Breaking Flexibility Down

ESIG Tutorial

Eamonn Lannoye
Program Manager

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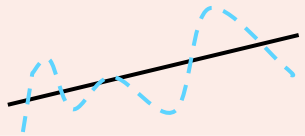
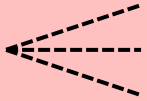
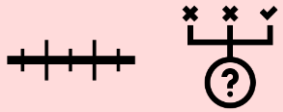
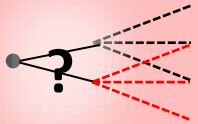
Two options to manage operational flexibility: Change reserve or change scheduling design

Cause	Type	Resolve in Scheduling	Approximating Reserve Examples
Variability	Between Intervals 		Flexible ramping reserve
Variability	Within Interval 		Frequency control reserves – regulation
Uncertainty	Between Intervals 		Flexible ramping reserve
Uncertainty	Within Interval 		Frequency control reserves – contingency
Uncertainty	Before First Interval 		None currently proposed

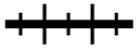
Key

 **Closer Gate Closure**

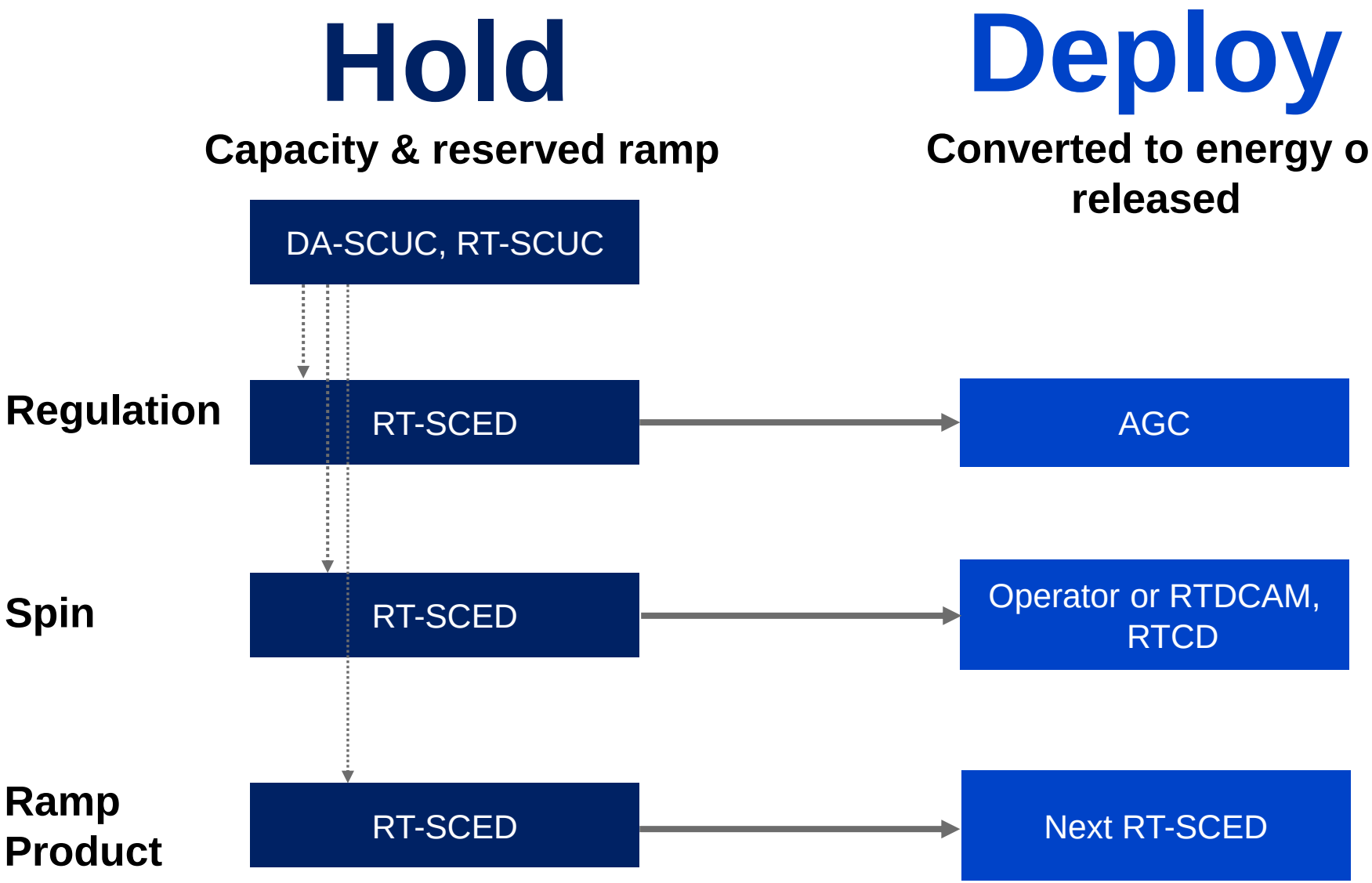
