



USER FORUM MAY 2018

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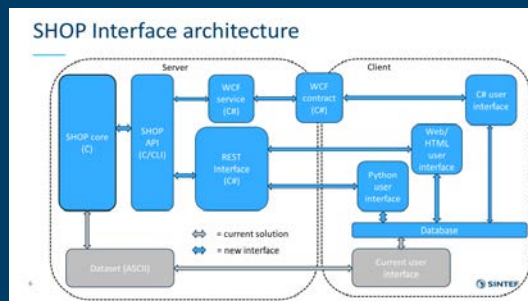
Produksjonsplanlegging 2017

Fart på HydroCen

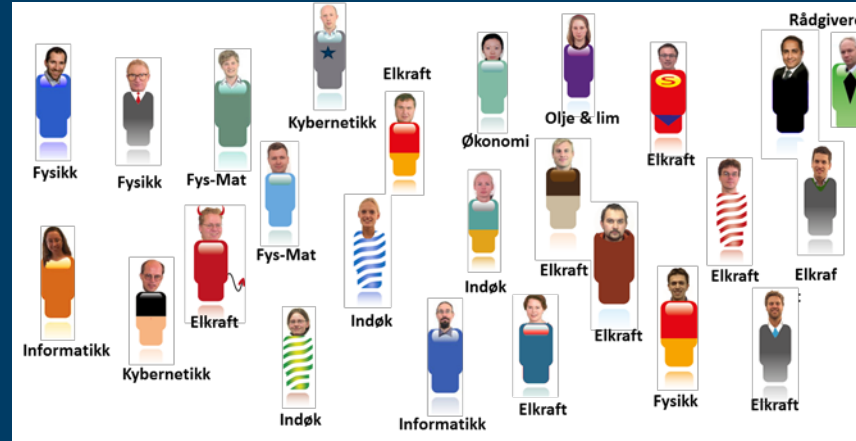


Stiller lag med:
dommer
linjemann
innbytter i
alle ledd

Første bruker
(Fortum) på felles
API-ProdRisk SHOP og
steg mot nytt API på
energisystem-
modellen



Klar for nye utfordringer og nye seire



Brukermøte 2017



Starter nytt
NFR prosjekt

Solgt 5 lisenser
til ca. 2.1 mill.

Enabling multi-market price forecasting
PRIBAS project

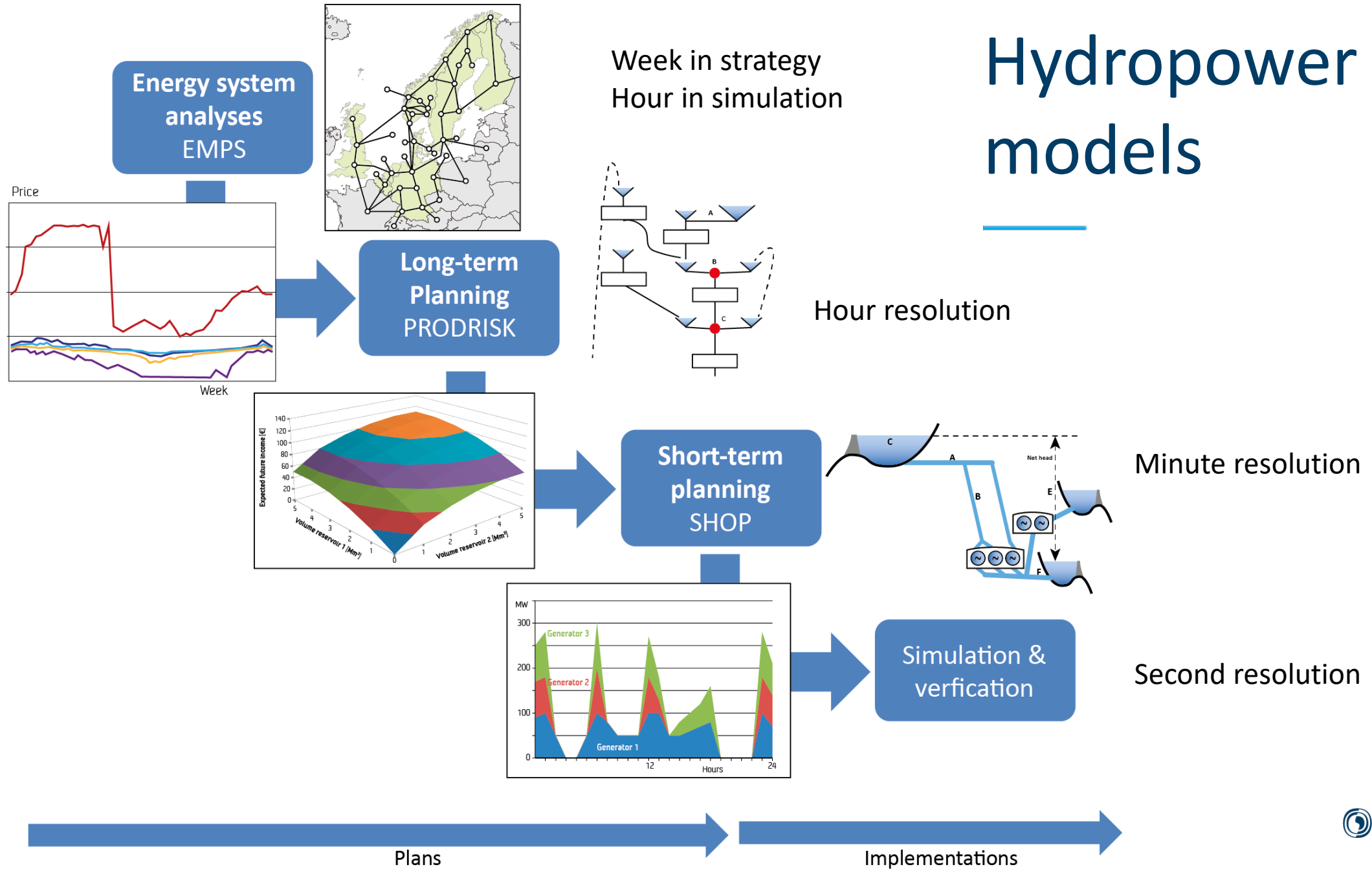
- This idea was included in the Power Exchange FME
- Fundamental prognosis model for multiple energy markets
- Consistent prices from SPOT – Intra Day – Balancing
- Hourly time resolution is the main focus
- Collaboration with EDF, UPM, CEPEL

