

A wide, powerful waterfall cascades over a rocky ledge into a turbulent river below. The water is white with foam, and the surrounding landscape is rugged and rocky under a blue sky with scattered clouds.

# ***USER FORUM SEPTEMBER 2020***

Ph. D. Michael M. Belsnes



# Agenda

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10:00-11:00

- The maintenance project in 2020
  - Annual account and budget
  - Error statistics
  - Information
    - New contract templates, the a reference group
- Strategic projects
  - Results from the energy model incubator project
  - Next generation market models

11:10-12:00

- Roadmaps and release plans
  - SHOP and the simulator module
  - ProdRisk
  - EMPS
- Discussion

# Model project 2020

- **Rakett - Shorten calculation time in FANSI**
- **Sum impact from new hydro revisions**
- **iScheduling - Automatic short-term planning**
- **Kobas - Price & volumes in RK**
- **Vannfly - Flow based market coupling in hydro systems**

ProdRisk – SHOP simulator used for effect on a real case

The SHOP Platform has improved communication and workflow for SHOP

- Now a similar platform for ProdRisk is under development.



Sold 12 licenses accumulating to 1,14mill NOK

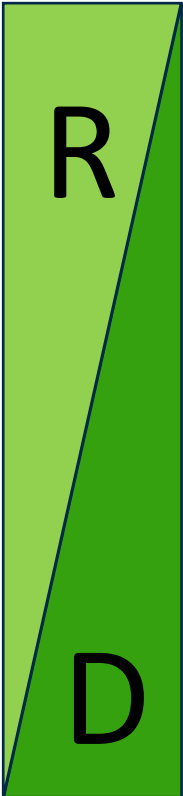
# Research gives a repository to activate when needed.

TRL 1	Basic principles observed
TRL 2	Technology concept formulated
TRL 3	Experimental proof of concept
TRL 4	Technology validation in lab
TRL 5	Technology validation in relevant environment
TRL 6	Demonstration in relevant environment
TRL 7	Demonstration in operational environment
TRL 8	System complete and qualified
TRL 9	Successful mission operations

Time horizon	Activity	Delivery	Partners	Financing
5-10 years	Ph.D studies Research		Universities	Consortiums NFR - (KPN) EU - (IA)
2-5 years	Research Development Testing in lab on real cases	Prototypes Scientific publications	Universities Partners from the	Consortiums Large industry NFR - (IPN) EU - (IA)
1-2 years	operational Education of industry Supporting application and use	applied and use and supported	power industry Software companies	Industry, single partners or consortiums Innovation Norway Enova

New competence

New practice



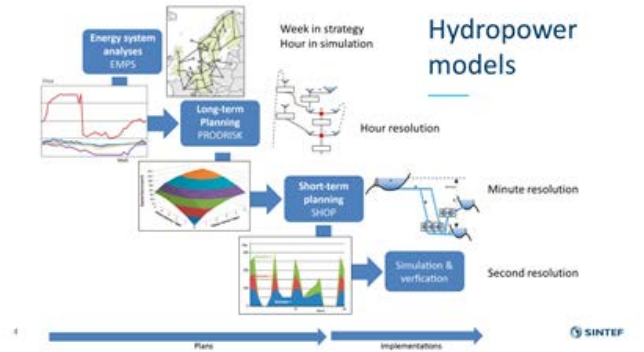
# UserForum 2019 - your participation matters

3) FRAMTIDEN TIL AI?  
KVANTEMASKINER?  
SENSORER & SIGNALER  
PRESSION I PROGNOSE  
VS MODELL  
FUSJONSKRAFT

MANAGEMENT  
MER INVOLVERING, JA TIL  
REFERENSE GRUPPER  
TRANSPARENS PÅ FEIL OG  
STATUS.  
HVORDAN SPENNE OPP FRA  
BLANKE ARK?  
- LØSE UTFORDRING MED  
GAMMEL KODE  
- STIFTELSE & FORSKNING OG  
LEVERANSE I PROSJEKTET.  
- UTLØSE EKSTRA FINANSIERING  
- MER STYRING TA MER RISK

