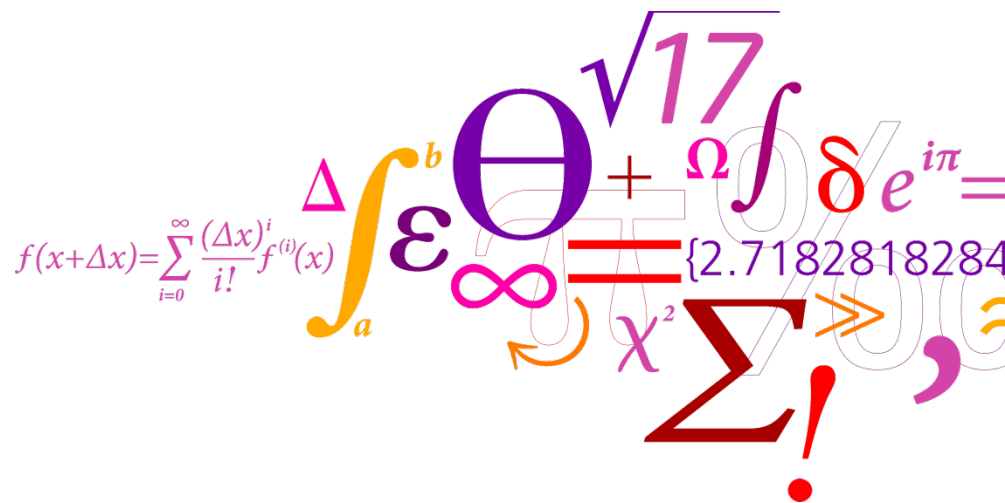


Energy data

What for?

