

# Smart Energiforbrug

Rune Grønborg Junker (DTU Compute)



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- Setup



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- Setup
- Flexibility Function



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- Setup
- Flexibility Function
- Price Generation

# Setup



# Setup



- Swimming pools



# Setup



- Swimming pools
- Electrical heating



# Setup

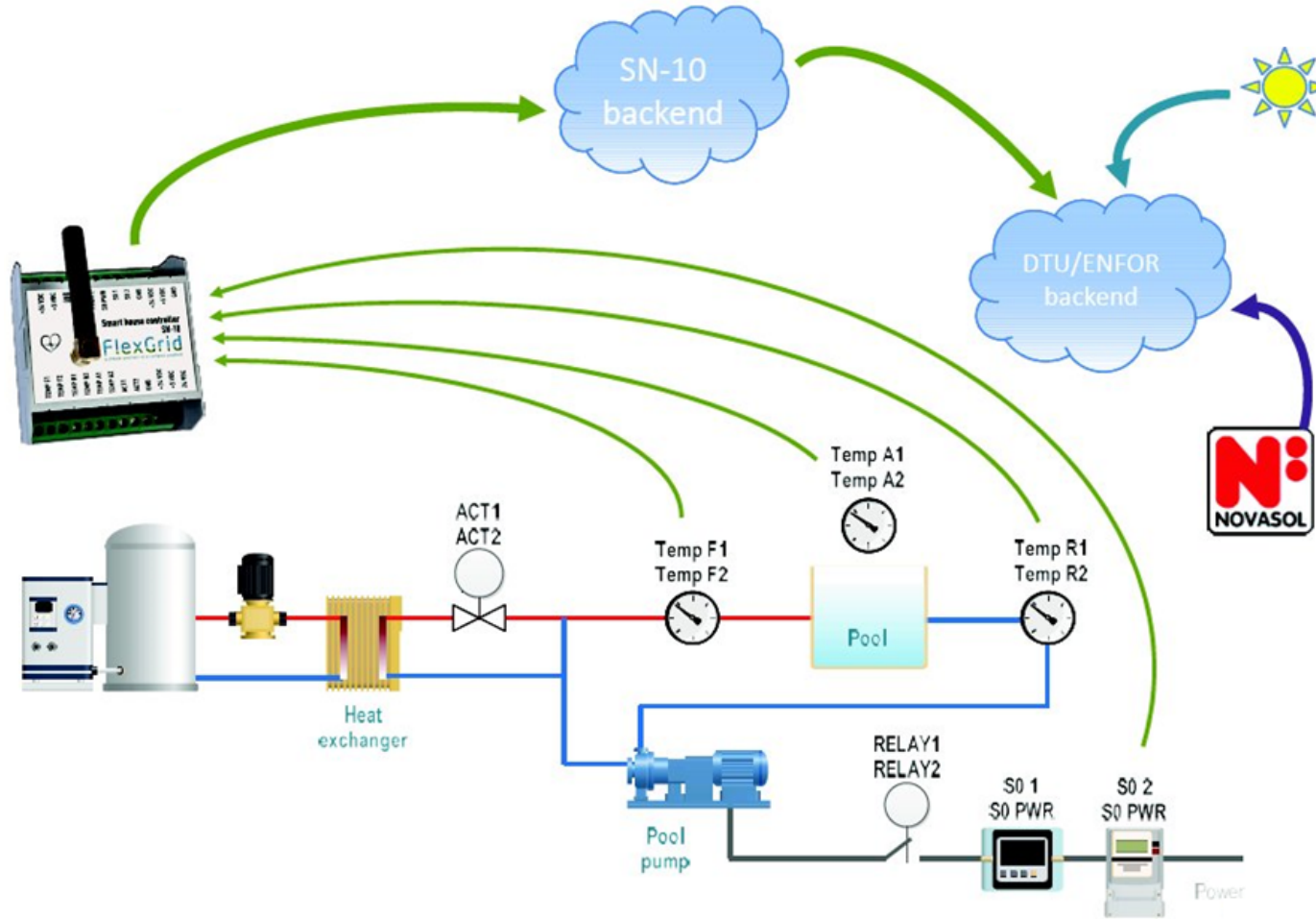


- Swimming pools
- Electrical heating
- Smart price-based control of heating





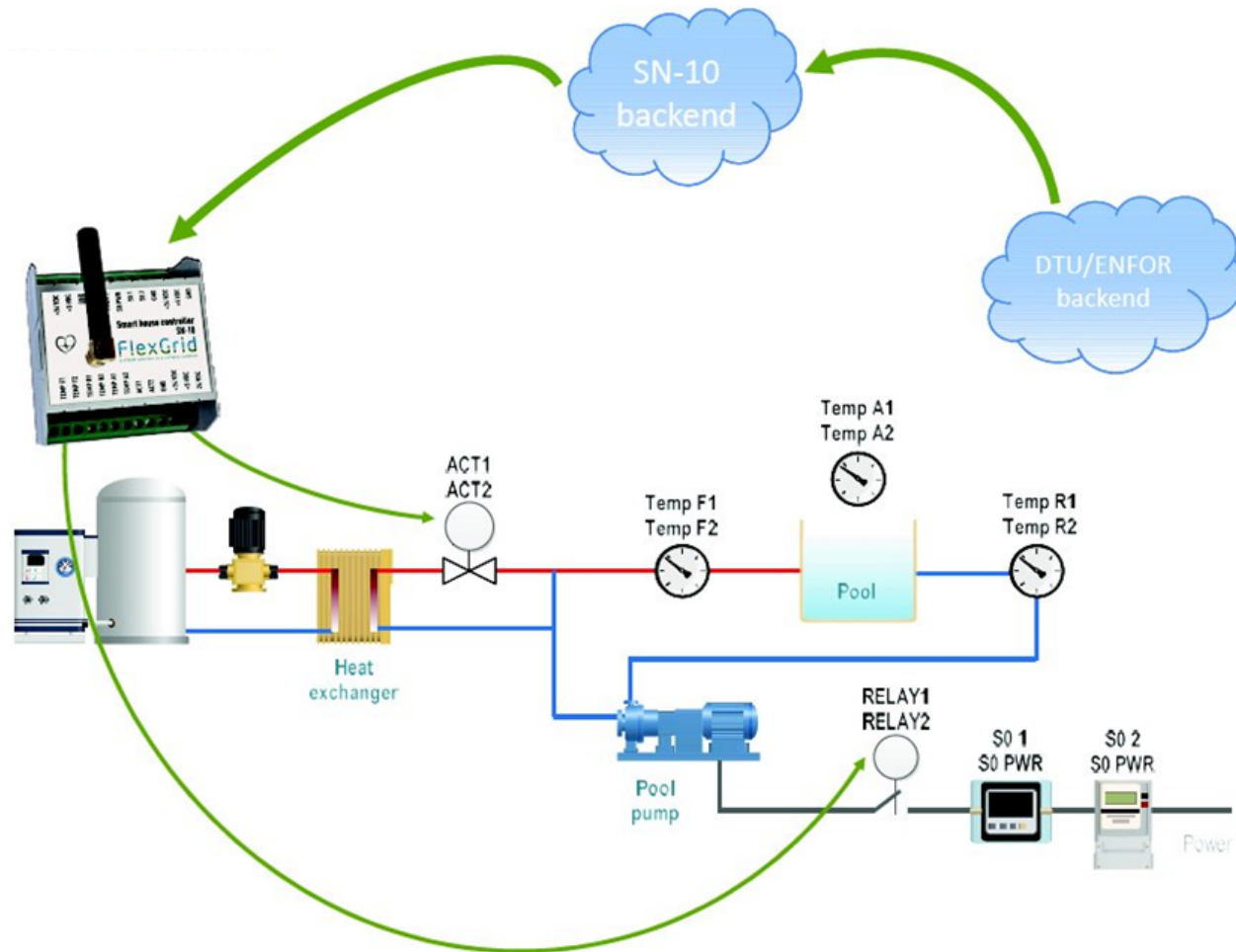
# Setup



CITIES

SmartNet

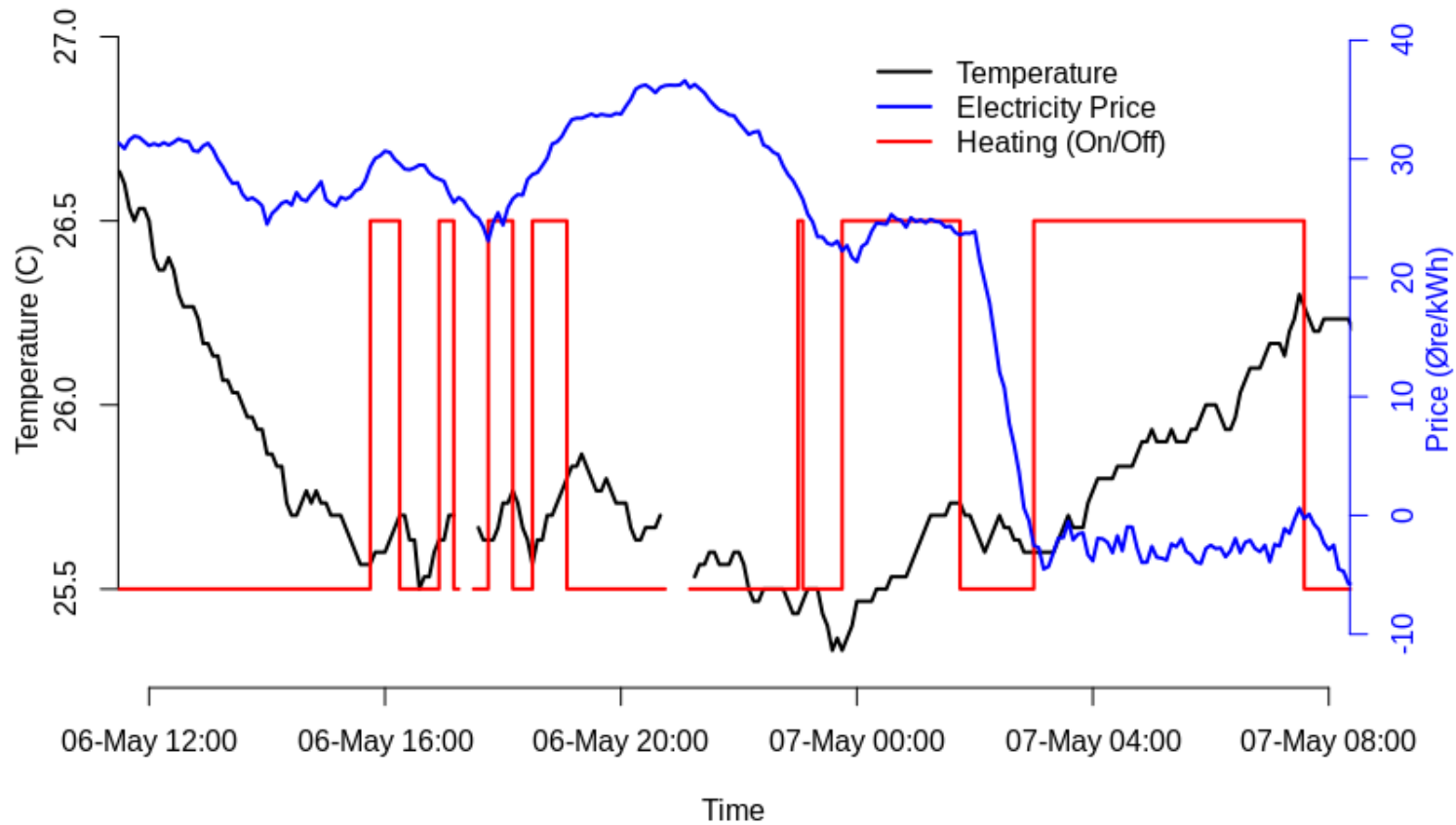
# Setup



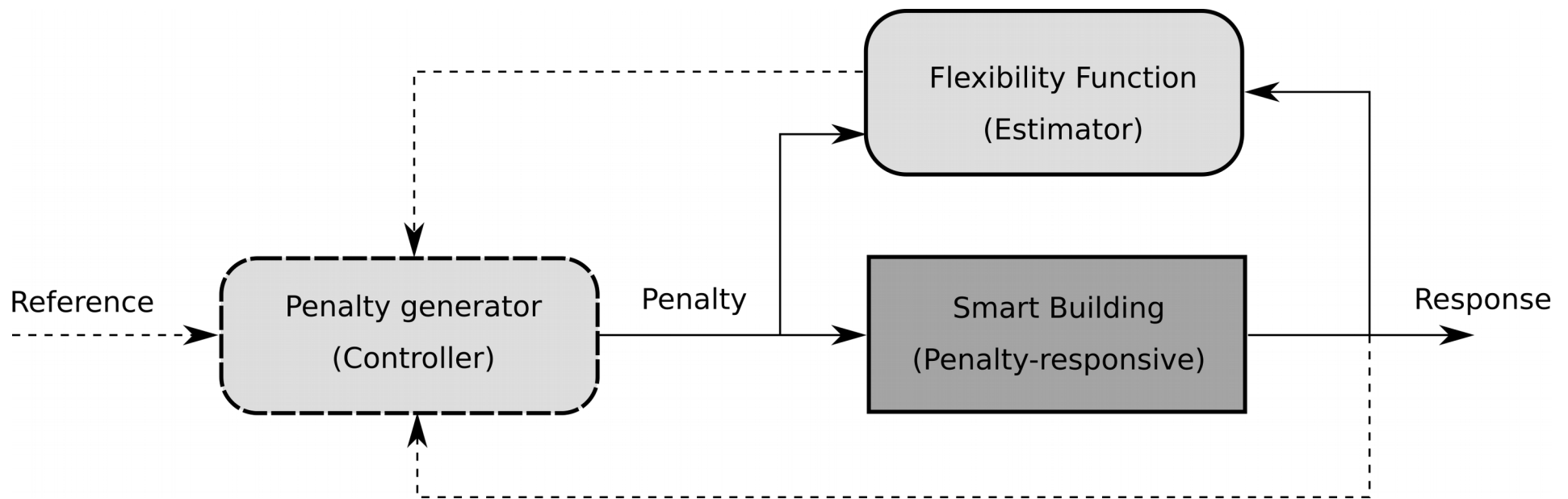
CITIES

SmartNet

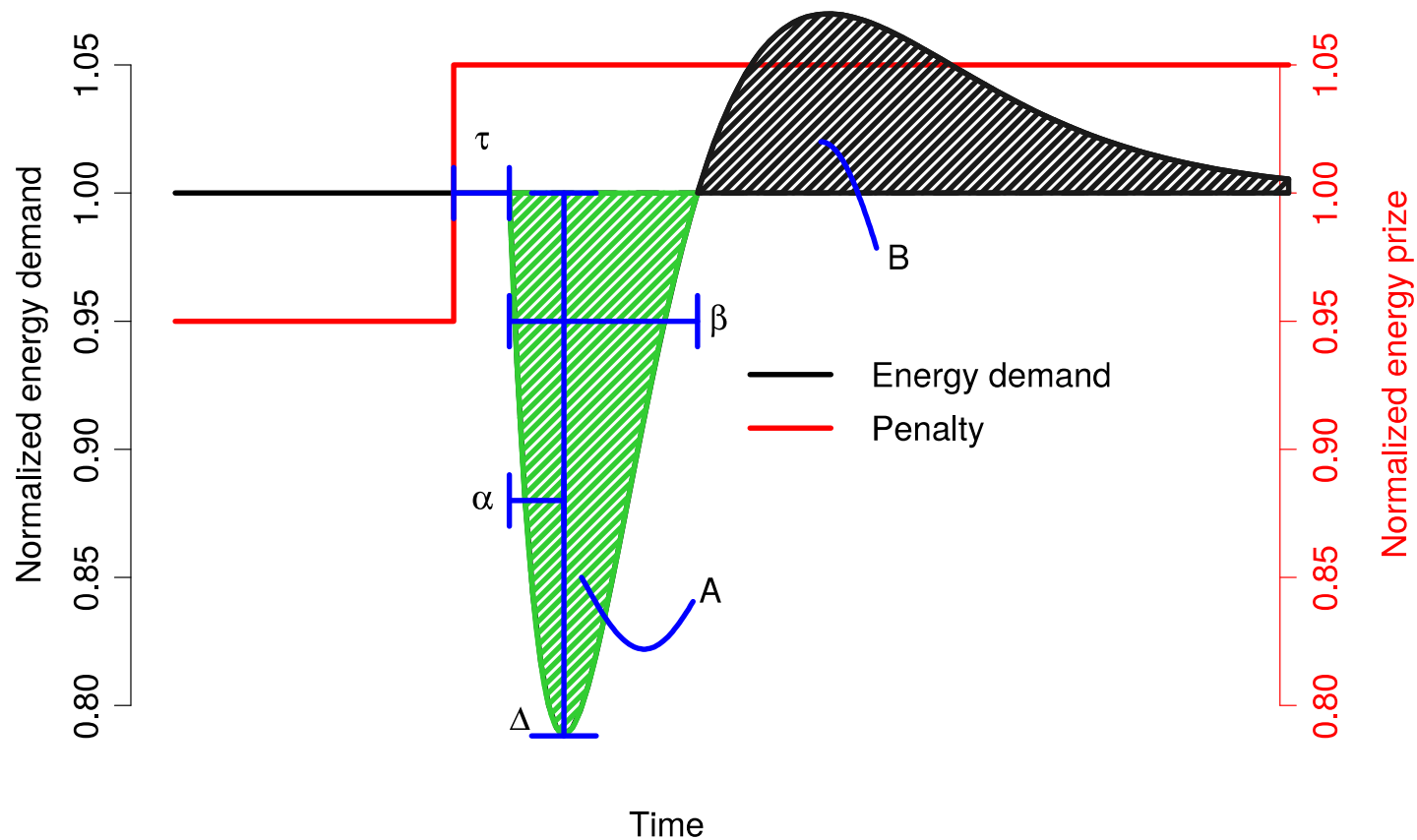
