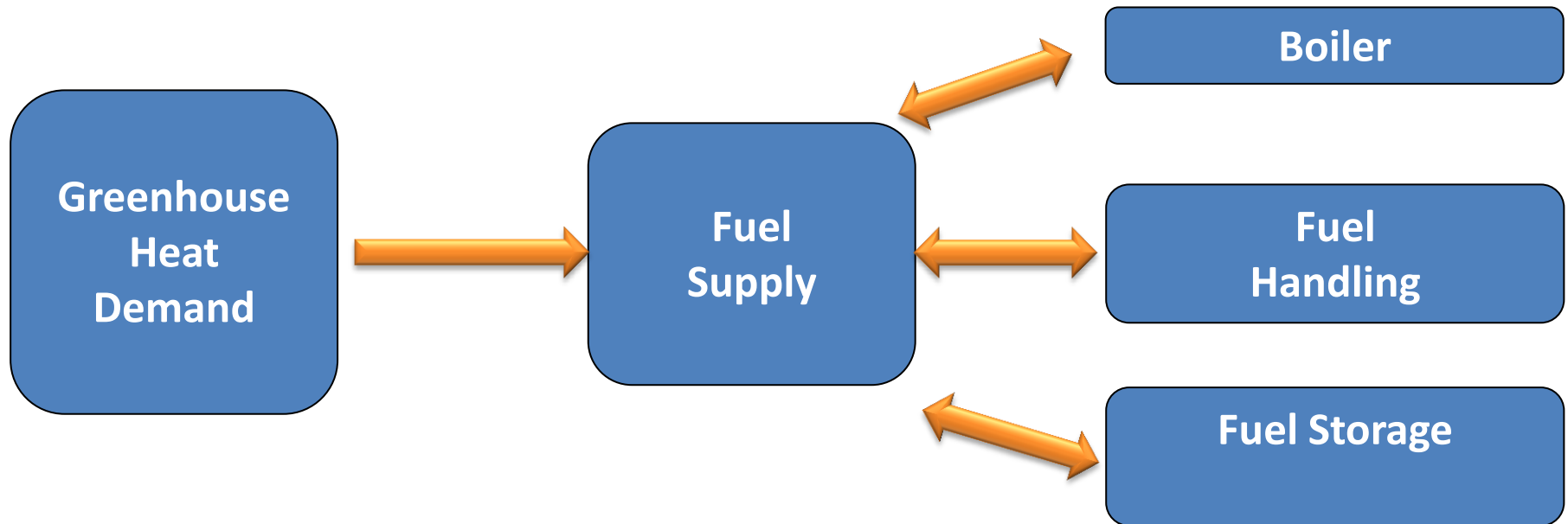


# Biomass Heating for Horticulture

Laying the foundations of a  
successful project