PhD student

Riccardo Bergamini

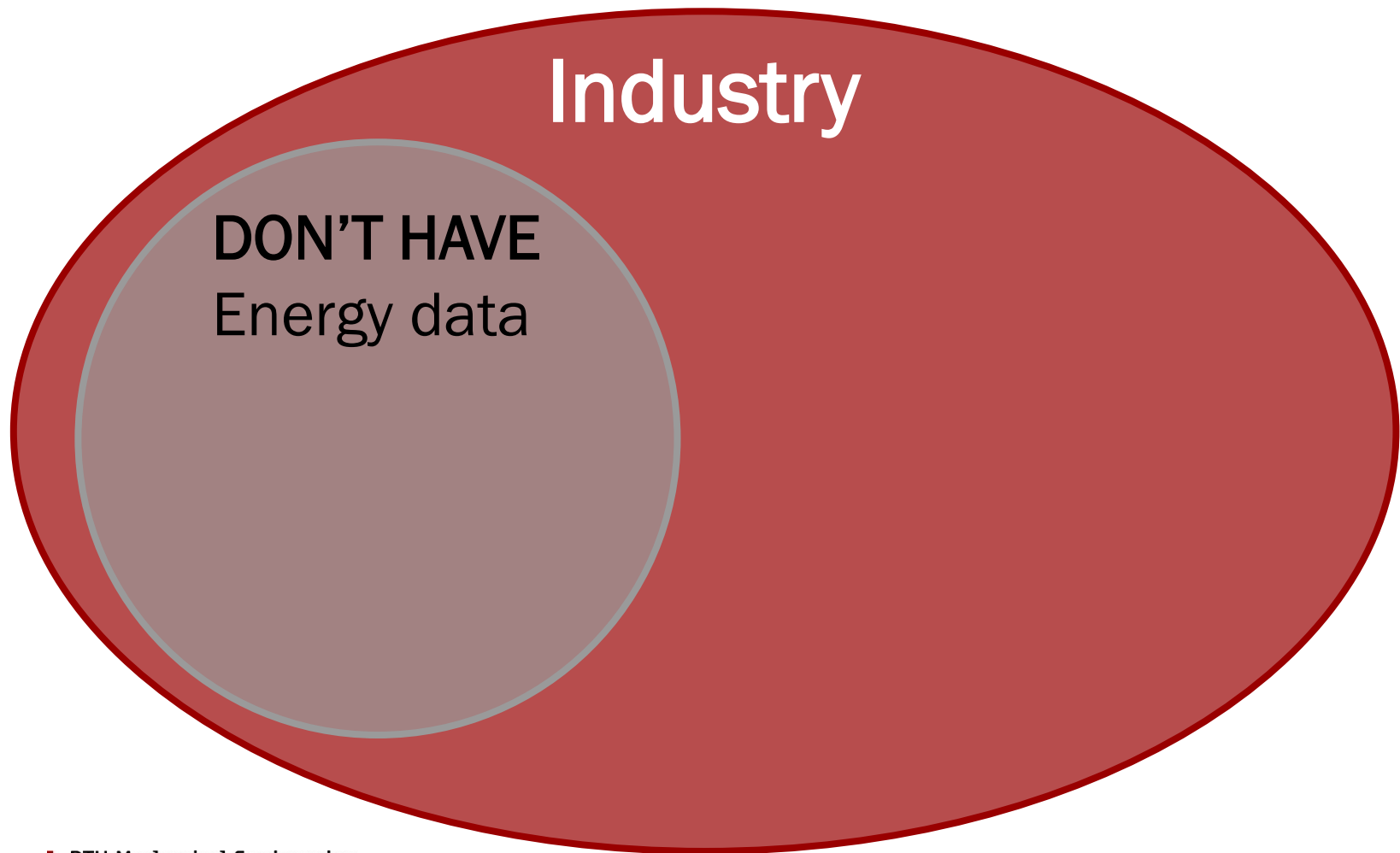


Introduction

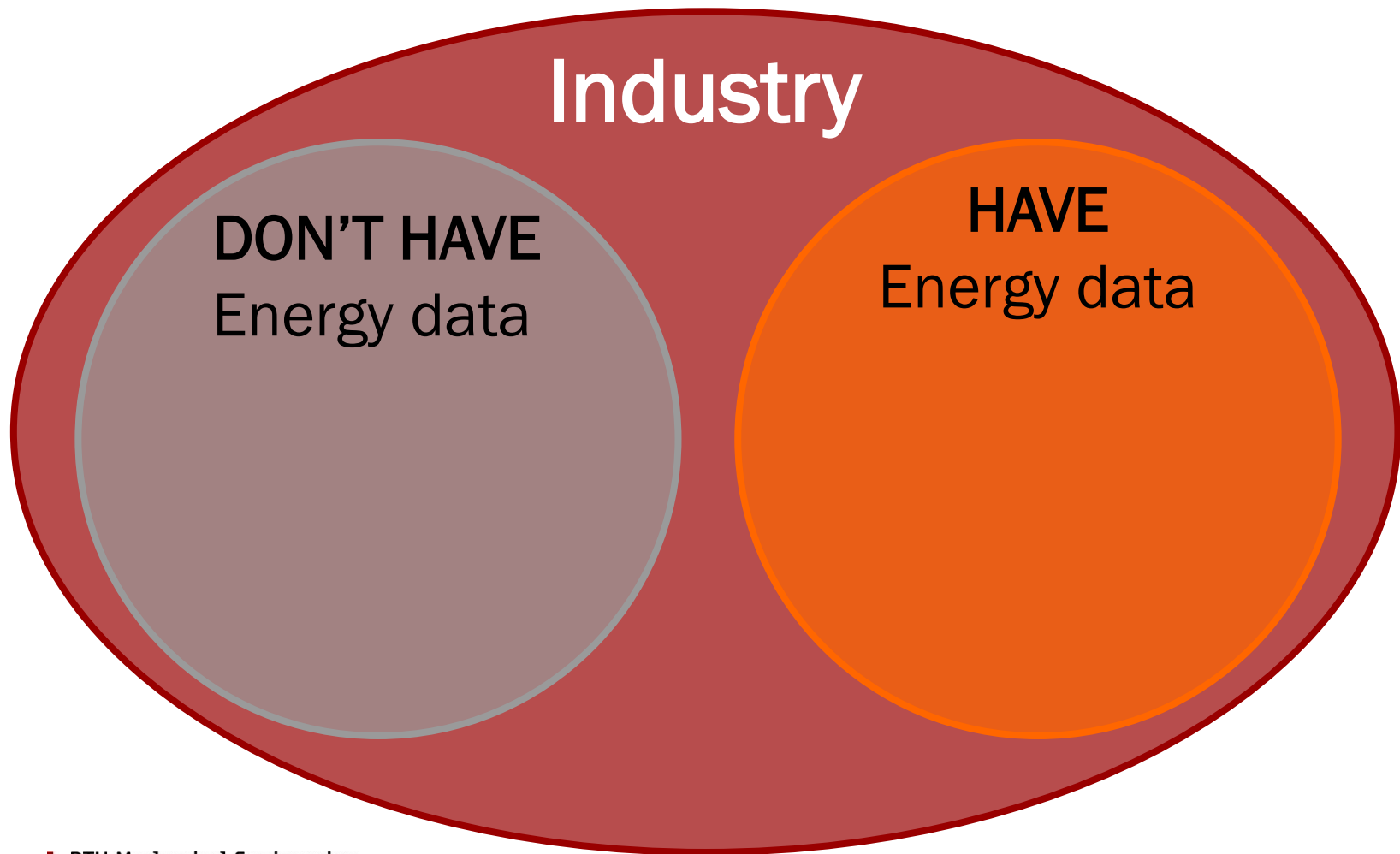


Industry

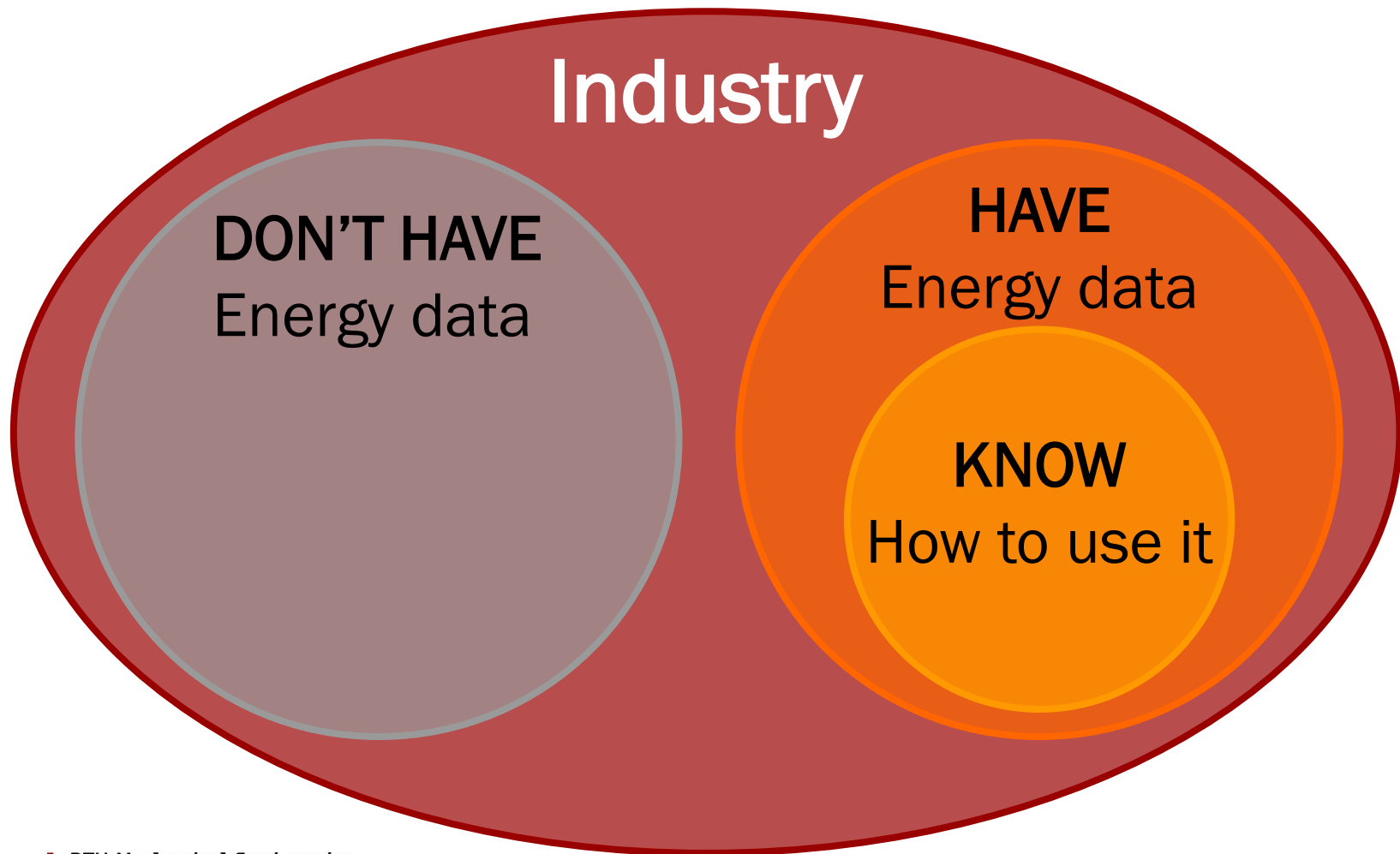
Introduction



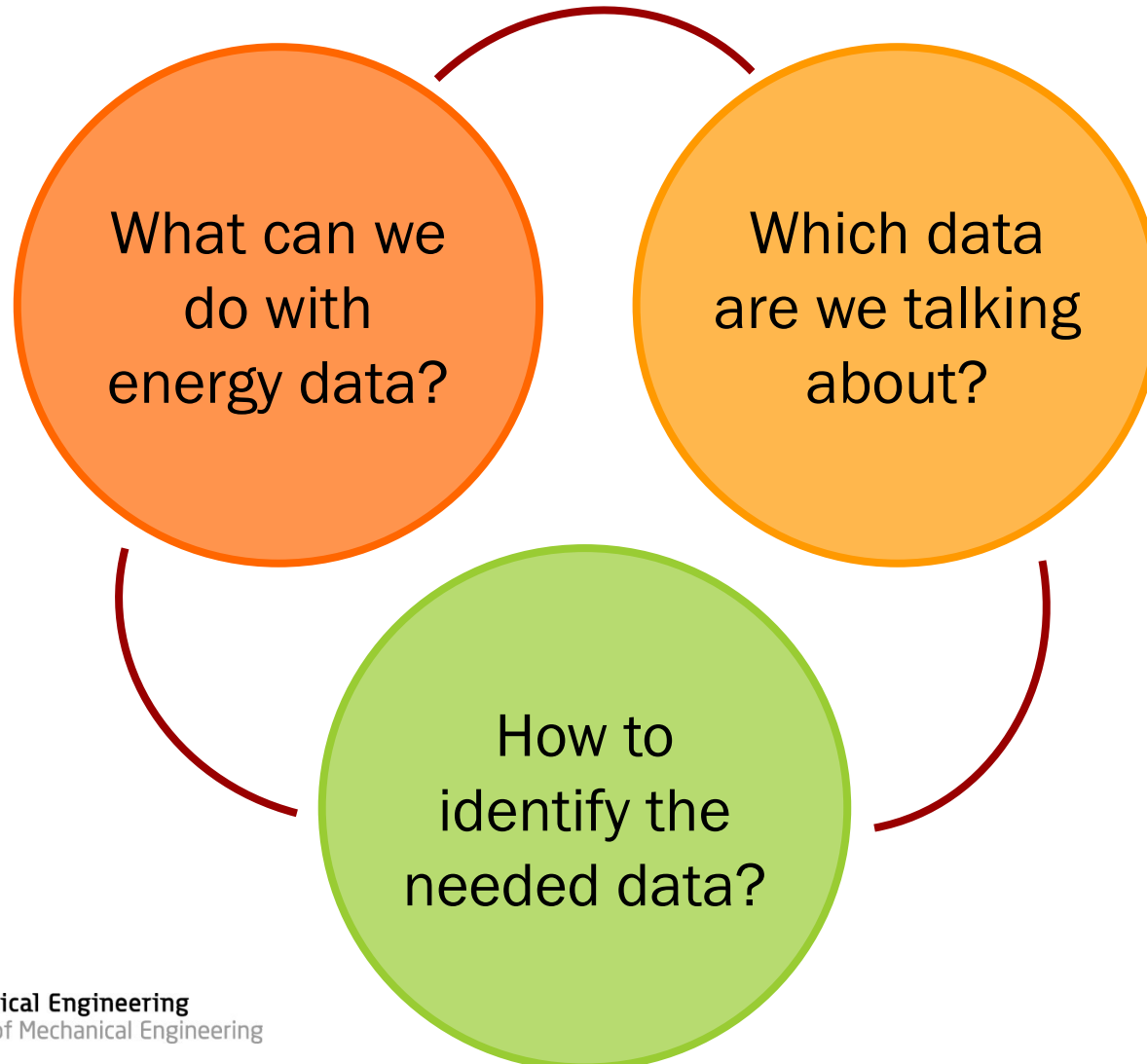
Introduction



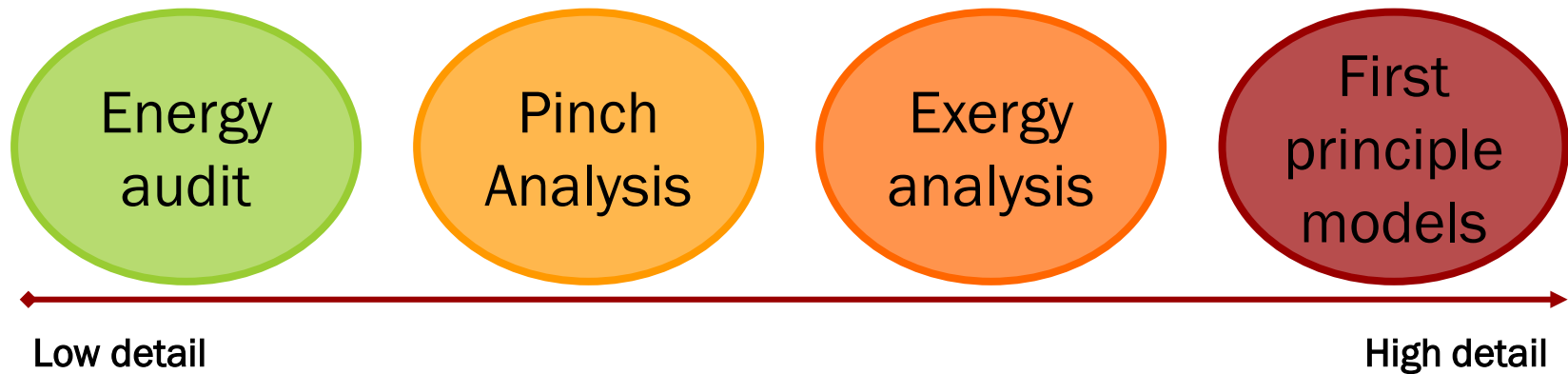
Introduction



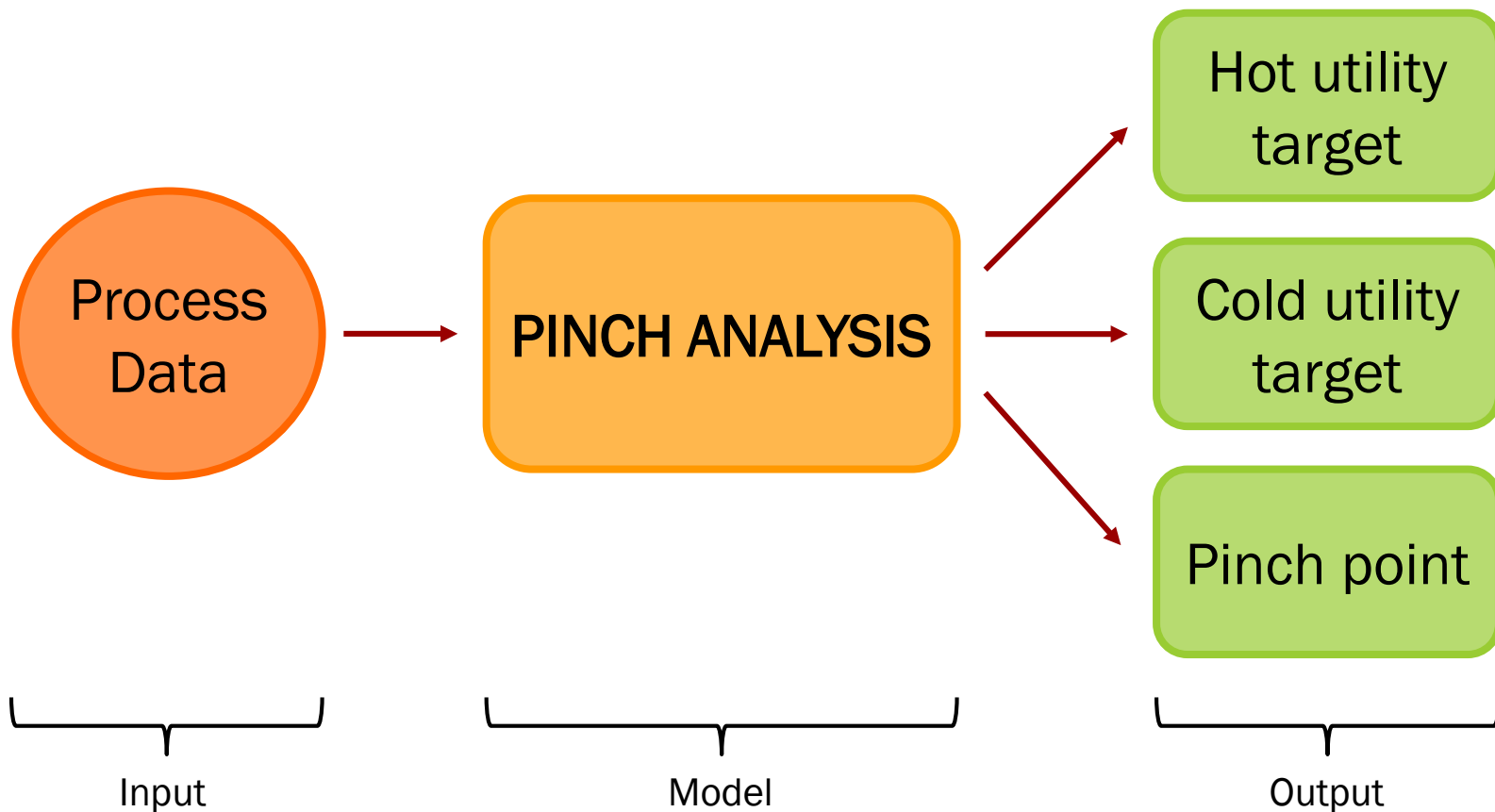
Main questions