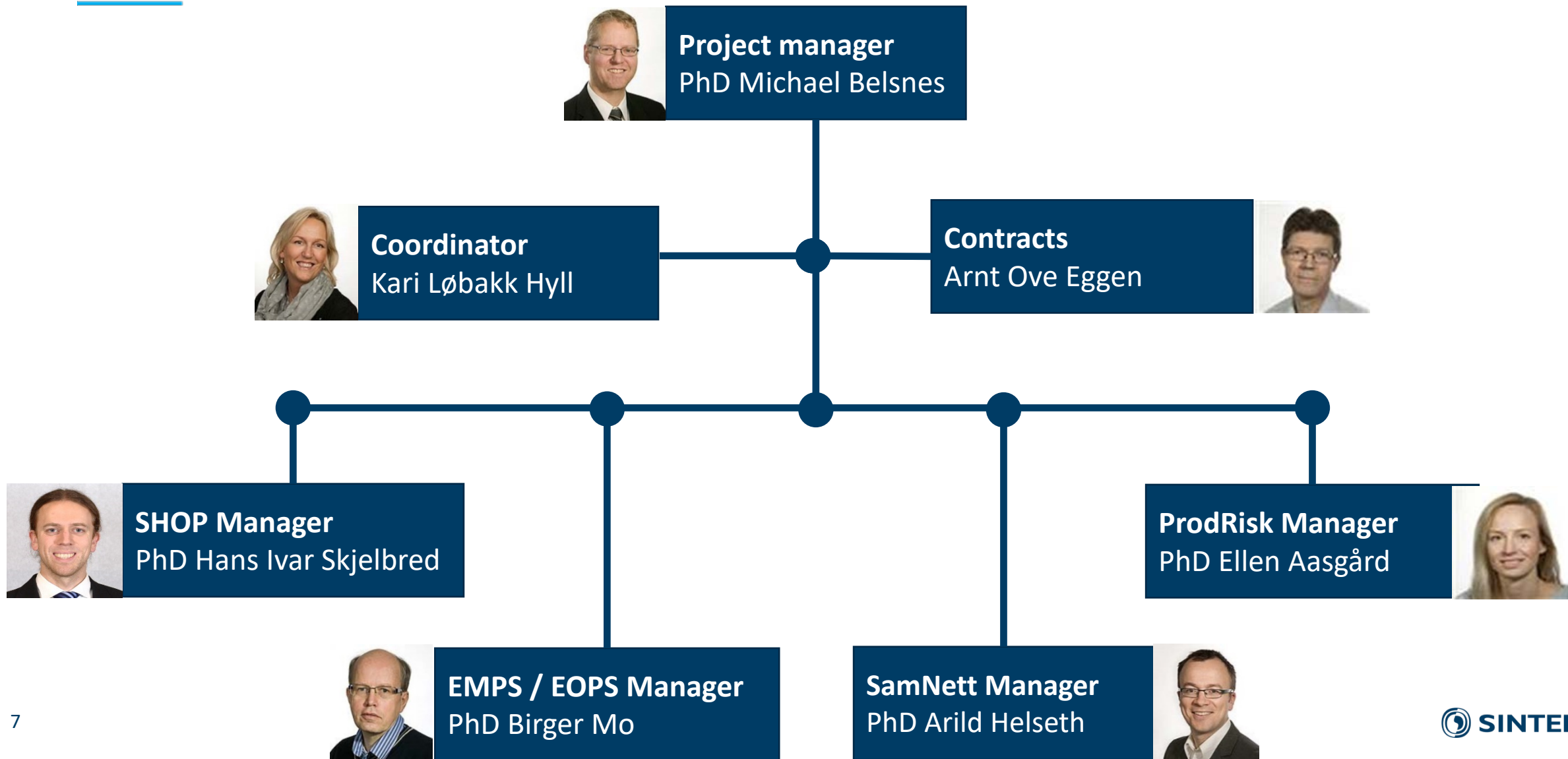
2 IT  
\* AUTOMATISERING  
\* OVERSIKTLIG INFRASTRUKTUR  
\* FOR DATA BEHANDLING  
\* ENDRER DELER AV KJERNEN TIL AI/ML  
\* BEDRE RESULTATPRESENTASJON  
\* ENKEL TILGANG TIL MYE DATA  
\* BEDRE STRUKTUR PÅ RELEASE → KODEBRANN  
WHAT TO MODEL?  
\* HØYERE TIDSPRESISNING  
\* STØRRE OPTIMISERINGSPROBLEM  
→ REGNETID

