

# Does your reinsurance fit into the world of Solvency II?



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# Dynamic Reinsurance Analysis using PillarOne answers risk specific questions



- What is your annual **gross risk** situation?
- Which lines of business/claims/perils are your main **risk drivers**?
- What is your annual **net capital requirement** after reinsurance?
- How can your **capital relief** be optimized by reinsurance?

**PODRA** provides **answers**

# What is PODRA?

## PillarOne Dynamic Reinsurance Analysis

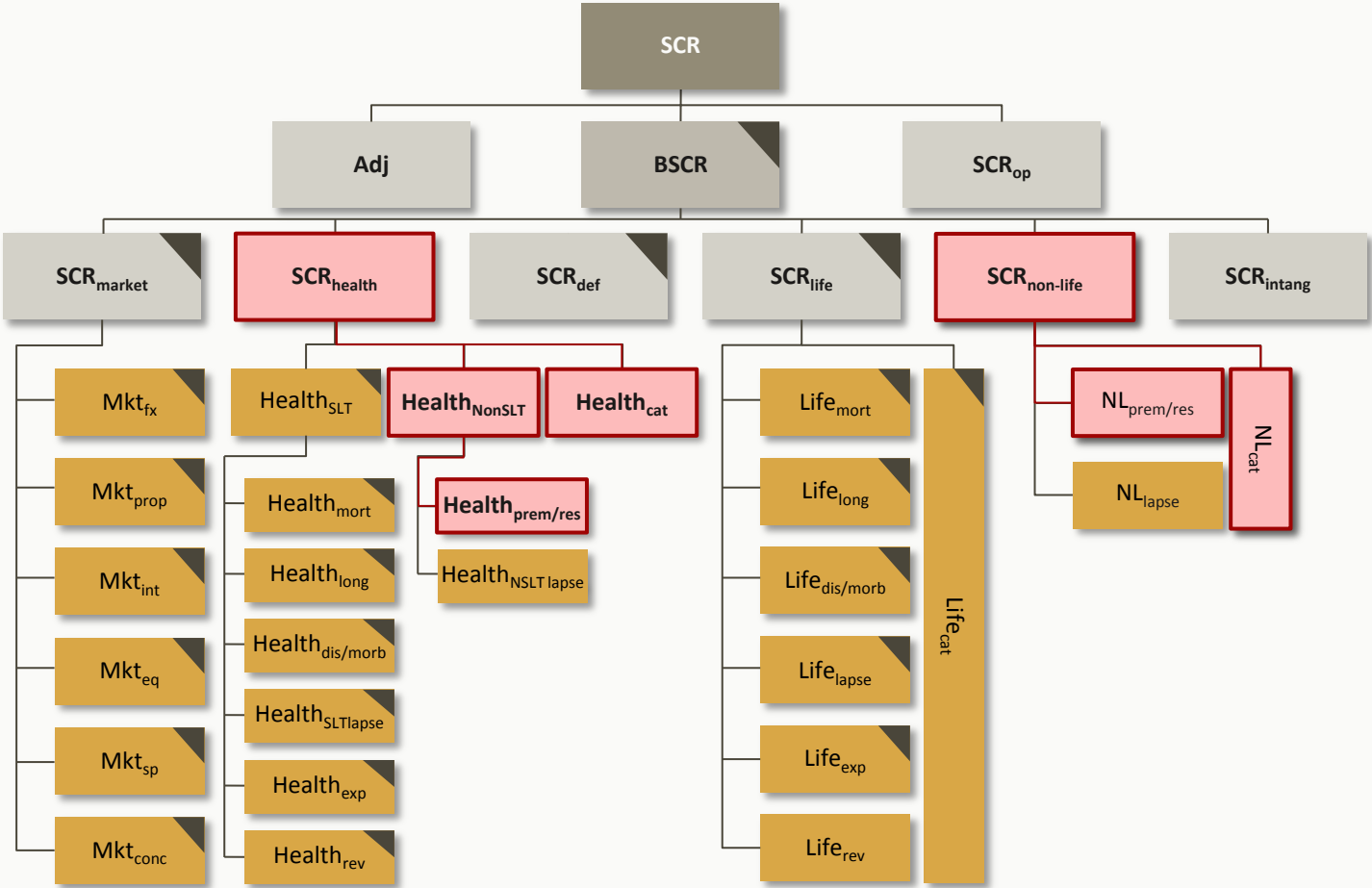


PODRA is a **tool developed by Munich Re** to describe and measure underwriting risk in P&C insurance business.

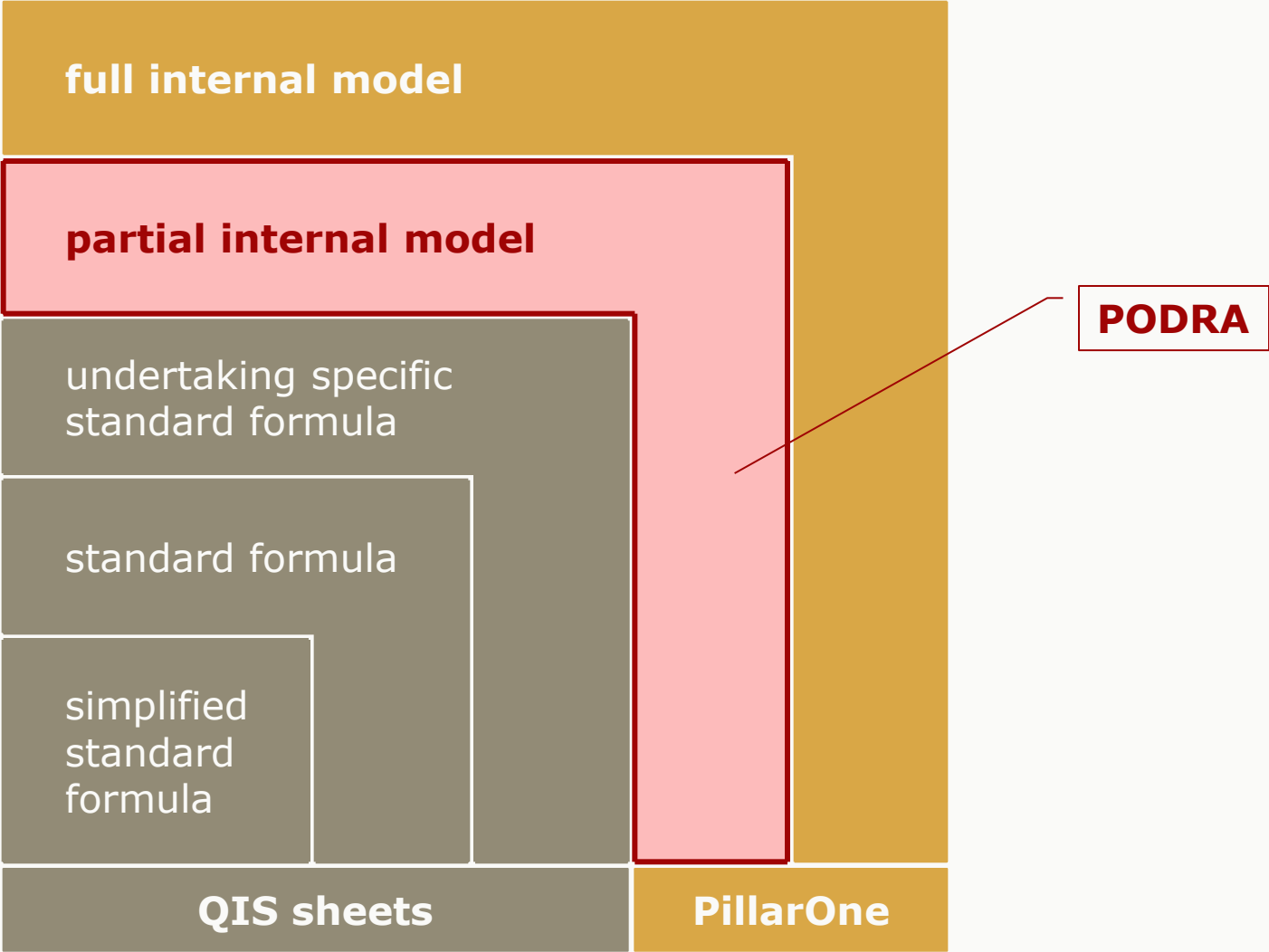
It is based on the **PillarOne.RiskAnalytics software**, an open-source project initiated and sponsored by Munich Re.

[www.pillarone.org](http://www.pillarone.org)

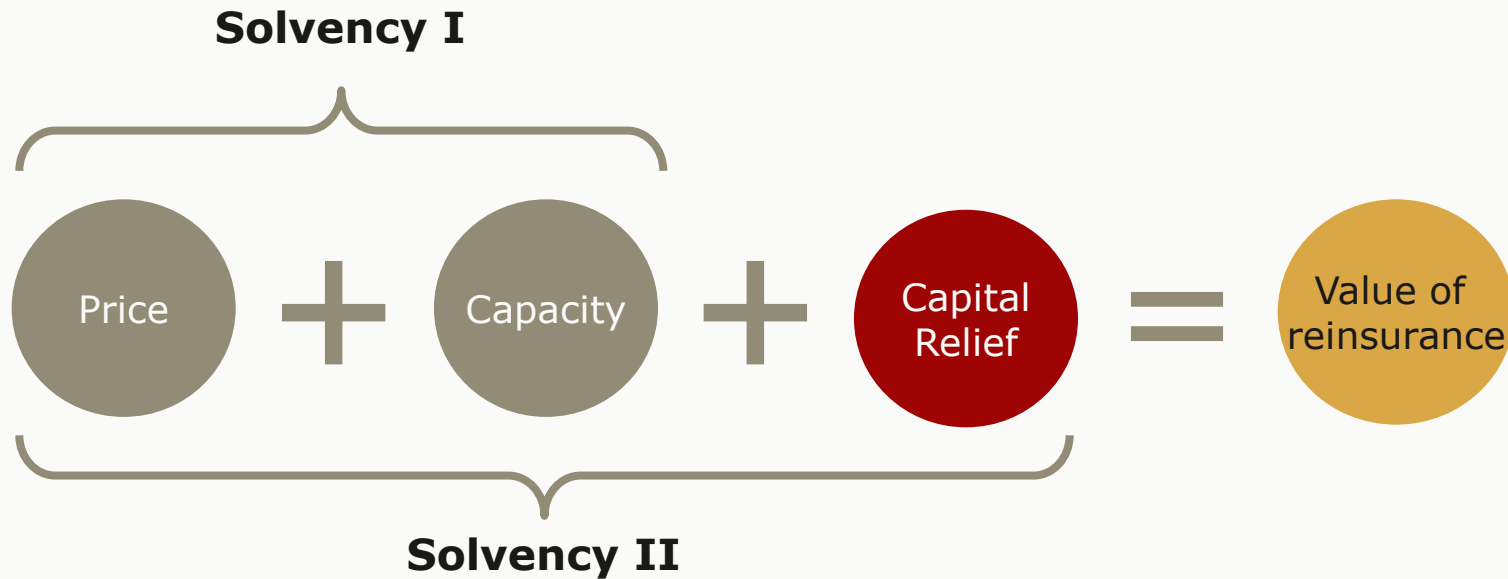
# Which part of the Solvency Capital Requirement (SCR) is covered by PODRA?



# PODRA covers quantitative aspects of a partial internal model



# Additional benefit of reinsurance under Solvency II

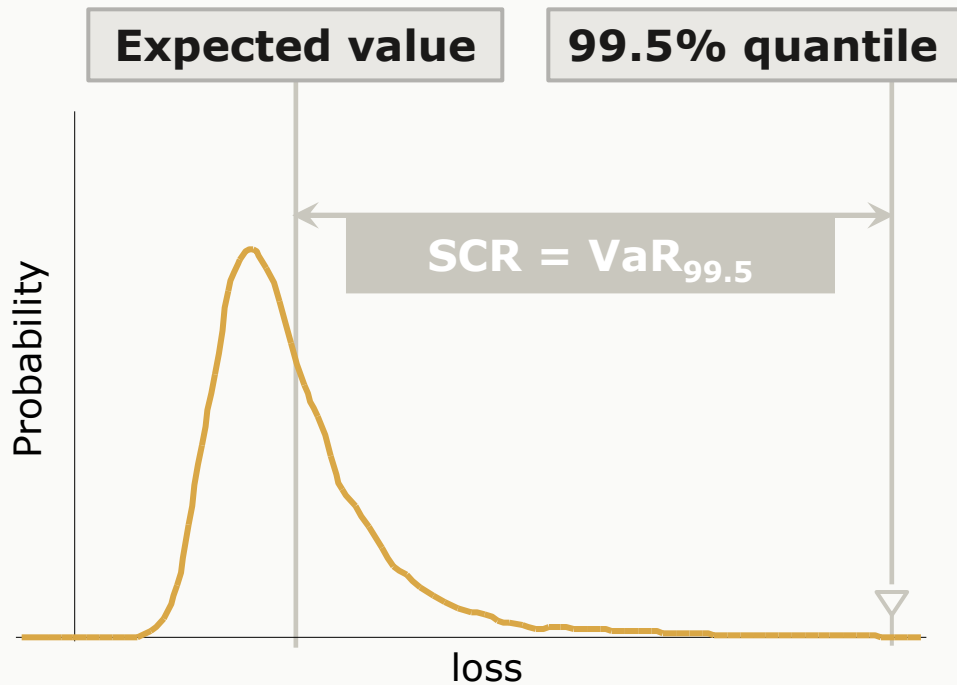


- Traditionally reinsurance is seen as additional underwriting capacity
- With Solvency II reinsurance becomes also a strong capital relief tool.

