

Why is storage important and how can we get it done?

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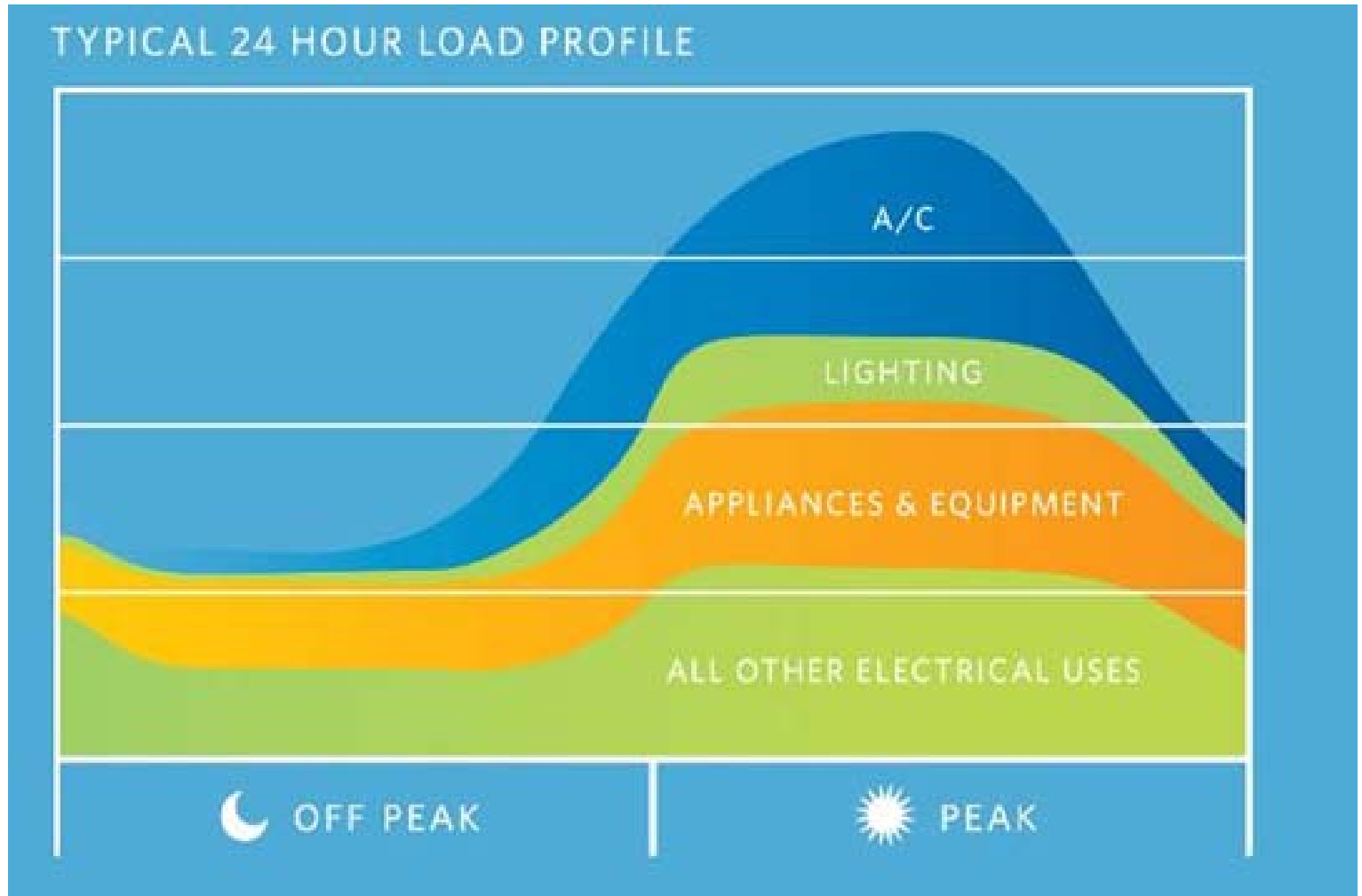
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Setting the Stage

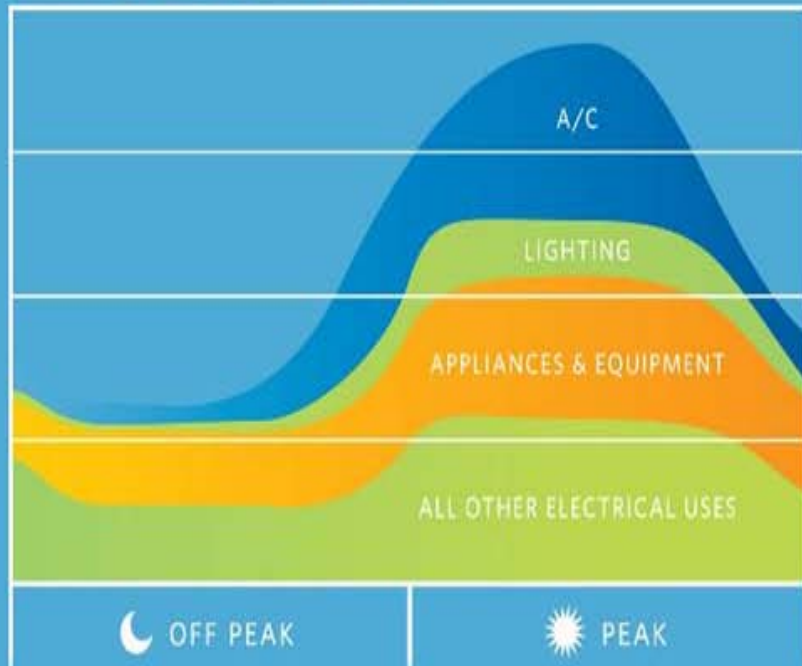
- System Efficiency NOT Site Efficiency
- What is the effect of storage on the grid?
- Why is storage so hard to model?
- Requirement = Cost Effective