# Setup



# Estimating Flexibility Function



# Flexibility Function



# Price generation



$$\operatorname{argmin}_{\lambda} (L(\lambda) - \operatorname{ref}_{\text{load}})^2$$



# Price generation

$$\begin{aligned}
 & \underset{u}{\operatorname{argmin}} \sum_{k=0}^N \lambda_{t+k} u_{t+k} \\
 & \text{s.t. } \forall s \\
 & \text{Temp}(u) \in \text{comfort}.
 \end{aligned}$$

$\lambda$

$$\underset{\lambda}{\operatorname{argmin}} (L(\lambda) - \text{ref}_{\text{load}})^2$$

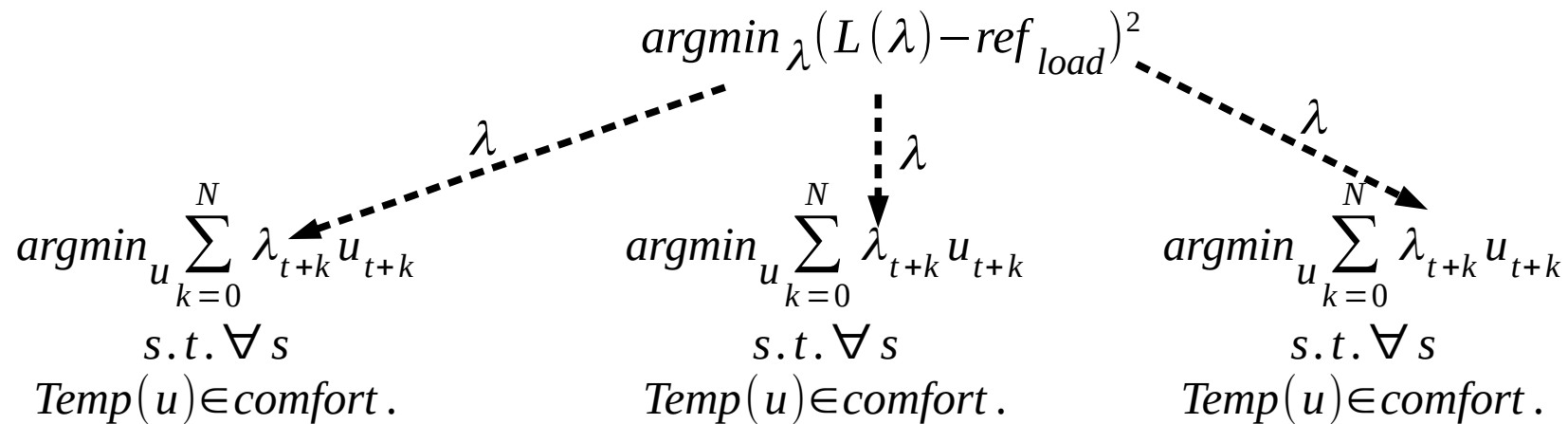
# Price generation

$$\begin{array}{l}
 \underset{\lambda}{\operatorname{argmin}} (L(\lambda) - \operatorname{ref}_{\text{load}})^2 \\
 \downarrow \lambda \\
 \underset{u}{\operatorname{argmin}} \sum_{k=0}^N \lambda_{t+k} u_{t+k} \\
 \text{s.t. } \forall s \\
 \operatorname{Temp}(u) \in \text{comfort}.
 \end{array}$$
  