# The maintenance project 2019



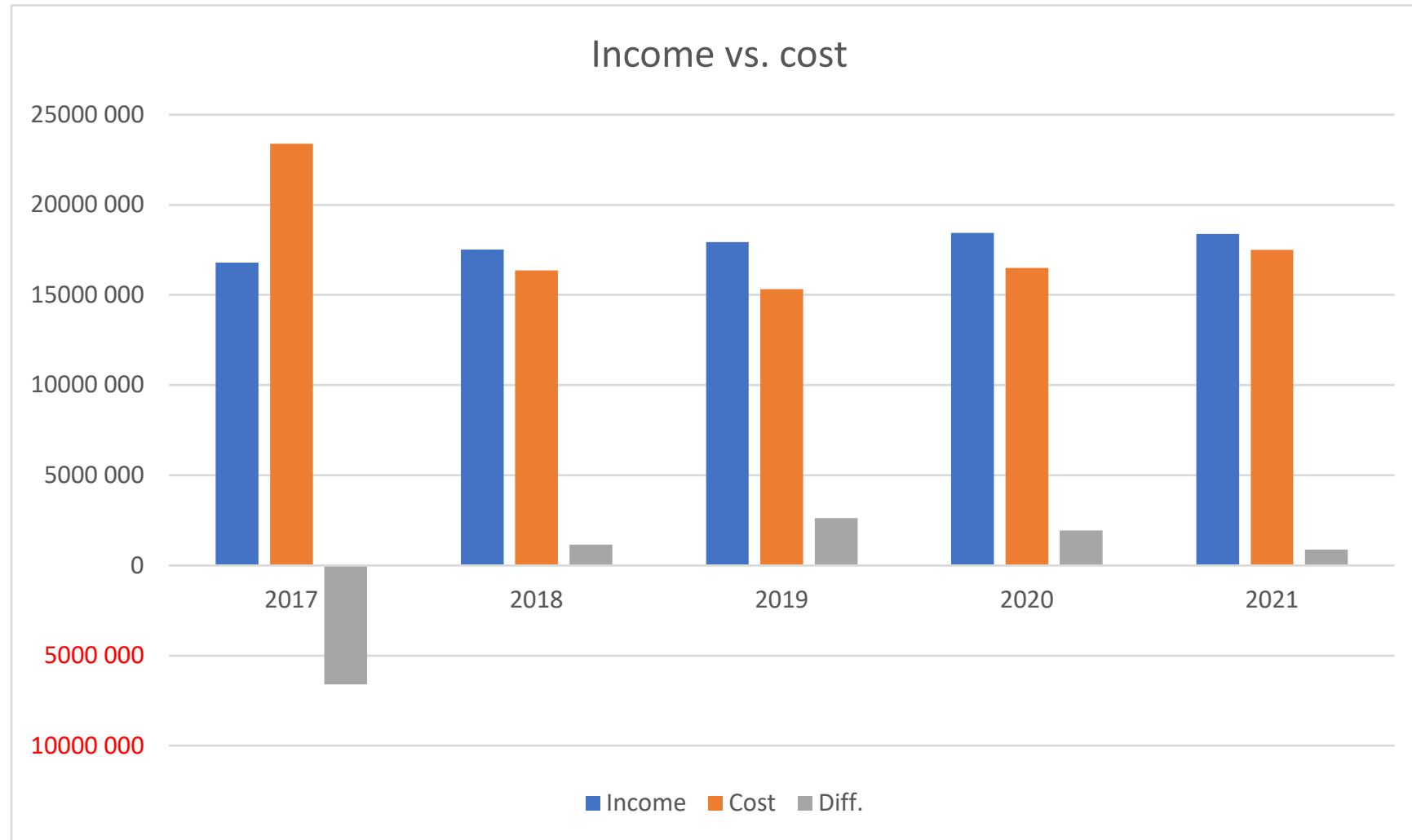
- Comprises all hydropower scheduling models where SINTEF Energy deliver maintenance:
  - EMPS (Samlast and SamNett), EOPS, ProdRisk, SHOP and the SHOP Simulator
  - Prototypes such as SHARM, EMPSW, FANSI, ReOpt is not included in the project
  - Customer list of 35+ customers with one or more licenses
- SINTEF is a Non-profit organization
  - What we invoice through the maintenance project is what we are using in the project.
- New sold licenses are used on the models

