Update on Technical Group High Penetration, ongoing and planned activities

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15th Grid Connection European Stakeholder Committee Meeting

11 September 2019, Ljubljana

Technical Group on High Penetration

Technical Group on High Penetration (TG HP)

Background

- Volunteers from 6 stakeholder groups:
  - TSOs: 2 Representatives
  - Wind Manufacturing Industry: 4 Representatives
  - HVDC Manufacturing Industry: 2 Representatives
  - PV Manufacturing Industry: 1 Representative
  - Power System Analysis tool providers/Consultants: 2 Representatives
  - Academia: 2 Representatives

- Stage 2 (2017 – 2019): High Penetration (HP)
  Longer term analysis and input into issues of extreme high penetration

- Is currently working on a joint report on grid forming capabilities
  - Contribution for setting up requirements on grid forming capabilities in future grid/network codes
- Inputs:
  - Links to research projects e.g. Migrate and Osmose
  - Projects with focus grid forming were already collected
  - Liaison with EG hosted by National Grid

- Meetings/webinars every 2-3 weeks

Developments & Milestones since 14th GC ESC meeting

State of play

- Last physical meeting on July 17 & 18 finalizing the draft
- Final draft was shared on July 24 with GC ESC and other interested organisations and expert groups for feedback
- Already a very positive feedback has been received

- Final feedback is expected **by September 13**
- The report will be refined accordingly – **September 30** the TG HP has scheduled a webinar
- ENTSO-E approval-editing-issuing **by end of December**

- Additional activities:
  - Dissemination activities at the Wind Integration Workshop in Dublin have been scheduled
  - Further outreach to dedicated and interested stakeholders will be considered

Structure of the report

PPM: Power Park Module
HCS: HVDC Converter Stations
LFDD: Low Frequency Demand Disconnection

Executive Summary
Abbreviations
1 The Interconnected European Power System
- **1.1** Moving towards high penetration of power electronic interfaced generation
- **1.2** Power system stability challenges *(system inertia, system splits, short circuit levels)*

2 Power System Needs under High Penetration of PEIPSs
- **2.1** Frequency stability concerns
- **2.2** Voltage stability concerns
- **2.3** Other low system strength issues relating to fast dynamics
- **2.4** Classes of Power Electronic Interfaced Power Sources arising from IGD HPoPEIPS *(class 1 PPMs, class 2 and 3 PPM/HCS)*
- **2.5** Requirements for Grid Forming PoPEIPS
  (create system voltage, fault contribution, sink for harmonics and unbalances, contribution to inertia, survival of LFDD, control interactions)
- **2.6** Operational boundaries for GFC performance *(example: inertia response)*
- **2.7** Cost Considerations *(for wind, solar PV, grid-scale storage)*
- **2.8** Must-Run Units
- **2.9** Synchronous Compensators / Condensers (SCs)
- **2.10** Spatial Distribution of Grid Forming Units or Must-Run Units

3 Proposed Tests and Benchmarking
- **3.1** Simulation, Testing, validation, and certification *(control and subsystem testing, site testing)*

4 Outstanding questions
Literature References
5 Annex
- **5.1** Terminology and Definitions
- **5.2** Characterising of Converter Based Inertial Response for Generic Performance Evaluation of Gain and Damping Factors

Final report ~50 pages

Outstanding questions

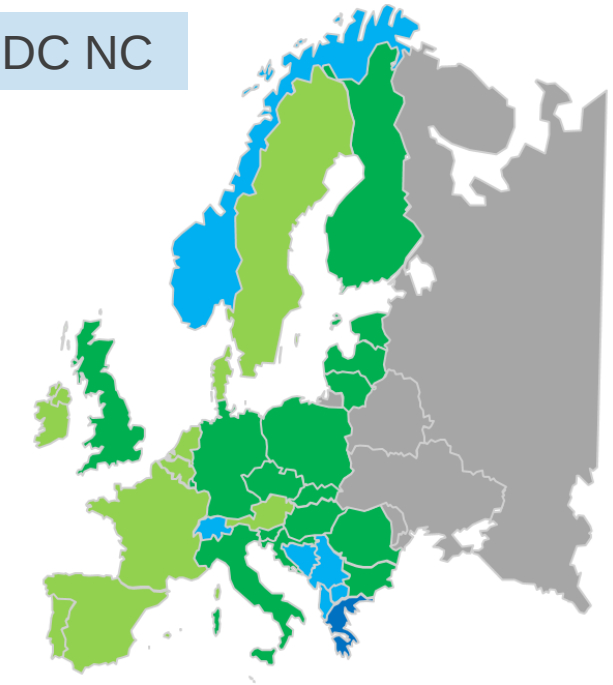
- What proportion of the converter interfaced equipment need to have the seven characteristics in question?
- Where and when will the capabilities need to be available?
  - Different urgencies between small SAs (e.g. GB now) and countries in large SAs (e.g. CE later)
  - Wind Europe suggest manufacturers need 5 years to prepare even after full spec / codes delivered
- Are some types of converter interfaced equipment better suited to deliver GFC with these characteristics cheaper and more effective than others?
  - small embedded units versus larger units connected at higher voltages?
- If a market driven approach is adopted, questions arise as to the market design.
  - Would available capability or utilisation be remunerated?
  - Would payments have to be location-based?
  - Could the entire required range of services (seven covered here) be obtained on the market?