SINTEF

To Do Today:

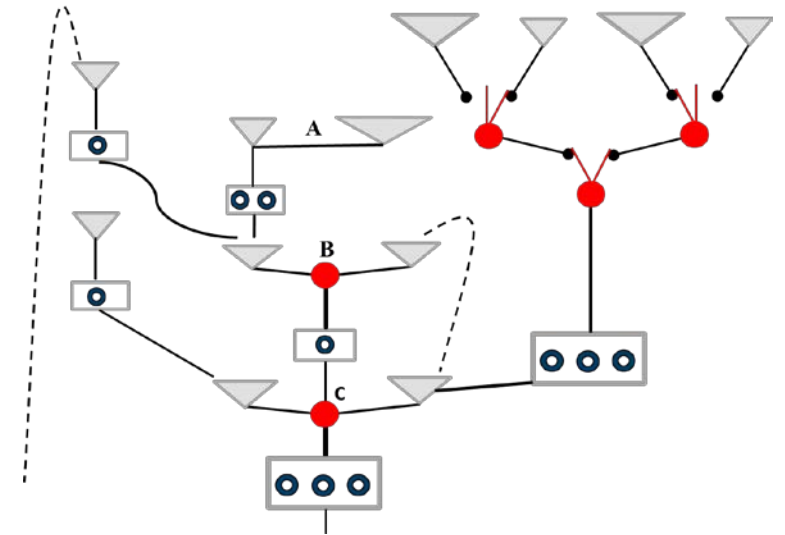
✓ Work hard
»» get paid ««

Hydropower models

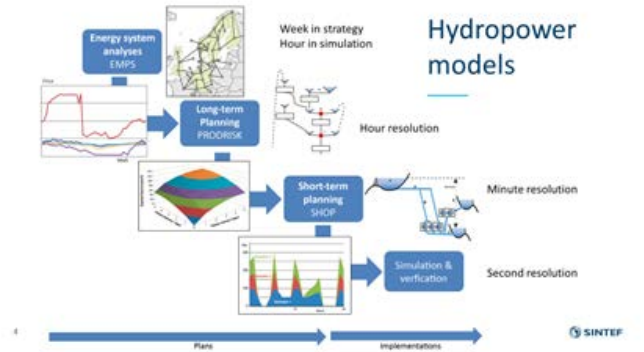


Content

- Organization of the maintenance project
- Economy
 - Budget
- Activities within the license project
- Direction of the maintenance project
 - Drivers & barriers
 - Research and development
- Discussion