# Project organization



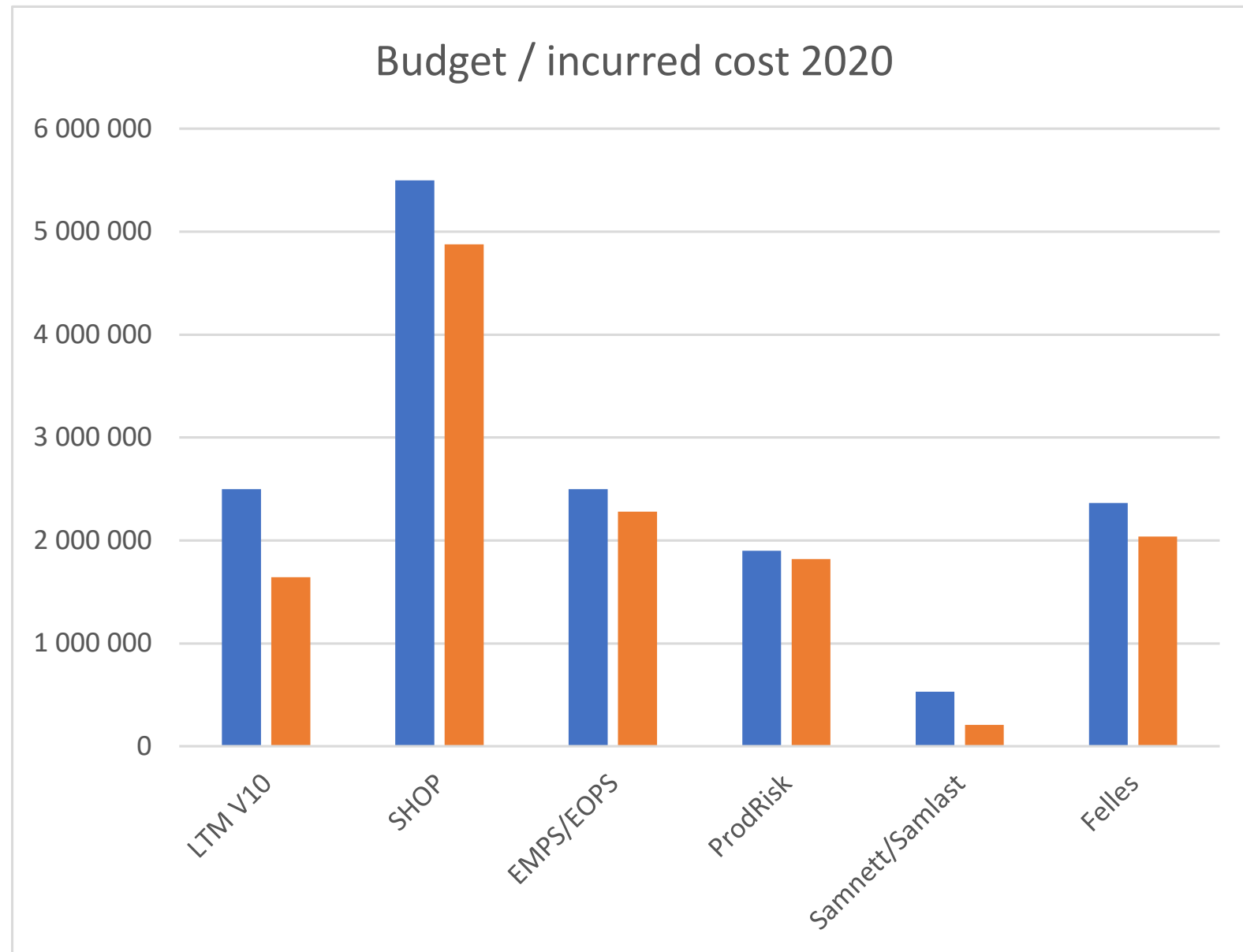


# Budget and consumption 2017-2021