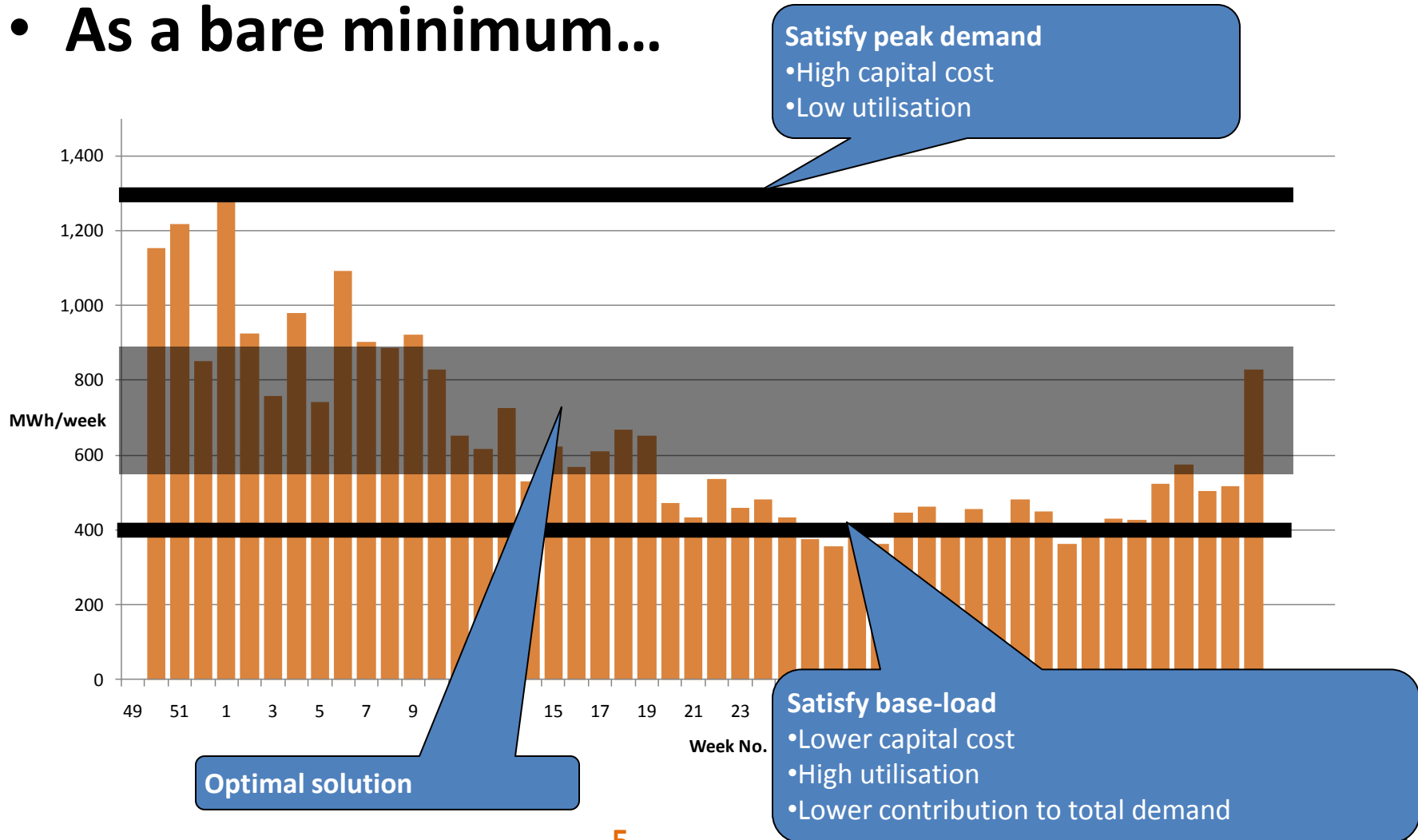
- **Your starting point could be**
  - I use 7,000,000 kWh of natural gas
  - So I need 2,100 tonnes of wood chip