**Reinsurance** provides both: underwriting **capacity** and capital **relief**

# Solvency Capital Requirement under Solvency II

## Definition



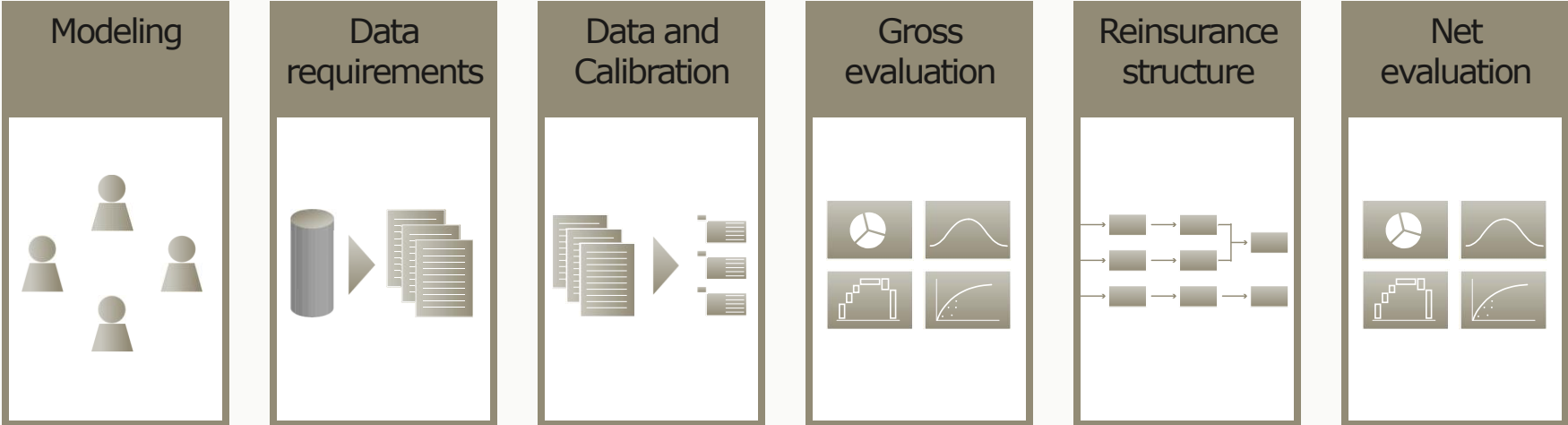
## Solvency Capital Requirement (SCR)

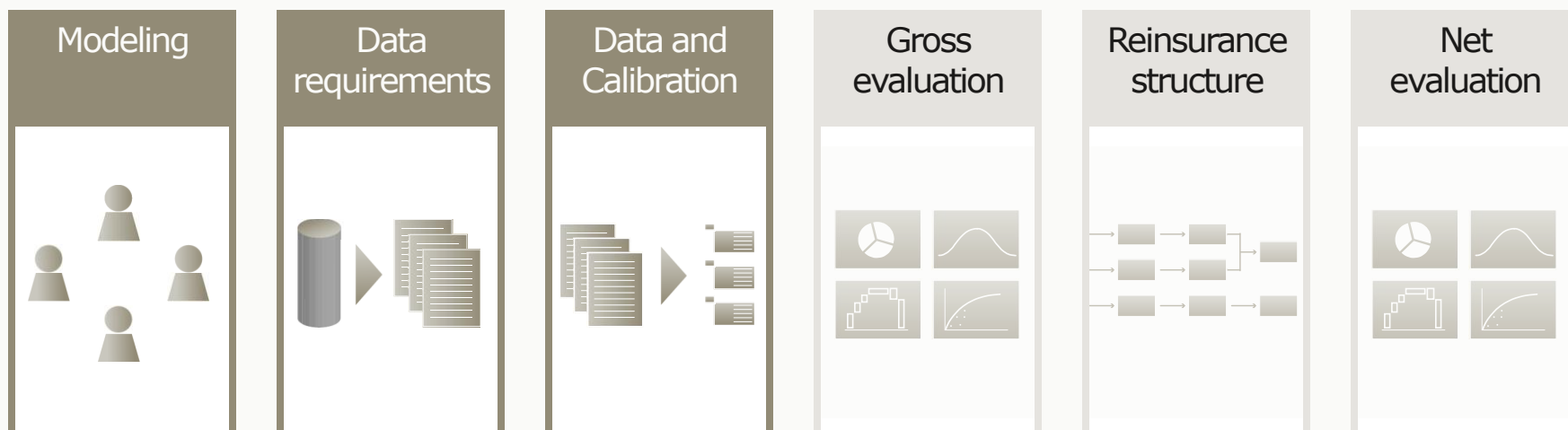
= centered Value at Risk 99.5%  
( $VaR_{99.5}$ )

= 99.5% quantile –  
expected value

≙ 200 year loss

SCR under Solvency II corresponds to centered  $VaR_{99.5}$





Identify relevant LoBs/perils and determine correct parameters

- Motor hull (MH)
- Motor third party liability (MTPL)
- Personal accident (PA)
- Property (Prop)

### **Aim: Distribution of following parameters**

1. Attritional loss  
Average loss ratio % (expected value) and standard deviation %
2. Large loss  
frequency / severity model
3. Perils  
frequency / severity model

Total loss = Attritional losses + Large losses + Perils

# Data and Calibration

## All losses, 2010

		MH	MTPL	PA	Prop
Gross premium		97.0	189.2	53.9	72.9
loss threshold $x_0$		0.5	1.0	0.2	0.07
<b>Attritional loss (<math>\leq x_0</math>)</b>					
loss ratio distribution		LogNormal	LogNorm	LogNorm	LogNorm
	$\mu$	80.0%	82.3%	39.0%	56.3%
	$\sigma$	5.4%	7.0%	9.0%	11.4%
<b>Large loss (<math>&gt; x_0</math>)</b>					
frequency distribution		Poisson	Poisson	Poisson	Poisson
	$\lambda$	1.00	4.87	3,63	13.32
severity distribution		Pareto	Pareto	Pareto	Pareto
	$\alpha$	0.52	1.42	1,23	1,76
	Limit	20.0	100.0	3.0	1.0
<b>Cat loss</b>					
<b>Earthquake</b>					0.07
	$x_0$				Poisson
	frequency distribution				0,280
	$\lambda$				PML curve
	severity distribution				
<b>Flood</b>					0.07
	$x_0$				Poisson
	frequency distribution				0,500
	$\lambda$				PML curve
	severity distribution				
<b>Storm</b>					0.07
	$x_0$				Poisson
	frequency distribution				1,260
	$\lambda$				PML curve
	severity distribution				

in m€

# Data and Calibration

## Correlations between lines of business

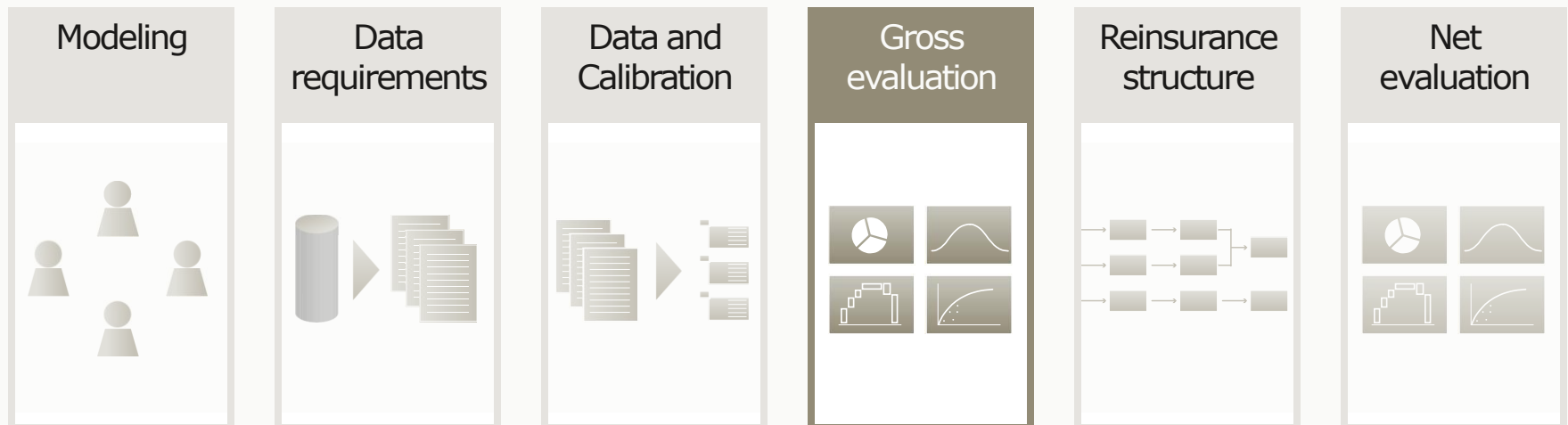


### Correlations matrix

	MH	MTPL	PA	Prop
MH	100%			
MTPL	50%	100%		
PA	25%	25%	100%	
Prop	25%	25%	25%	100%

Source: European Commission

# Fourth step



Identify relevant LoBs/perils and determine correct parameters

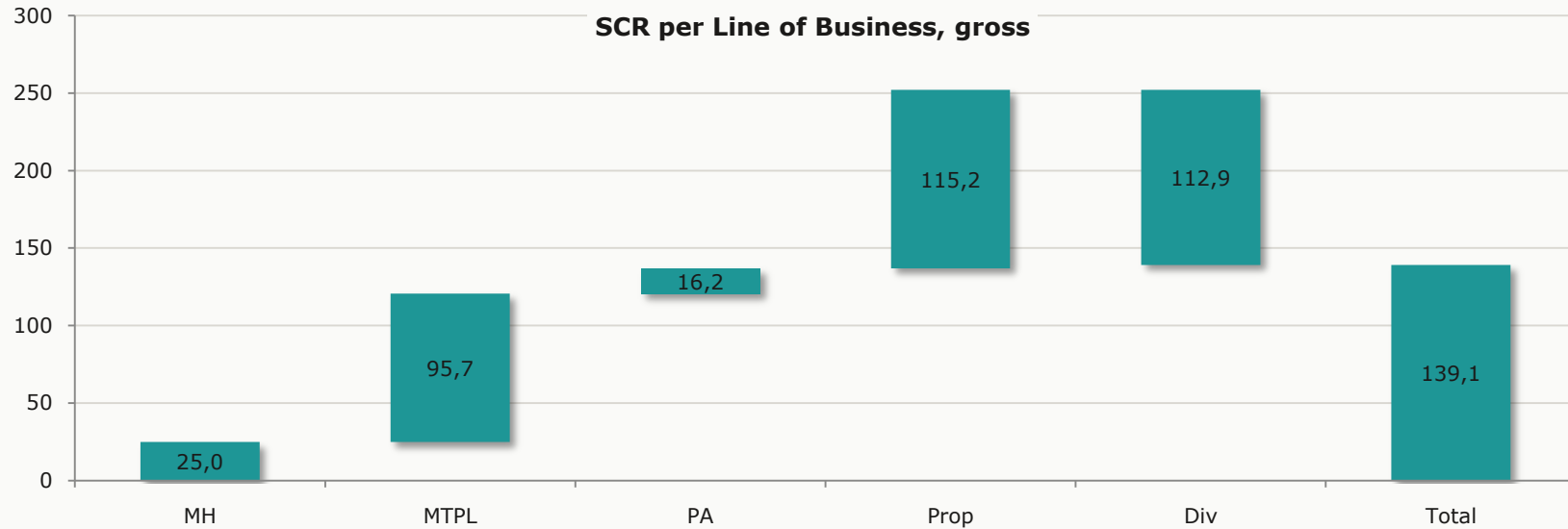
## Analysis views

1. Total portfolio:  
SCR per line of business
2. Individual lines of business:  
SCR per loss type



# Gross evaluation

## All Lines of Business



- The capital requirement of the gross portfolio (SCR) is 139.1 m€

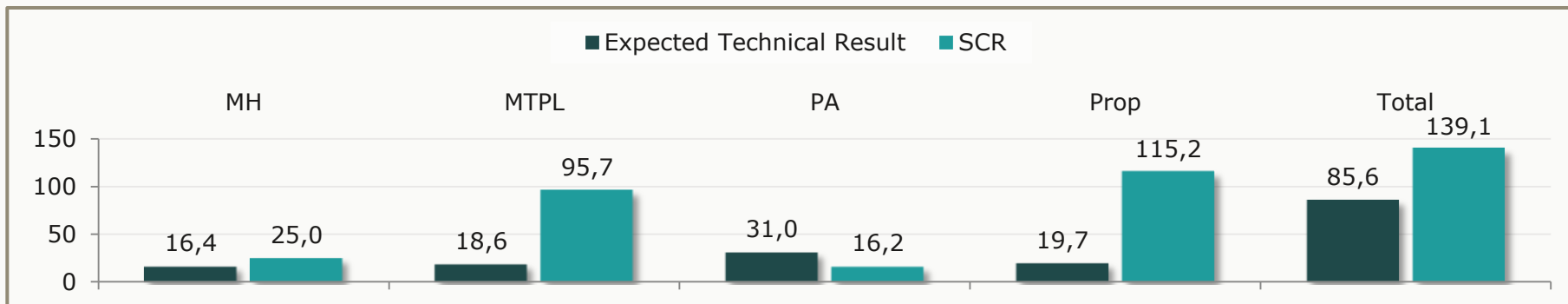
- The main risk drivers are Motor Third Party Liability and Property