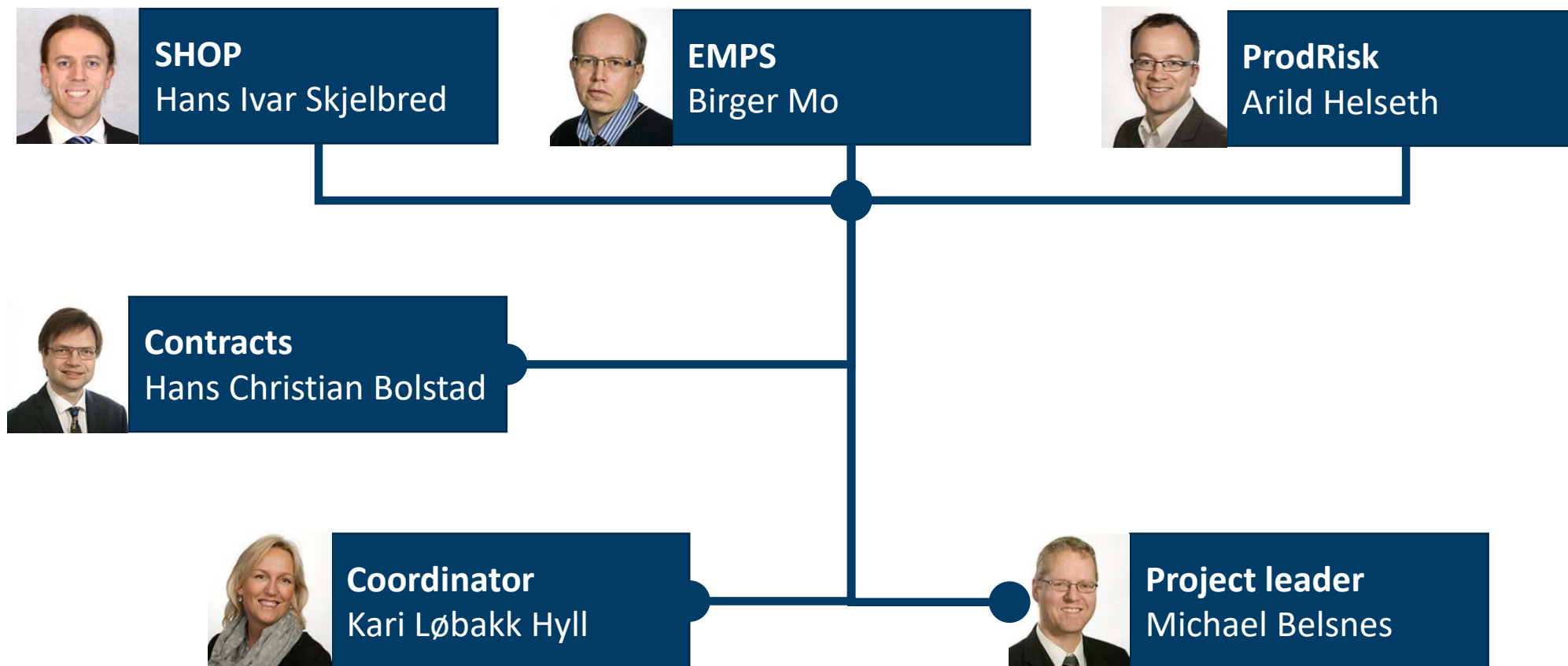


The maintenance project



- Comprices all hydropower scheduling models where SINTEF Energy deliver maintenace:
 - EMPS (Samlast and SamNett), EOPS, ProdRisk, SHOP (Simulator)
 - Customer list of 35 customers with one or more licenses
- SINTEF is a Non-profit organization, what we bill on the maintenance project is what we are using in the project.
- Sold licenses are used on the models