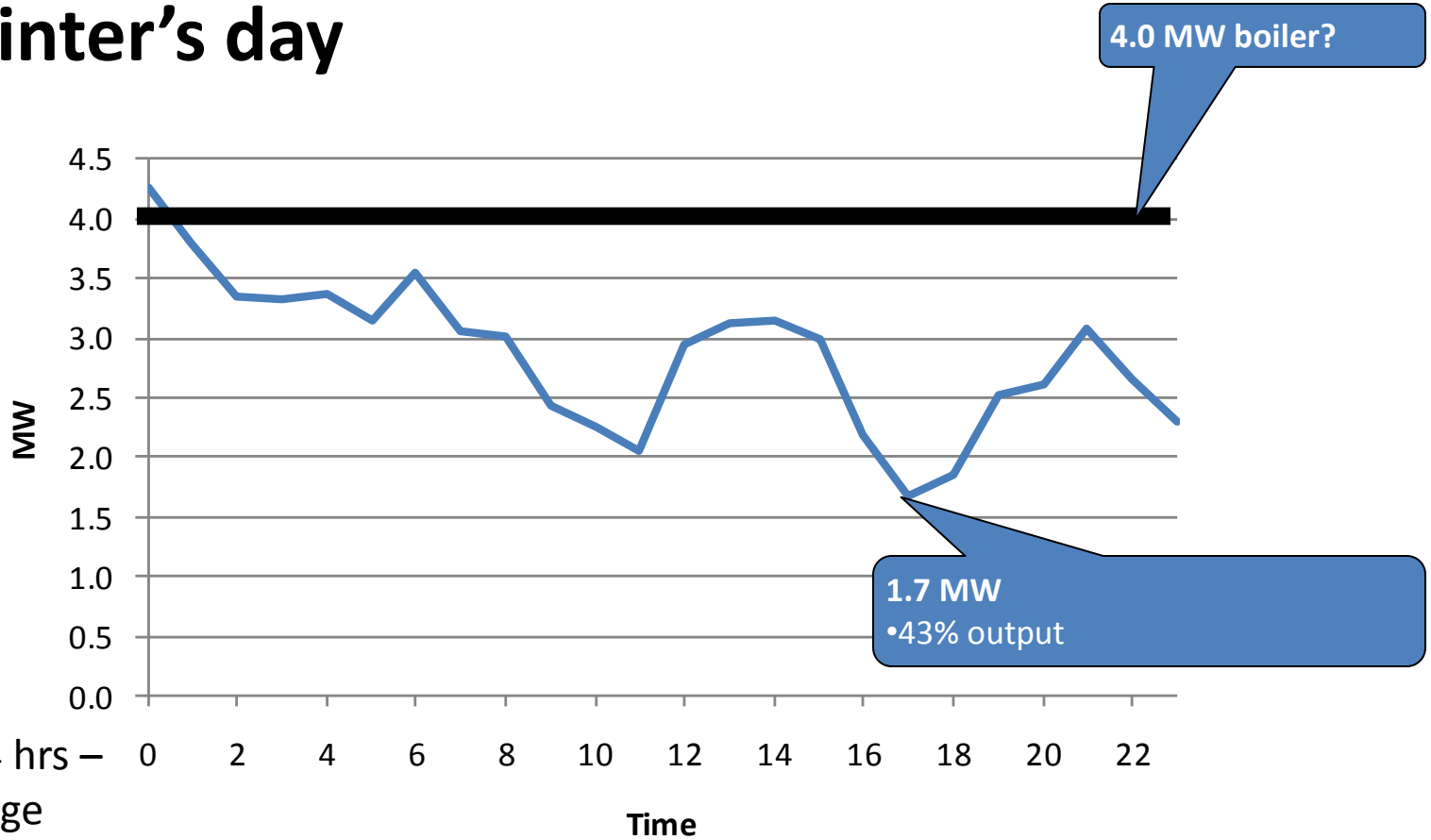
- **Another starting point could be**
  - My current boilers are 5 MW
  - So I need a 5 MW biomass boiler