 **Stochastic or Robust Scheduling**

 **Increased Scheduling Frequency**

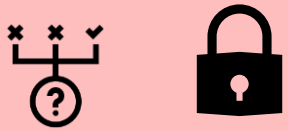
 **Multi Period Scheduling with Look Ahead**

 **Shorter Scheduling Intervals**

Reserve types should be defined by scheduling process



Additional aspect: congestion relief

Cause	Type	Resolve in Scheduling	Approximating Reserve Examples
Variability	Changes in congestion pattern		Minimum zonal reserve requirements
Uncertainty	Changes in congestion pattern		None currently proposed

Key

 **Closer Gate Closure**

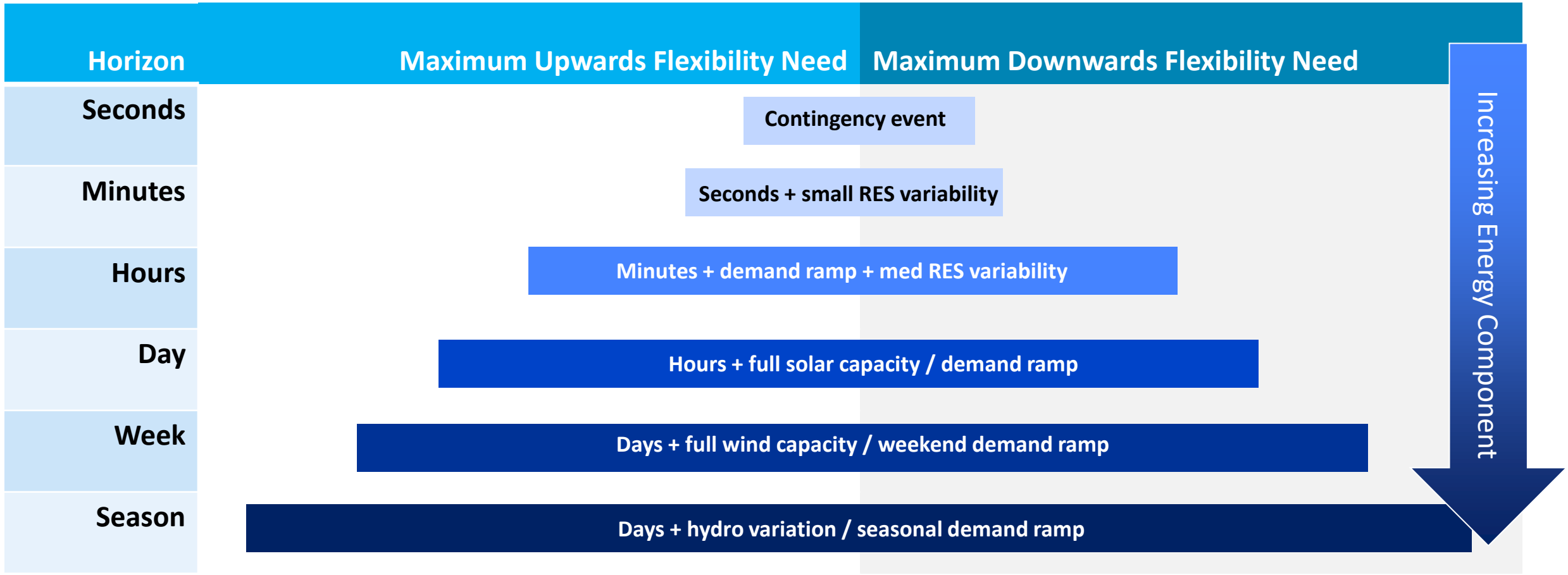
 **Stochastic or Robust Scheduling**

 **Multi Period Scheduling with Look Ahead**

 **Security Constrained Dispatch**

Can also be influenced by reactive power provision

Two Dimensions of Timescales: Horizons



Significantly larger flexible capacity need at seasonal level than at second level