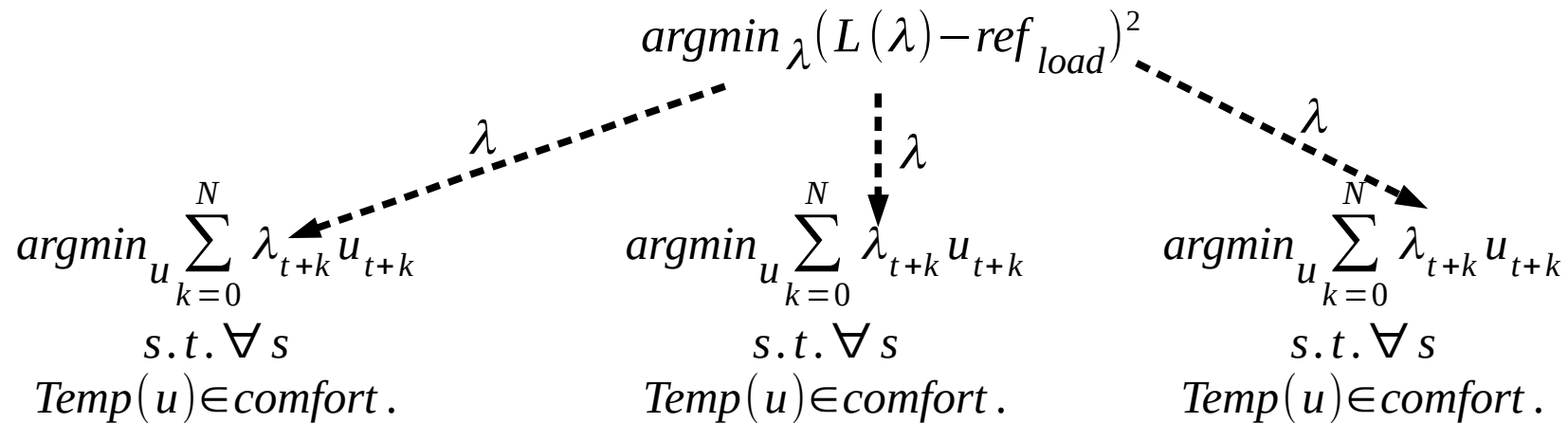
$$\begin{array}{l}
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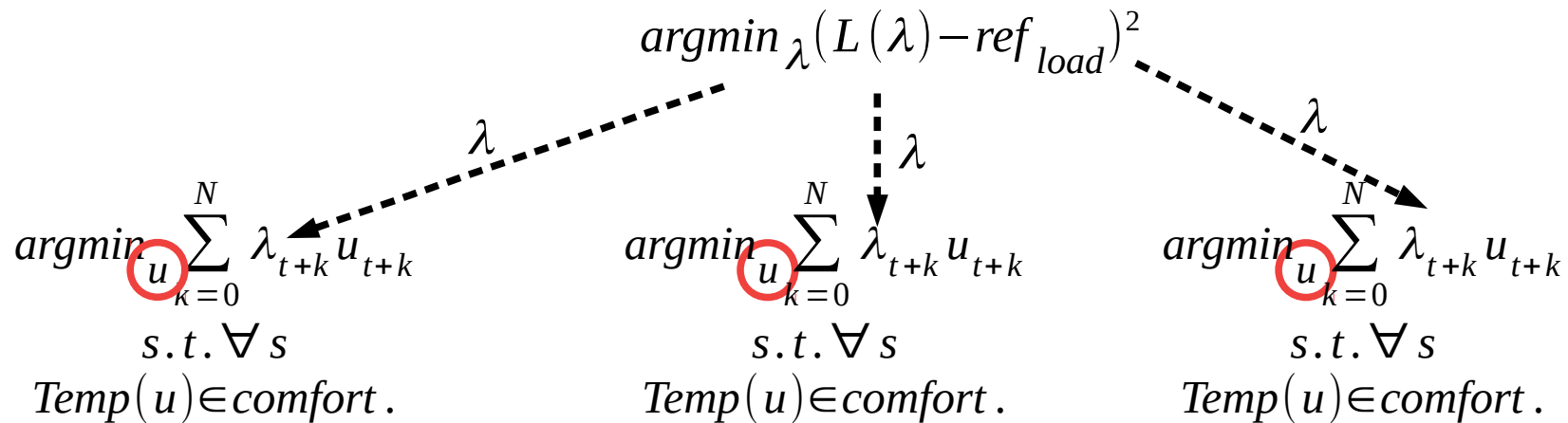
# Price generation