Monitoring of non-exhaustive requirements

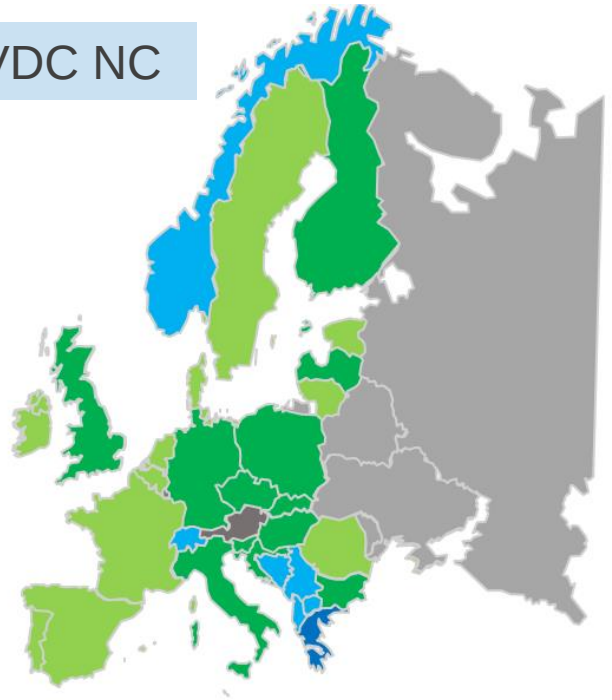
CNC Implementation Monitoring – August 2019

RfG NC

DC NC



HVDC NC



- For RfG, in some countries cases there is partial approval e.g. thresholds approved but not all values of non-exhaustive requirements
- Existing vs new PGMs survey here

Approved/binding
Submitted for approval
Submission&Approval is pending
Non EU MS - implementation under different framework
No proposals

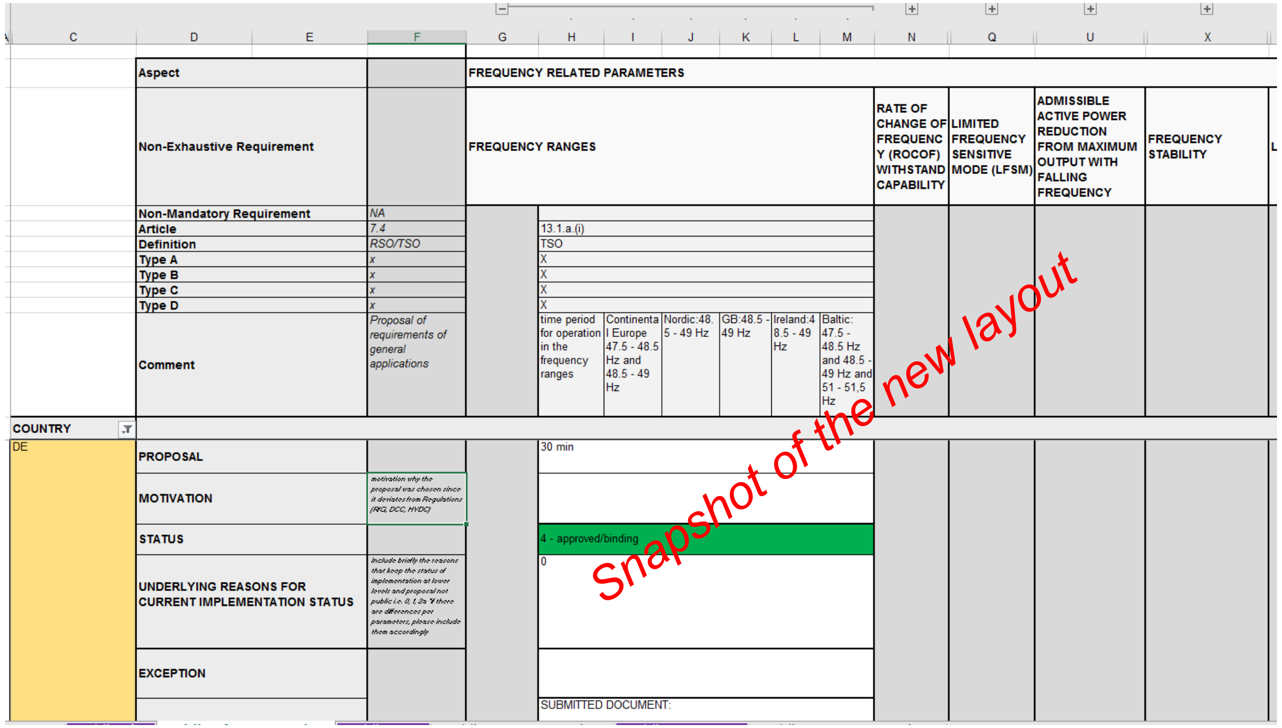
More details on the proposals of the TSOs here