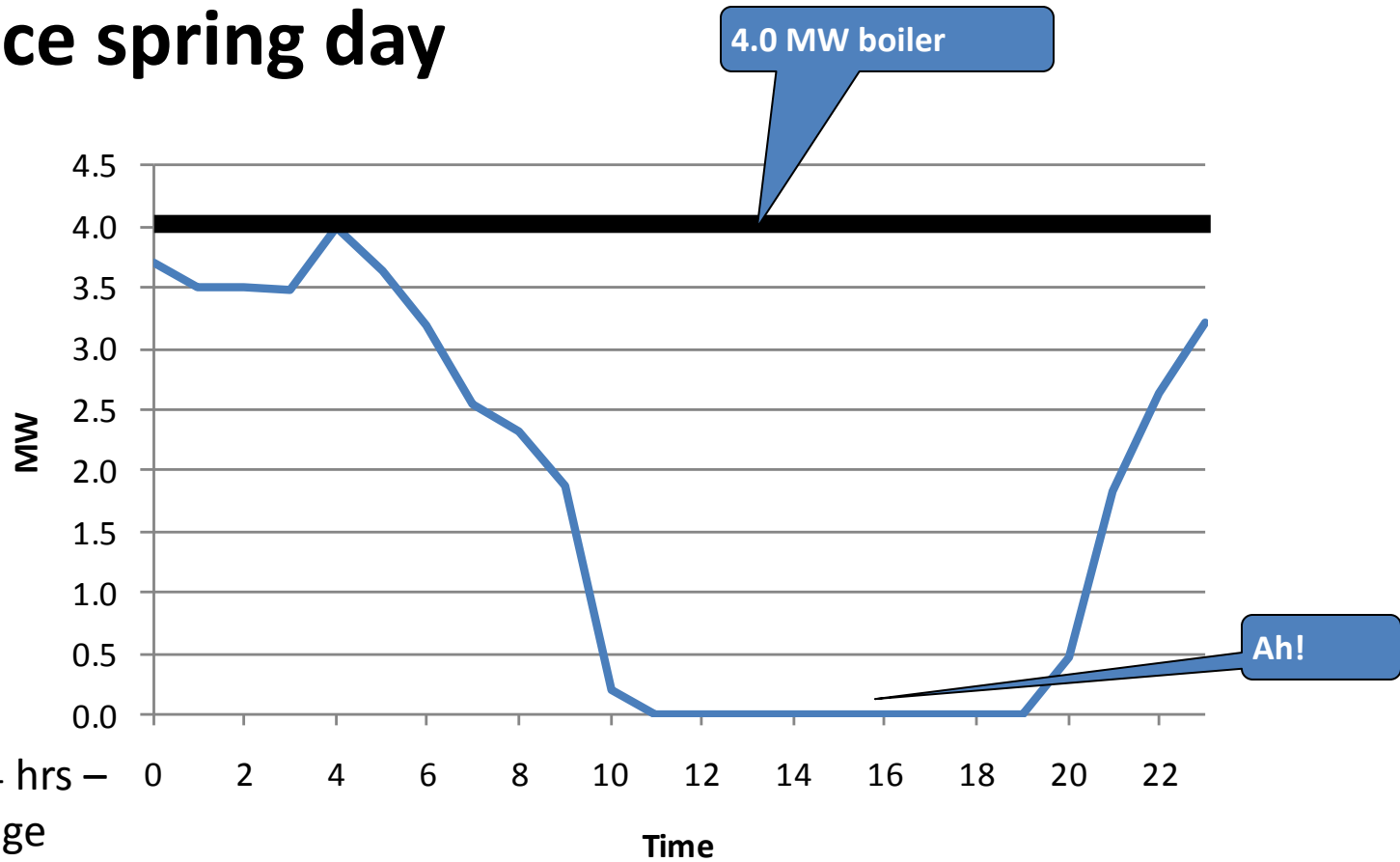
- As a bare minimum...