in m€

Gross portfolio is highly unbalanced

# Risk measures gross

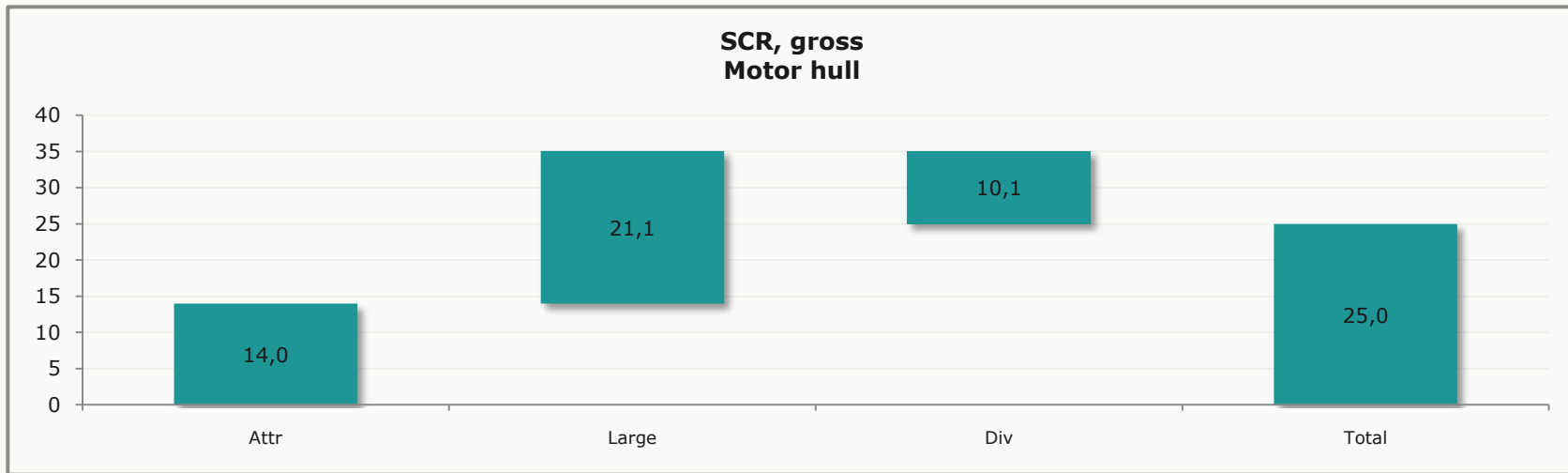
Gross						
	Premium	Expected loss	Expected techn. result	Loss ratio	Standard deviation	SCR
Motor hull	97.0	80.6	16.4	83.1%	7.1	25.0
Motor third party liability	189.2	170.7	18.6	90.2%	20.2	95.7
Personal accident	53.9	22.9	31.0	42.5%	5.0	16.2
Property	72.9	53.3	19.7	73.1%	22.4	115.2
Simple sum	<b>413.1</b>	<b>327.5</b>	<b>85.6</b>		<b>54.7</b>	<b>252.1</b>
Diversification					19.3	112.9
Total	<b>413.1</b>	<b>327.5</b>	<b>85.6</b>	<b>79.3%</b>	<b>35.5</b>	<b>139.1</b>



in m€

# Gross evaluation

## Motor hull

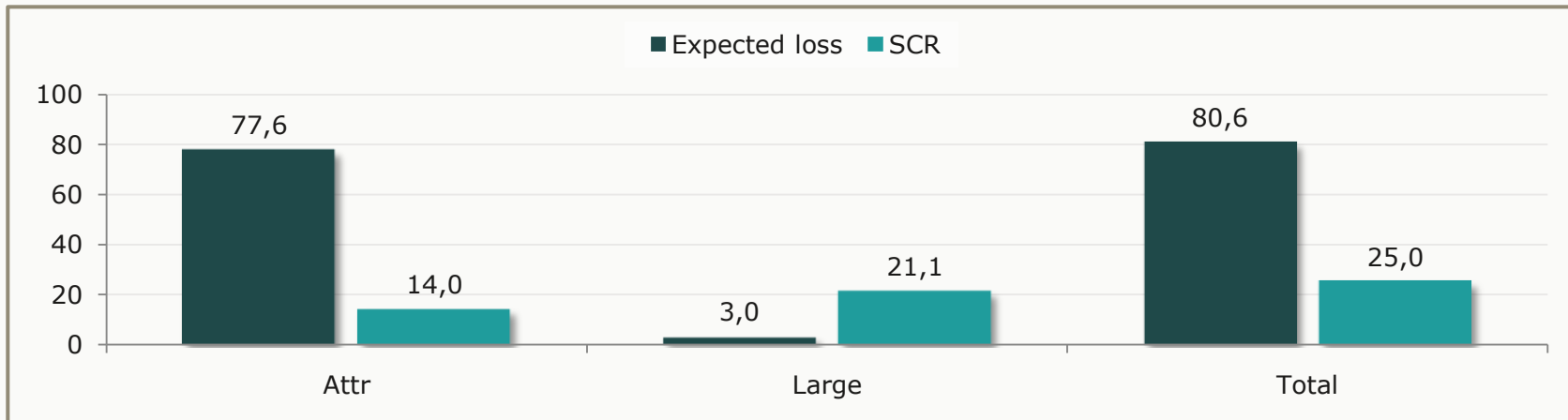


- Motor hull portfolio is dominated by large loss component
- Attritional loss component has a significant impact

# Gross evaluation

## Motor hull

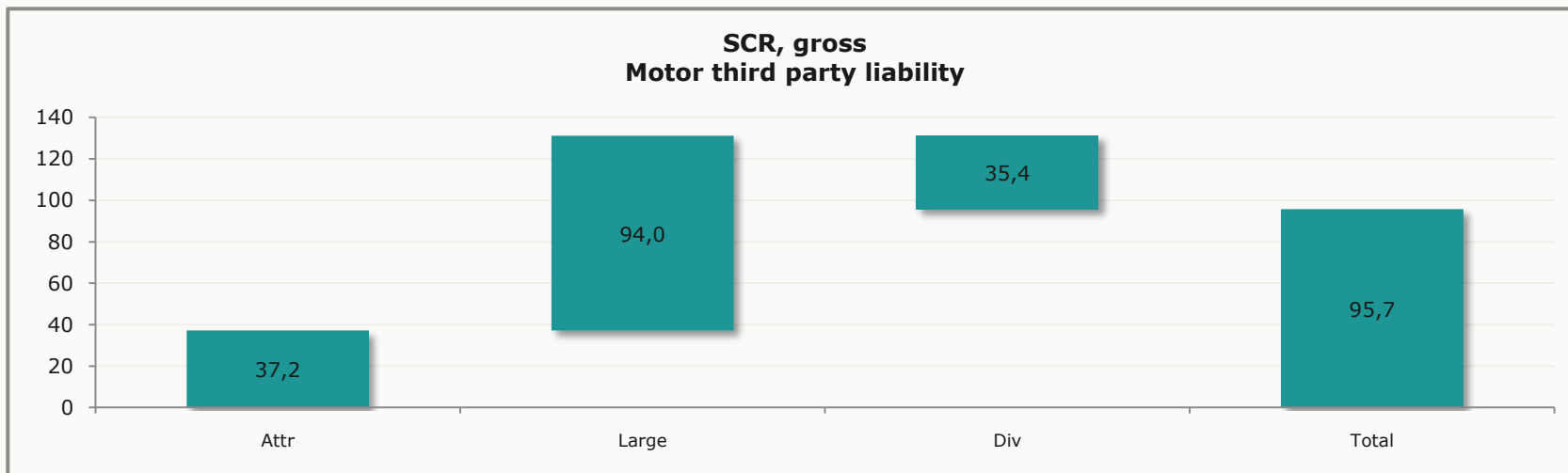
Motor hull			
	Expected loss	Standard deviation	SCR
Attritional	77.6	5.2	14.0
Large	3.0	4.9	21.1
Simple sum	<b>80.6</b>	<b>10.0</b>	<b>35.1</b>
Diversification		2.9	10.1
Total	<b>80.6</b>	<b>7.1</b>	<b>25.0</b>



in m€

# Gross evaluation

## Motor third party liability

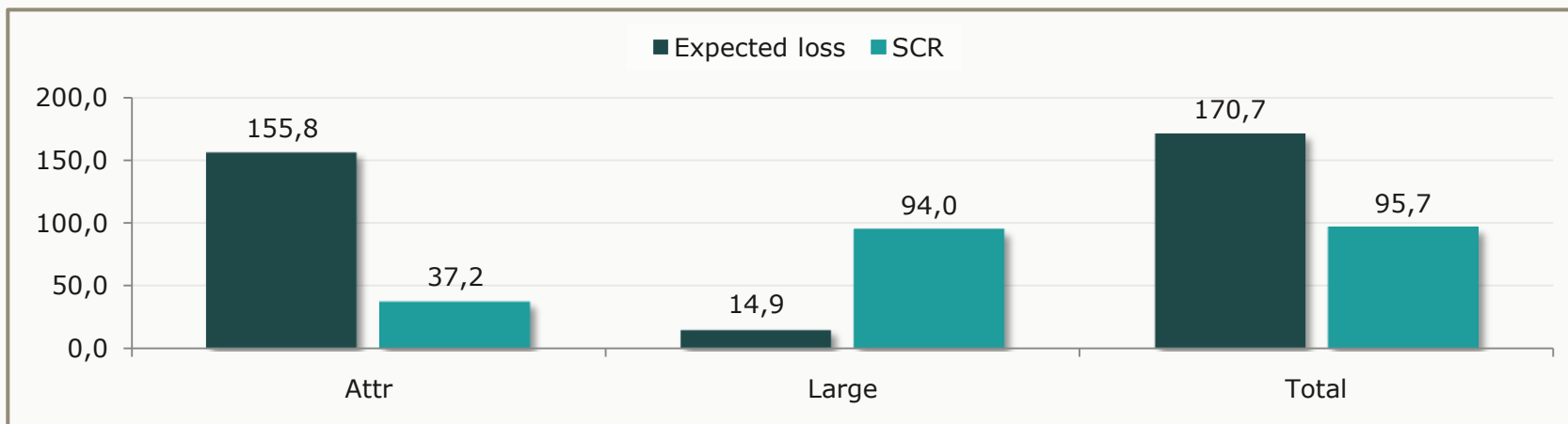


- MTPL portfolio is dominated by the large loss component

# Gross evaluation

## Motor third party liability

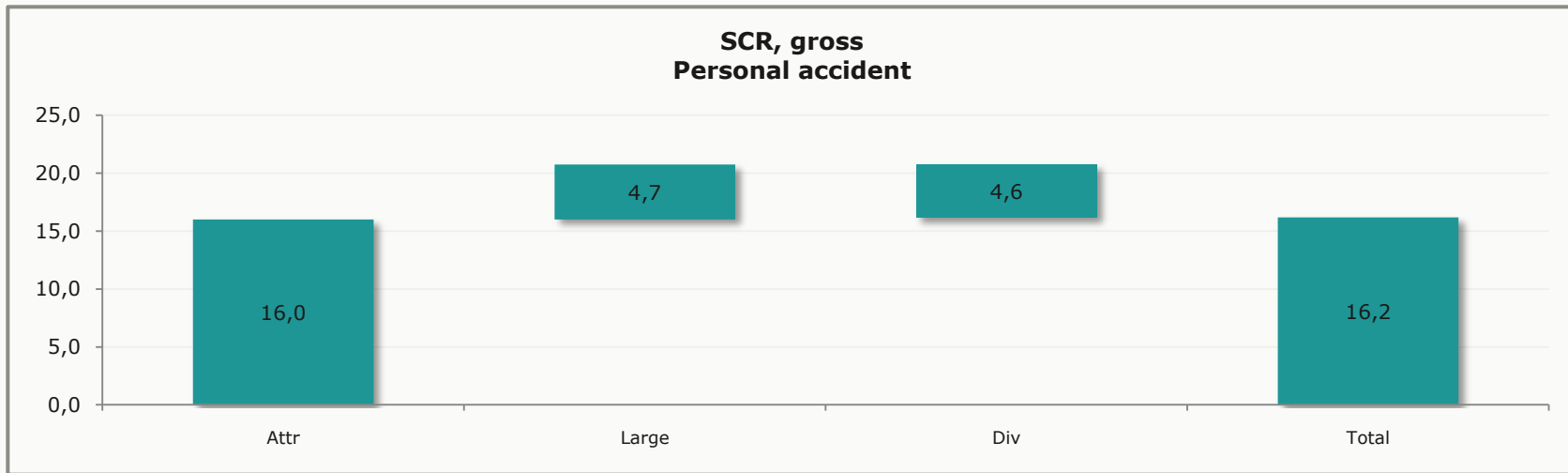
Motor third party liability			
	Expected loss	Standard deviation	SCR
Attritional	155.8	13.2	37.2
Large	14.9	15.2	94.0
Simple sum	<b>170.7</b>	<b>28.4</b>	<b>131.1</b>
Diversification		8.2	35.4
Total	<b>170.7</b>	<b>20.2</b>	<b>95.7</b>