Active Library updates – Monitoring Excel File

- The monitoring excel file that was tracking the national proposals for the non-exhaustive requirements was updated and published in June 2019
- The new layout facilitates the filtering of each country's information and includes more information e.g. links to national websites/documentation (when available) and dates of approval – in collaboration with ACER

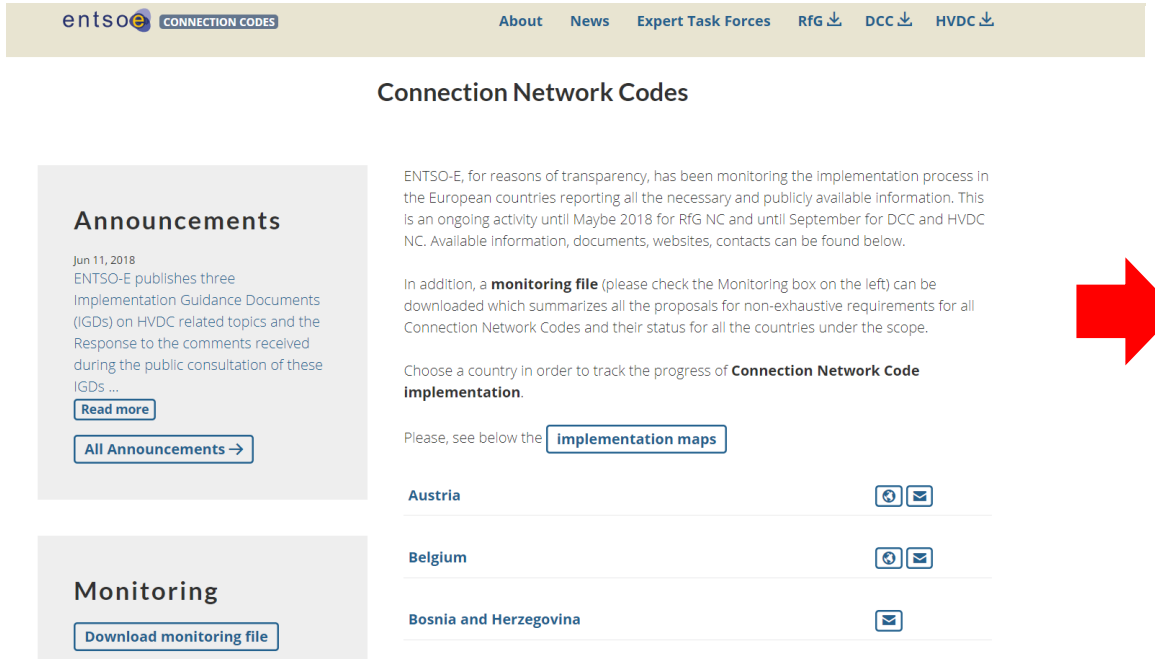
ENTSO-E will try to complete the excel file and Active Library by next GC ESC meeting

