Energy planning for climate change using R, StarCluster and Shiny

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EOH-ESA
Uncertainties

Rainfall (21 GCM’s with two RCPs)

+ Adaptation(5 SSP) + Power System (27) + Trading (5) = 15 487 scenarios
Software Tools for Academics and Researchers

- Scripted EC2 compute cluster
- Manage placement, permissions and host names
- Based on Ubuntu AMI, pre-installed R, Spark etc.
- Installs and configures
  - Oracle Grid Engine
  - Network File Share
  - Plugins: e.g. spark
Using StarCluster with R (qsub)

```r
lapply(1:15487, function(i) {
    cmd <- "qsub -S /usr/bin/Rscript /nfs/run.r %d"
    system( sprintf(cmd,i) )
})
```

run.r

```r
#!/usr/bin/Rscript
i <- commandArgs(TRUE)
result <- balance.supply.and.demand.scenario(i)
fn <- sprintf("/nfs/%d.rdata",i)
save(result, file=fn)
```
run.r <- function(i){
  result <- balance.supply.and.demand.scenario(args)
  fn <- sprintf("/nfs/%d.rdata",i)
  save(result, file=fn)
}

spark.lapply(1:15487,run.r)
Decisions under uncertainty

Climate: Capacity Impact

Generation difference (Zambia) - [RCP.RCP45, SSP.SSP1]

Planning: Map (GIS) - Transmission Flows - (Click on country to filter, Click on Sea for ALL)

Biomass  Coal  Gas  Hydro  Nuclear  Oil  Solar PV
Solar Thermal  Wind

Generation difference (Zambia) - [RCP.RCP85, SSP.SSP1]