- A winter's day**



- **A nice spring day**



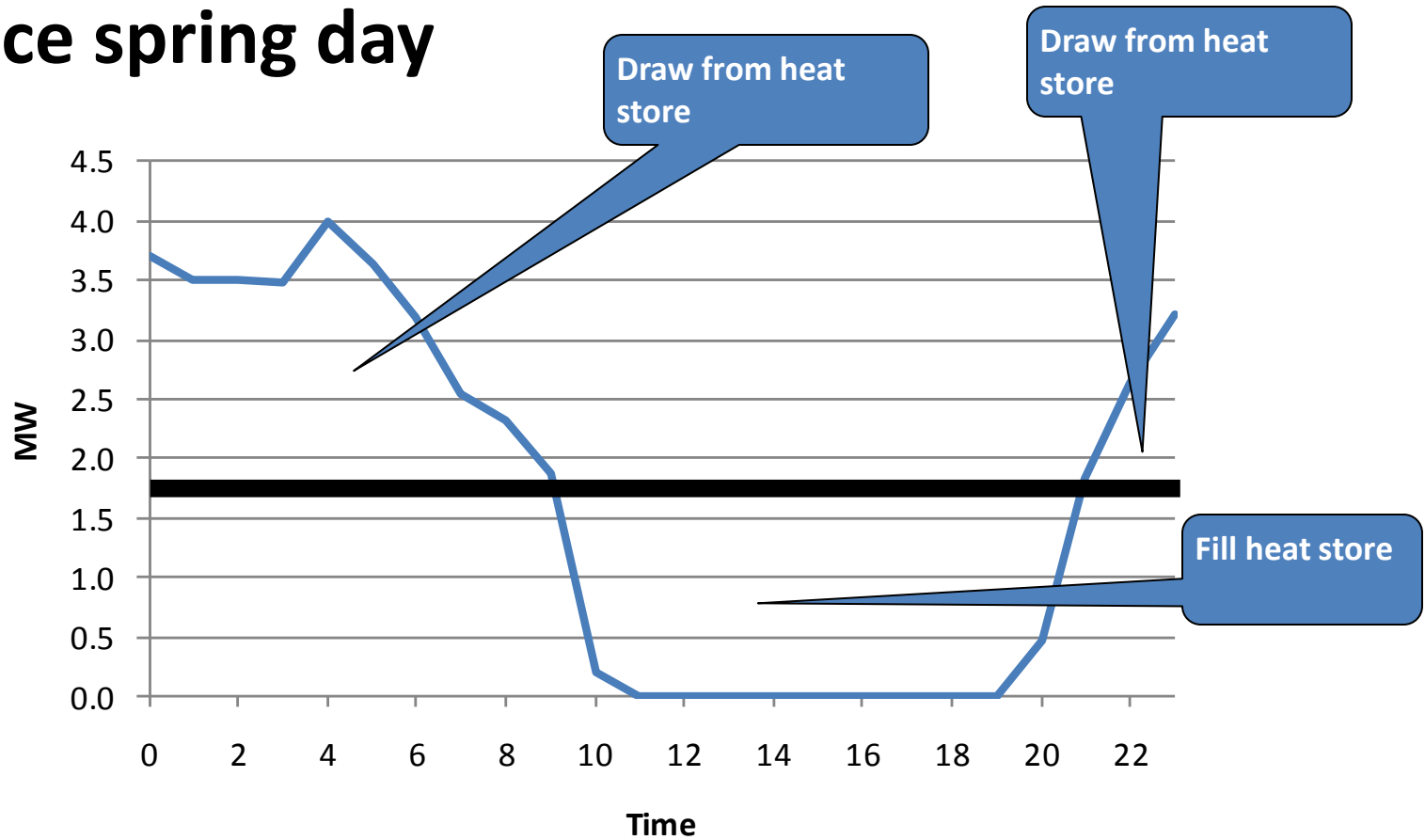
50 MWh in 24 hrs –  
1.7 MW average

- **Max. demand**
  - 5.0 MW
- **Winter's day**
  - Total heat demand 69 MWh
  - 2.9 MW boiler 24 hrs
- **Spring day:**
  - Total heat demand 40 MWh
  - 1.7 MW boiler 24 hrs
- **Heat stores are the key to:**
  - Optimal boiler sizing
  - Pain-free operation





- **A nice spring day**



- **Rules of thumb**

- 200 m<sup>3</sup> store
- Maximum temperature = 90°C
- Minimum temperature = 45°C
- $\text{MWh} = \frac{\text{Size (m}^3) \times \text{Tdiff} \times 4.18}{3,600}$
- Storage capacity = 10 MWh