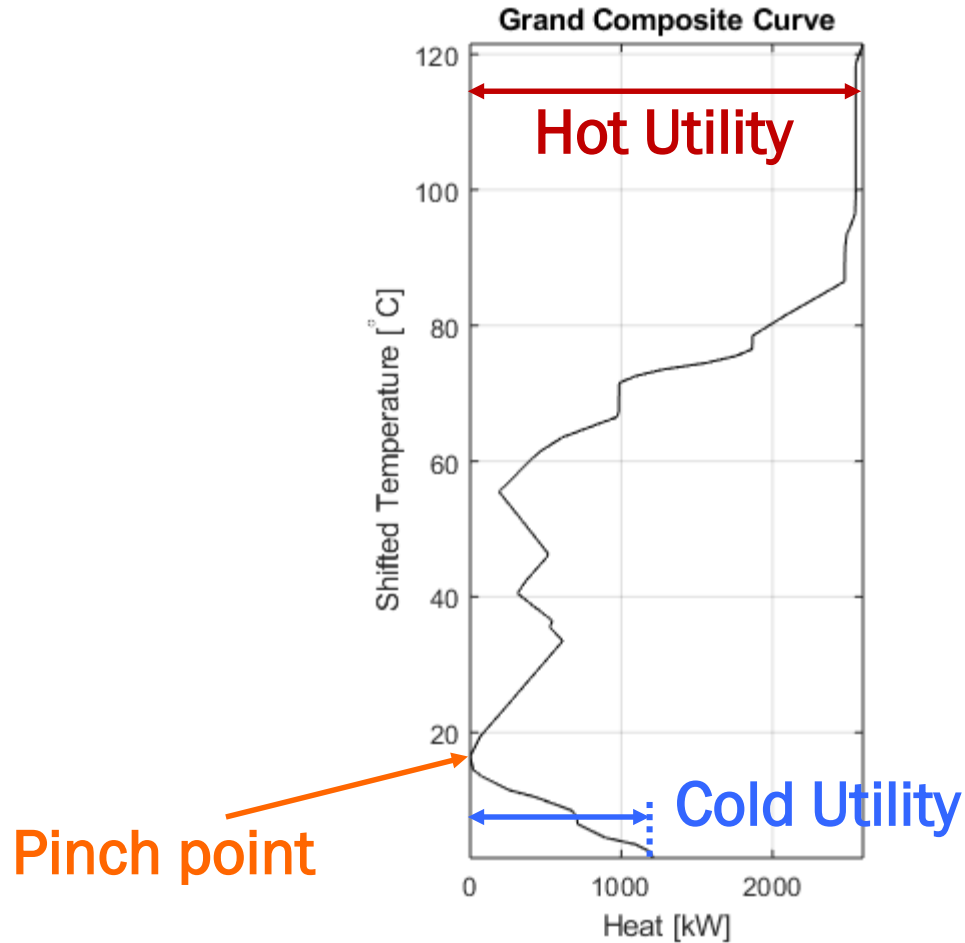
1.1 What to use data for?



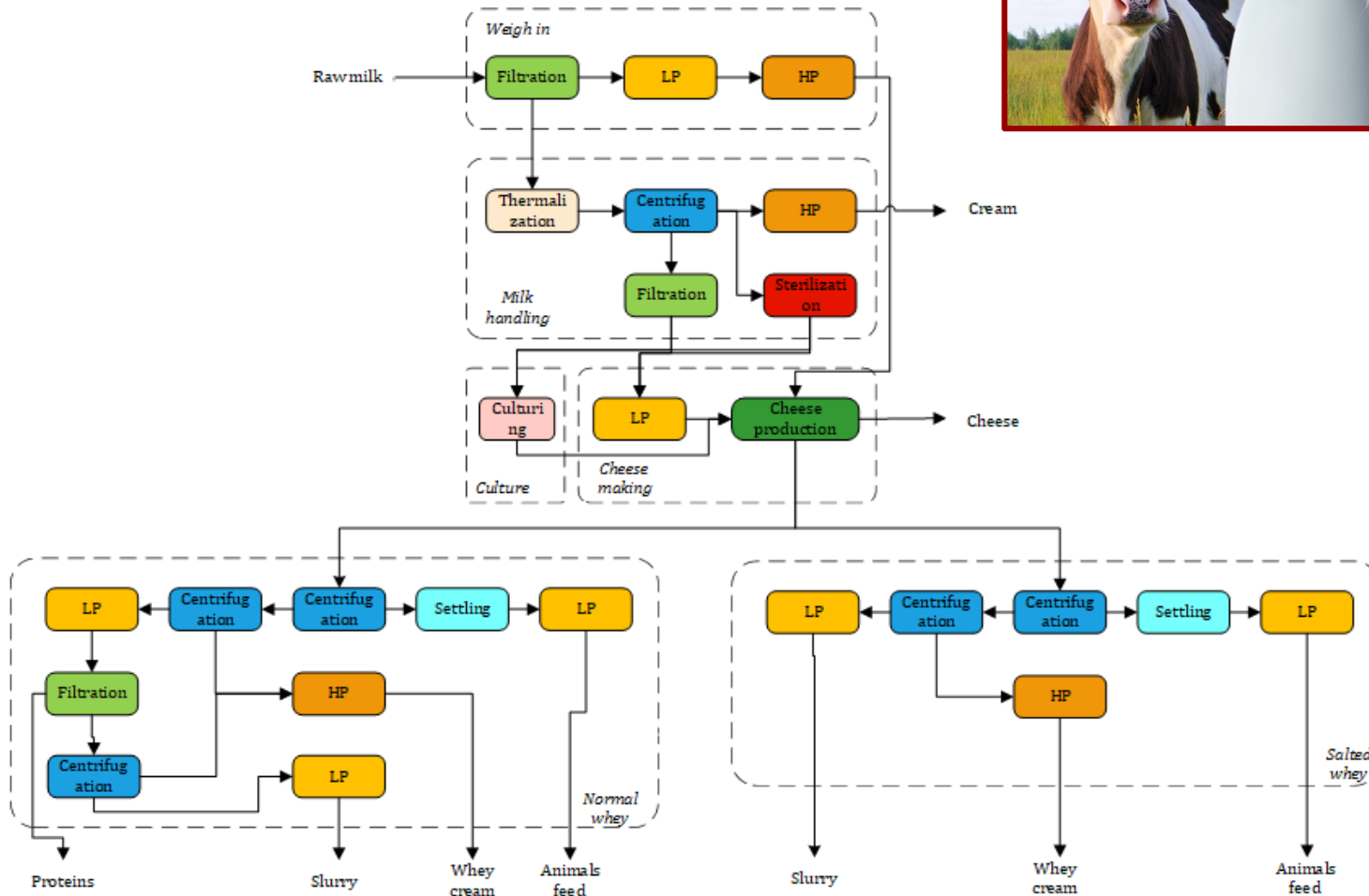
1.2 PINCH ANALYSIS



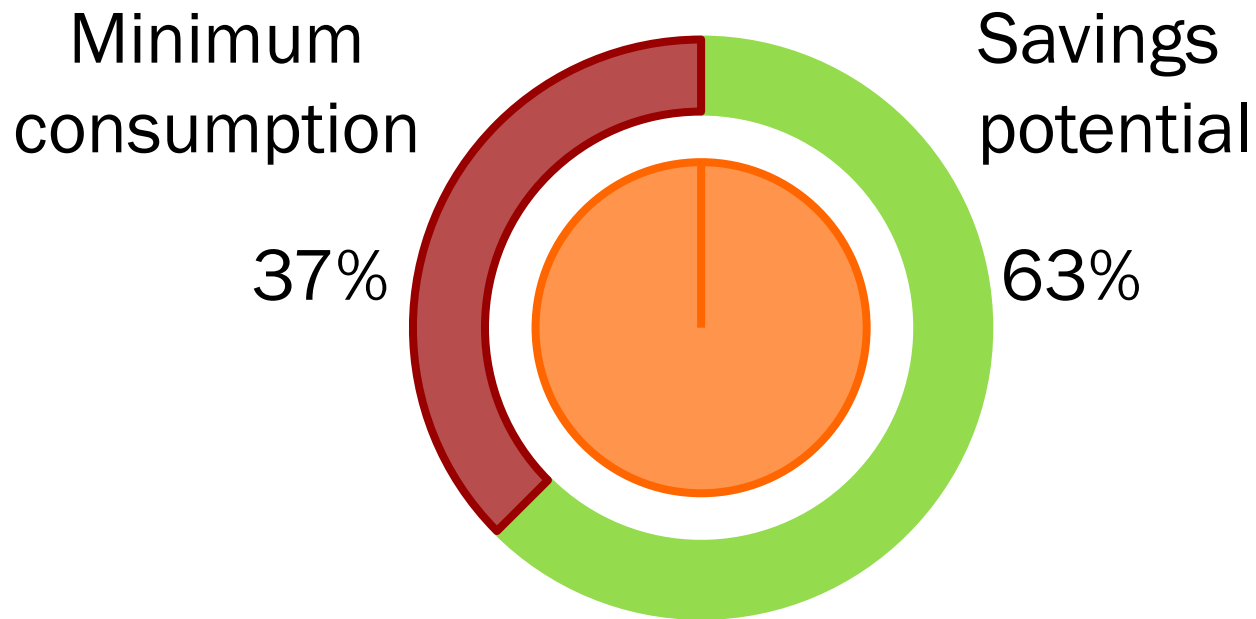
1.3 PINCH ANALYSIS – Grand Composite Curve



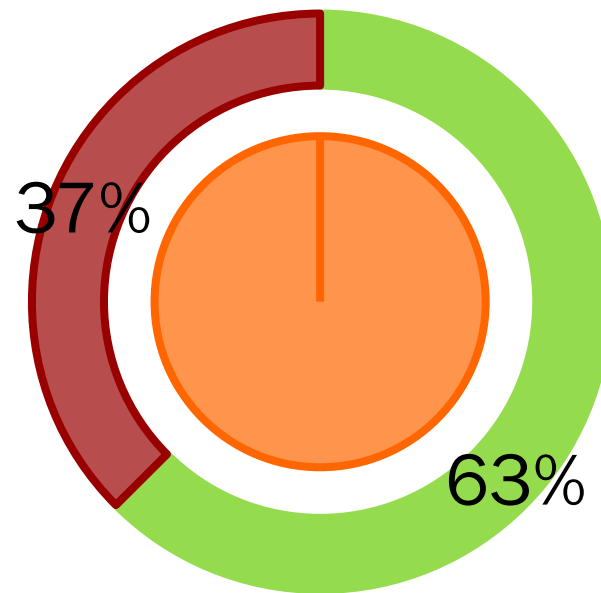
1.4 Case study



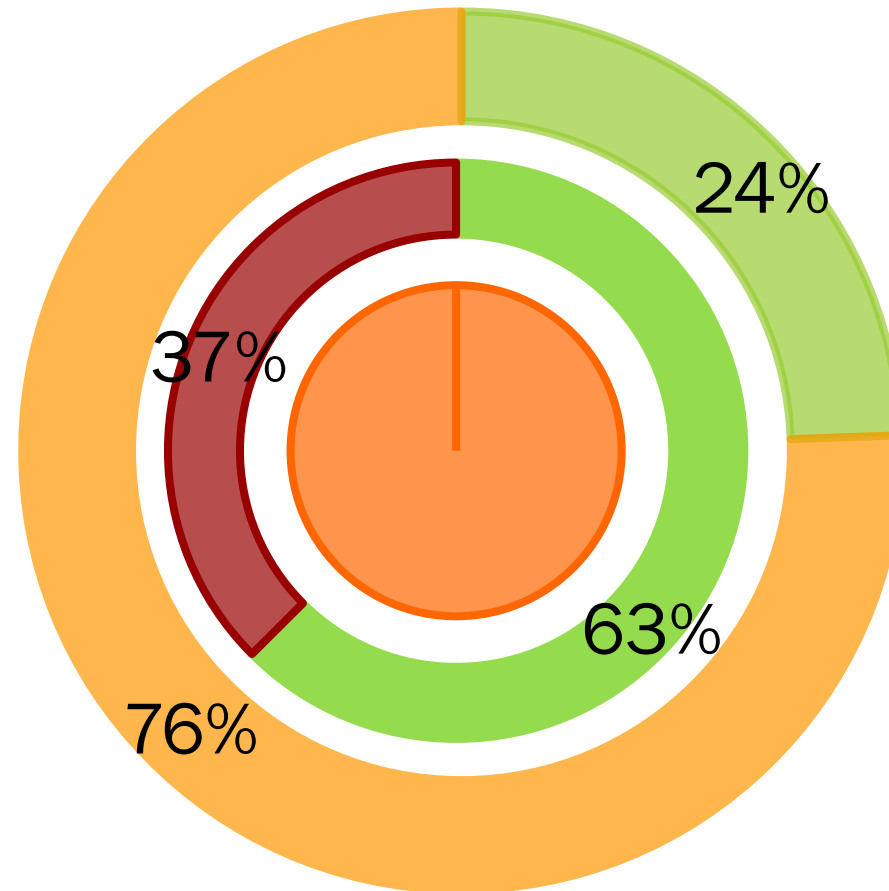
1.5 Application of Pinch analysis – Energy targeting