in m€

# Gross evaluation

## Personal accident

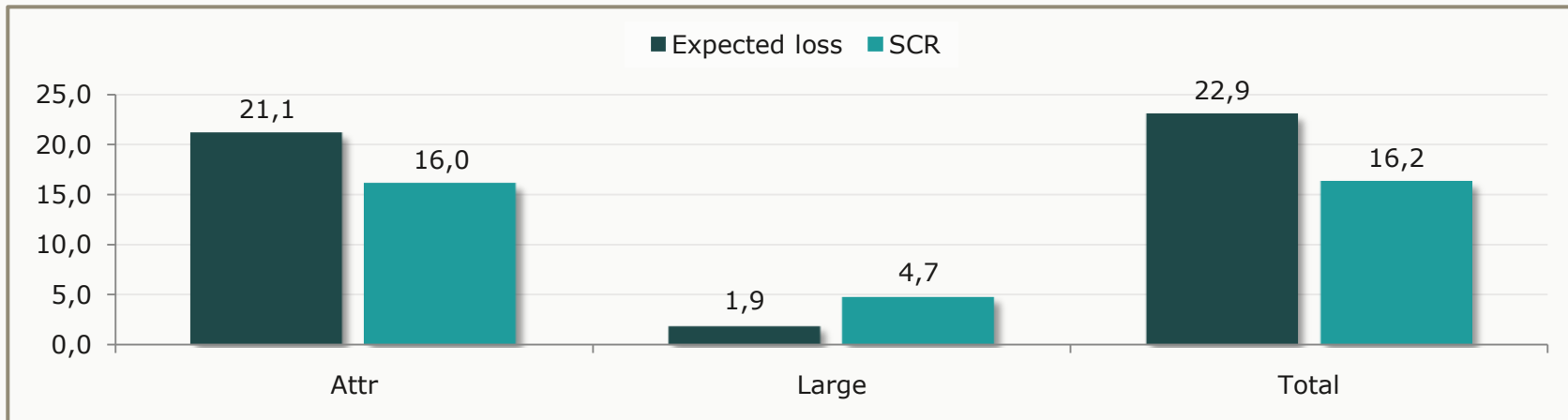


- Personal accident risks are dominated by the attritional loss component

# Gross evaluation

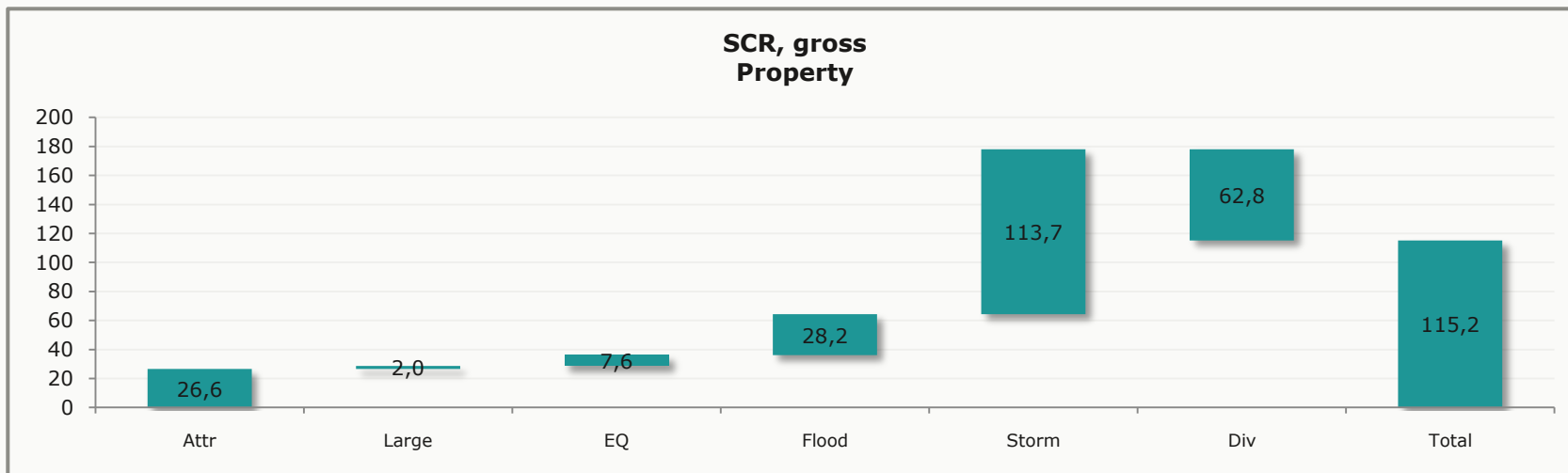
## Personal accident

Personal accident			
	Expected loss	Standard deviation	SCR
Attritional	21.1	4.9	16.0
Large	1.9	1.3	4.7
Simple sum	<b>22.9</b>	<b>6.2</b>	<b>20.7</b>
Diversification		1.1	4.6
Total	<b>22.9</b>	<b>5.0</b>	<b>16.2</b>



in m€

# Gross evaluation Property

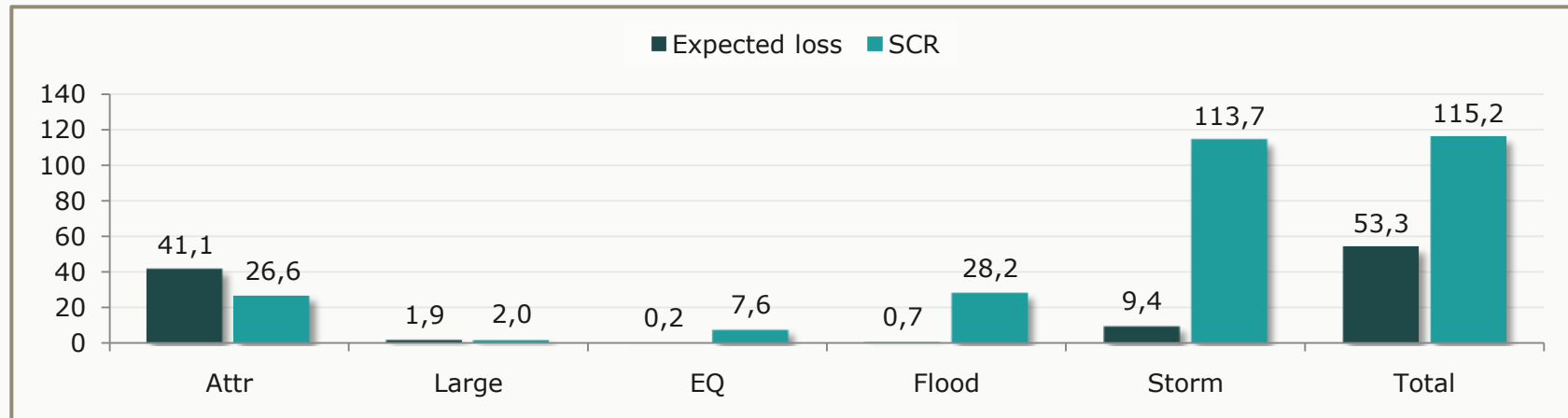


- Property portfolio is largely dominated by storm component

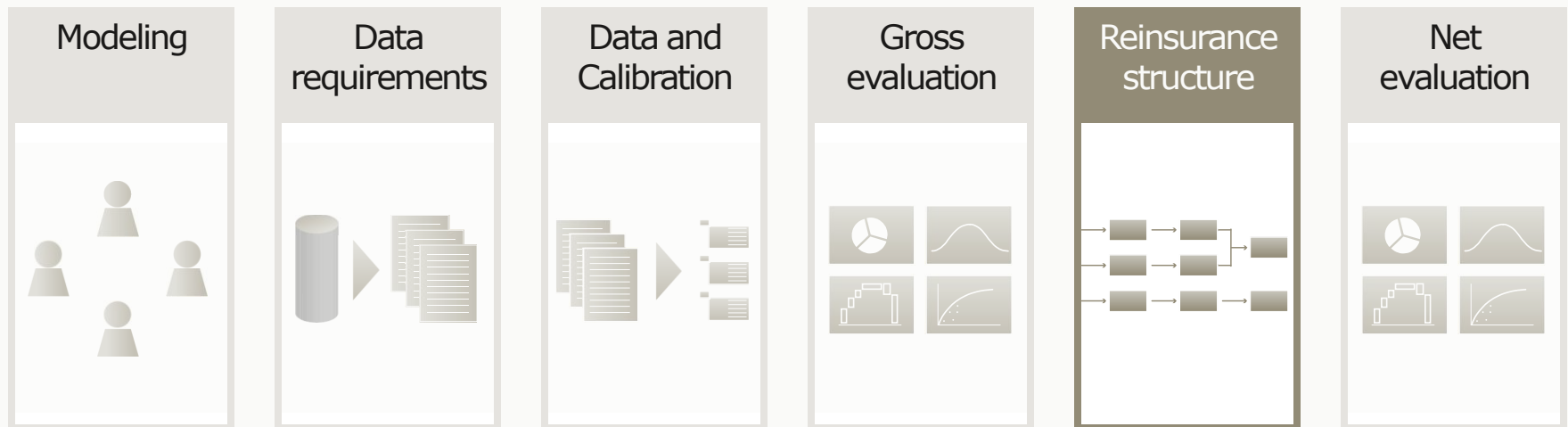
- Flood component and attritional losses also play an important role


# Gross evaluation Property

Property	Expected loss	Standard deviation	SCR
Attritional	41.1	8.3	26.6
Large	1.9	0.7	2.0
Earthquake	0.2	1.9	7.6
Flood	0.7	3.1	28.2
Storm	9.4	20.4	113.7
Simple sum	<b>53.3</b>	<b>34.3</b>	<b>177.9</b>
Diversification		11.9	62.8
Total	<b>53.3</b>	<b>22.4</b>	<b>115.2</b>



in m€



 We integrate reinsurance

# Reinsurance programme: NP

MH	Wxl 19,5 xs 0,5
MTPL	Wxl 99 xs 1
PA	Wxl 2,8 xs 0,2
Prop	Cxl 14 xs 1 → Stoploss 300% xs 100%

# Reinsurance programme: NP

## Details, 2010

MH	WXL 19.5 xs 0.5
Based on	GNPI
Limit	19.5
Att. Point	0.5
Rate	4.3%
AAL	195.0
Reinstatements	0
Share	100%

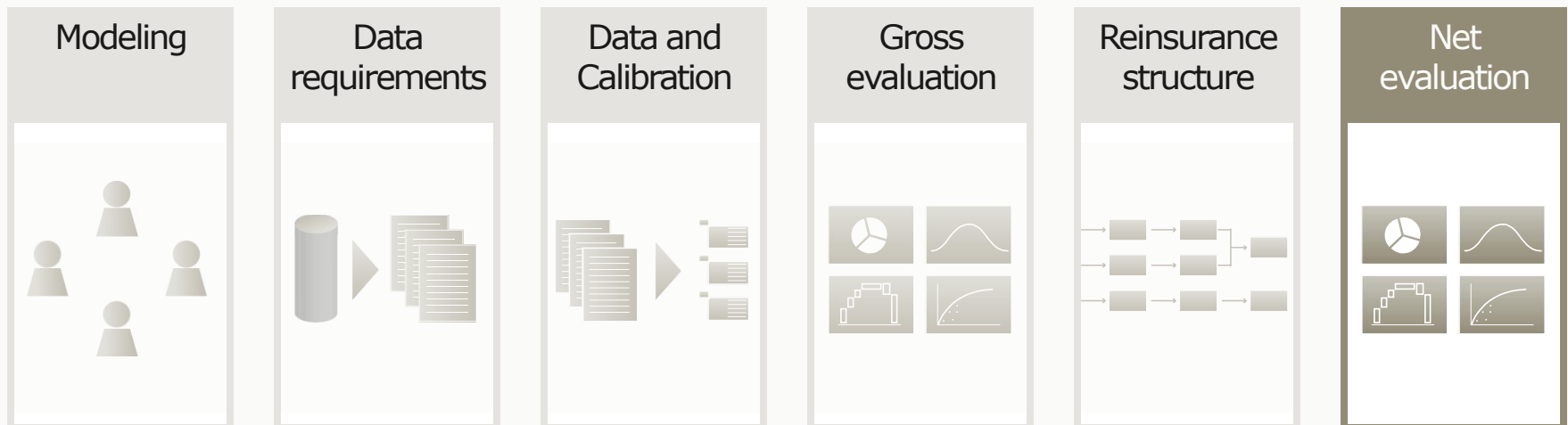
MTPL	WXL 99 xs 1
Based on	Net
Limit	99.0
Att. Point	1.0
Rate	5.73%
AAL	990.0
Reinstatements	0
Share	100%

# Reinsurance programme: NP

## Details, 2010

PA	WXL 2.8 xs 0.2
Based on	GNPI
Limit	2.8
Att. Point	0.2
Rate	1.78%
AAL	8.4
Reinstatements	0
Share	100%

Prop	CXL 14 xs 1	→ Stoploss 300% xs 100%
Based on	GNPI	Net
Limit	14.0	101.9
Att. Point	1.0	34.0
Rate	6.88%	12.100%
AAL	56.0	-
Reinstatements	3@100%	0
Share	100%	100%



We integrate reinsurance

## Analysis views

### 1. Total portfolio

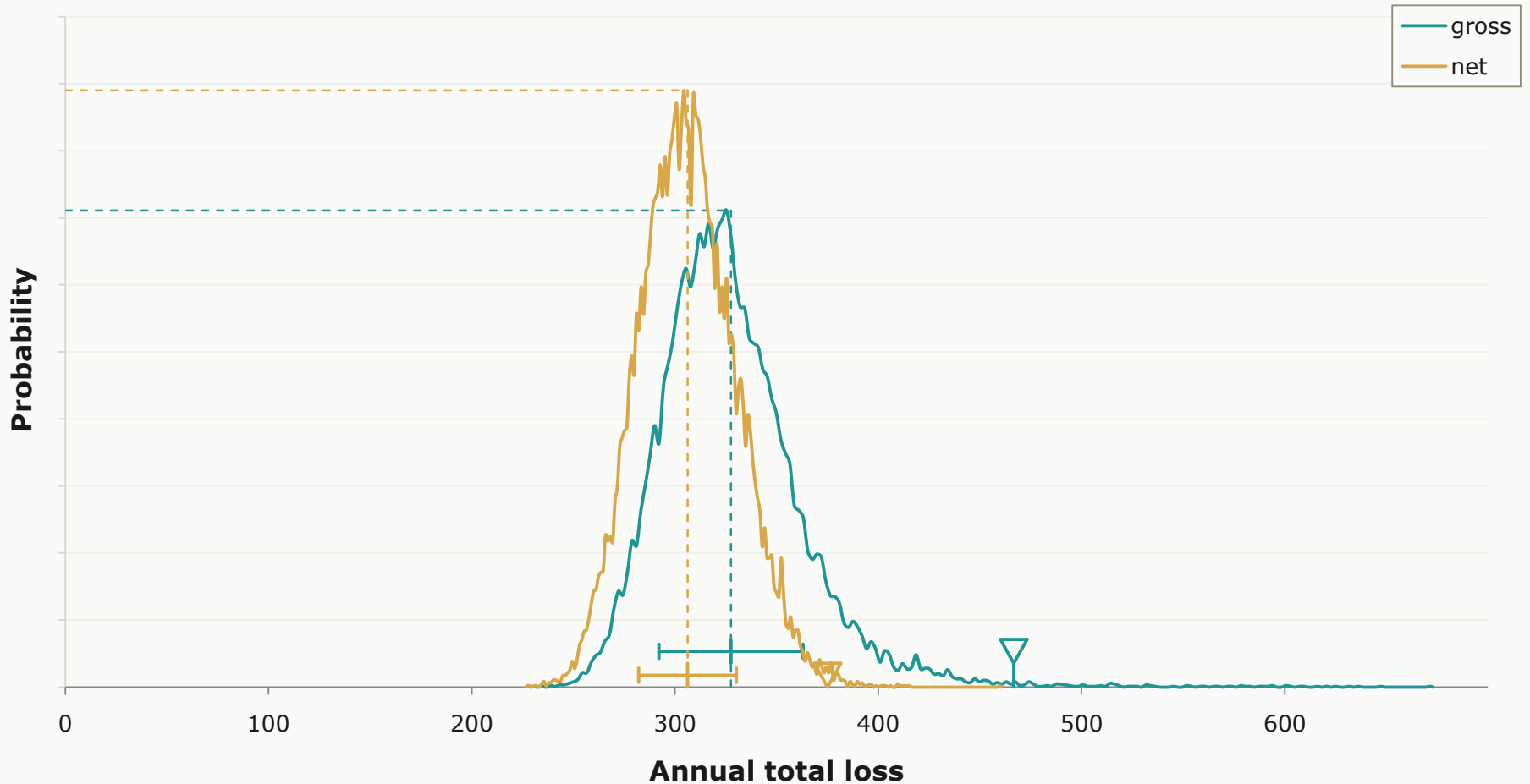
- Total loss distribution
- Risk mitigation per line of business through given RI structure
- Cost efficiency of current RI structure
- Relation of target rating to risk capital and cost efficiency