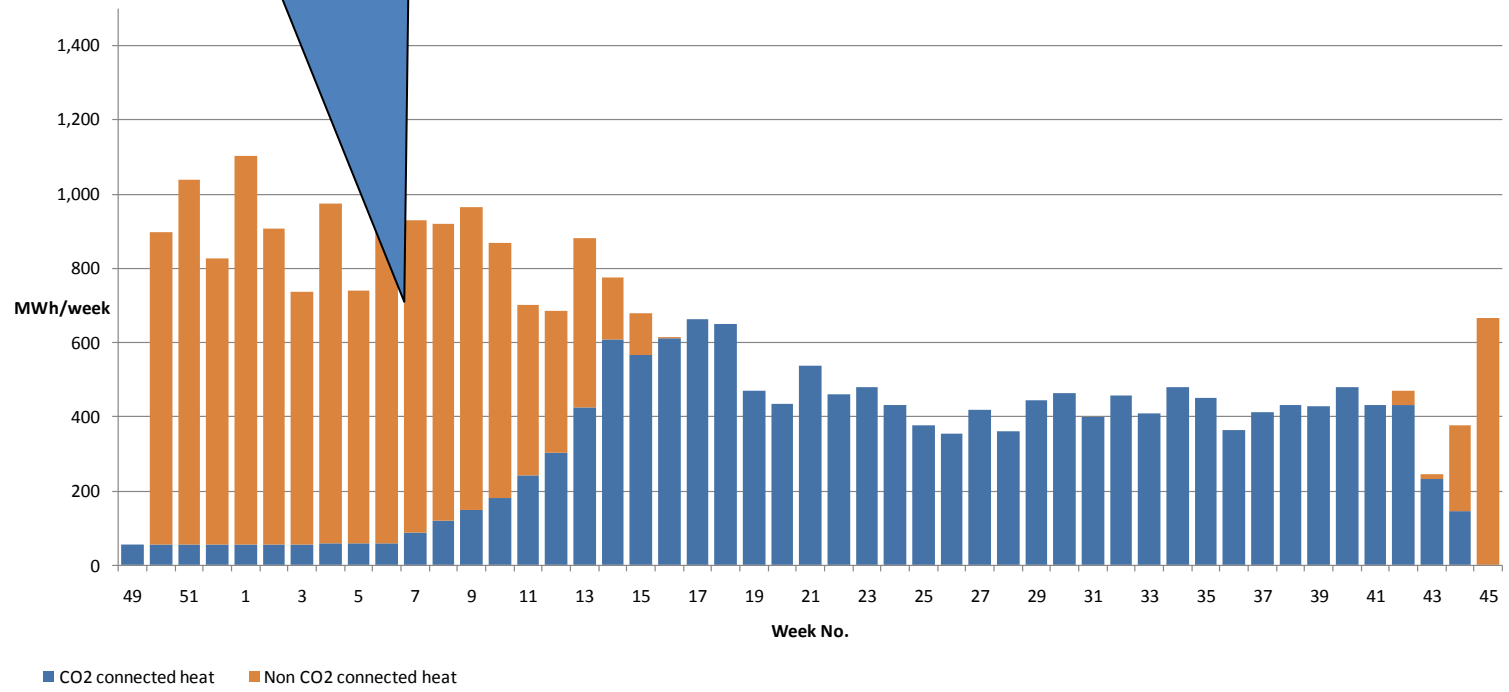
- **So, what's the answer?**
  - Site specific
  - Look at available data and do feasibility
- **Optimum boiler size:**
  - $\frac{1}{3}$  of peak heat demand
  - 1 MW for RHI!
- **Heat store size:**
  - 50 m<sup>3</sup>/Ha is plenty
  - Practical limit 150 m<sup>3</sup>/MW boiler
  - Satisfy 80 – 90% of annual heat demand (ignoring CO<sub>2</sub> enrichment)



- Current non-natural gas heat sources
  - Do not provide CO<sub>2</sub> for greenhouse enrichment
  - As a rule, pure CO<sub>2</sub> is too expensive