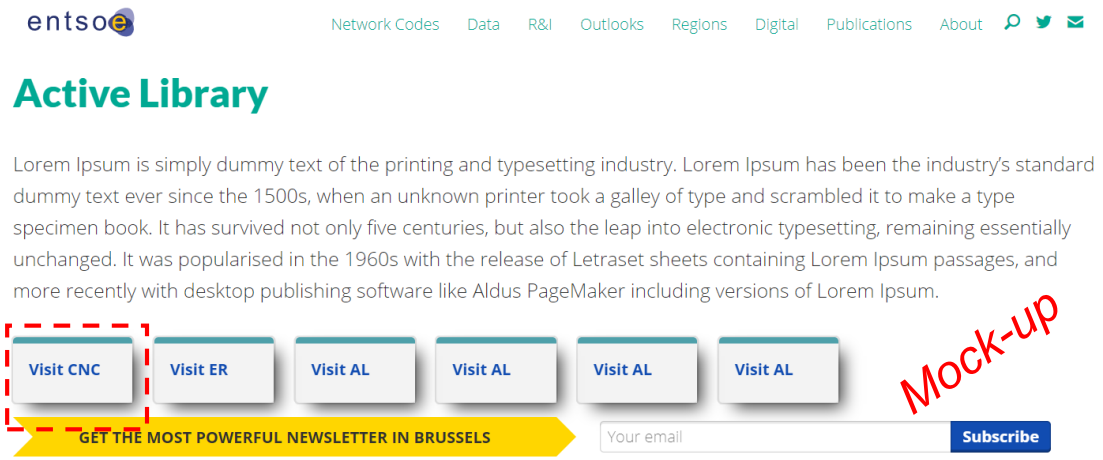
Possible further updates and incorporation of more detailed information when the monitoring report is available (end of 2019)



Active Library – new layout under development

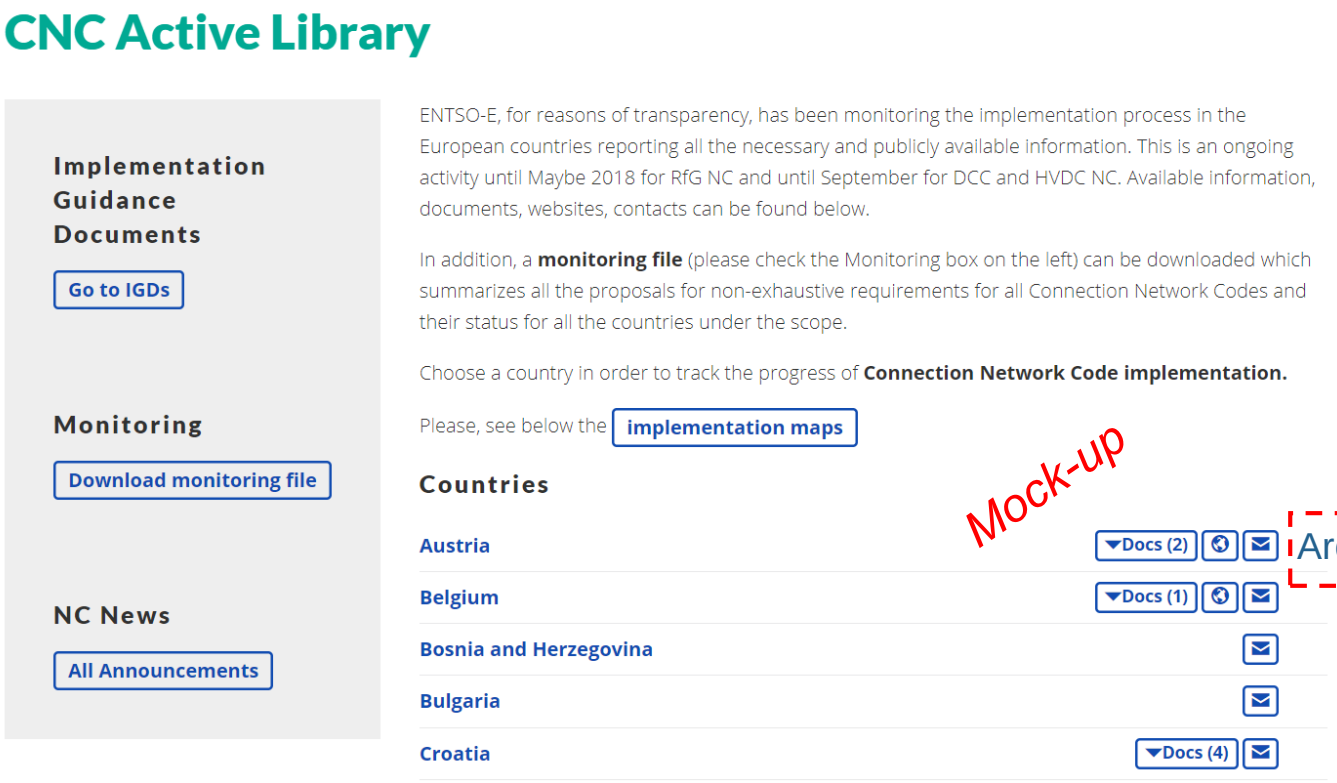
Current view based on the “old” ENTSO-E site