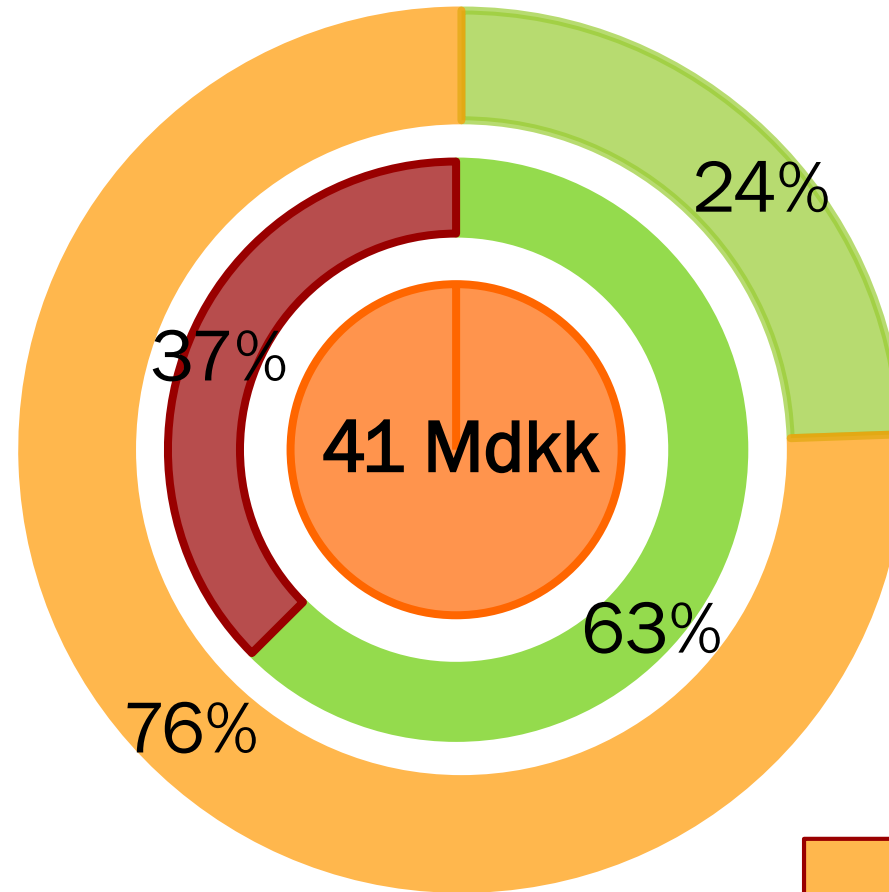
1.6 Application of Pinch Analysis – Retrofit results



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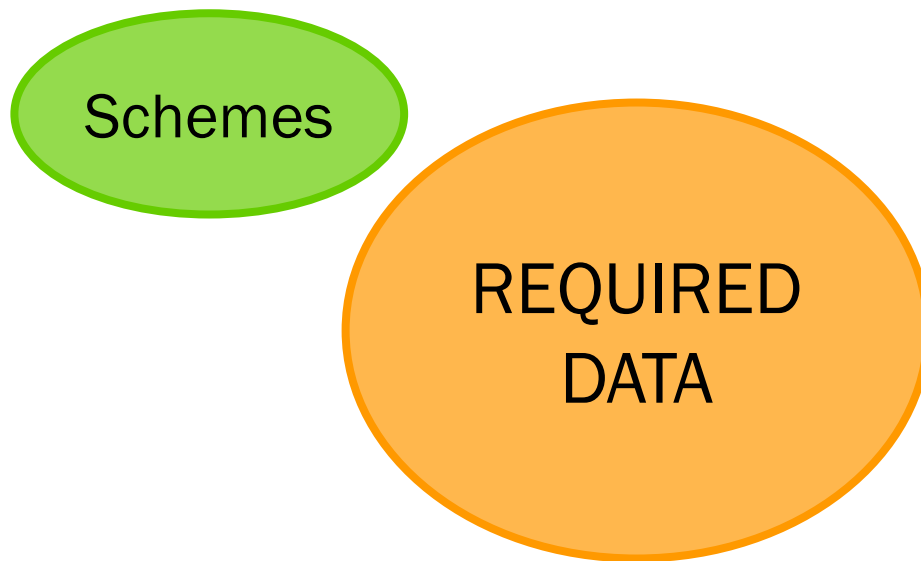
PBT = 4.1 years

2.1 Which data are we talking about?

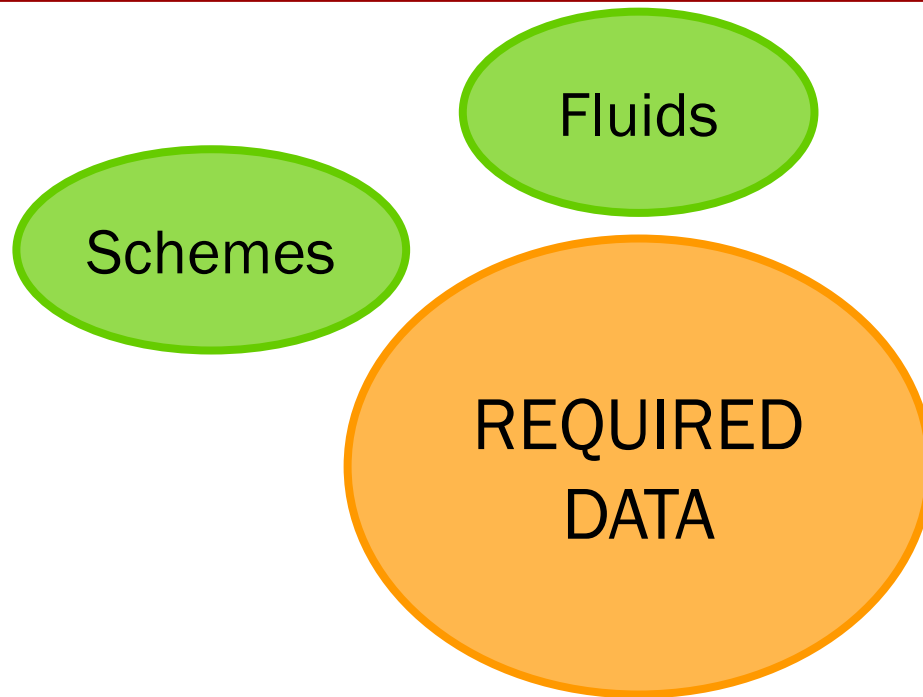


REQUIRED
DATA

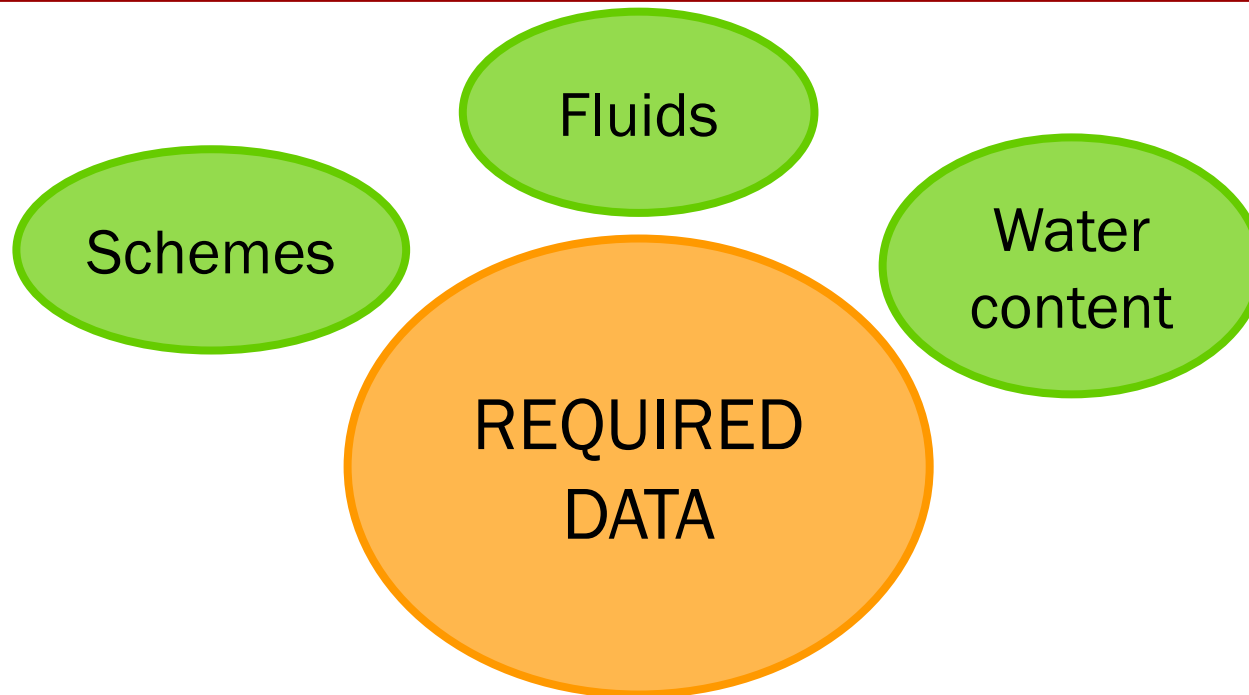
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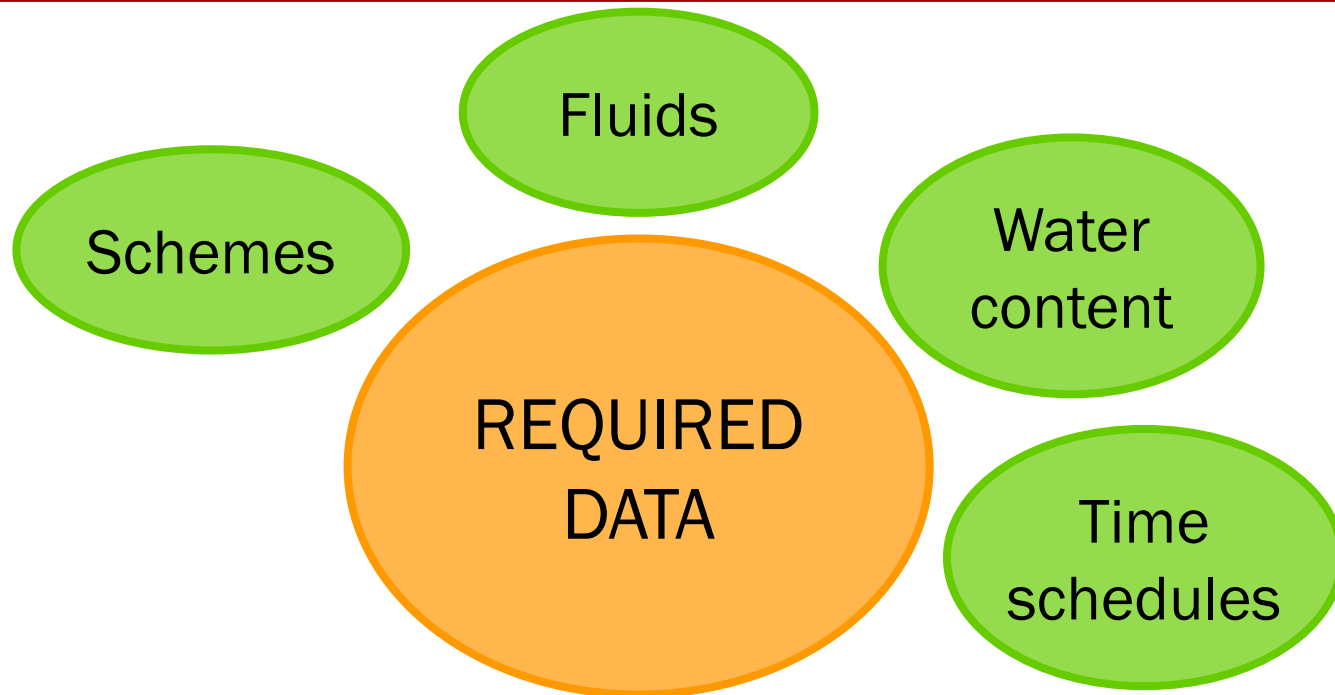
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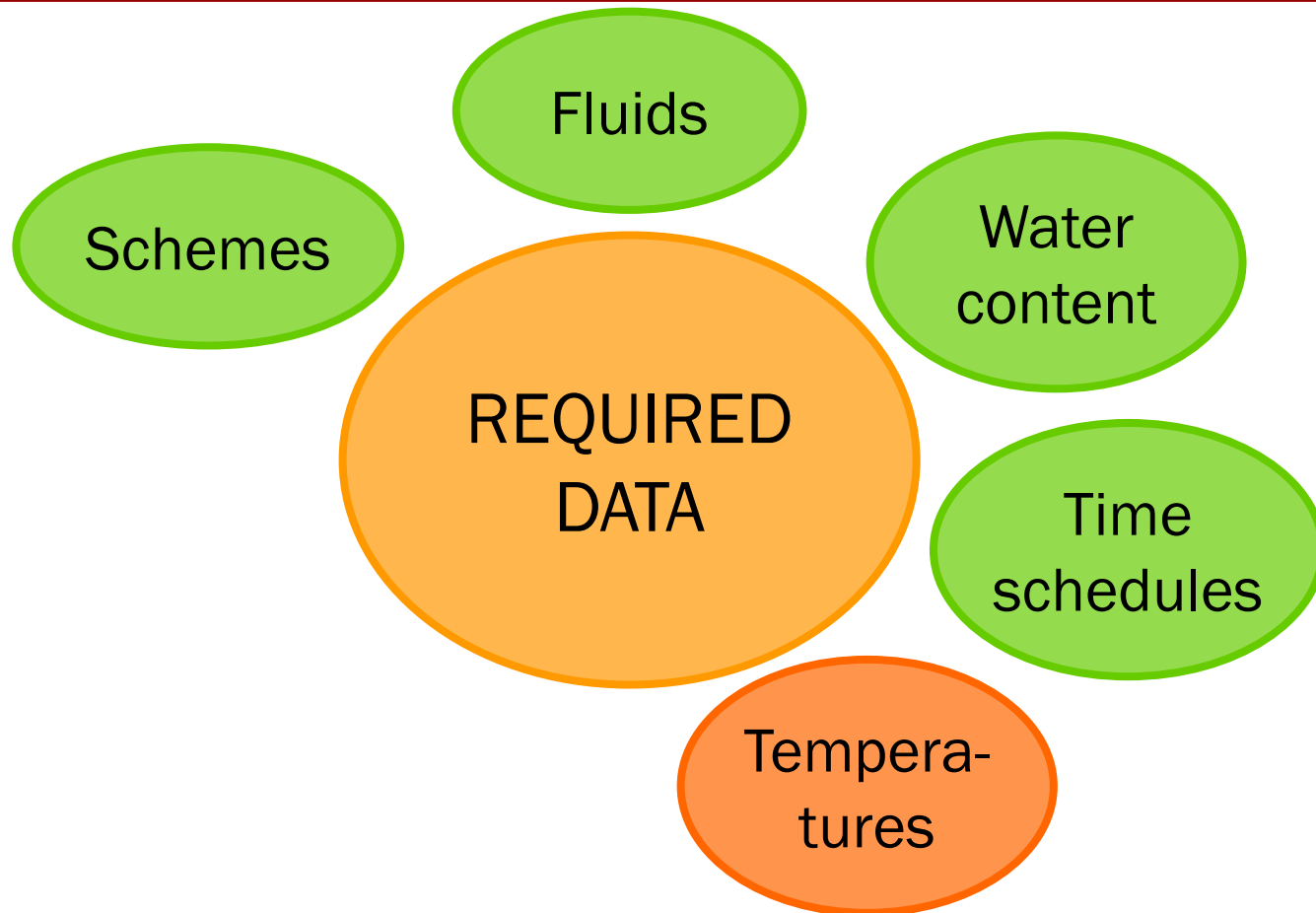
2.1 Which data are we talking about?