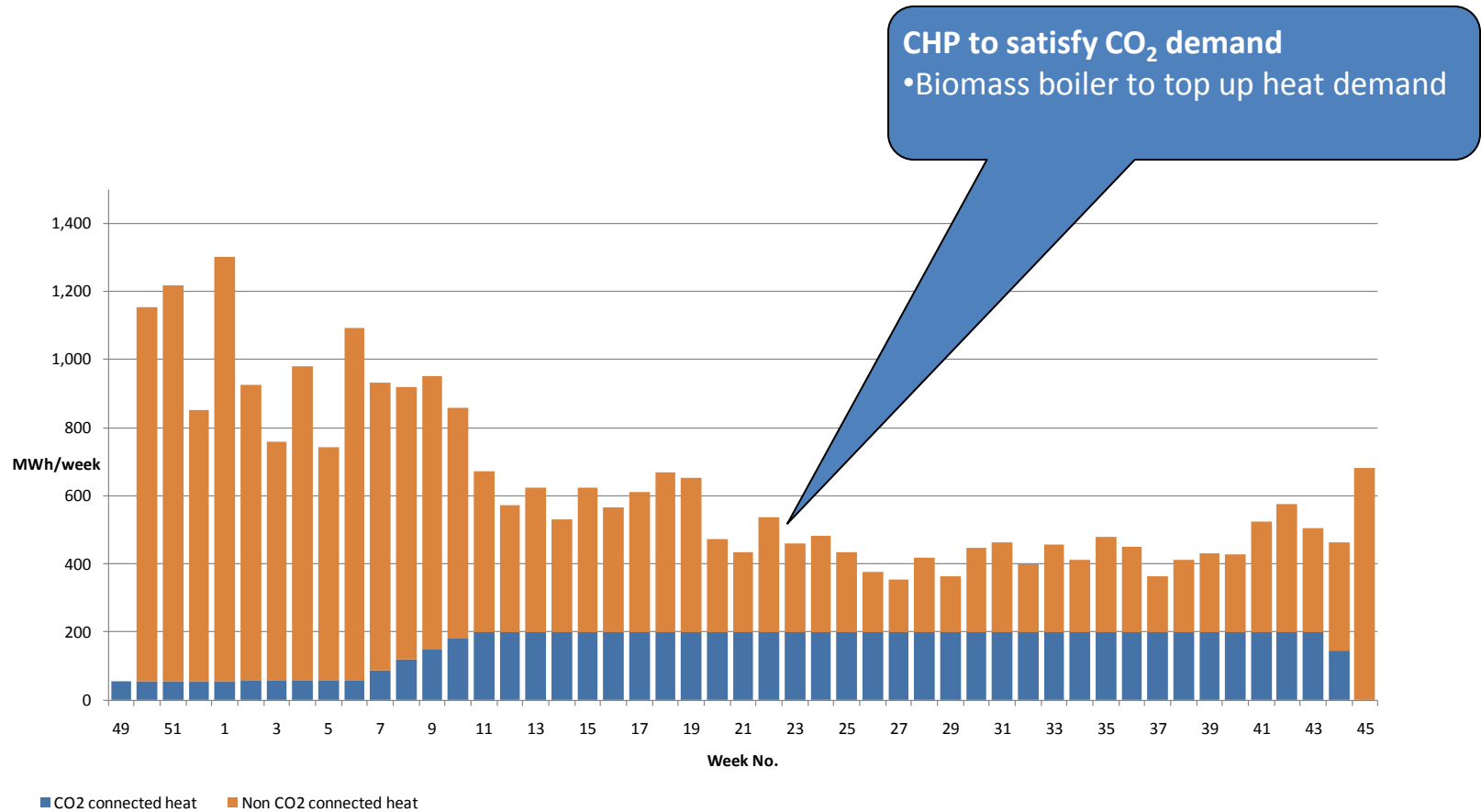


**Potential for biomass heat**  
• Reduced to around 35%



- **CHP**
  - Almost 2 x CO<sub>2</sub> per kWh of heat compared to a boiler





**CHP to satisfy CO<sub>2</sub> demand**  
• Biomass boiler to top up heat demand

	Fossil fuel	100% biomass	Optimised (no CO <sub>2</sub> req't)	Optimised for RHI (with CO <sub>2</sub> req't)
Boiler size	5 MW	5 MW	1.7 MW	1 MW
Total fuel used (MWh)	7,000			
Heat store size (m <sup>3</sup> )	n.a.	50	150	125
% from biomass	0	100%	80%	40%
Tonnes of wood chip p.a.	0	2,100	1,700	850



- **Heat demand**

- Impacts on every area of a biomass boiler installation
- The more data the better (within reason)
  - Read your meters every week
  - Better still, store / export data from your greenhouse computer
- Maximise financial benefits
- Minimise operational problems

- **Do not use cheap heat as an excuse for wasting heat**
  - Energy efficient greenhouse will have lower peak heating demands
  - Smaller biomass boiler required
  - Less capital
  - Faster payback

# Any questions?