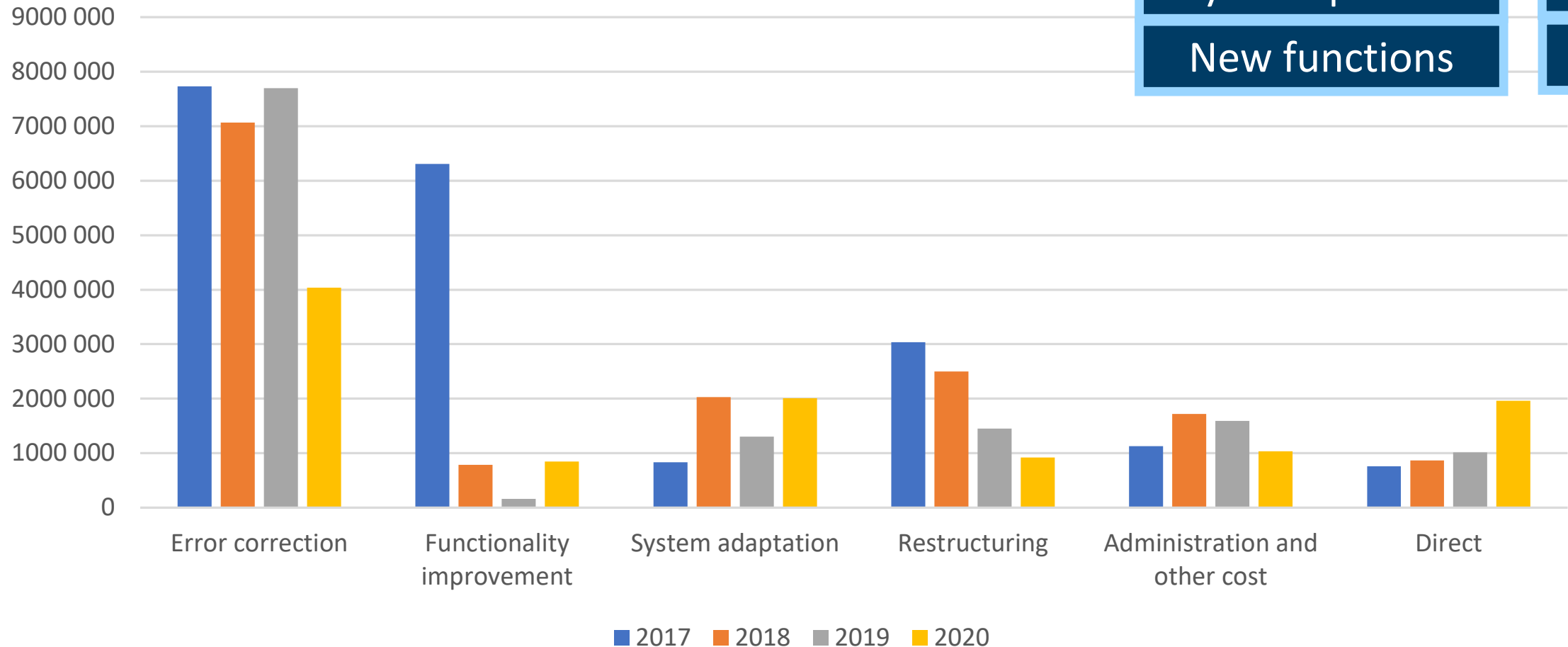
# Budget and incurred cost 2020



# Incurring cost per delivery group

Error corrections	30%