Two Dimensions of Timescales: Acquisition Timeline

Investment

- **Adequacy assessments:**
  - Flexibility integrated into LOLE / EUE calcs
- **Flexible Capacity Requirements**
  - California FRAC-MOO
- **Flexible Capability Payments**
  - EirGrid DS3

Ops. Planning

- **DA Market constraints**
  - MISO Flexiramp
- **Balance Responsibility**
  - EU portfolio markets
- **Flexibility markets**
  - Piclo, Nodes, GOPACS, DA/RE, Equigy

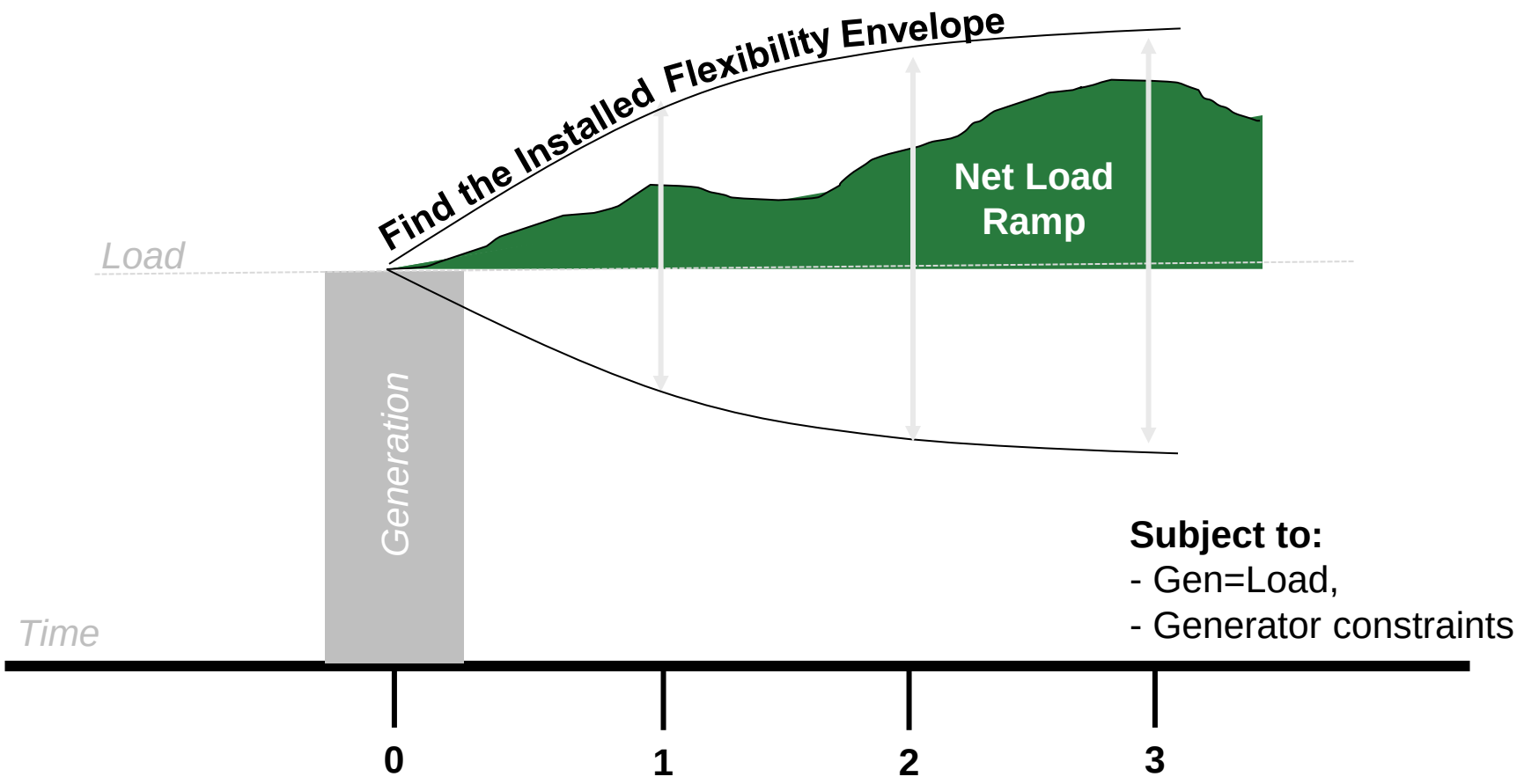
RT. Ops

- **RT Market deployment**