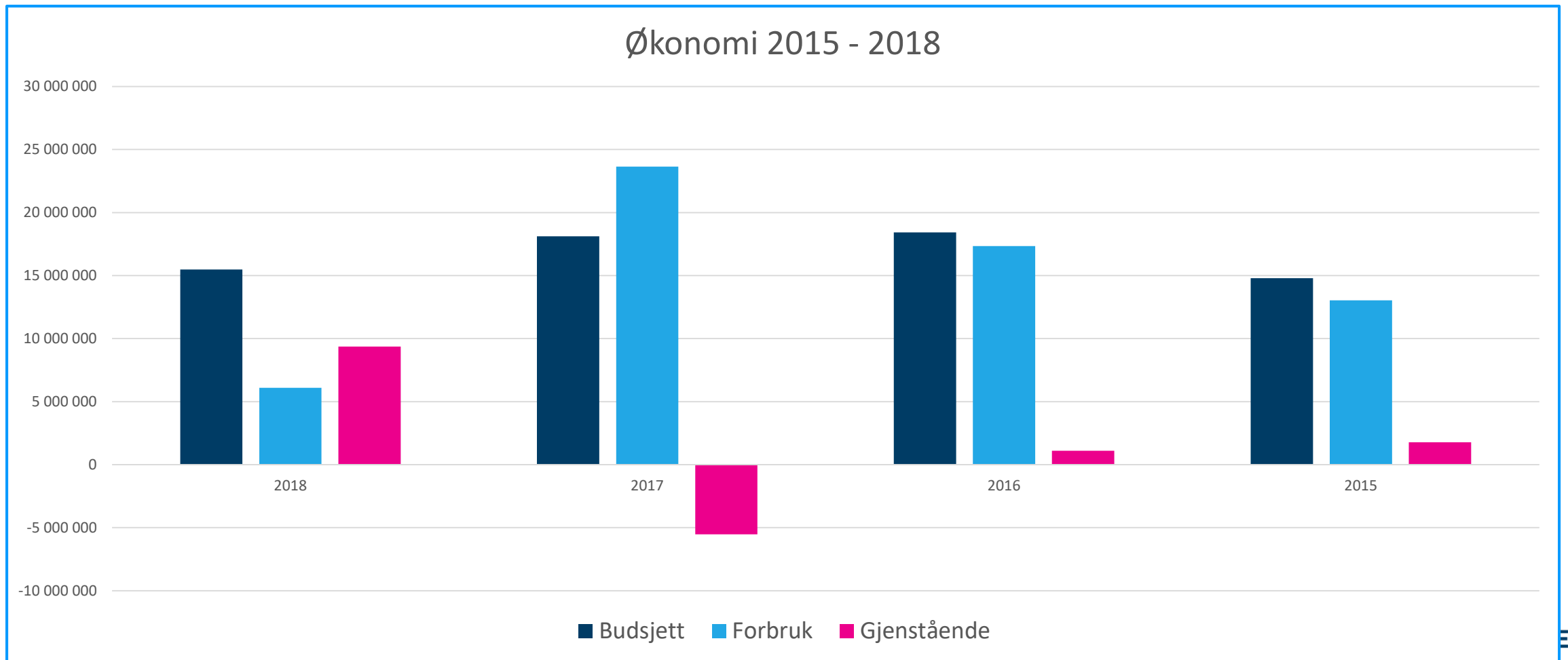
Project organization



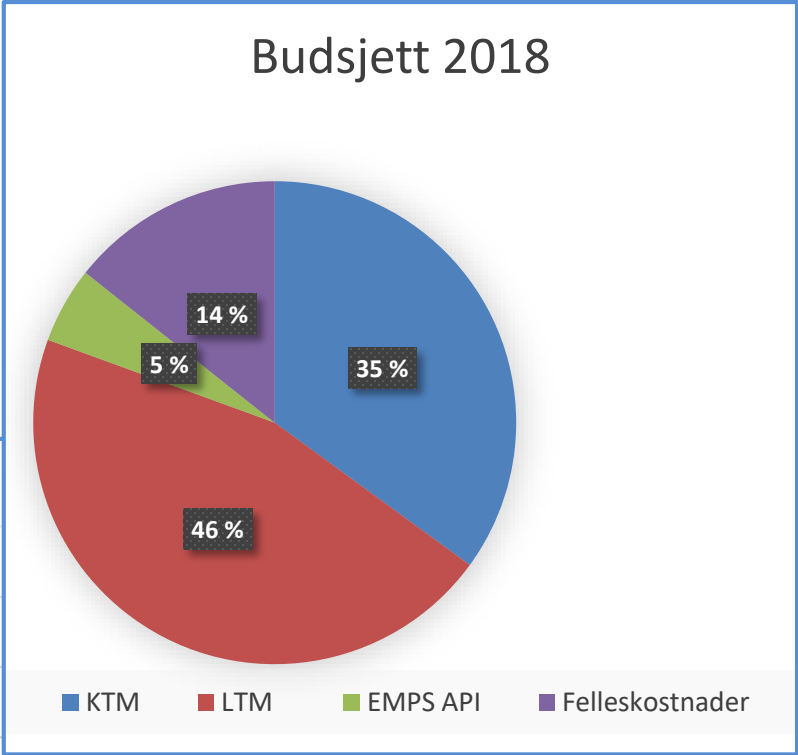
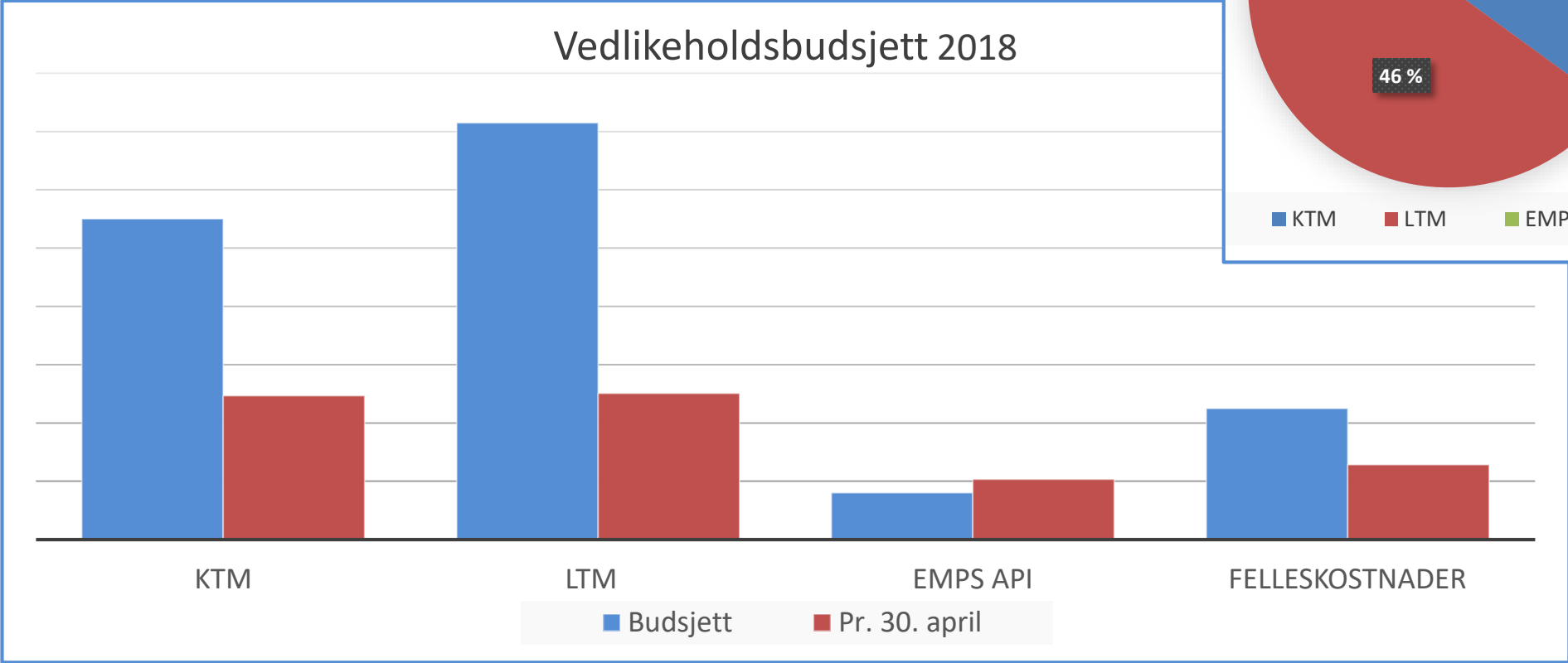
Tasks

- Project meetings every 2-3 week
 - Budget for next year – distribution between models and tasks
 - Budget follow-up – budget revision
 - Budget approval by the model responsible
- Resource planning
- Follow-up on license-initiated projects
- New sales