(Next slide)

CNC Active Library



Archive

The new AL will provide easy access to:

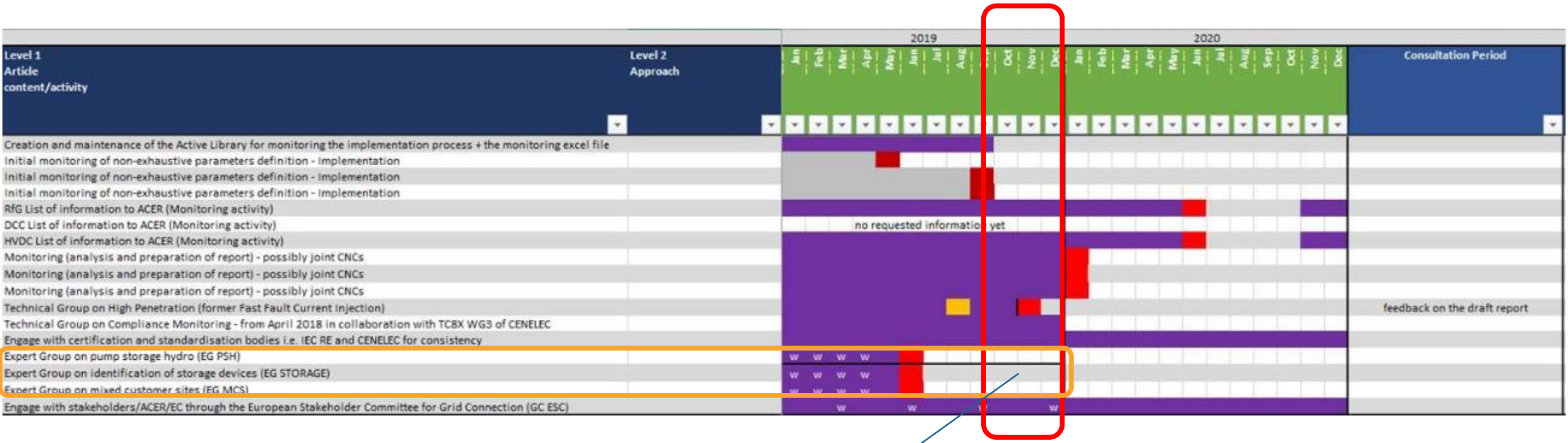
- Final approved documents (national documentation) when available – organized by CNC
- National sites (update the current ones when required)
- Contact people (already incorporated in the old version)
- Any archived material shared during the national implementation process

- **In each country in the current AL:**
  - Already available documents from the implementation time will remain
  - Already available tasks from the implementation time will remain

Note! The quality of information per country differs significantly due to the differences of the national implementation. For more details, one can consult national websites or the national contacts when those exist.

Overview of planning

Overview planning for next months



Phase 2 of the EGs will be incorporated

GC ESC EGs

Expert Group on Pump Storage Hydro
- The final report was fine tuned in the part of the variable speed technologies with the incorporation of specific expertise
- The final adjustments do not influence the final conclusions or recommendations
- Final report will be reviewed by the EG
- The revised EG will work on justifications/assessment of the final recommendations.

Expert Group on Identification of storage devices
- The final report has been put into the right template
- The revised EG will work on justifications/assessment of the final recommendations

Expert Group on Mixed Customer Sites
- The final report incorporated ACER's view
- The revised EG will work on justifications/assessment of the final recommendations

Questions:
- Should we publish already the final technical reports or first incorporate the "justifications" work?