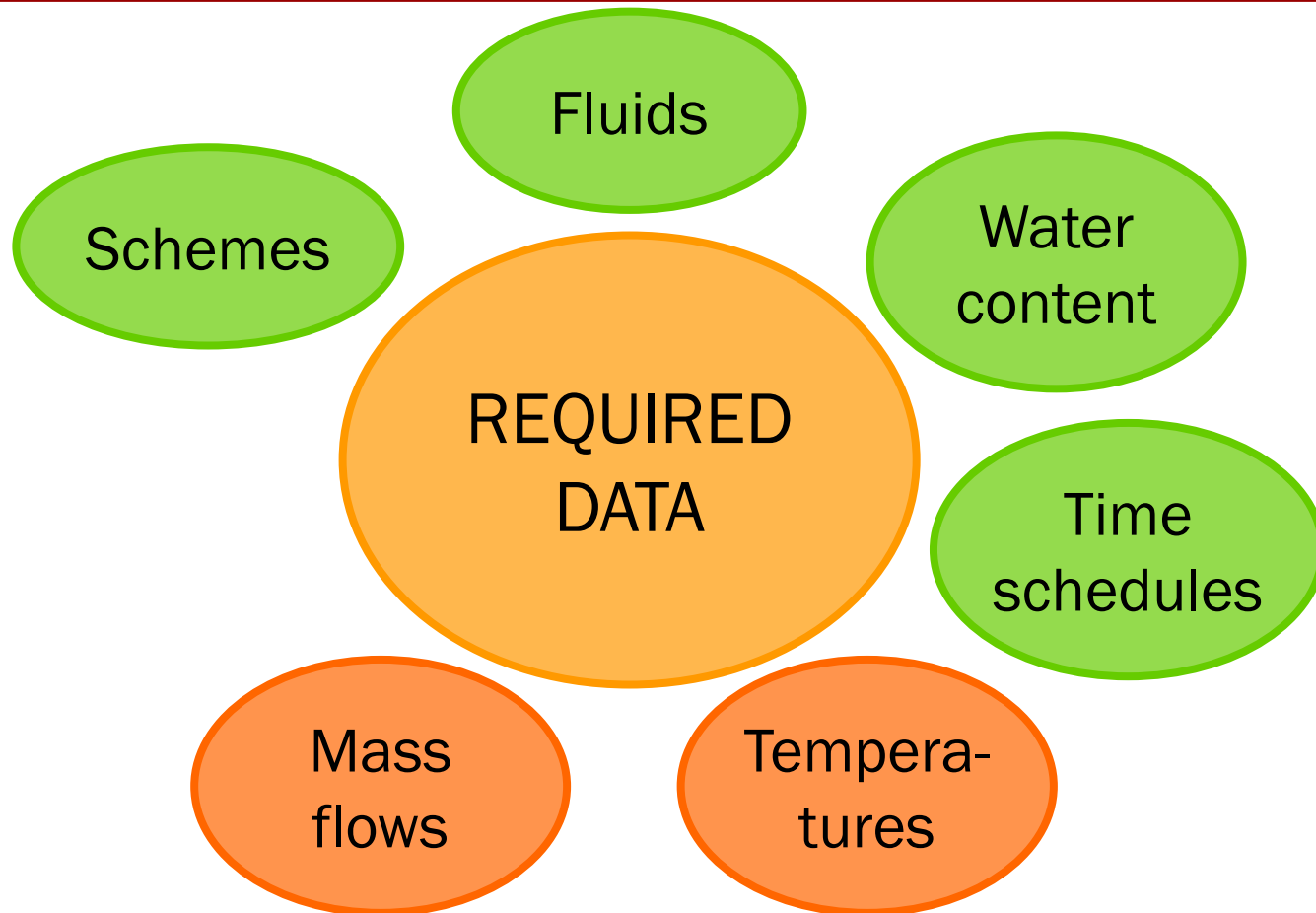
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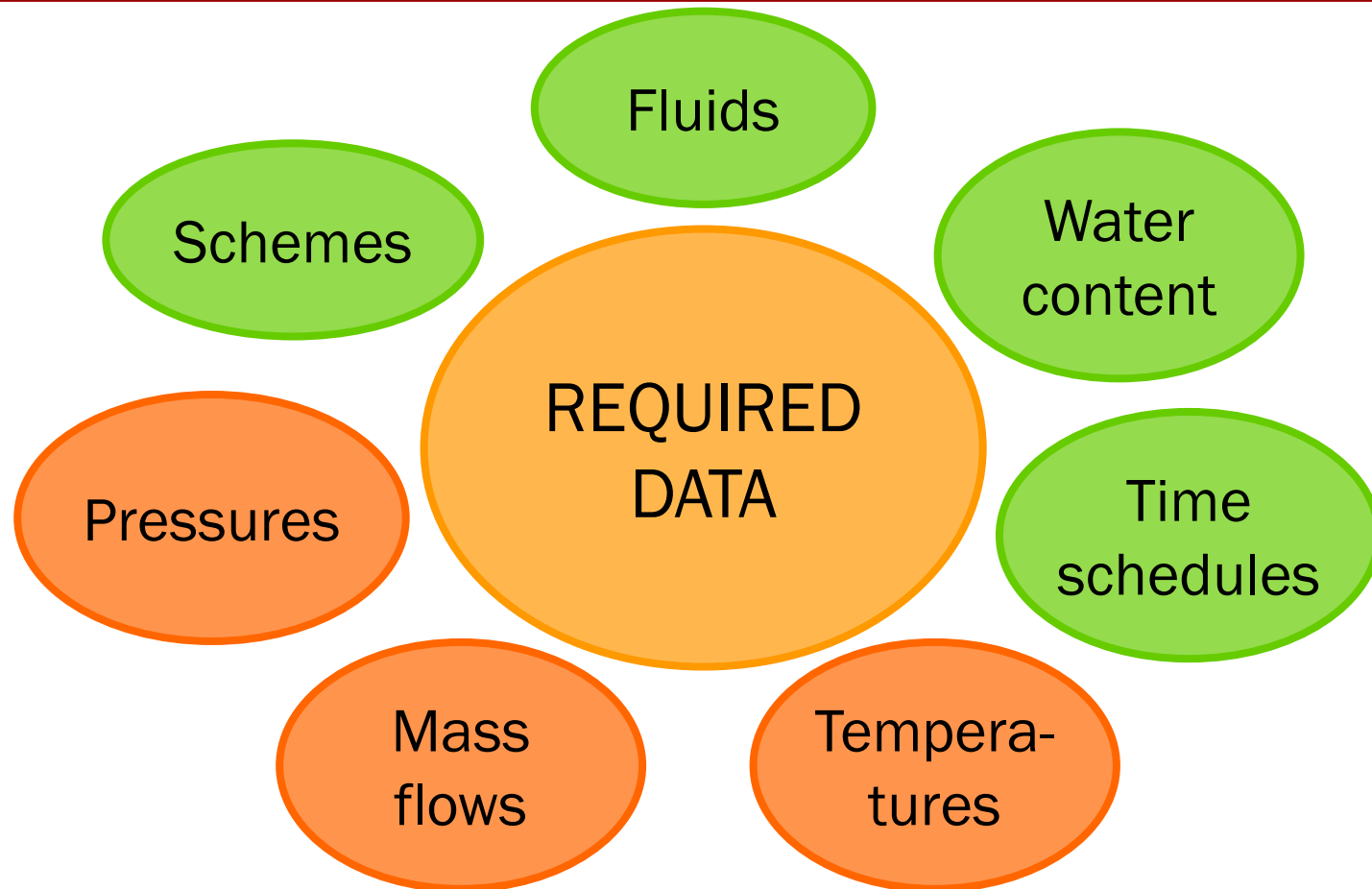
2.1 Which data are we talking about?