The Problem – Load Shape

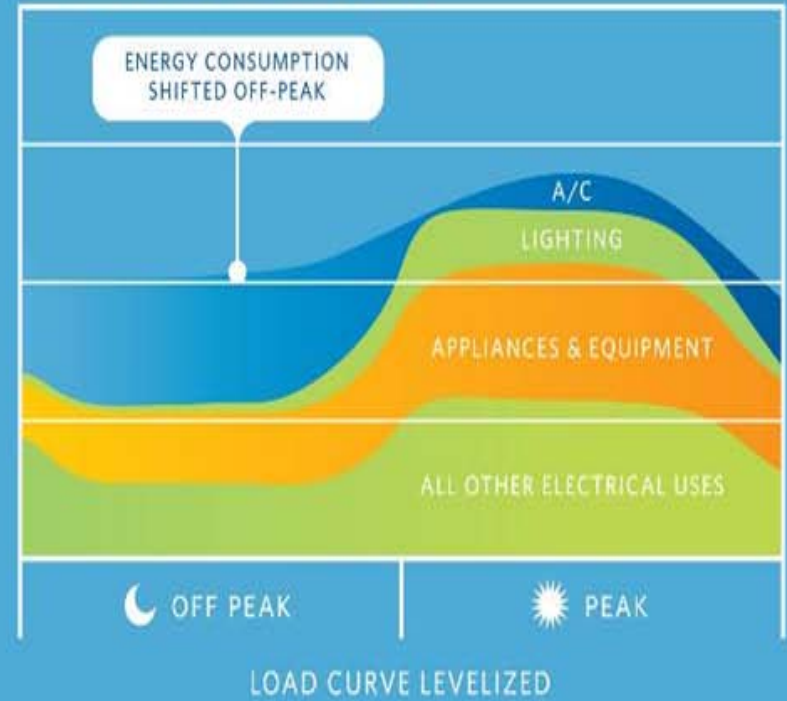


The Solution

TYPICAL 24 HOUR LOAD PROFILE

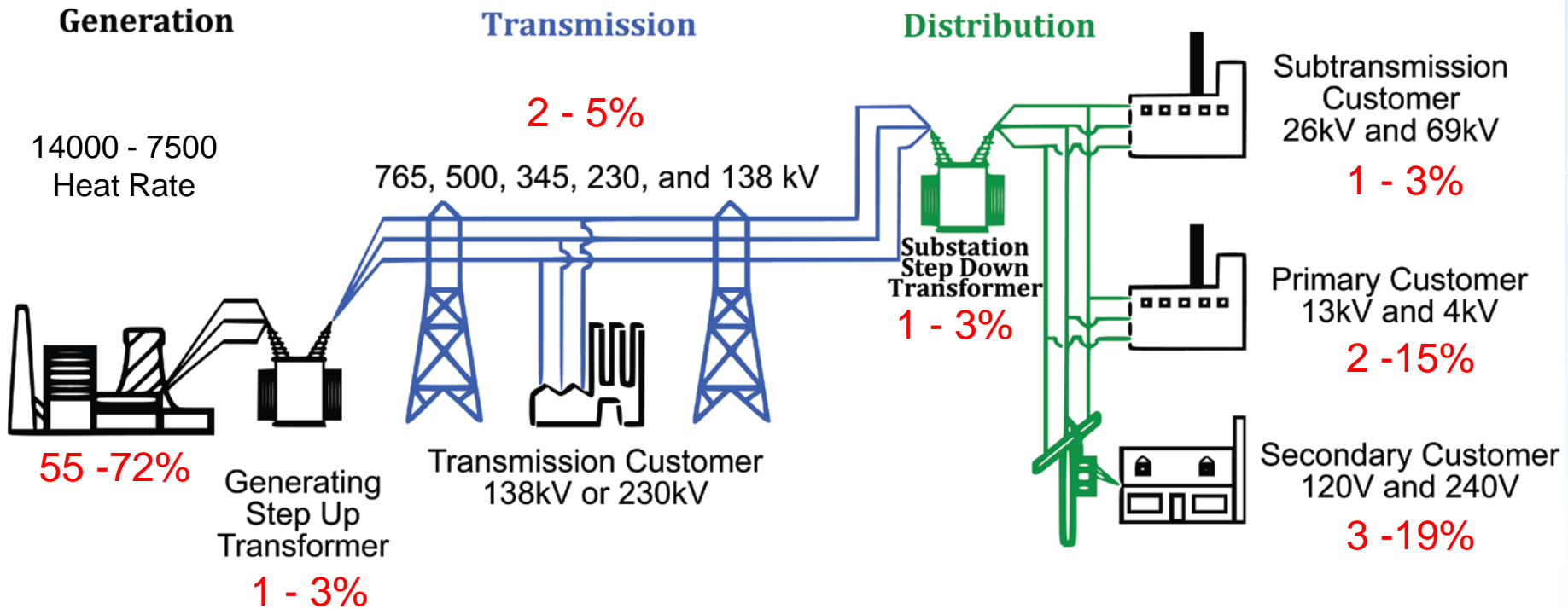


TYPICAL 24 HOUR LOAD PROFILE

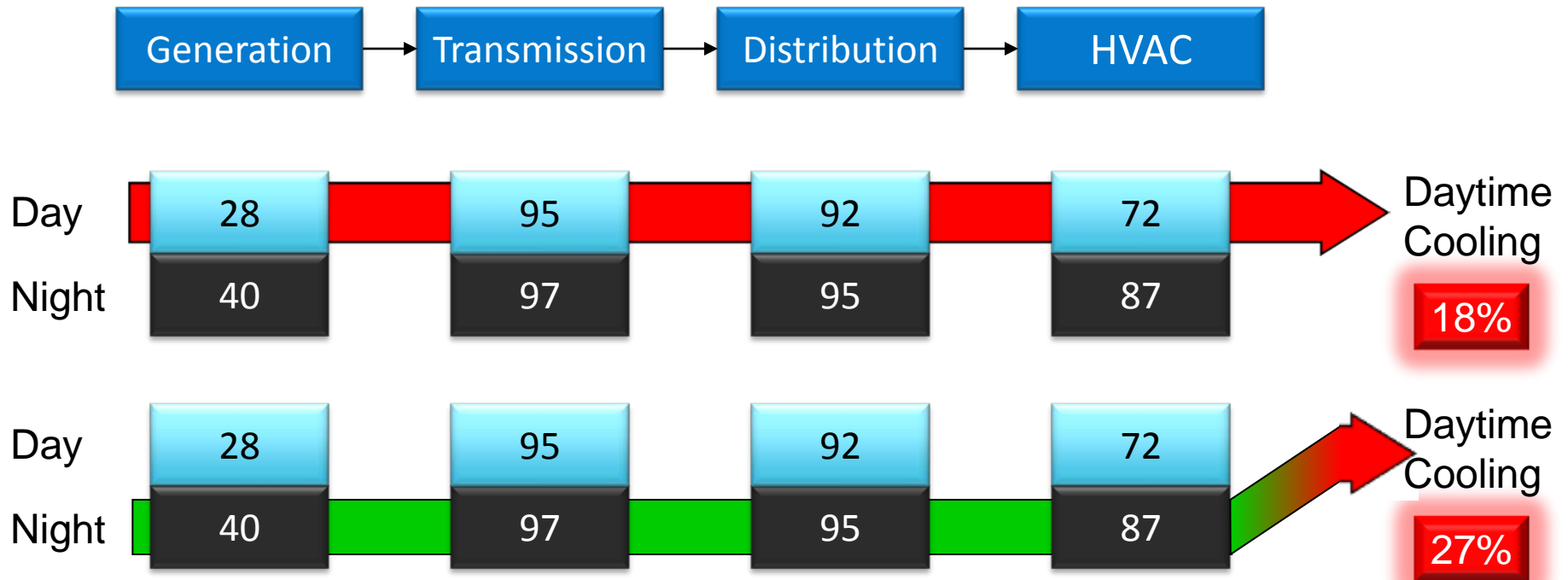


The Impact of Storage on Energy System Efficiency

Typical Electrical System Average *Losses*



Energy End-to-End Electrical System Energy Efficiency ...with Ice Bear or Thermal Energy Storage



- *Ice Bear storage uses fuel 50% more efficiently ($18\% \times 1.5 = 27\%$)*
- *Ice storage avoids interconnection issues, safety concerns, and conversion losses.*
- *Nothing is lower cost or safer for the environment than water as a storage medium.*

Need New Models to Value

- Existing Tools
 - IRP
 - Typical generation model (Prosim, Promod, Etc.)
 - Unit commitment?
 - Other Values
 - Regulatory “TRC” (Total Resource Cost Test)
 - Apples-to-apples comparison
 - Levelized cost
- New Tools Needed
 - Total Value Proposition
 - Typically apples-to-apples plus incremental value propositions
 - Compare Storage WITH instead of TO
 - Storage is a Reliability Asset for Utilities

Some Value Streams to Consider

