# Session lll - Improvements

- Metrics (Alexander Clemm)
- General thoughts on solutions & tradeoffs (Suresh Krishnan)
- General thoughts on solutions & tradeoffs (incl. routing) (Russ White)
- Multicast (Louis Navarre)
- Data formats (Brendan Moran)

# Session III – Many Take-aways

- A range of metrics needed for **devices, paths, flows, and overall network**
  - Next steps: **YANG models, protocol extensions**, etc.
- Focus on **Scope 3**, consider Scope 4 – given their relative size
  - **Sustainability considerations, best practices & tradeoffs** should be put into a document
- **Merge multiple metrics into one**, to jointly optimize and avoid the problem being NP-complete
- From a **control plane perspective**, to reduce power usage, consider removing redundant links or equipment, and/or reduce link speed
  - All of which can be done in a **Time Variant (TVR) manner,** which actually has beyond-routing, across-layer, HW/SW applicability, i.e., schedule to do more/less when we know that conditions will be better/worse in terms of environmental impact
- **Timely to reconsider multicast** - tradeoff simplicity vs efficiency
  - New solutions for old challenges – stateless mcast for scalability, user space impl performance reasonable, etc.
  - **Re-use techniques from elsewhere** - constrained networks, including wireless low-power contexts
- **Typically 30% energy reductions when using binary vs text data formats**
  - Stop thinking of the network as an infinite resource
  - Stop ignoring data formats, even if a small reduction in isolation, in the aggregate can add up, e.g., if moved to a CBOR representation of MIME, for all MIME-encoded e-mail
- Even if **monitoring not very efficient** in & of itself**, must understand where energy is consumed**
- etc etc etc