### 2. Individual lines of business

- SCR relief per contract
- SCR relief per loss type

# Annual total loss Gross vs net (NP)

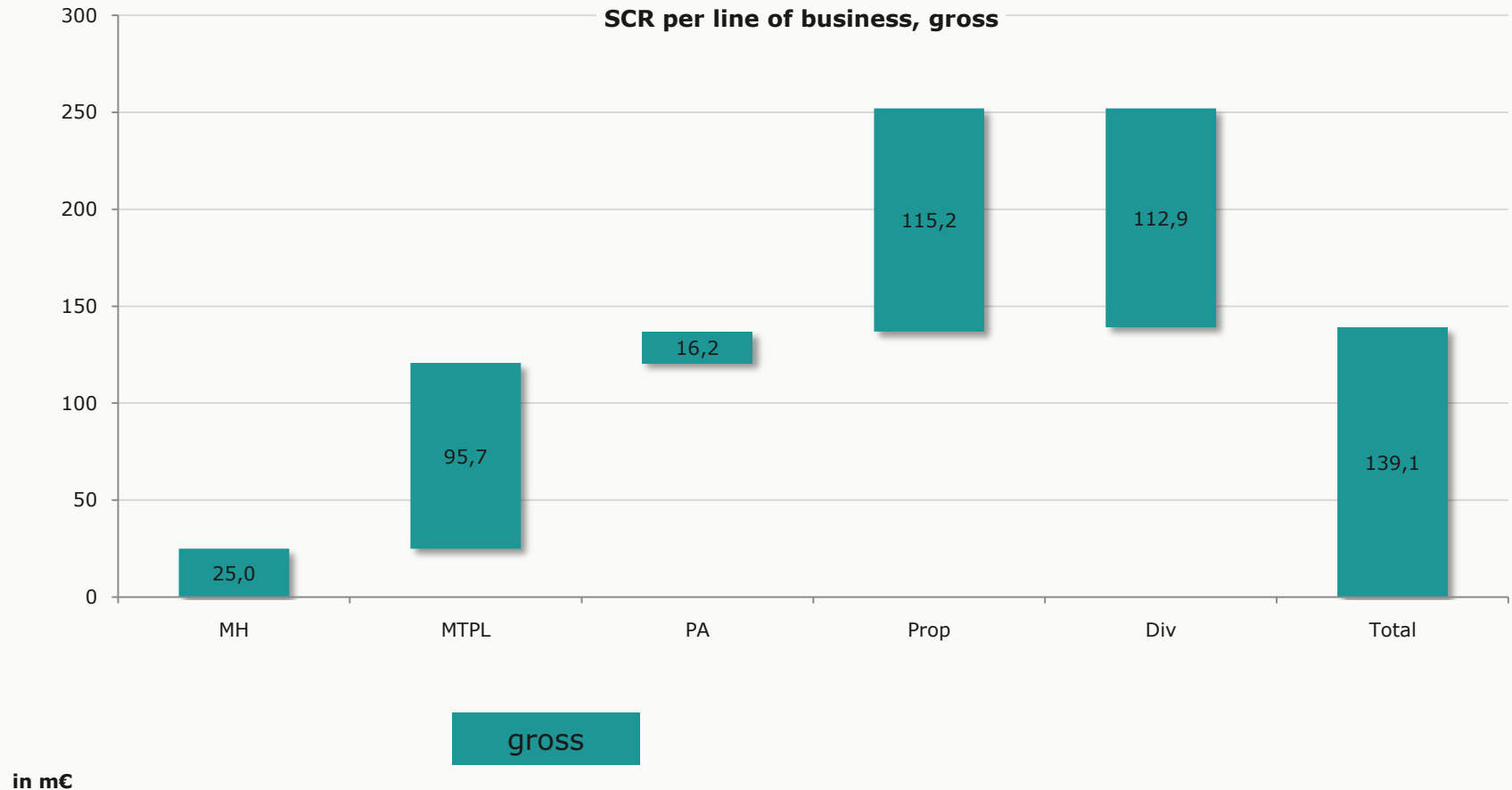
## CapitalEagle: Annual total loss distribution



