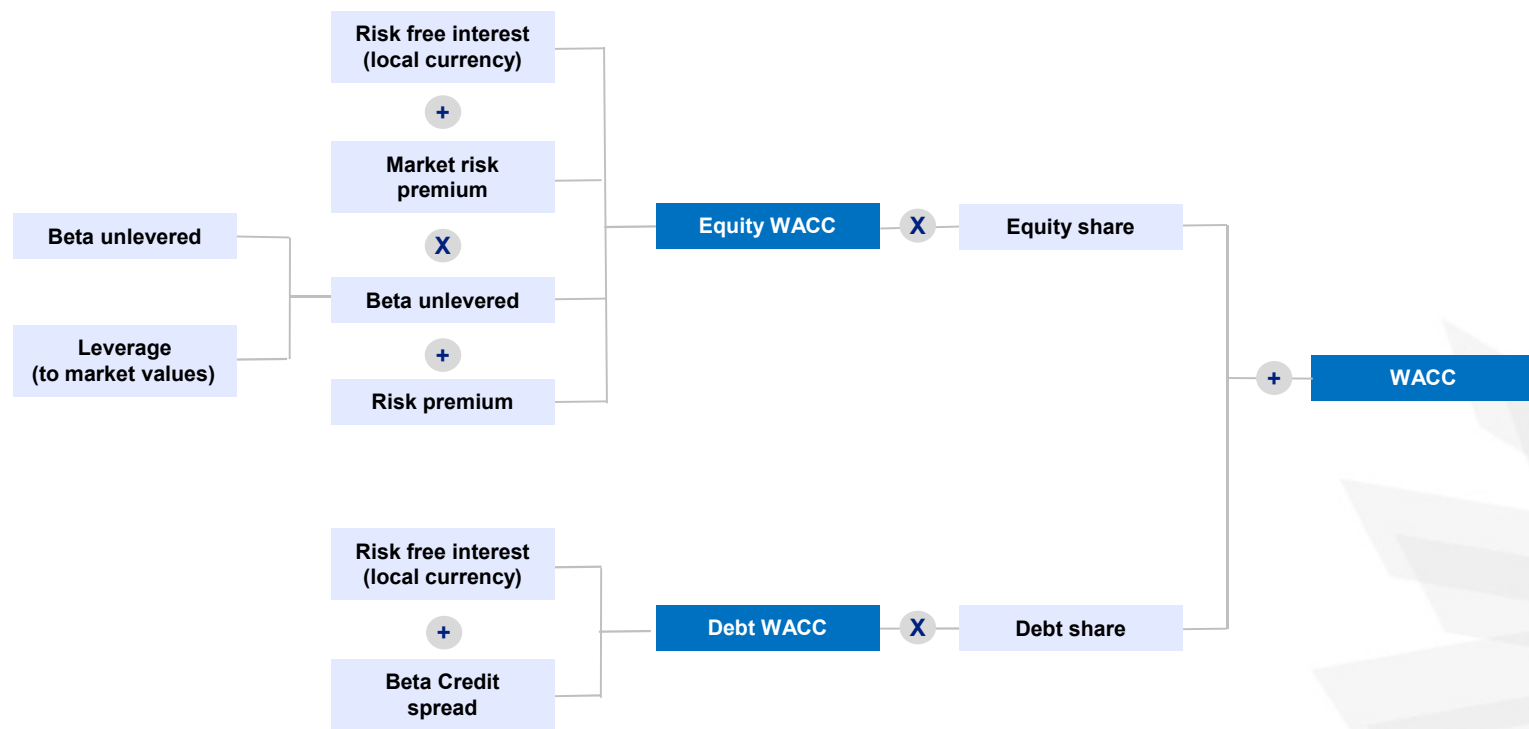
Technology and design risk	1	2	3	4	5
1	a+	a	a-	bbb+	bbb-
2	a	a-	bbb+	bbb	bb+
3	a-	bbb+	bbb	bbb-	bb
4	bbb+	bbb	bbb-	bb+	bb-
5	bbb-	bb+	bb	bb-	b+