Budget: 2015-2018

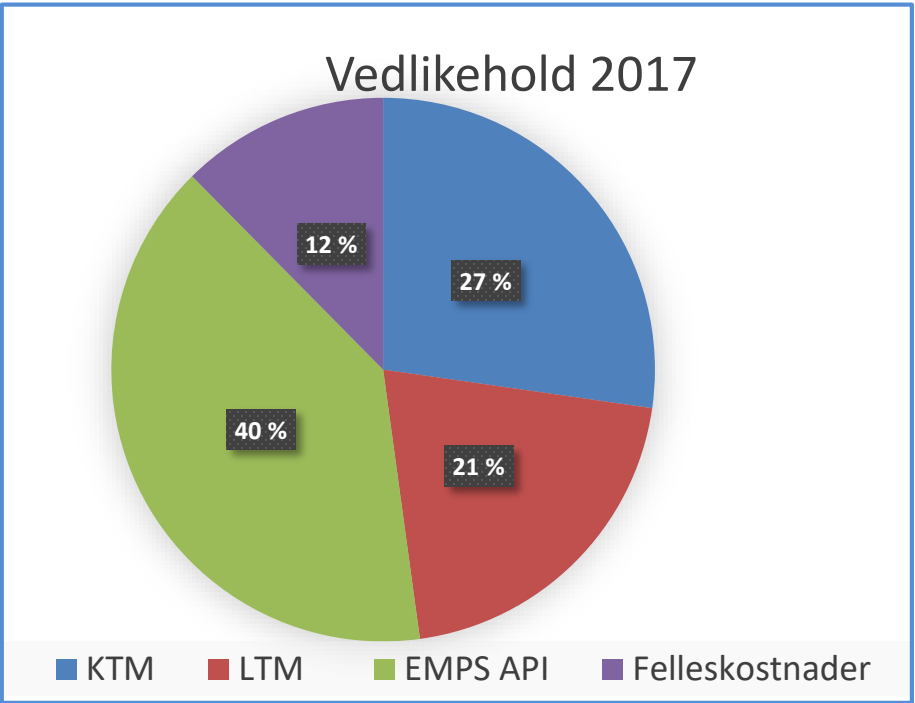
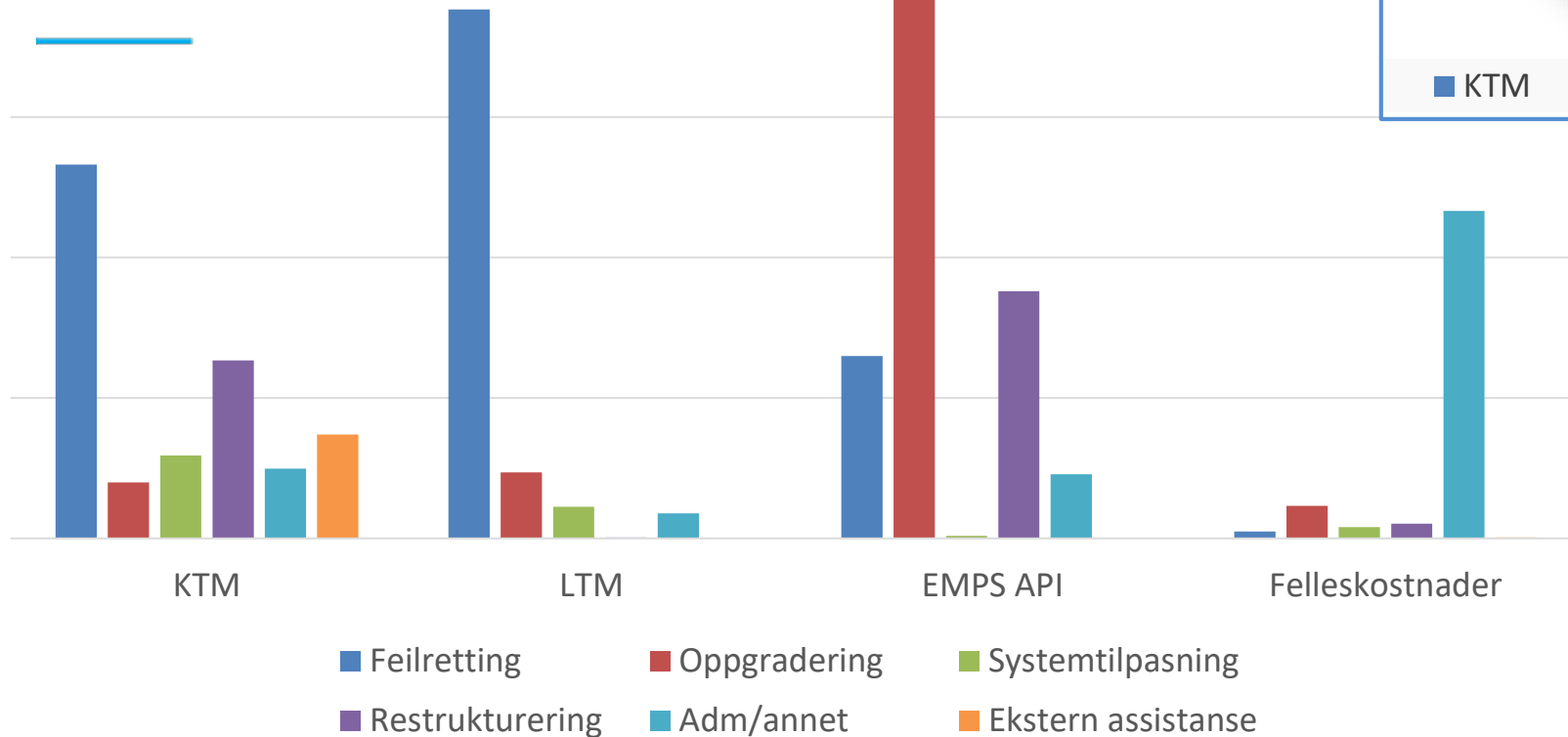


Management 2018



Dist. between activities 2017

Vedlikehold 2017



Activities within the license project

- Phase 1 of a test-system for the LTM models (1000 kkr)
 - Short-term: Establishing minimum auto testing of new versions
 - Long-term: 1. step compiling-linking, integration server, test system.
- We can automate tests supposed to give close to equal results
- New functionality will always need check by the developers but the system can support the process – easy comparison.
- User manual integrated in the SDK on SHOP
 - Today we have a word document and an automatic message list without integrated documentation. Help and documentation is a manual process
 - Include the manual with the SDK – get help where you are - improved updating of the documentation

Drivers and barriers: Digitalization

- Much more available data from calculations sensors and open sources - BigData
- Automation of processes – vision of the digital hydropower station
- Closer connection between model results and trading solution – automatic trading
- Maintenance signal into the scheduling process, sensor data into scheduling, floating limits in scheduling.