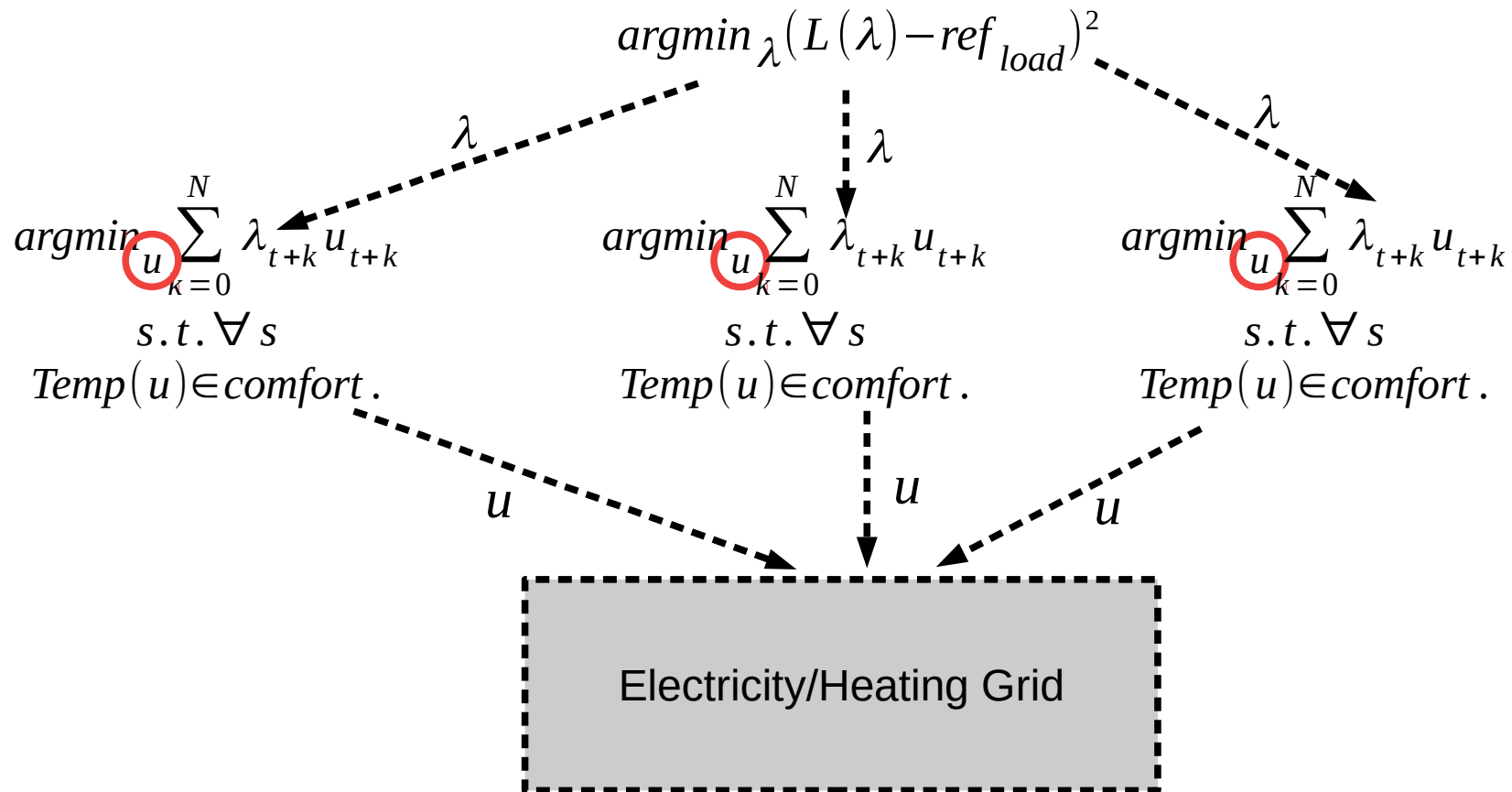
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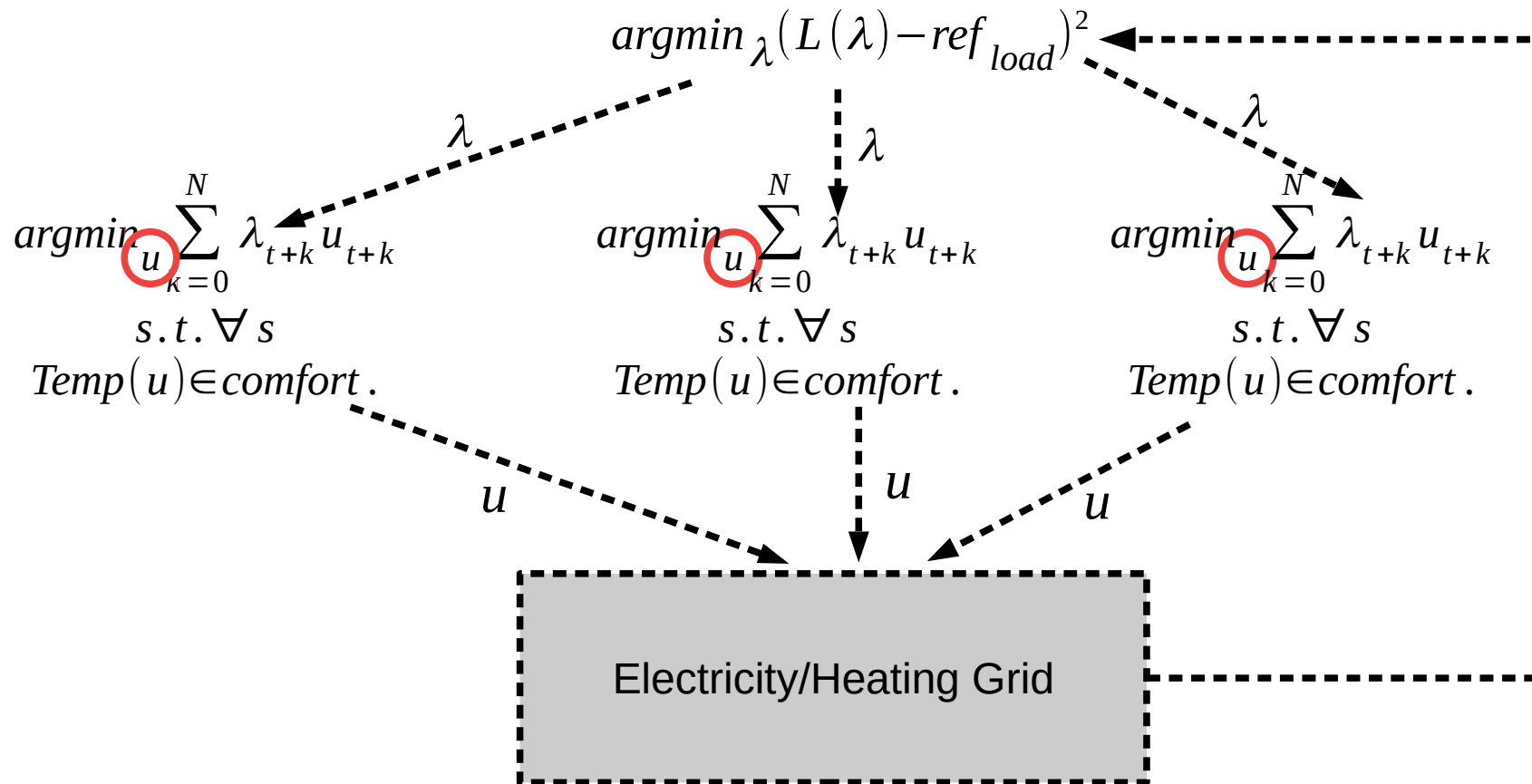
# Price generation