in m€

# Net evaluation (NP)

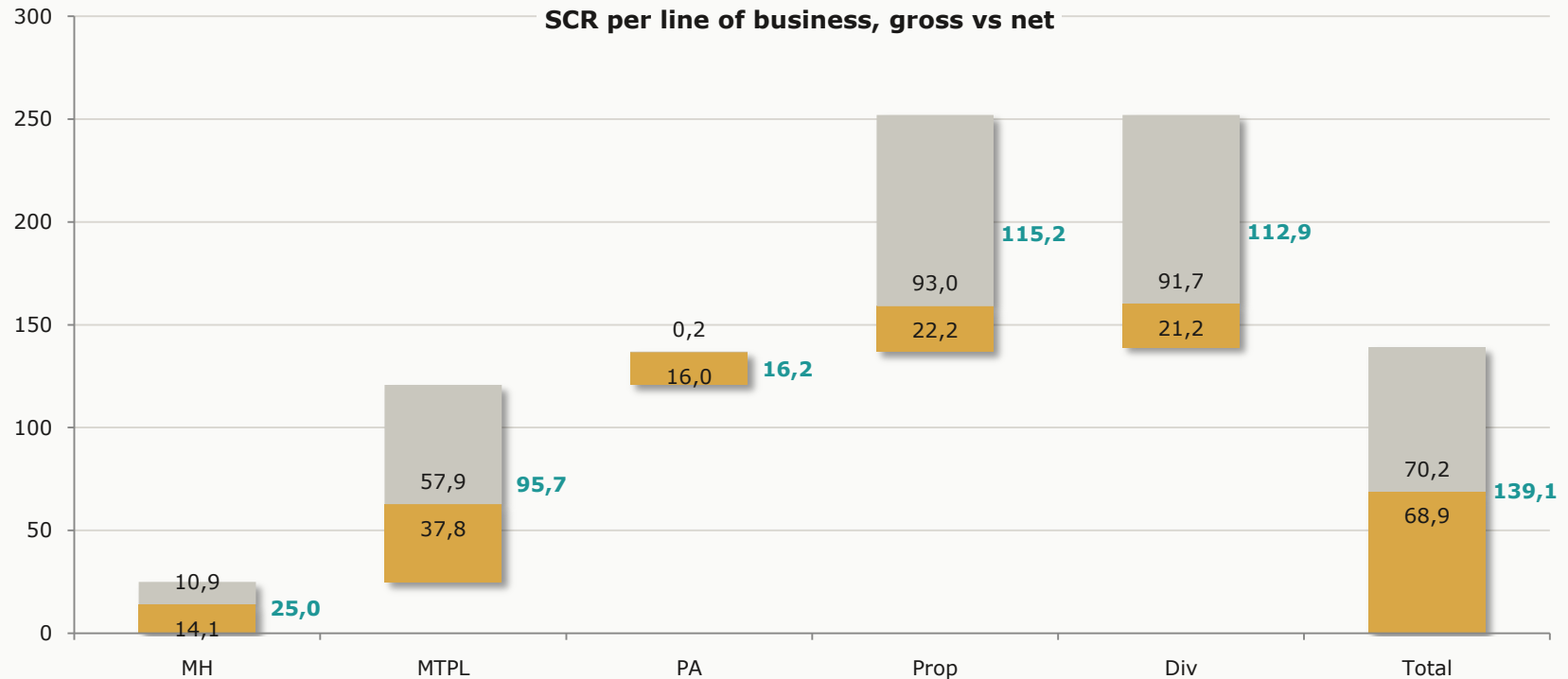
## All lines of business, gross



Very heterogenous portfolio

# Net evaluation (NP)

## All lines of business, gross vs net



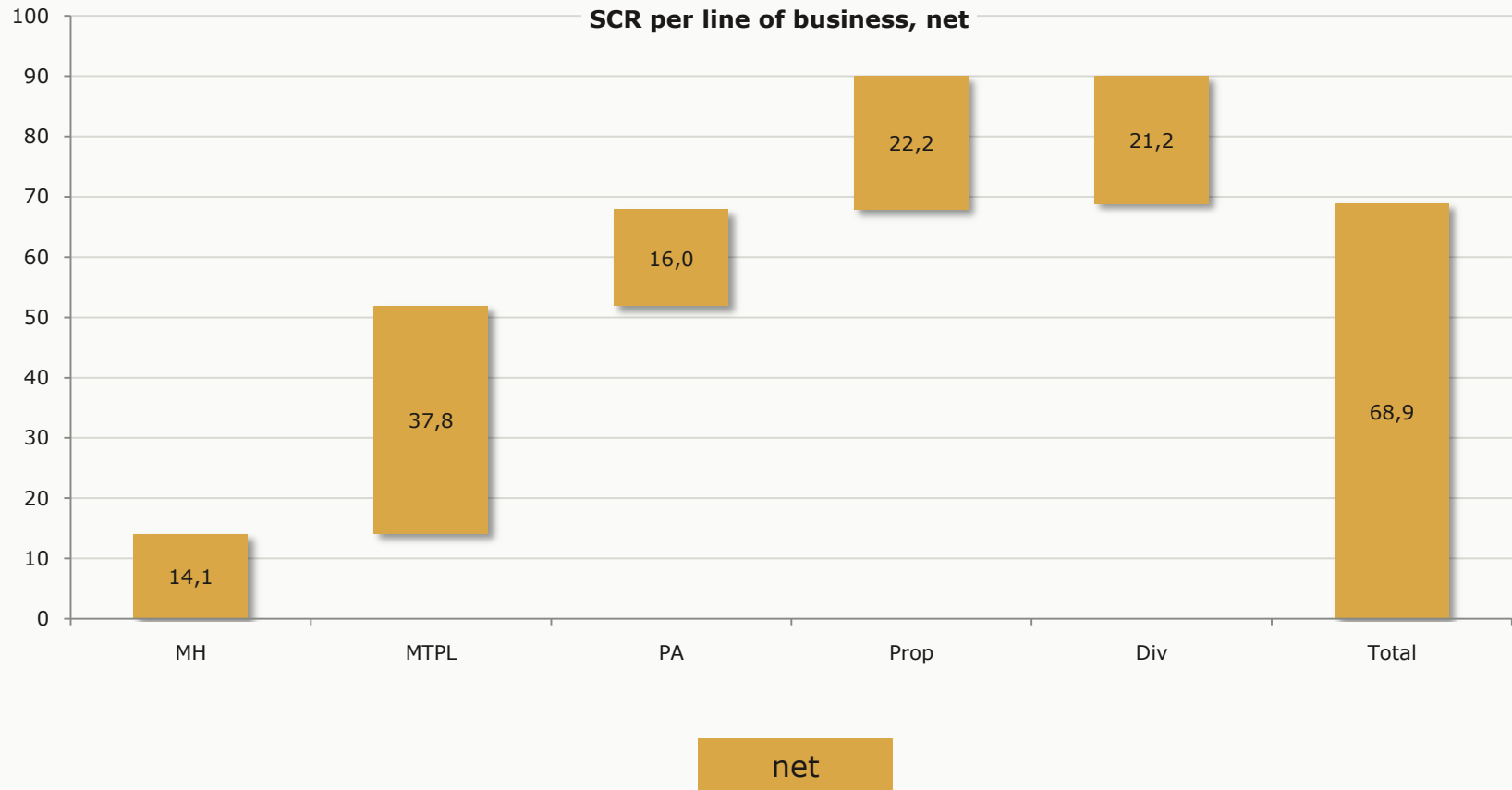
gross = net + ceded

in m€

Strong impact of reinsurance on main risk drivers

# Net evaluation (NP)

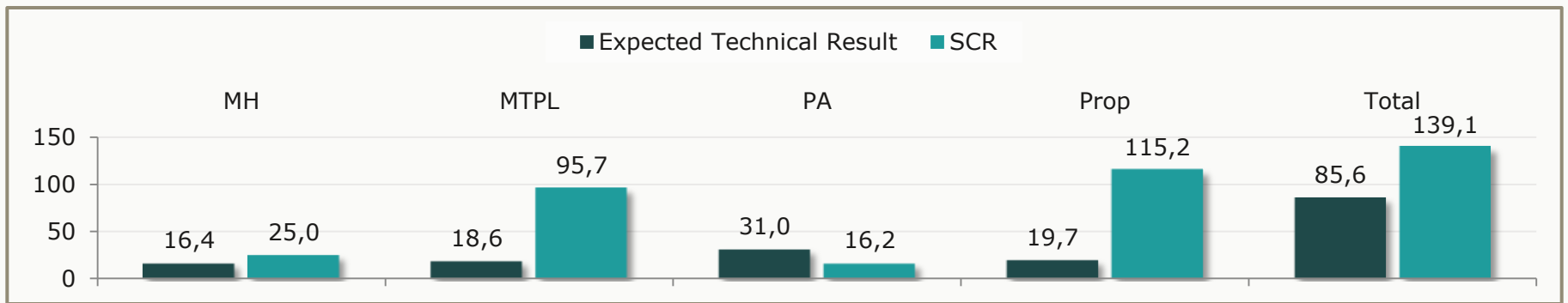
## All lines of business, net



Net portfolio is more homogenous than gross portfolio

# Risk measures gross

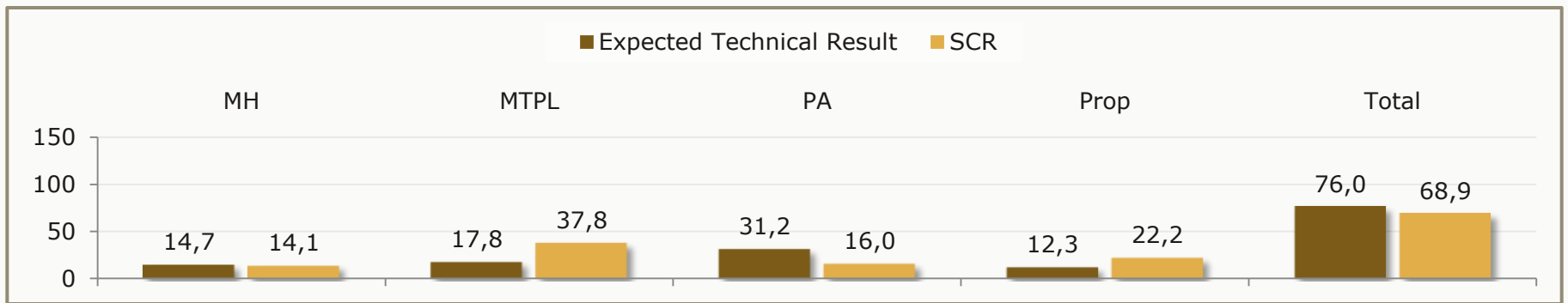
Gross						
	Premium	Expected loss	Expected techn. result	Loss ratio	Standard deviation	SCR
Motor hull	97.0	80.6	16.4	83.1%	7.1	25.0
Motor third party liability	189.2	170.7	18.6	90.2%	20.2	95.7
Personal accident	53.9	22.9	31.0	42.5%	5.0	16.2
Property	72.9	53.3	19.7	73.1%	22.4	115.2
Simple sum	<b>413.1</b>	<b>327.5</b>	<b>85.6</b>		<b>54.7</b>	<b>252.1</b>
Diversification					19.3	112.9
Total	<b>413.1</b>	<b>327.5</b>	<b>85.6</b>	<b>79.3%</b>	<b>35.5</b>	<b>139.1</b>



in m€

# Risk measures net (NP)

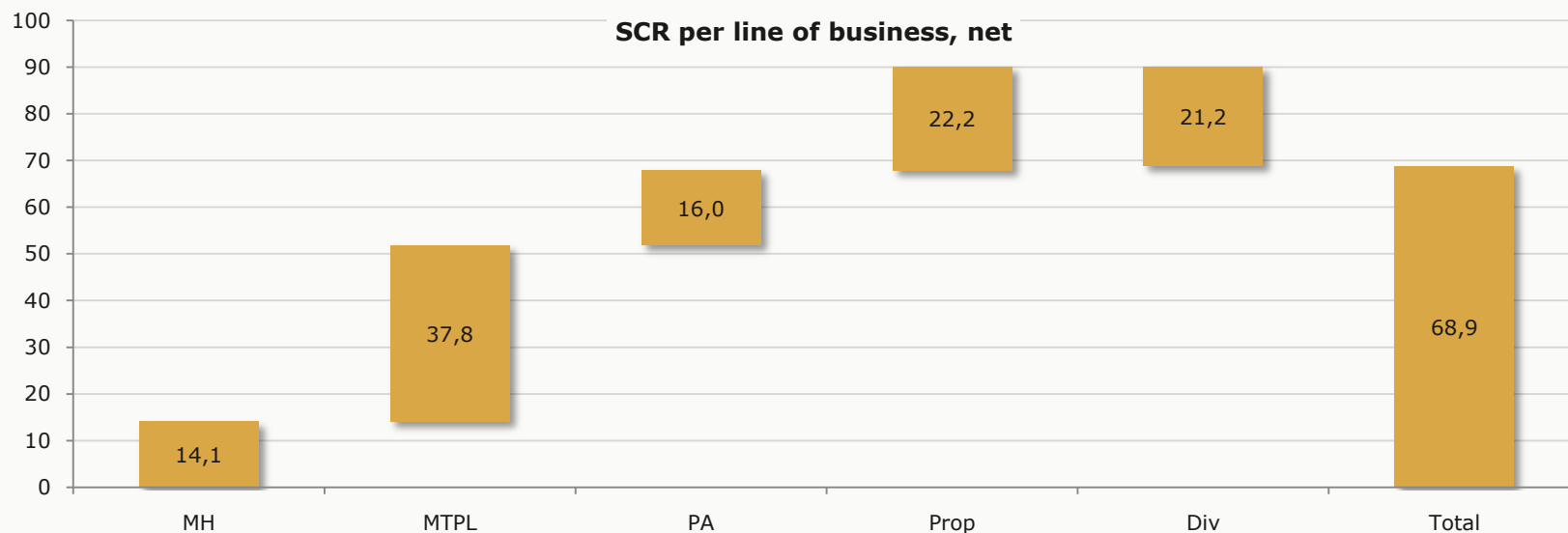
Net after RI (NP)						
	Premium + RI commission	Expected loss	Expected techn. result	Loss ratio	Standard deviation	SCR
Motor hull	92.8	78.1	14.7	84.1%	5.2	14.1
Motor third party liability	178.4	160.6	17.8	90.1%	13.4	37.8
Personal accident	52.9	21.8	31.2	41.1%	4.9	16.0
Property	57.9	45.6	12.3	78.8%	9.4	22.2
Simple sum	<b>382.1</b>	<b>306.2</b>	<b>76.0</b>		<b>32.9</b>	<b>90.1</b>
Diversification					8.9	21.2
Total	<b>382.1</b>	<b>306.2</b>	<b>76.0</b>	<b>80.1%</b>	<b>24.0</b>	<b>68.9</b>



in m€

# Net evaluation

## Impact of current reinsurance (NP)



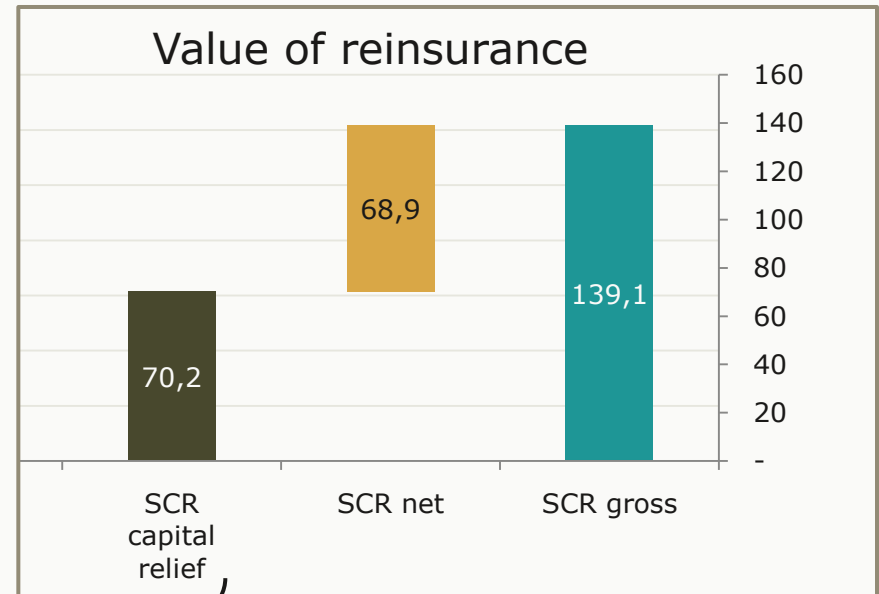
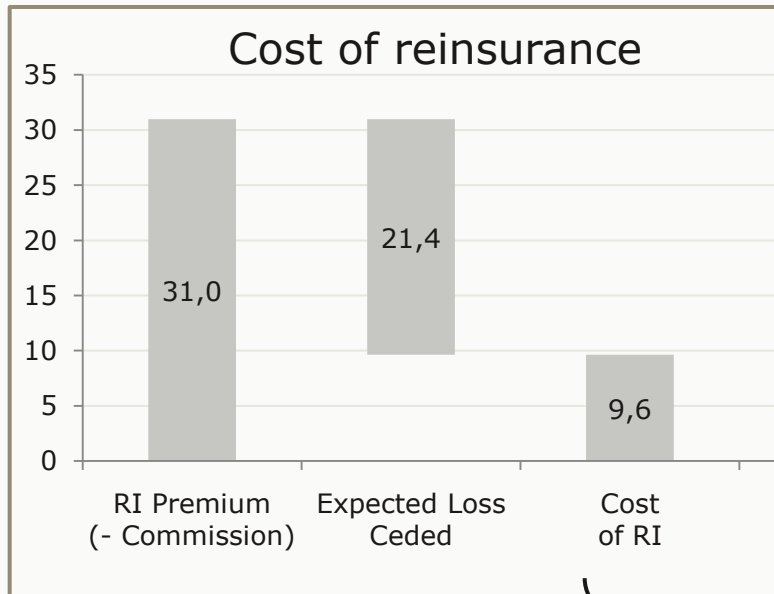
- The capital requirement of the net portfolio (SCR) is 68.9 m€
- The net main risk driver is Motor Third Party Liability