Drivers and barriers: Emission targets

- European emission targets 2020-2030-(2050)
 - Massive electrification is expected in transport and process industry
 - All electricity from renewables in 2050
 - The commission focus on increasing cross-border exchange, common market solutions and higher involvement of the consumers through the – Clean Energy for all act.
- Increased renewable production results in more frequent larger and faster variability in power production
 - Demanding shorter timesteps
 - New constraint types becomes binding in scheduling and energy system modelling
 - Increasing short-term uncertainty
- Decreasing cost of power production from solar and wind power puts pressure on the energy price

Renewable cost going down

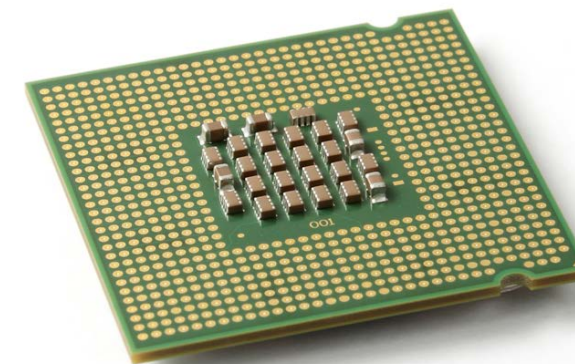


CEDREN Centre for Environmental Design of Renewable Energy



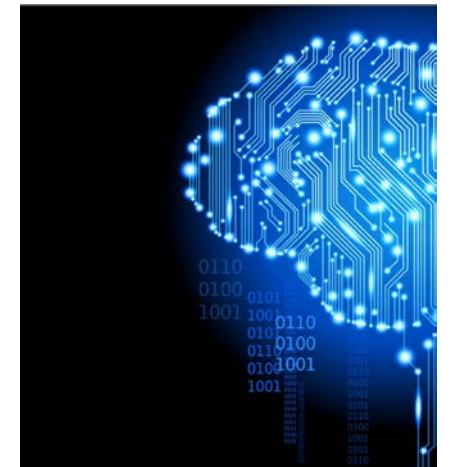
Drivers and barriers: ICT

- CPU speed is not increasing significantly
 - Lower execution times must come from parallelization or by improved methods.
- Standardization gives increased use of high level language for integration and process control and GUI.
 - Cost of solutions go down while the need for competence
- Centralized solutions emerge and more is placed in the Cloud.
 - Challenges pricing principles and ICT competence in SINTEF



Drivers and barriers: Operation Research

- Main optimizers such as CPLEX, Gurobi and Express still reduces calculation time.
- New OR methods that can handle important characteristics such as non-linearity SDDiP is developed
- Non-linear non-convex problems remains outside reach for practical purposes.
- Introduction of more effective AI methods
 - Still very calculation heavy – typically learning is done in Cloud solutiono
 - When and where to use AI as a supplement to optimization?

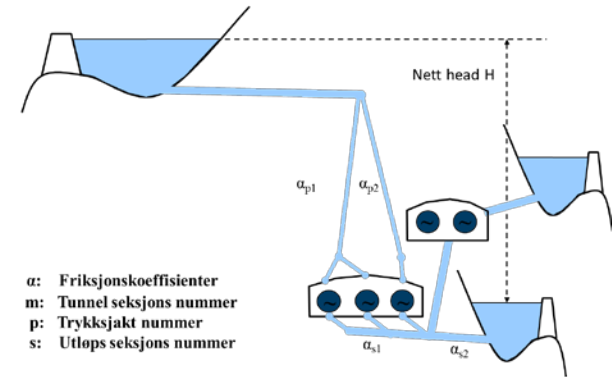


Drivers and barriers: Research

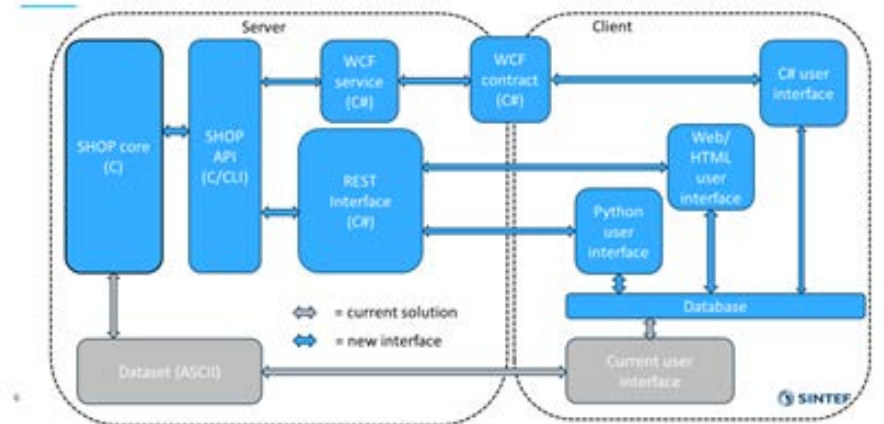
- The power sector is changing fast regarding: energy mix, regulation and actors. A research project delivering a prototype after 4 years is considered long. Is new versions ready when we need them?
- The collaboration needs a strategic approach to research and use of the public support system
- Models must "researchable" and deliver results faster and cheaper
- Arena work will be increasingly important both our model arenas and the external arenas such as NRC, EnergiX, Nordic Energy Research, H2020 and FP9.
- Challenged on IPR from project partners and state grant rules from the government
- Challenged from the FME's regarding what is included in the FME and what not.