  - RT Dispatch
  - Self-balancing

Installed Flexibility (IFLEX) model

» Find the installed flexibility envelop

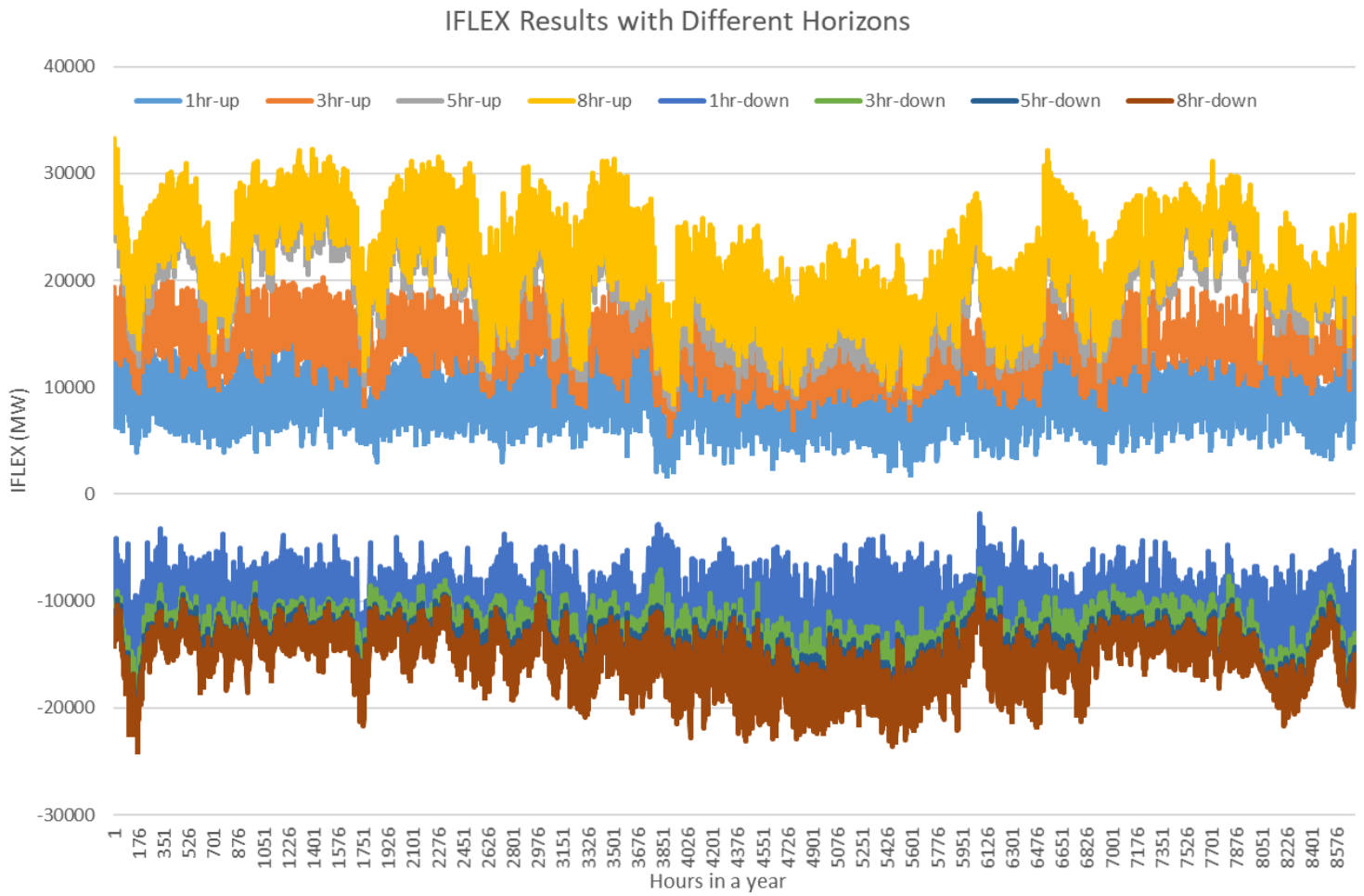
- Sufficient flexibility if net load ramp is within the envelop



IFLEX by Time Horizon

(From the 1,3,5,8 up & down run)

»IFLEX by horizon in both upward and downward directions



Comparison of IFLEX and Available FLEX by horizon

»Compares the flexibility that could be got vs. that which is provided by economic dispatch and conventional reserve.