- The capital relief of reinsurance structure NP on SCR is 70.2 m€

in m€

The net portfolio is more homogenous than the gross portfolio

# Capital Cost Ratio of reinsurance programme NP



Compare this ratio with other financial instruments

# Capital Cost Ratio change for different target rating (NP)

## SCR relief



## 'A+' rating capital relief

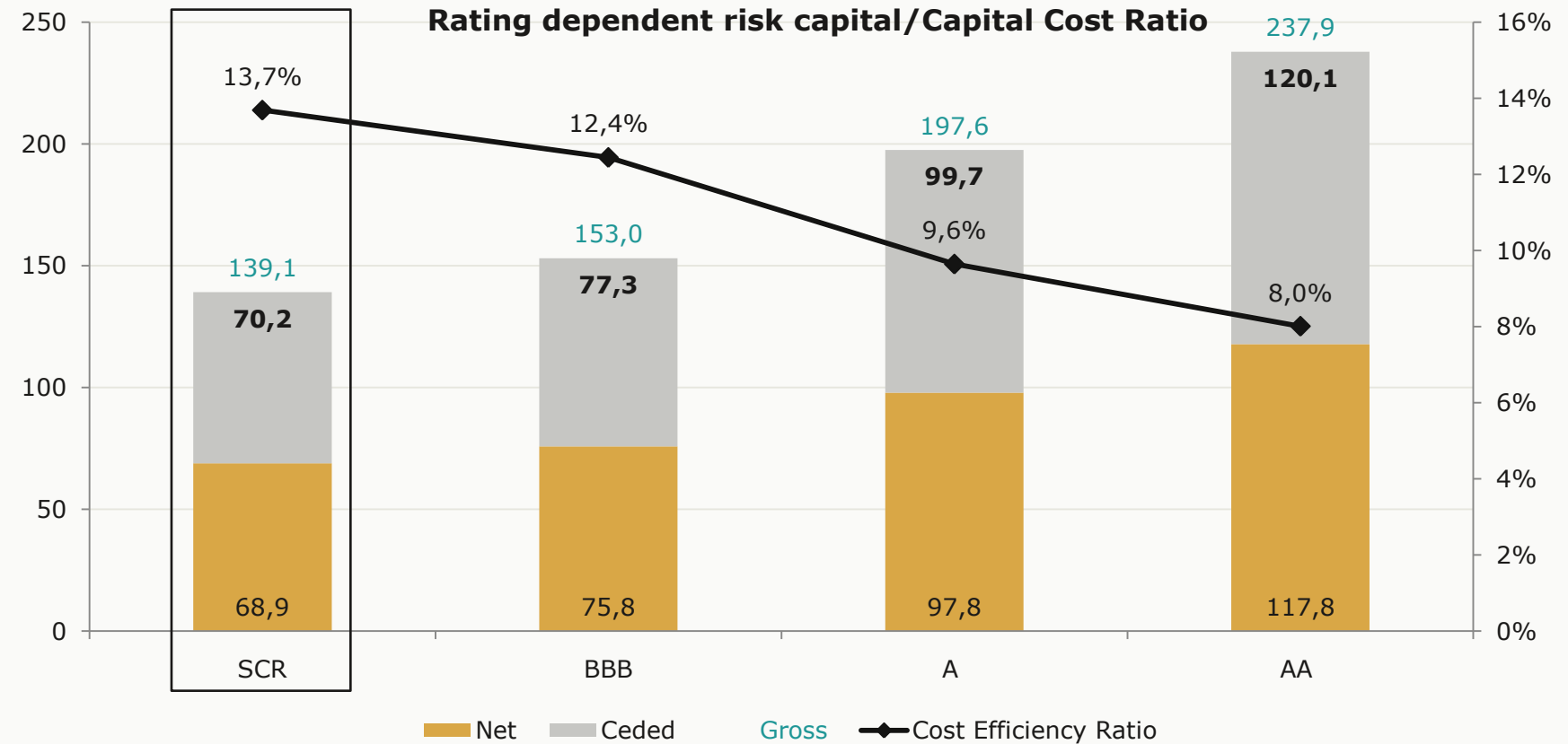


Values obtained by scaling SCR relief and are only illustrative

Higher target rating improves the Capital Cost Ratio

# Net evaluation (NP)

## Influence of rating



in m€

Values obtained by scaling SCR relief and are only illustrative

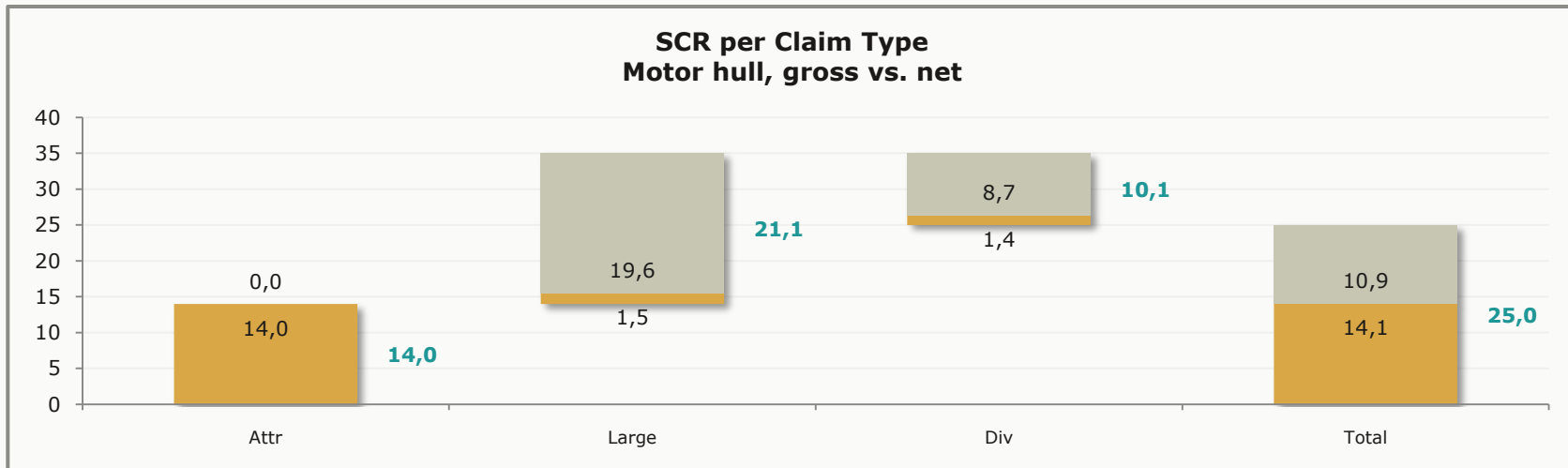
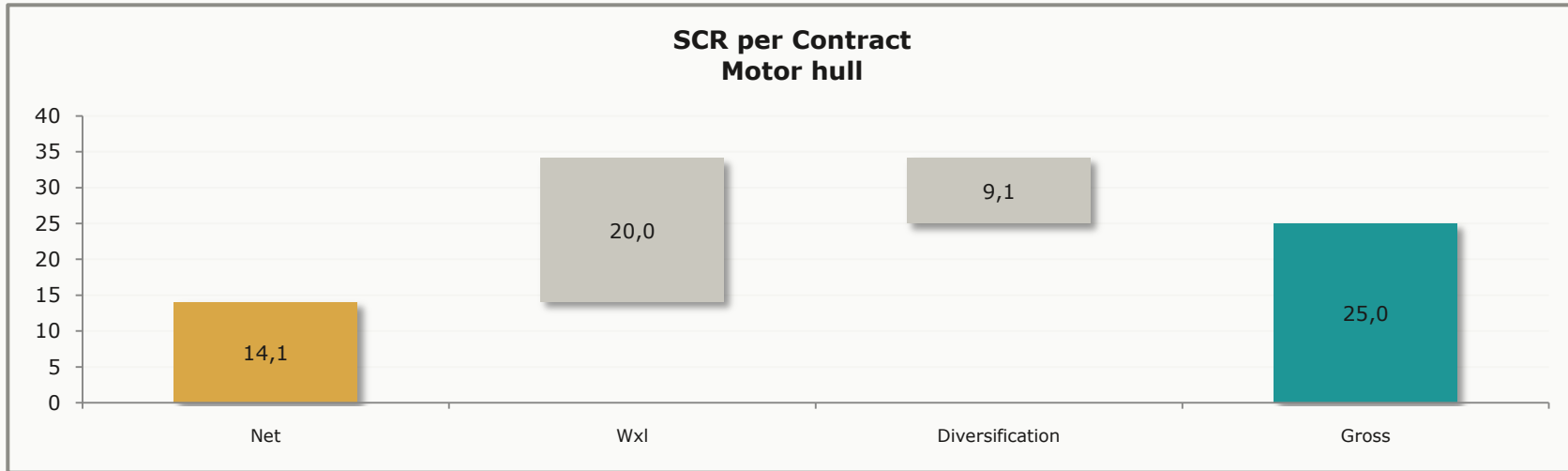
Superior Capital Cost Ratio of RI at higher ratings

# Gross-Net comparison NP, reinsurance view

- The Risk Capital Relief from the gross portfolio to the net after reinsurance portfolio is as follows:
  - Motor hull: 10.9 m€
  - Motor third party liability: 57.9 m€
  - Personal accident: 0.2 m€
  - Property: 93.0 m€
  
- Where does the Risk Capital Relief come from?



# Motor hull gross vs net (NP)



in m€

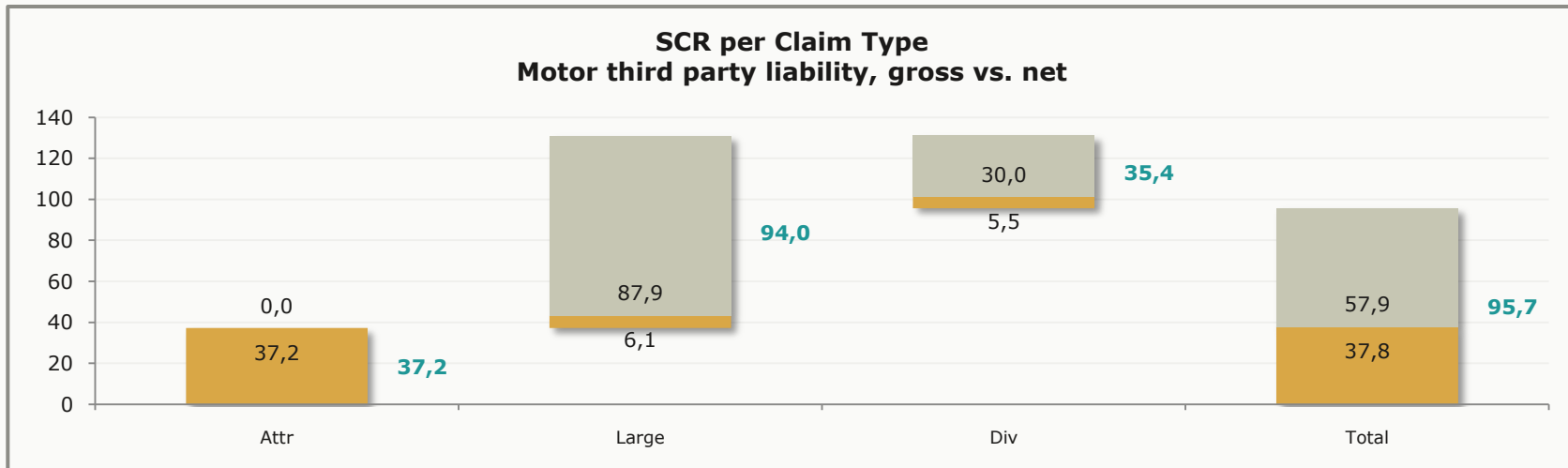
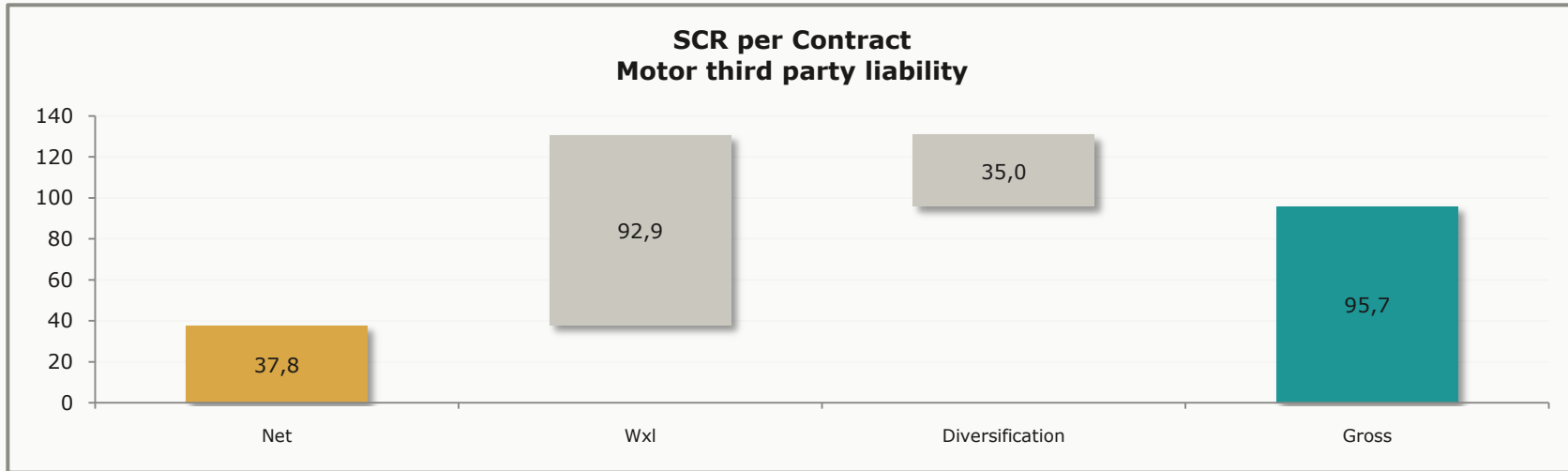
# Motor hull gross vs net (NP)

Motor hull (NP)						
	Premium + RI commission	Expected loss	Expected techn. result	Standard deviation	Solvency Capital Requirement (SCR)	
Net (NP)	92.8	78.1	14.7	5.2	14.1	
Wxl	4.2	2.5	1.6	4.6	20.0	
Simple sum	<b>97.0</b>	<b>80.6</b>	<b>16.4</b>	<b>9.8</b>	<b>34.1</b>	
Diversification				2.7	9.1	
Gross	<b>97.0</b>	<b>80.6</b>	<b>16.4</b>	<b>7.1</b>	<b>25.0</b>	

- WXL treaty captures almost the entire risk capital requirement for the Large Loss component

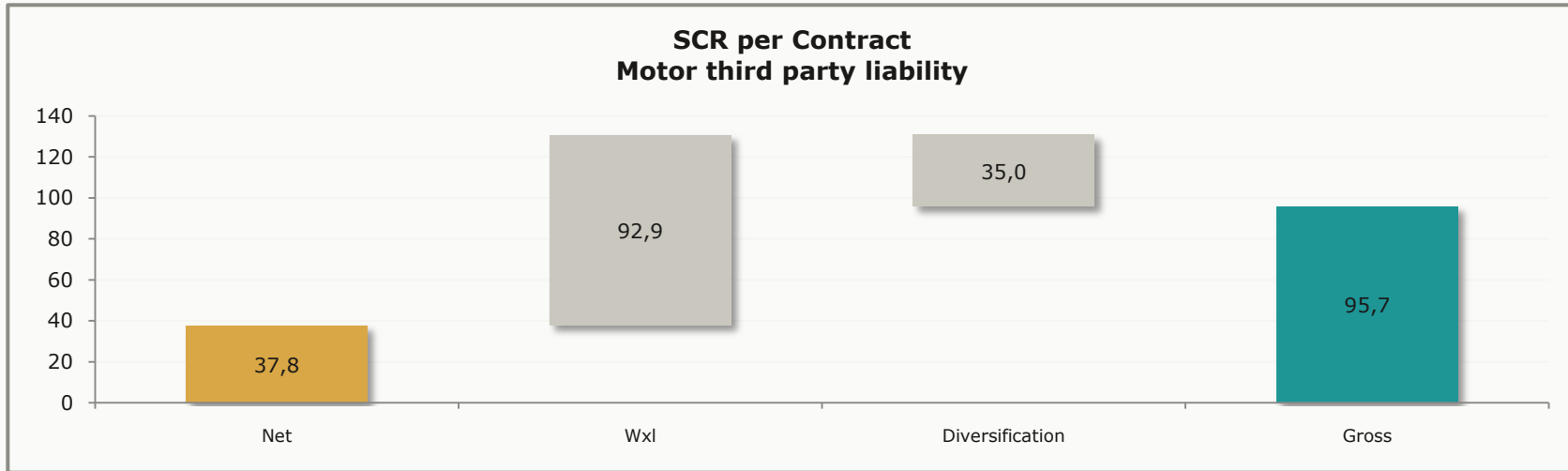
- The Attritional Loss component is fully retained by the insurer

# Motor third party liability gross vs net (NP)



in m€

# Motor third party liability gross vs net (NP)



- WXL treaty captures almost the entire risk capital requirement for the Large Loss component

- The Attritional Loss component is fully retained by the insurer
- Improvements of the reinsurance structure should address the attritional loss component