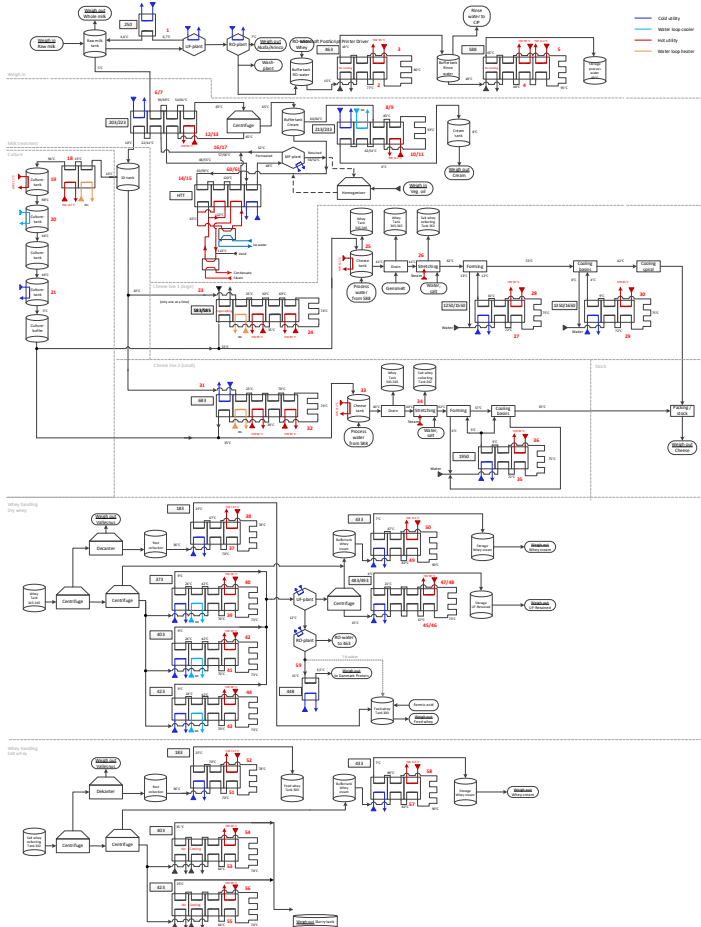
2.1 Which data are we talking about?



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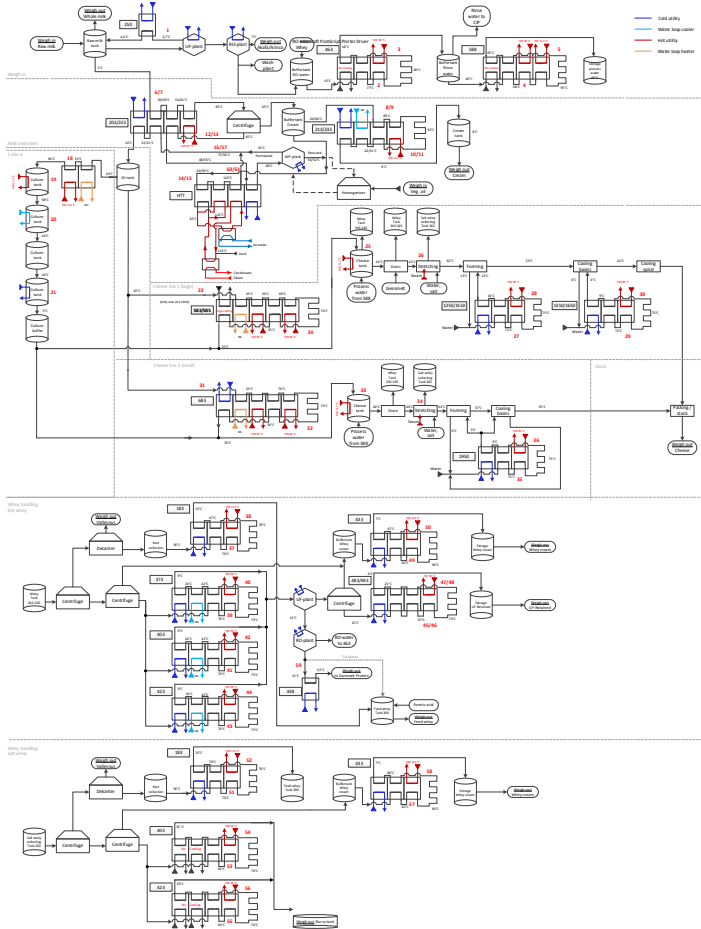
2.2 Data acquisition – measurements involved



Data complexity:

- 33 mass flow rates
- 104 temperatures
- 62 total solids contents

2.2 Data acquisition – measurements involved



Data complexity:

- 33 mass flow rates
- 104 temperatures
- 62 total solids contents



205
measurements

2.2 Data acquisition simplification strategy

Step 1: Rough data acquisition

Step 2: Uncertainty analysis


Step 3: Sensitivity analysis

Step 4: Allowed uncertainty maximization

Step 5: Detailed data acquisition

2.2 Data acquisition simplification strategy

Step 1: Rough data acquisition



No ad-hoc
measurements

Step 2: Uncertainty analysis

Step 3: Sensitivity analysis

Step 4: Allowed uncertainty maximization

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2.2 Data acquisition simplification strategy

Step 1: Rough data acquisition

No ad-hoc
measurements

Step 2: Uncertainty analysis

Acceptable
uncertainty

Step 3: Sensitivity analysis

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2.2 Data acquisition simplification strategy

Step 1: Rough data acquisition

No ad-hoc
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Important
parameters

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2.2 Data acquisition simplification strategy

Step 1: Rough data acquisition

No ad-hoc
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Important
parameters

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Required
precision

Step 5: Detailed data acquisition

2.3 Data acquisition simplification strategy

Step 1: Rough data acquisition



No ad-hoc
measurements

205 process values taken from:

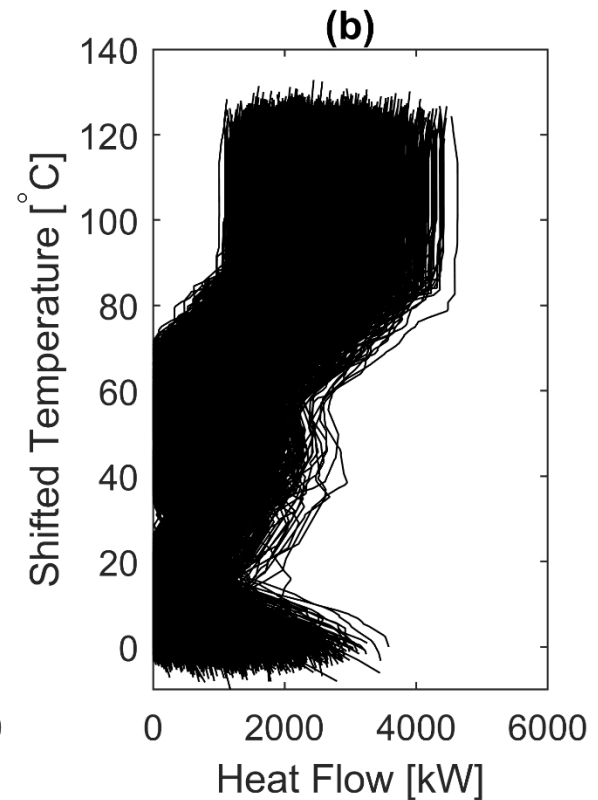
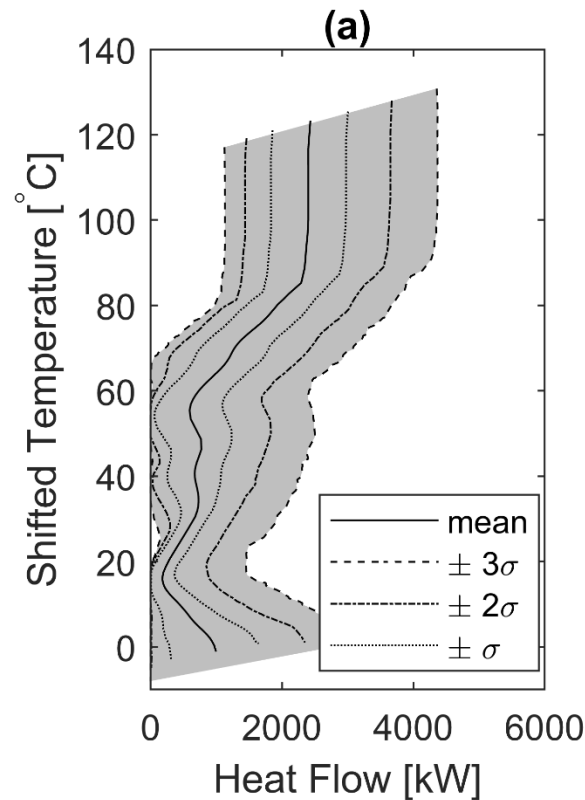
- Existing measurement system
- Expert review
- Annual production and consumption records

2.4 Data acquisition simplification strategy

Step 2: Uncertainty analysis



High uncertainty
assigned to the
rough data



2.5 Data acquisition simplification strategy

Step 3: Sensitivity analysis



Important
parameters

Of the 205 required values...

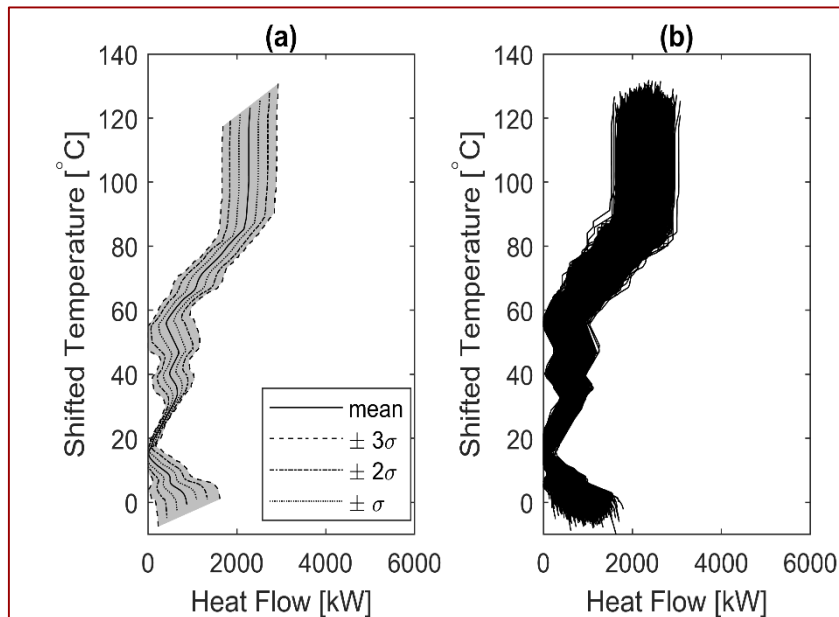
...**only 44 need precision** in their definition!