Drivers and barriers: Software development

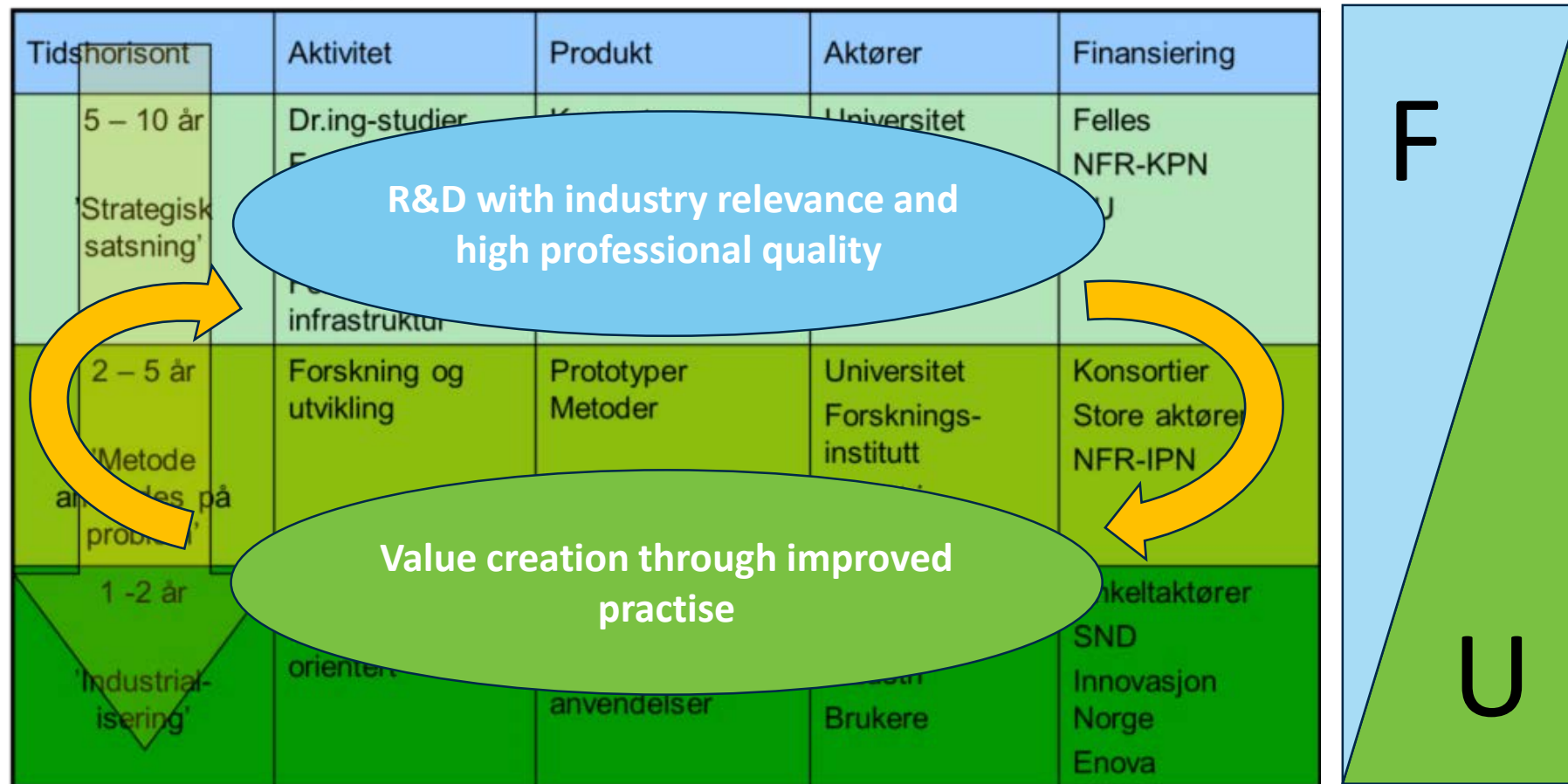
- Our power producers are taking an increasingly professional approach to ICT and models use in their planning processes that is mirrored in the supply industry, and also impact SINTEF
- Challenges the way projects are carried out in SINTEF – in a good way.
- Front-end that the user are seeing becomes increasingly important as the same time as the front-end becomes thinner. Is our front-end approach adequate?
- Is there a drive away from joint research and development and joint solutions towards more competition on solution not just competition on use?