LCOE: Depreciation factor



Depreciation factor is often a “**weighted average capital cost**” rate

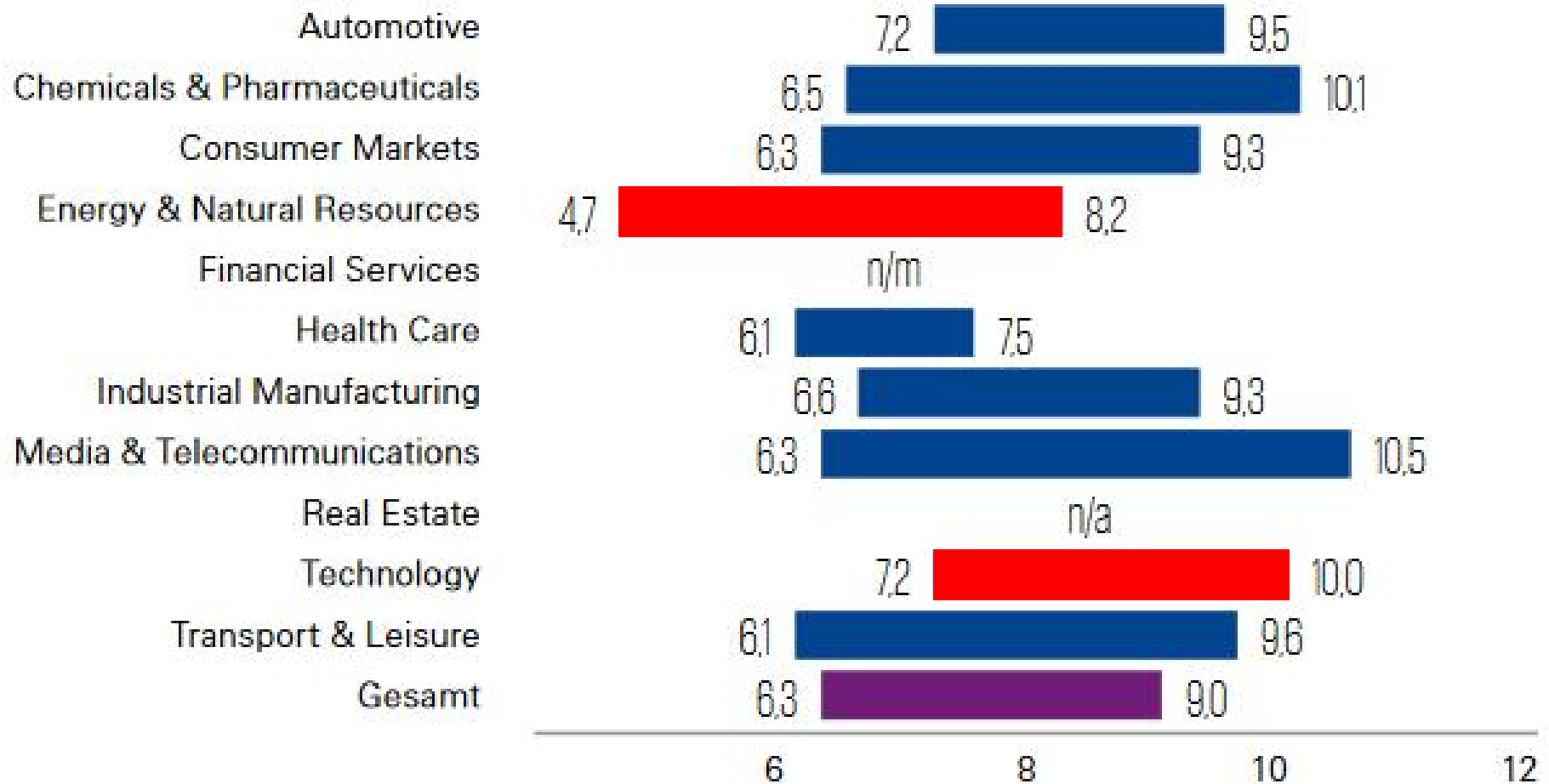
$$WACC_{project} = WACC_{country} + WACC_{partners} + WACC_{local}$$



WACC for different industrial fields



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Gap analysis

20 Identified technical gaps in different project phases

Risk	Phase/field	Identified critical technical gaps		
creation	Year-0 Procurement/ product selection and testing	<ol style="list-style-type: none"> Insufficient EPC technical specifications to ensure that selected components are suitable for use in the specific PV plant environment of application. Inadequate component testing to check for product manufacturing deviations. Absence of adequate independent product delivery acceptance test and criteria. 		
	Planning/ lifetime energy yield estimation	<ol style="list-style-type: none"> The effect of long-term trends in the solar resource is not fully accounted for. Exceedance probabilities (e.g. P90) are often calculated for risk assessment assuming a normal distribution for all elements contributing to the overall uncertainty. Incorrect degradation rate and behavior over time assumed in the yield estimation. Incorrect availability assumption to calculate the initial yield for project investment financial model (vs O&M plant availability guarantee). 		
	Transportation	<ol style="list-style-type: none"> Absence of standardized transportation and handling protocol. 		
	Installation/ construction	<ol style="list-style-type: none"> Inadequate quality procedures in component un-packaging and handling during construction by workers. Missing intermediate construction monitoring. 		
	Installation/ provisional and final acceptance	<ol style="list-style-type: none"> Inadequate protocol or equipment for plant acceptance visual inspection. Missing short-term performance (e.g. PR) check at provisional acceptance test, including proper correction for temperature and other losses. Missing final performance check and guaranteed performance. Incorrect or missing specification for collecting data for PR or availability evaluations: incorrect measurement sensor specification, incorrect irradiance threshold to define time window of PV operation for PR/availability calculation. 		
	operation	Risks during operation Operation	<ol style="list-style-type: none"> Selected monitoring system is not capable of advanced fault detection and identification. Inadequate or absence of devices for visual inspection to catch invisible defects/faults. Missing guaranteed key performance indicators (PR, availability or energy yield). Incorrect or missing specification for collecting data for PR or availability evaluations: incorrect measurement sensor specification, incorrect irradiance threshold to define time window of PV operation for PR/availability calculation. 	
			Maintenance	<ol style="list-style-type: none"> Missing or inadequate maintenance of the monitoring system. Module cleaning missing or frequency too low.