2.6 Data acquisition simplification strategy

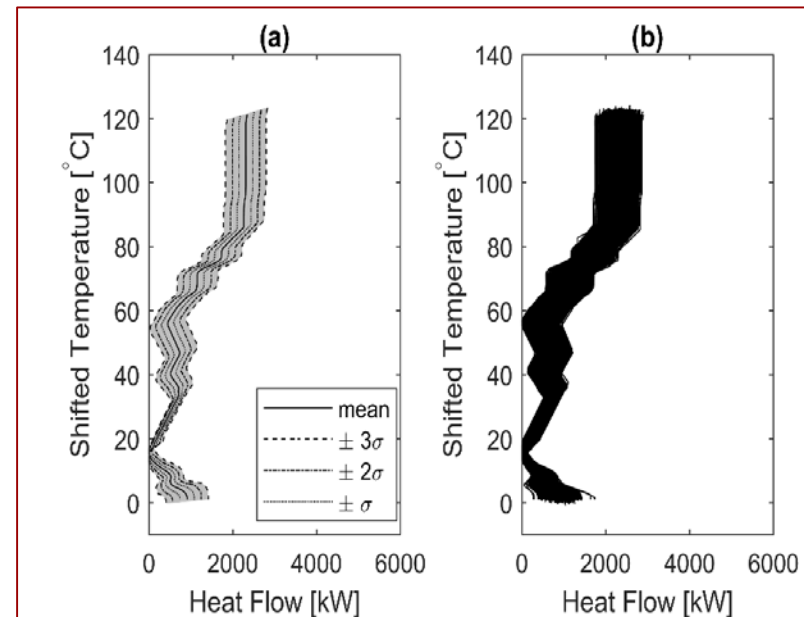
Step 4: Allowed uncertainty maximization

Required precision

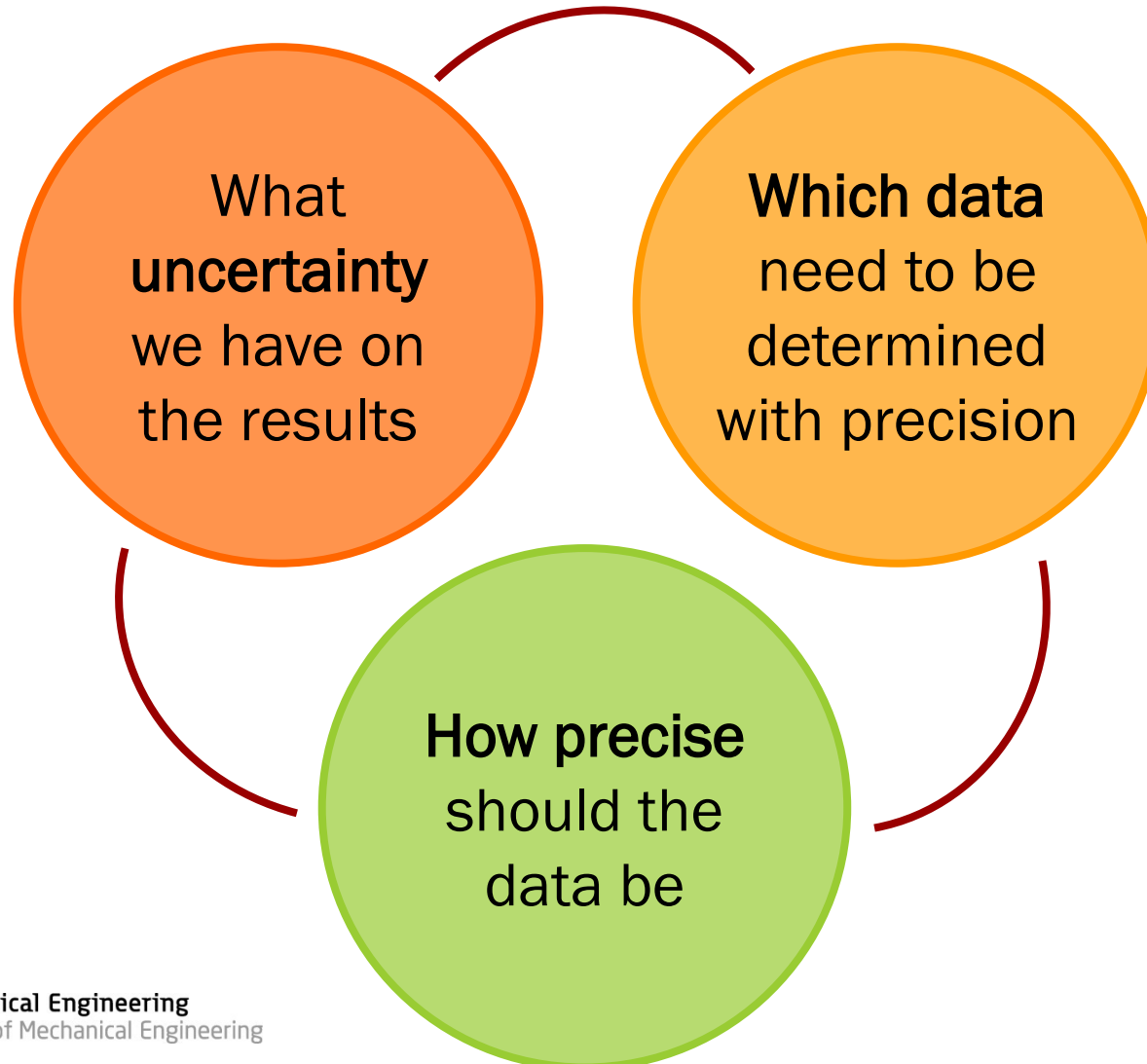
44 parameters



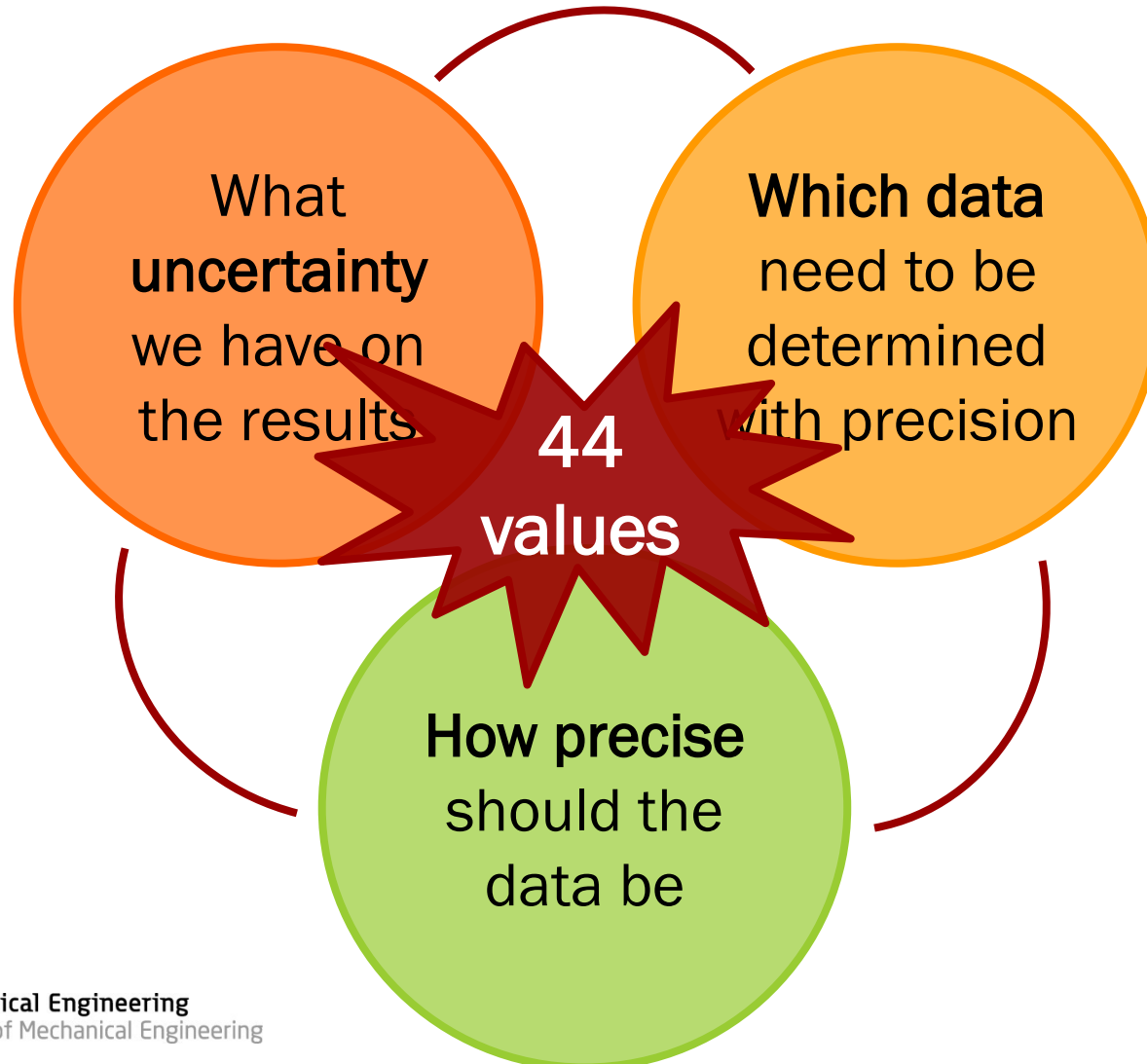
205 parameters



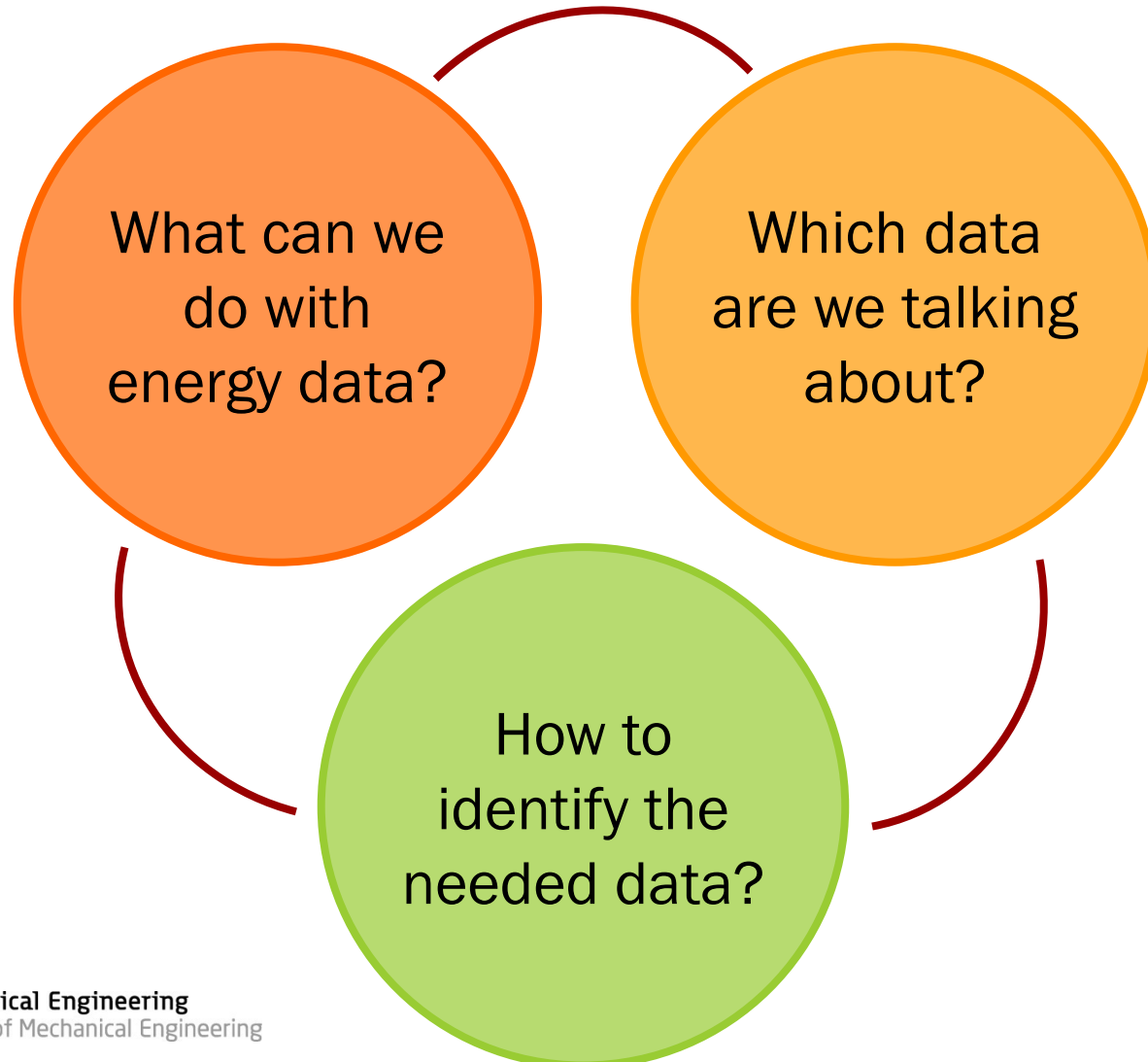
2.7 Data acquisition simplification strategy