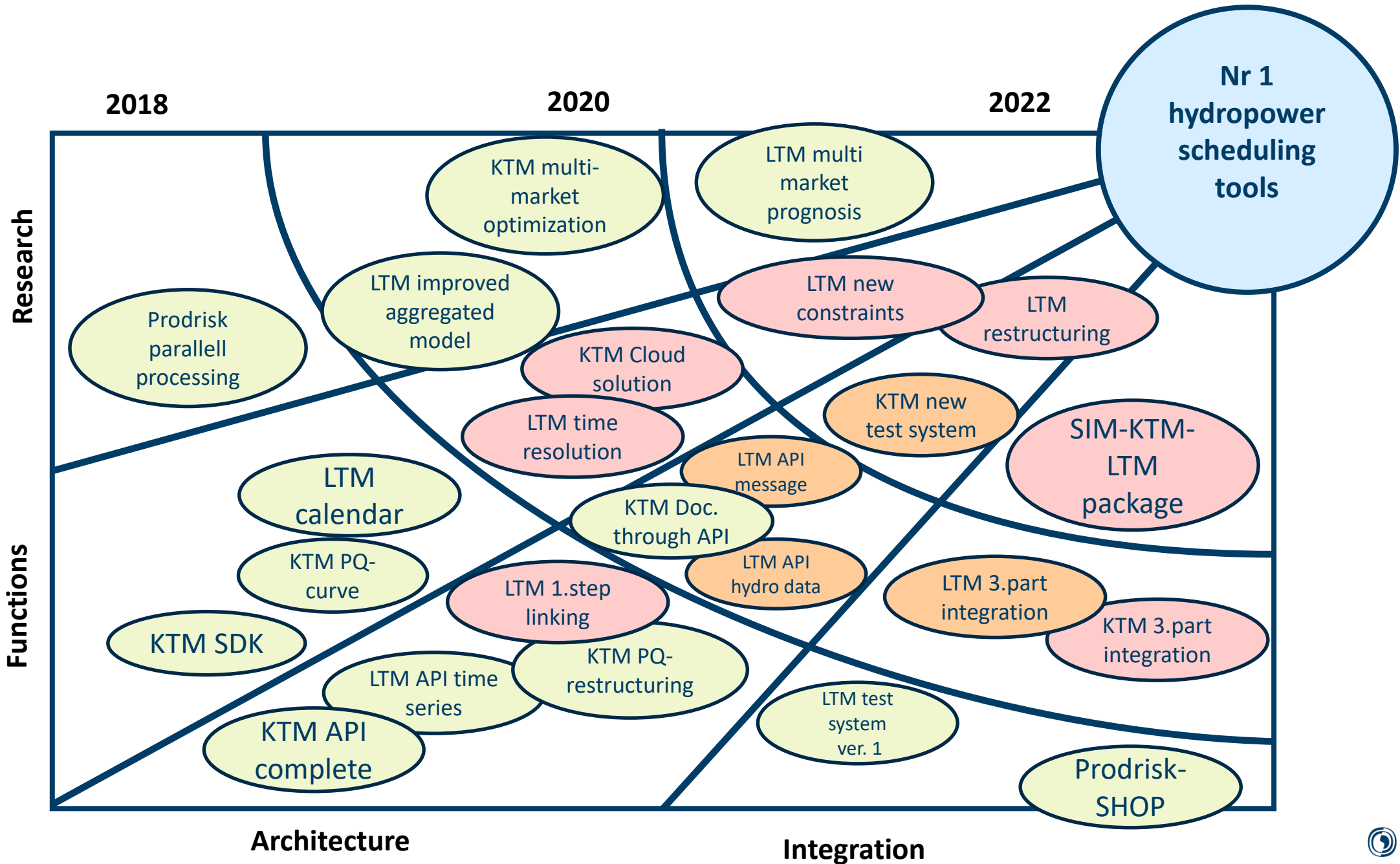


SHOP Interface architecture



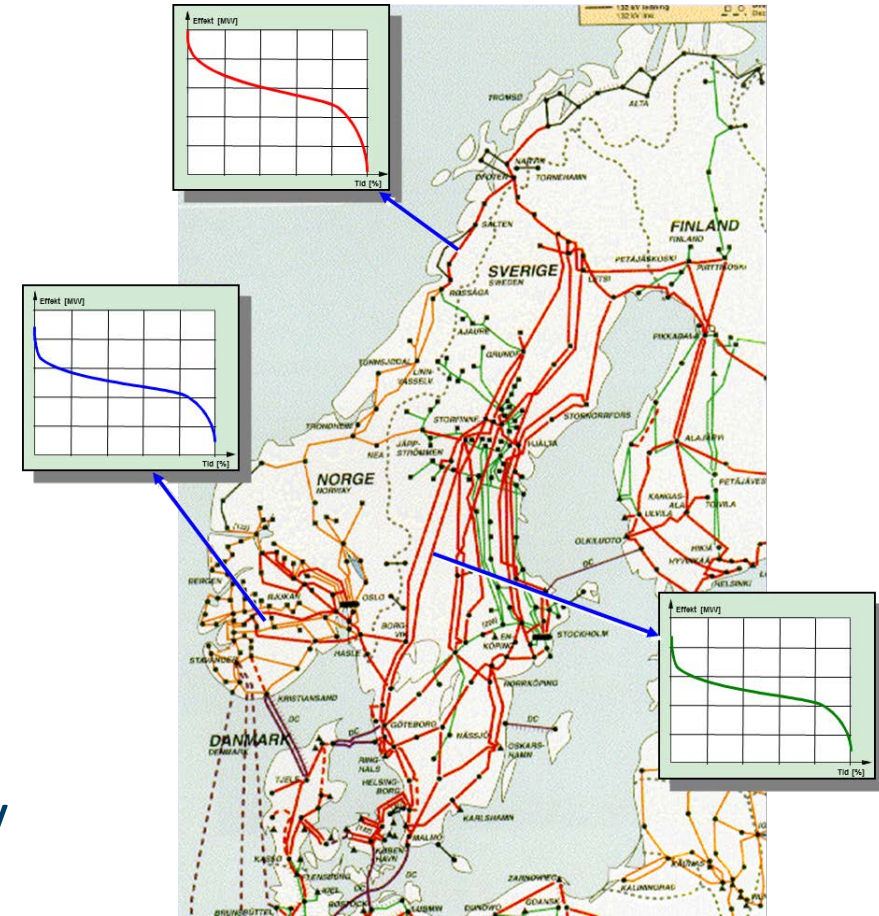
Target for the R&D process





Discussion

- Feedback to the project and presentation
- Is there drivers and barriers that are missing?
- What would be your company's number one priority 2018-2019?
- Reporting: What would you like to see on the user WEB



Teknologi for et bedre samfunn