Restructuring	30%
Sys. adaptation	20%
New functions	20%

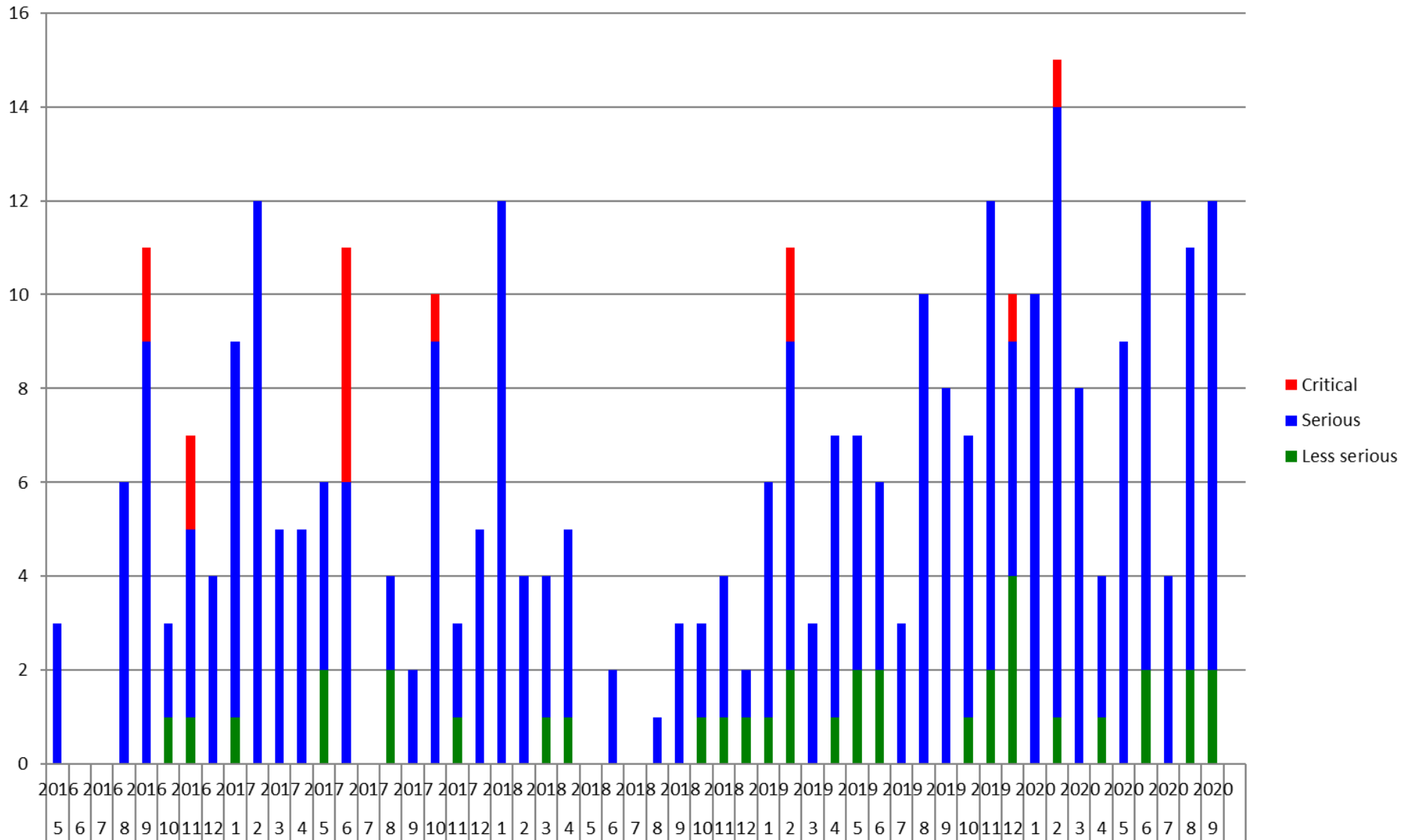