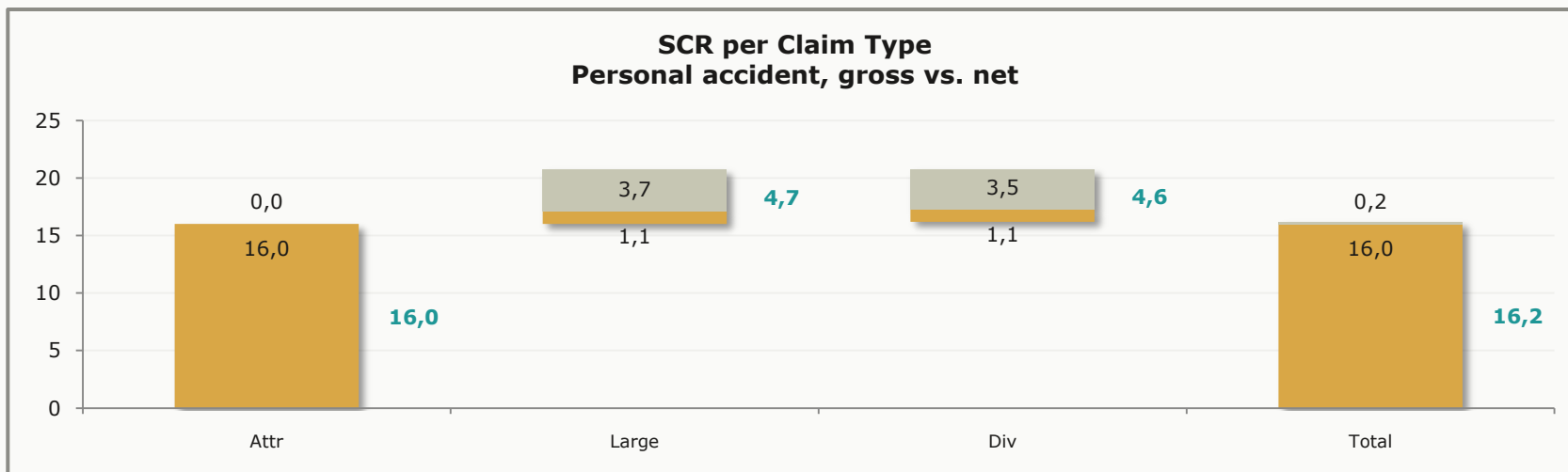
# Motor third party liability gross vs net (NP)

Motor third party liability (NP)					
	Premium + RI commission	Expected loss	Expected techn. result	Standard deviation	Solvency Capital Requirement (SCR)
Net (NP)	178.4	160.6	17.8	13.4	37.8
Wxl	10.8	10.0	0.8	14.3	92.9
Simple sum	<b>189.2</b>	<b>170.7</b>	<b>18.6</b>	<b>27.8</b>	<b>130.7</b>
Diversification				7.6	35.0
Gross	<b>189.2</b>	<b>170.7</b>	<b>18.6</b>	<b>20.2</b>	<b>95.7</b>

- WXL treaty captures almost the entire risk capital requirement for the Large Loss component

- The Attritional Loss component is fully retained by the insurer
- Improvements of the reinsurance structure should address the attritional loss component

# Personal accident gross vs net (NP)



in m€

# Personal accident gross vs net (NP)



- Excess of Loss covers most of the risk capital demand of the Large Loss component

- The Attritional Loss component is fully retained by the insurer

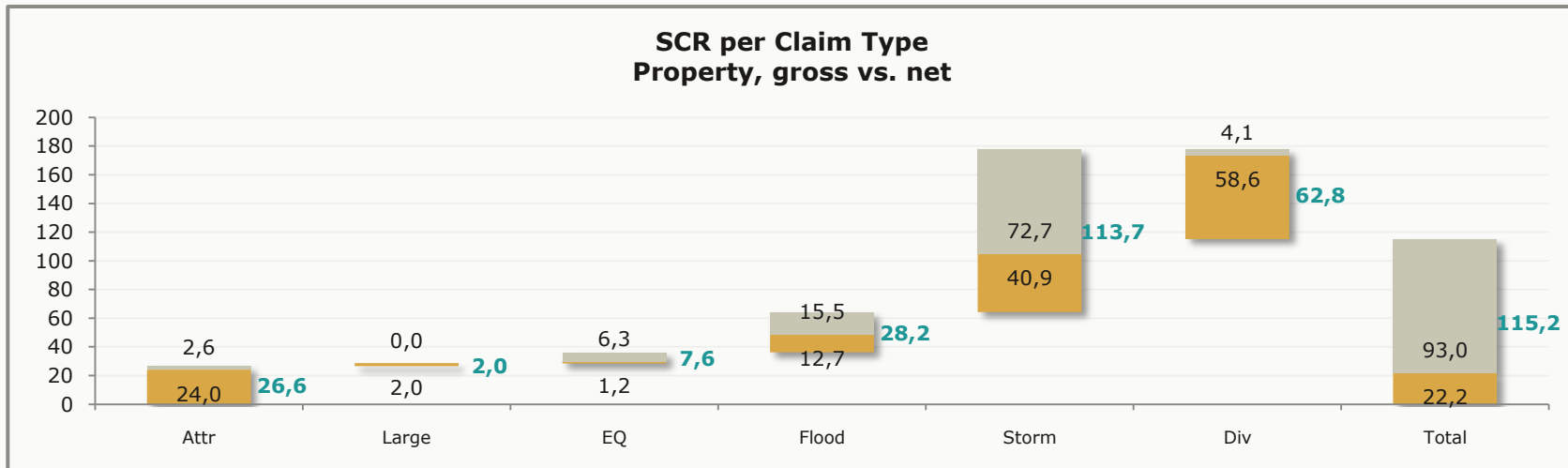
# Personal accident gross vs net (NP)

Personal accident (NP)						
	Premium + RI commission	Expected loss	Expected techn. result	Standard deviation	Solvency Capital Requirement (SCR)	
Net (NP)	52.9	21.8	31.2	4.9	16.0	
Wxl	1.0	1.1	-0.2	1.0	4.1	
Simple sum	<b>53.9</b>	<b>22.9</b>	<b>31.0</b>	<b>5.9</b>	<b>20.1</b>	
Diversification				0.9	3.9	
Gross	<b>53.9</b>	<b>22.9</b>	<b>31.0</b>	<b>5.0</b>	<b>16.2</b>	

- Excess of Loss covers most of the risk capital demand of the Large Loss component

- The Attritional Loss component is fully retained by the insurer

# Property gross vs net (NP)



in m€

# Property gross vs net (NP)

Property (NP)						
	Premium + RI commission	Expected loss	Expected techn. result	Standard deviation	Solvency Capital Requirement (SCR)	
Net (NP)	57.9	45.6	12.3	9.4	22.2	
Cxl	7.1	5.7	1.4	8.0	31.1	
Stoploss	8.0	2.0	6.0	12.4	86.0	
Simple sum	<b>72.9</b>	<b>53.3</b>	<b>19.7</b>	<b>29.7</b>	<b>139.2</b>	
Diversification				7.4	24.1	
Gross	<b>72.9</b>	<b>53.3</b>	<b>19.7</b>	<b>22.4</b>	<b>115.2</b>	

- CXL and SL treaties cover the entire risk capital demand of the Large Loss and NatCat risk components

- The Attritional Loss component is mainly retained by the insurer

- AAL = Annual Aggregated Limit
- Alpha = Loss severity
- GNPI = Gross Net Premium Income
- Lambda = Loss frequency
- LogNorm = Lognormal distribution
- LR = Loss Ratio
- Mean = Average Loss Ratio
- Pareto = Pareto distribution
- Poisson = Poisson distribution
- RBC = Risk Based Capital
- StdDev = Standard Deviation of the Loss Ratio
- $x_0$  = Attachment point

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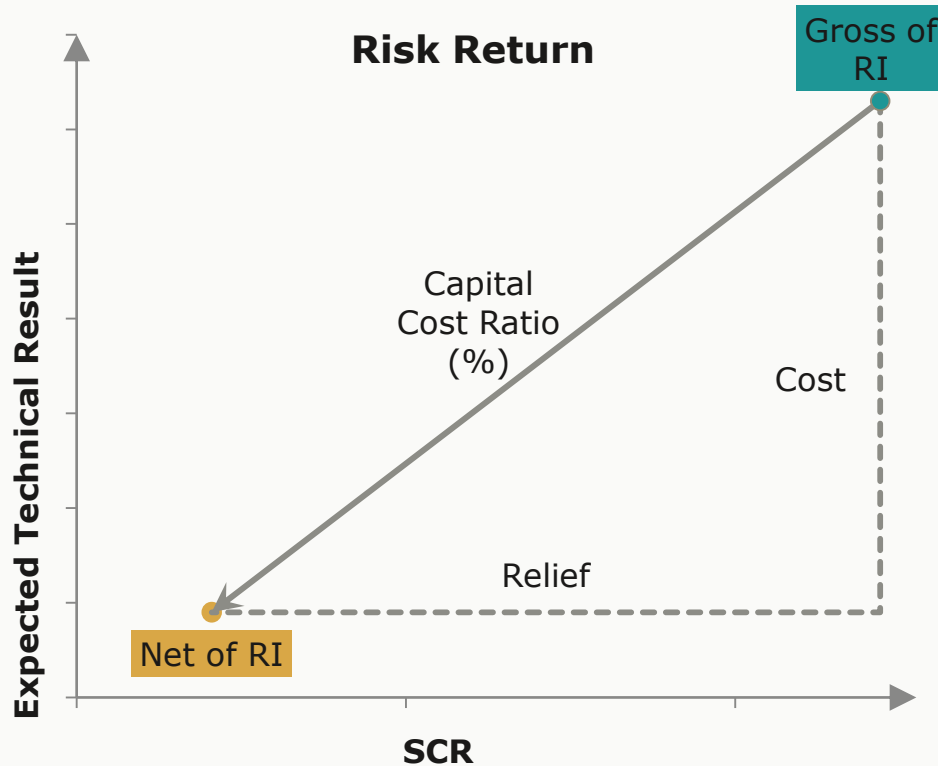
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# Appendix



# Reinsurance is a capital relief tool

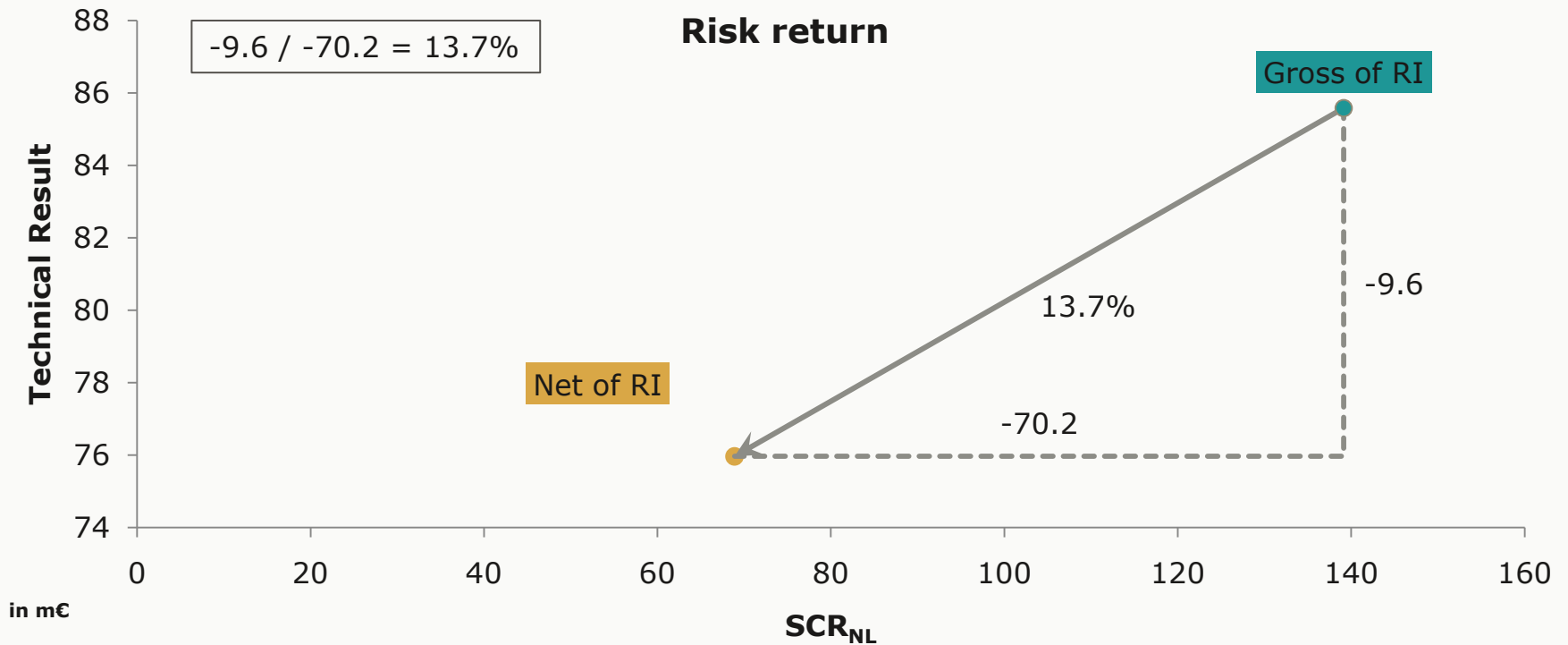


Expected technical result	
+	-
+ Premium	- RI Premium
+ RI Claims Recoveries	- Claims
+ RI Commissions (w/o any further expenses)	

Relief of reinsurance	
+	-
+ $SCR_{gross}$	- $SCR_{net}$

Capital Cost Ratio =  $\frac{\text{Cost of RI}}{\text{SCR relief due to RI}}$

# Risk return NP



Reinsurance outperforms equity increase when reinsurance  
Capital Cost Ratio is below equity interest