➔ Impact on cash flow model

➔ Impact on quality of installation

➔ Impact on risk/cost ownership

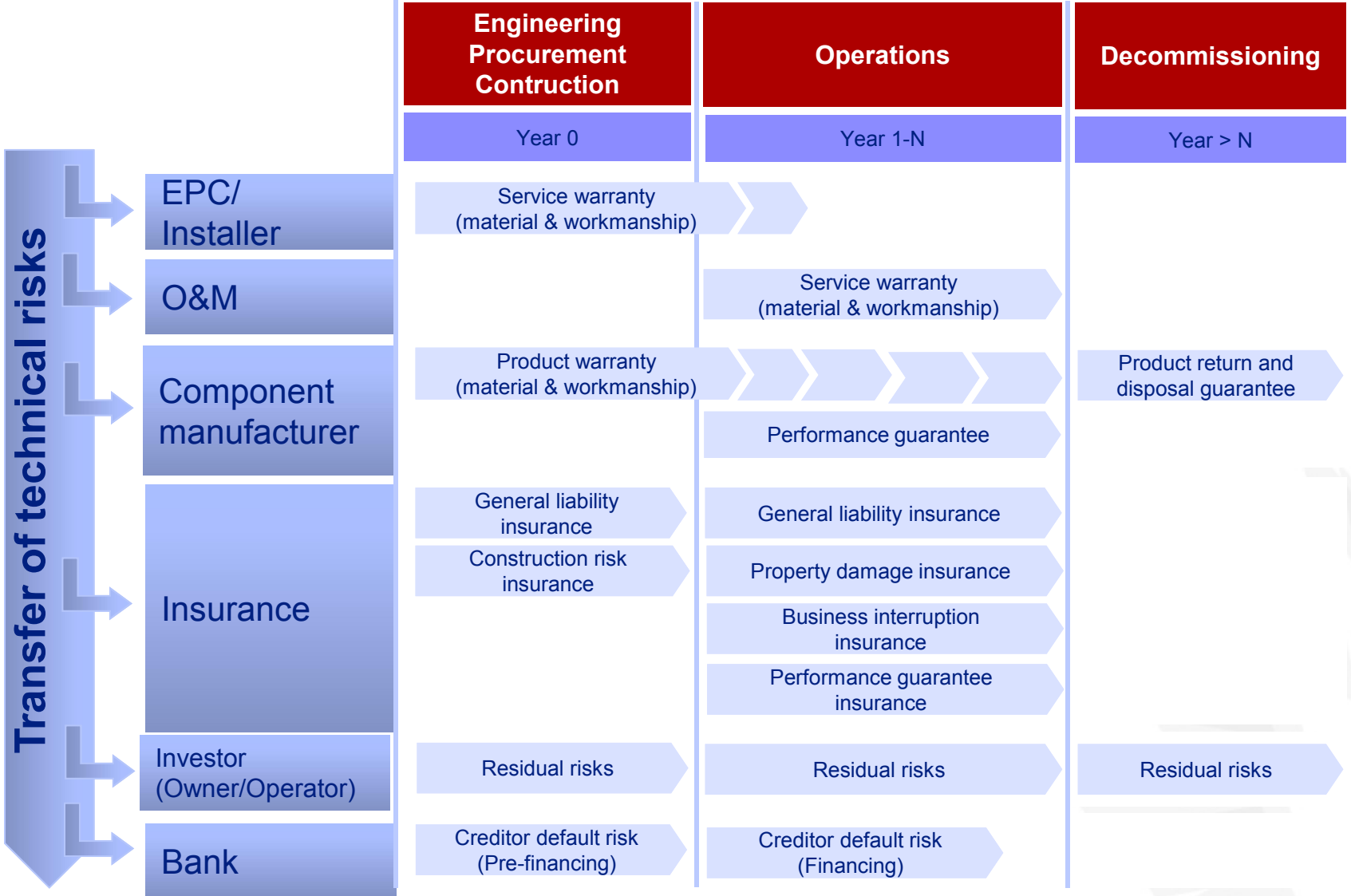
➔ Impact on risk/cost ownership and on O&M strategy

Source: www.solarbankability.eu

Mitigate risks for stakeholders



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Source: www.solarbankability.eu

The answer:



You are bankable, if you have in your project:

- only Tier 1 project partners or technology partners
- perfect PPA conditions
- a super solar site: superior energy yield etc.

OR

- you make compromises to some points above and “pay more”

OR

- you finance the project yourself

Bifacial technology has almost only upside potential, we have to share the benefits among the different stakeholders in a smart way.

Used sources:

www.solarbankability.eu

<https://assets.kpmg.com/content/dam/kpmg/ch/pdf/cost-of-capital-study-2016-de.pdf>

https://www.spratings.com/documents/20184/86990/SPRS_Project%2BFinance%2BRatings%2BCriteria%2BReference%2BGuide_FINAL/cdfde690-57d1-4ff4-a87f-986527603c22



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Thank you