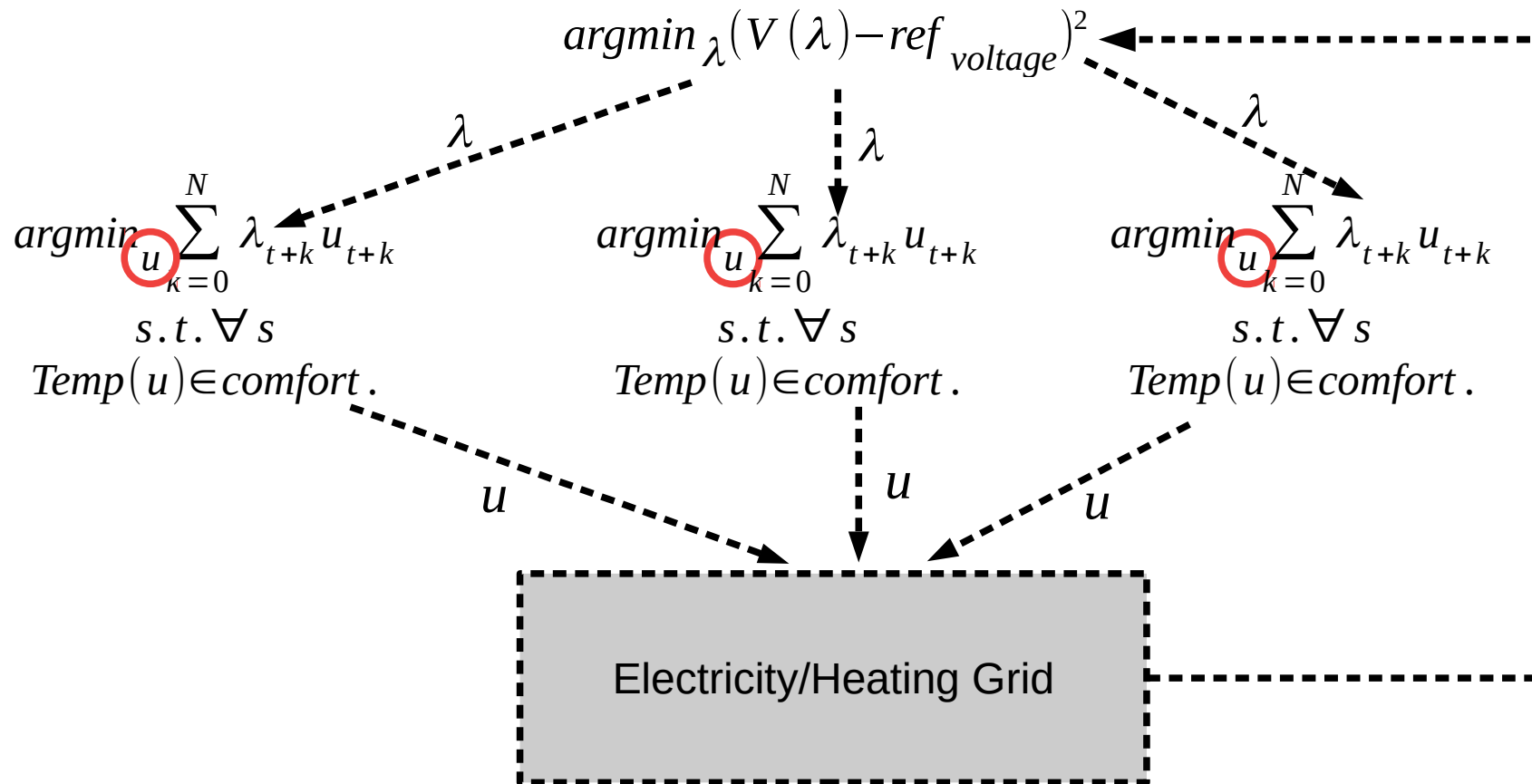
# Price generation



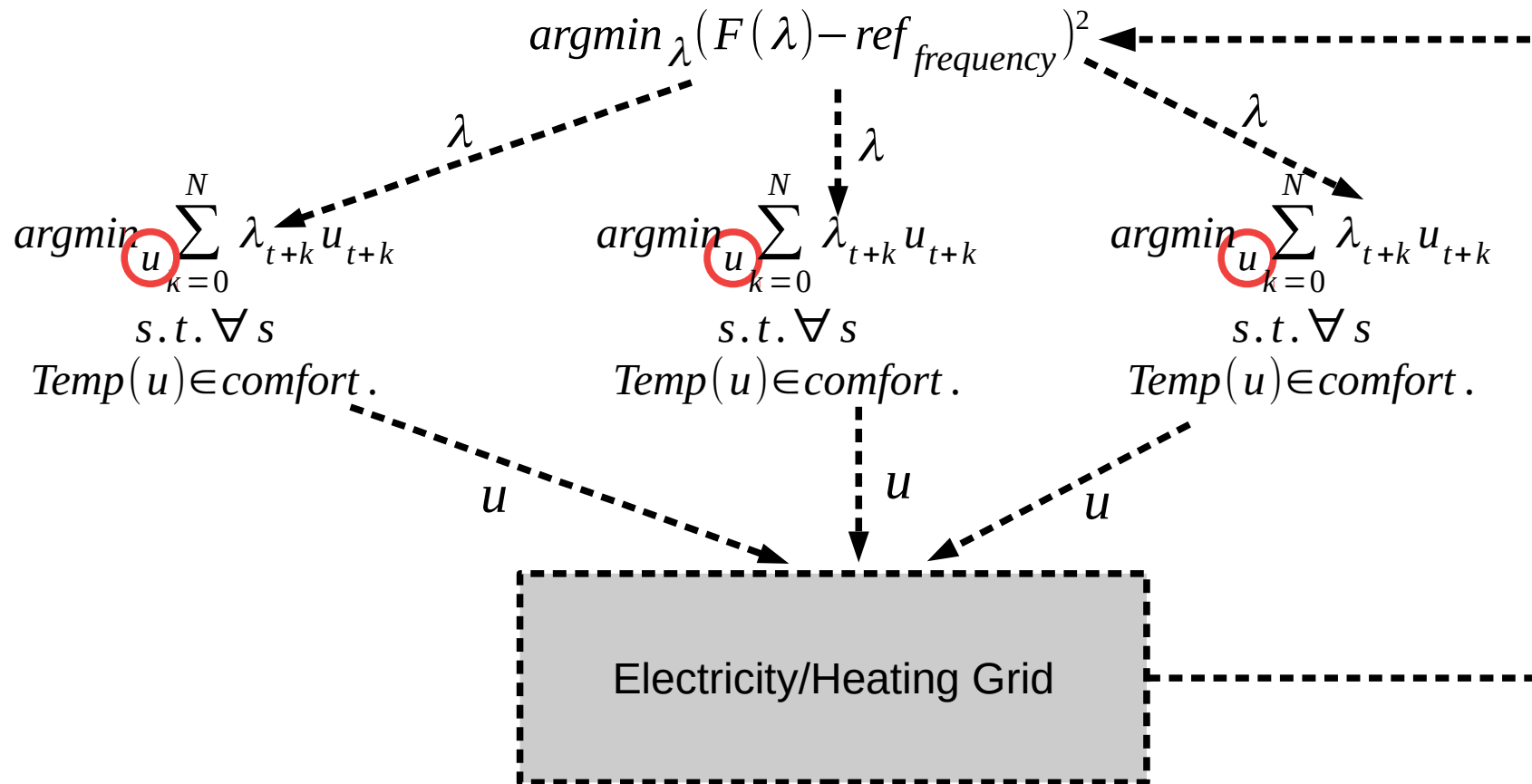
# Price generation



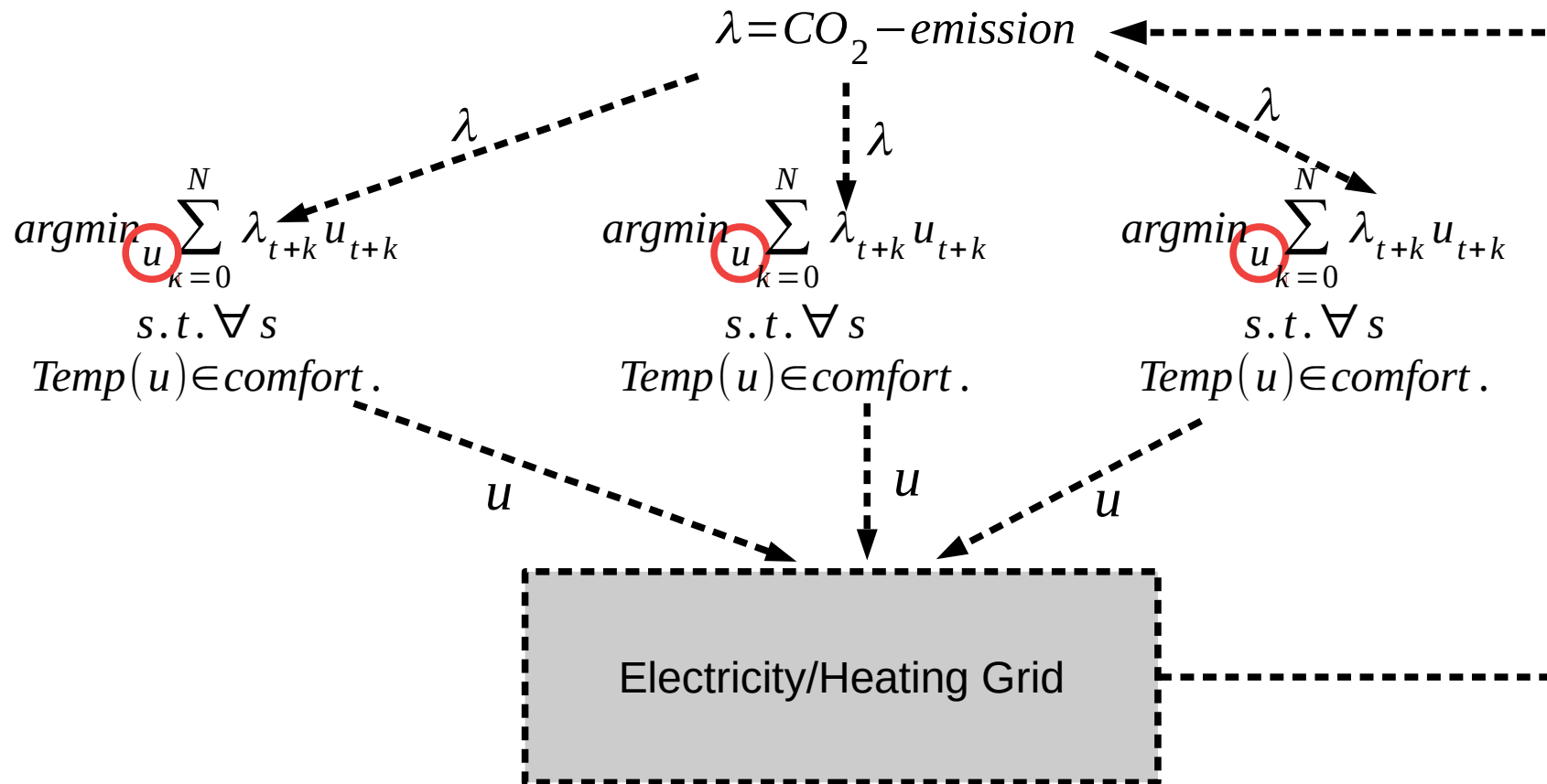
# Price generation



# Price generation



# Price generation





# Summary



# Summary



- React to price – save money



# Summary



- React to price – save money
- Control demand through price – solve problems



# Questions?