Annual incurred cost per activity



# Error statistics

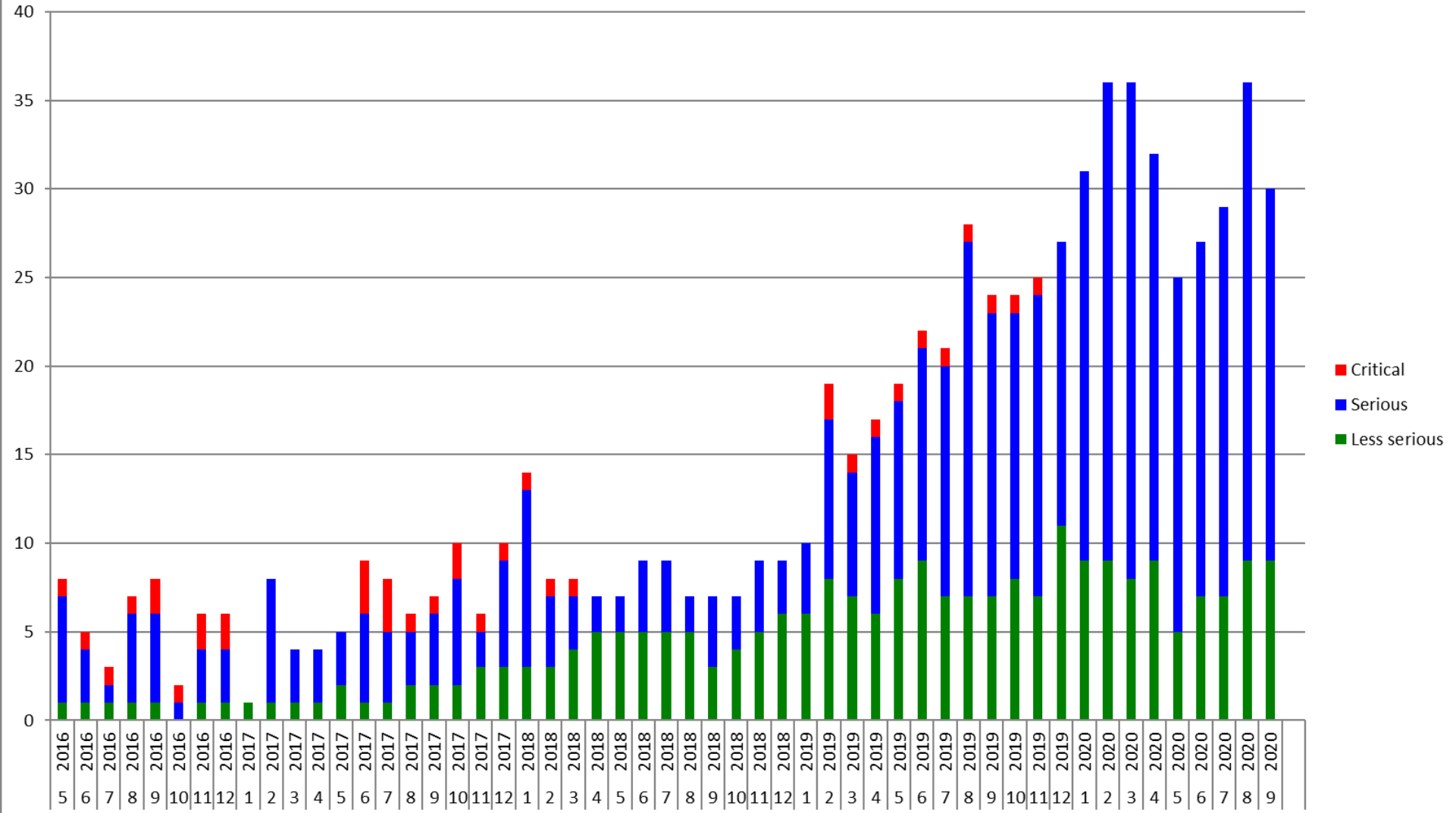
Bernt Garten Galtrud