2.7 Data acquisition simplification strategy



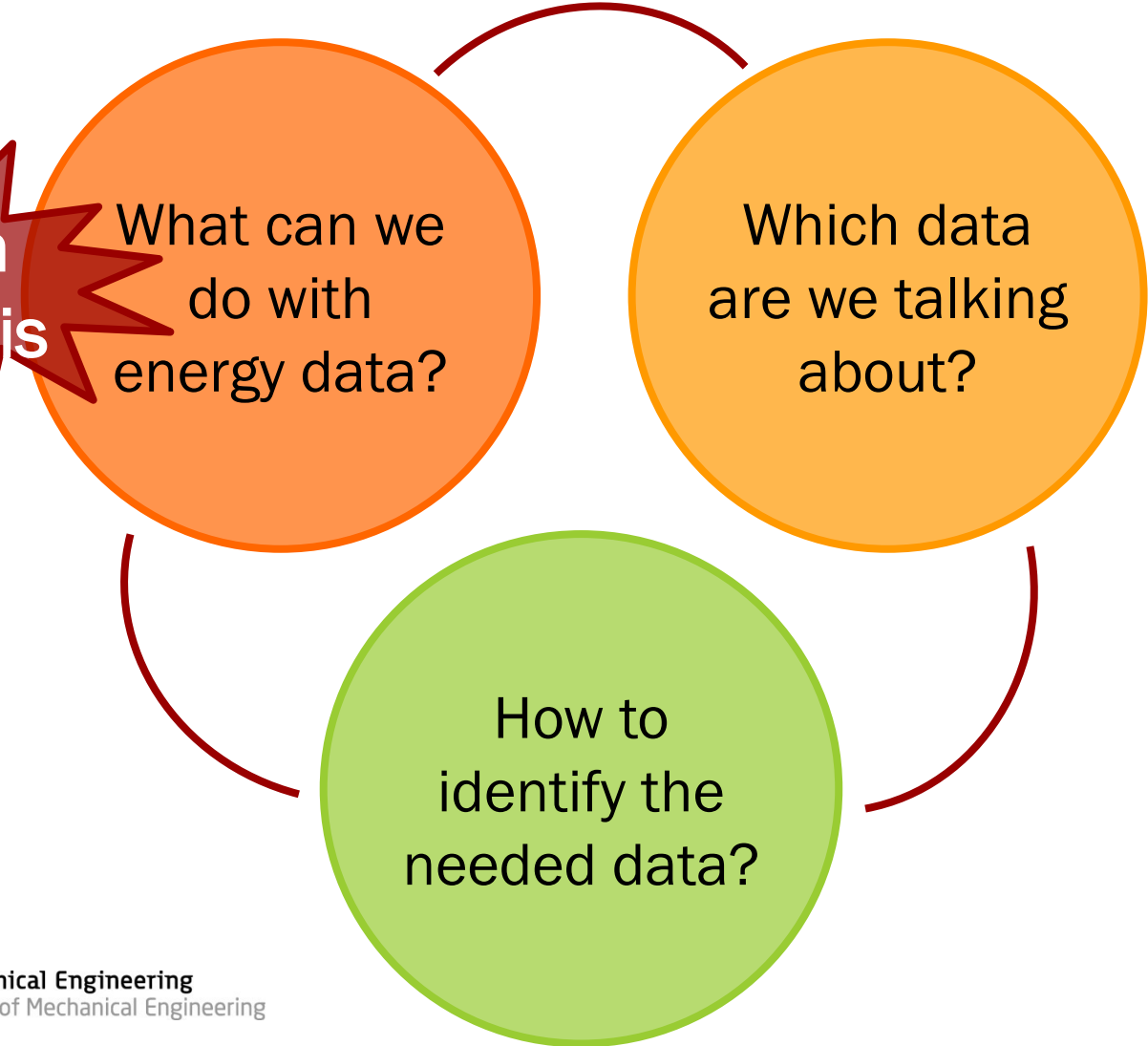
Main questions



Main questions



Pinch Analysis

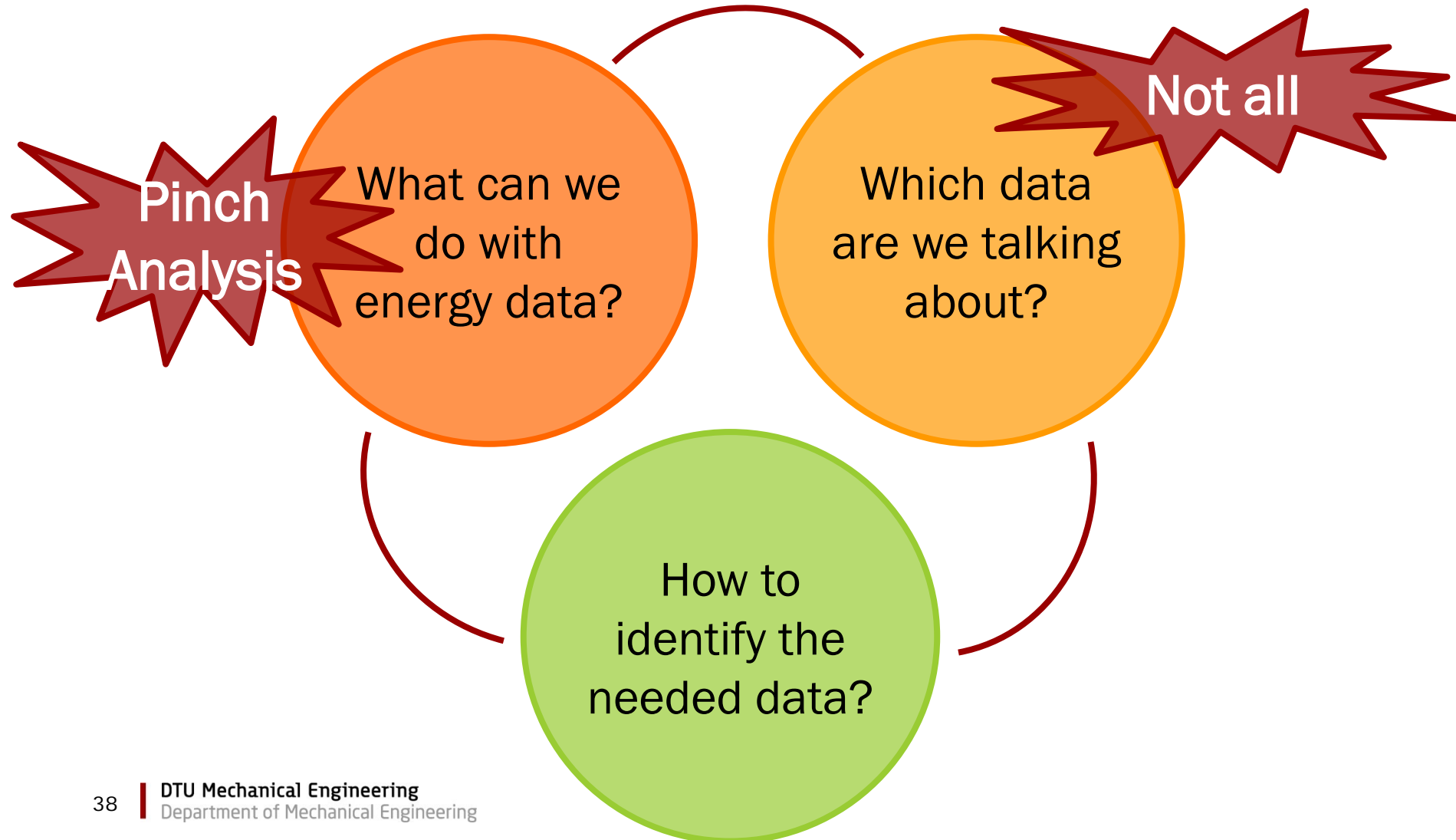


What can we do with energy data?

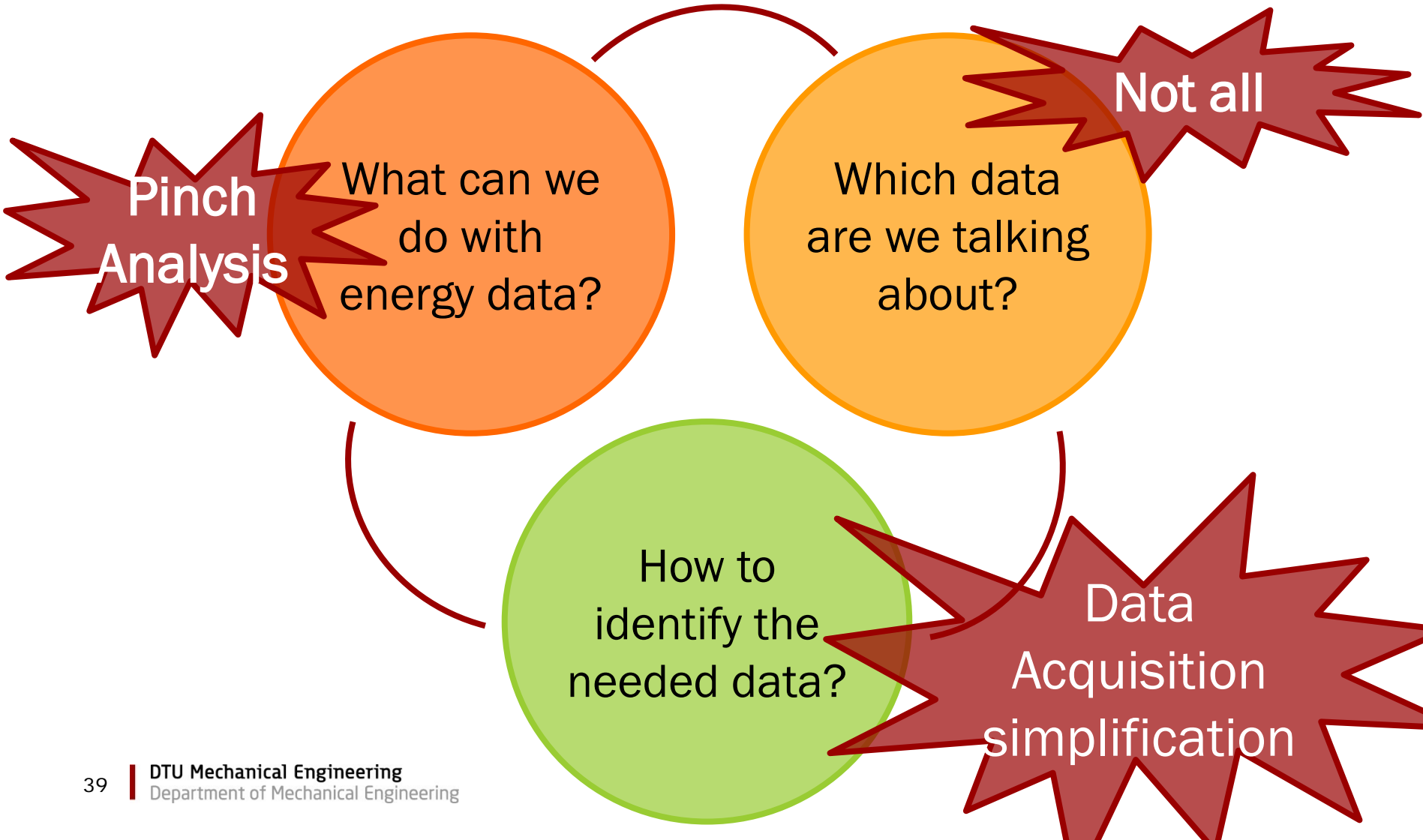
Which data are we talking about?

How to identify the needed data?

Main questions



Main questions



Energy data

What for?

PhD student

Riccardo Bergamini

QUESTIONS?

