



**CIMAC**

THE INTERNATIONAL COUNCIL ON COMBUSTION ENGINES



# What's the value of flexibility?

**Christian Hultholm**

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# What's the value of flexibility?

CIMAC Circle – Panel Discussion

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# Growing challenges for power systems

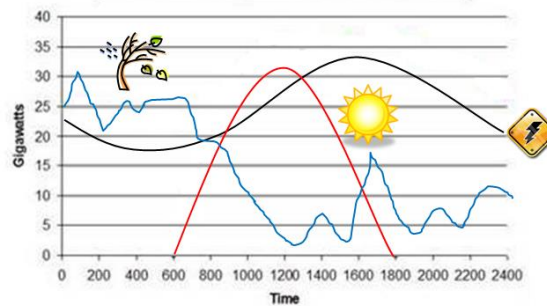
- **Variability of generation, intermittency**

- Increasing wind and solar production

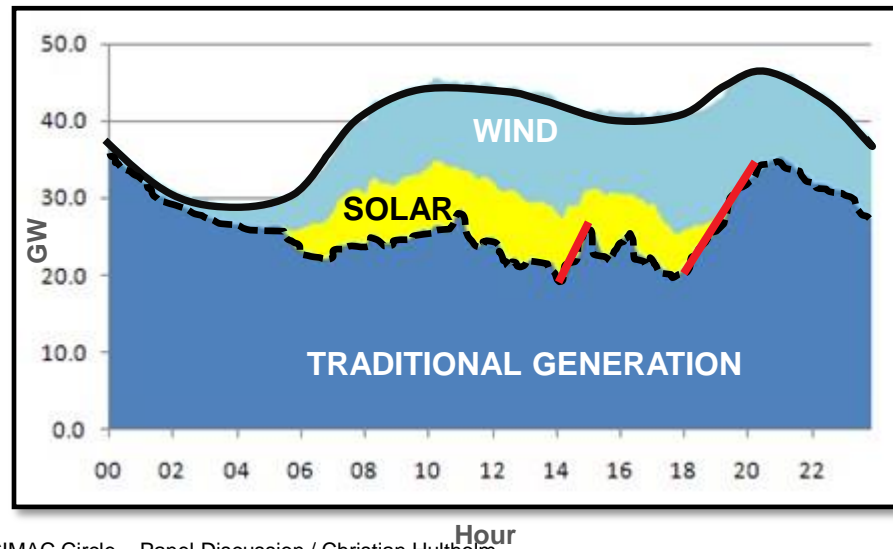


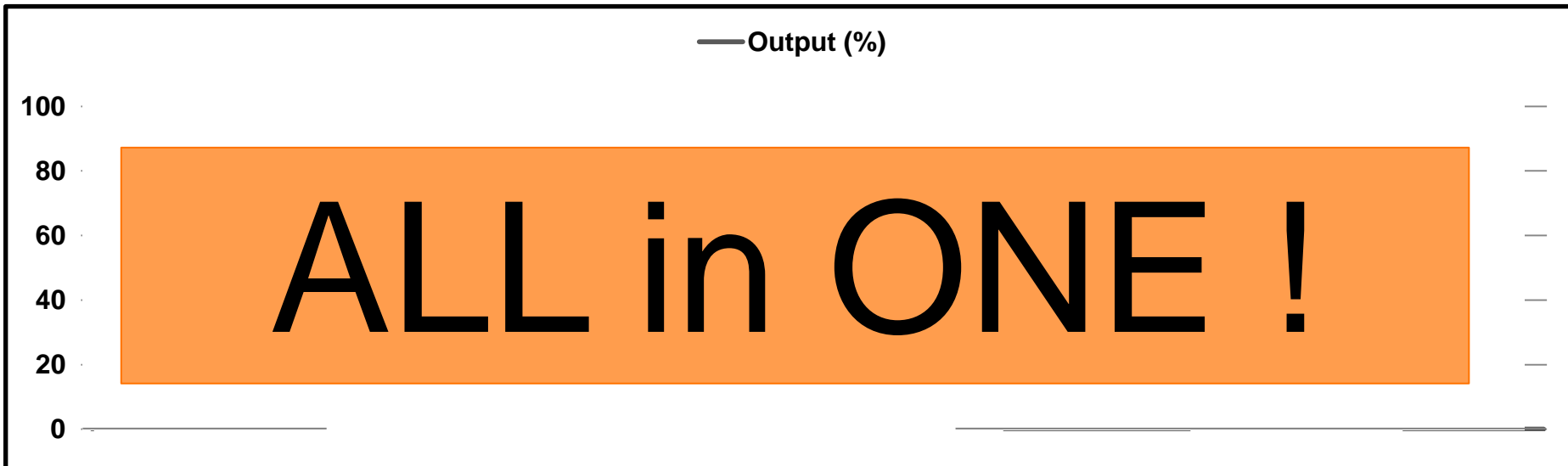
- **Forecasting error**

- Intermittent generation
- Demand side variations



**DAILY LOAD CURVE**





## 1 FASTSTART

### VALUE

- Grid stability support
- Ancillary Service market

### FEATURES

- Power to grid in 30s
- 2 min to full power
- Start up efficiency

## 2 BASELOAD

### VALUE

- Competitive life cycle generation cost
- Any output, same generation cost

### FEATURES

- Highest simple cycle efficiency
- Multi-unit → high firm capacity
- Flexicycle™

## 3 LOAD FOLLOWING

### VALUE

- Wind balancing
- Ancillary Service market
- Frequency control

### FEATURES

- Part-load efficiency unaffected
- No EOH cost for cycling

## 4 LOW-LOAD OPERATION

### VALUE

- "low load" = No load
- Not running when no revenue

### FEATURES

- 1 min shutdown
- 5 min minimum down time
- Zero fuel cost
- Zero emissions

## 5 FAST STOP

### VALUE

- Not running when no revenue
- PV enabler

### FEATURES

- 1 min shutdown
- No minimum up-time
- No EOH calculation





Value of flexibility – 200 MW ICE vs. OCGT (DART Energy + A/S):

**WORTH  
15 MILLION  
US DOLLARS  
EVERY YEAR**

# 573 MW, IPP3, Jordan



## IPP3, Jordan

Customer	National Electric Company (NEPCO)
Type	Wärtsilä 50DF multi-fuel power plant
Operating mode	Flexible baseload
Gensets	38 x Wärtsilä 18V50DF
Total output	573 MW
Fuel	Natural gas, HFO, LFO
Scope	Partly EPC
Delivered	2014

***” We trust Wärtsilä to professionally and competently to lead the EPC consortium for the successful completion of this major and important project.”***

***Mr Young Jin Bae, Chief Executive Officer of Amman Asia Electric Power Company***