## Reported bugs LTM

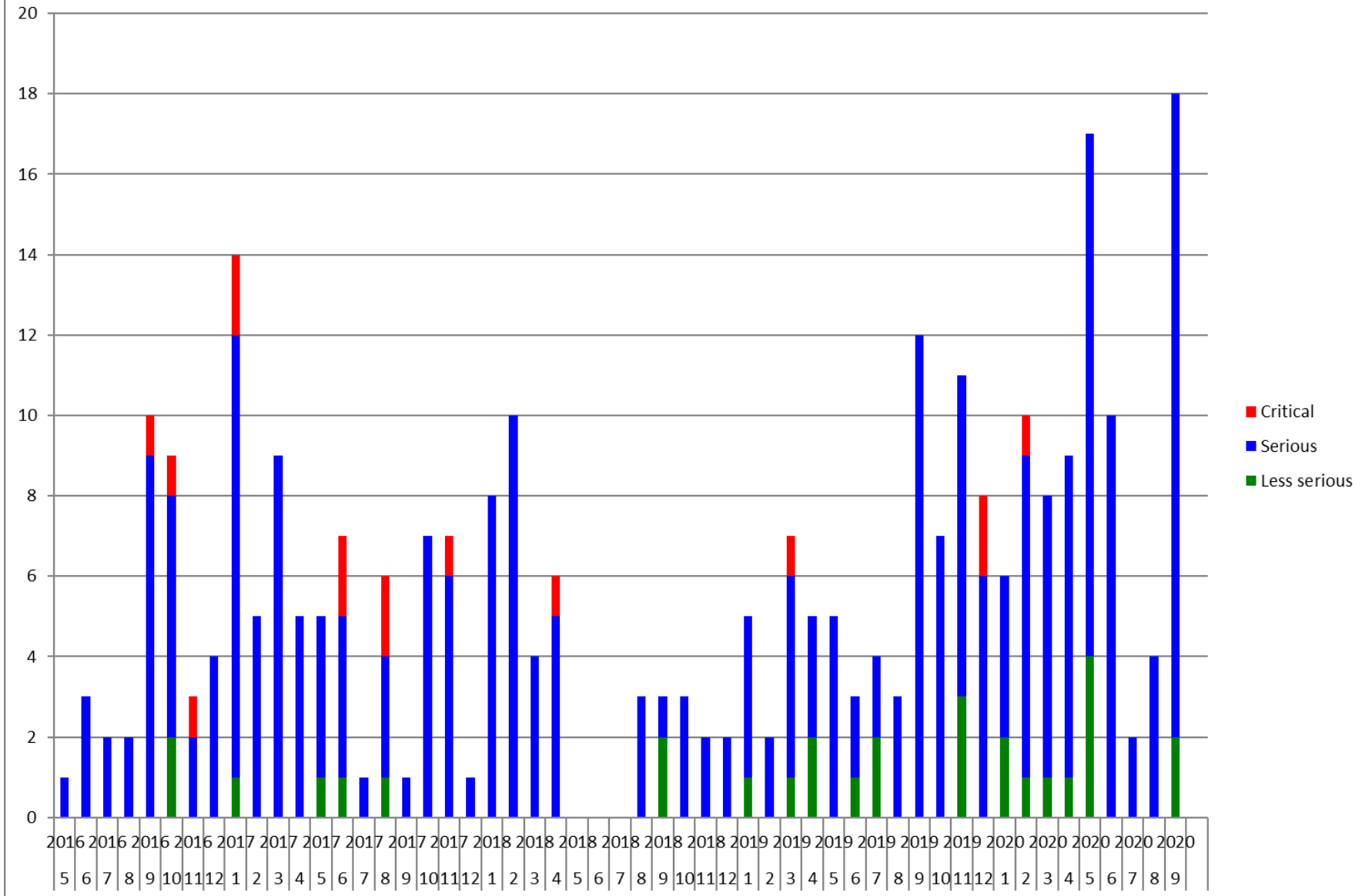




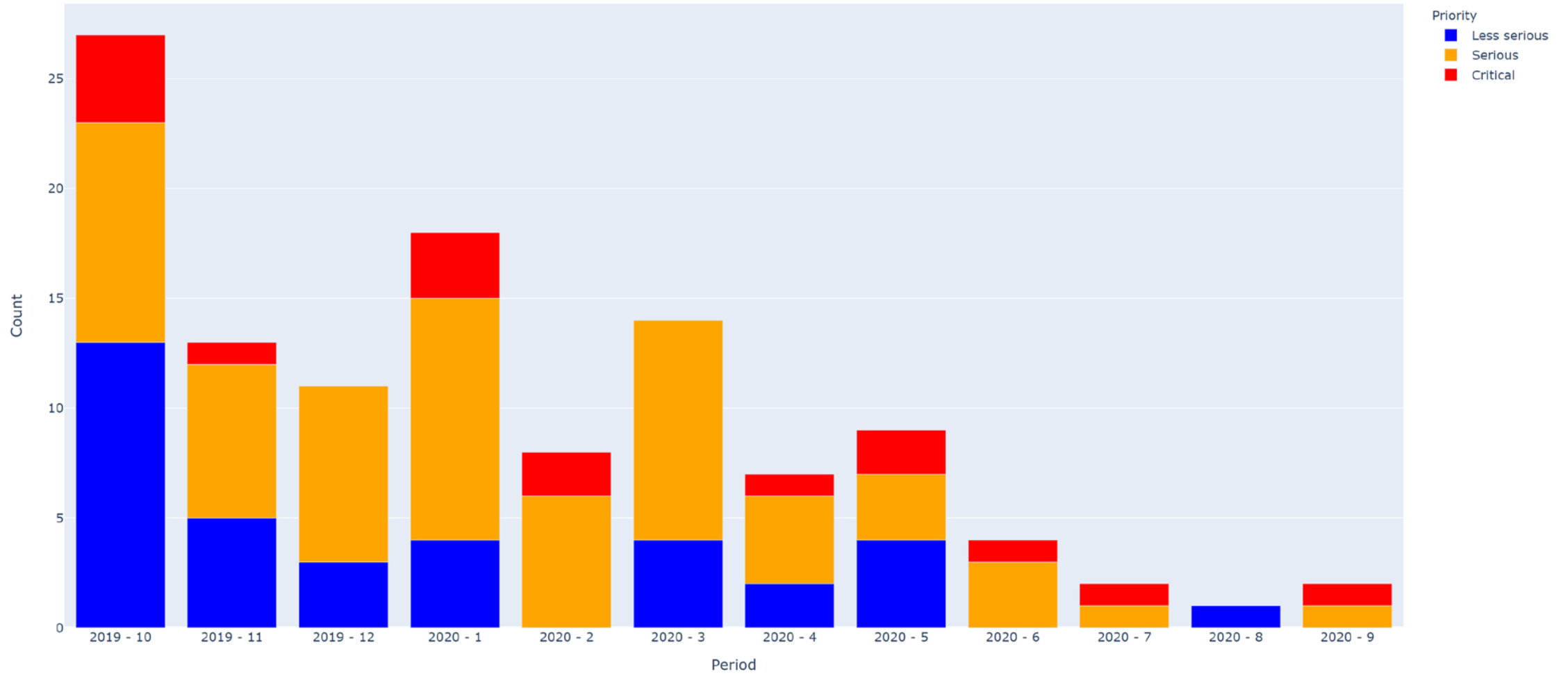
### Open bugs LTM



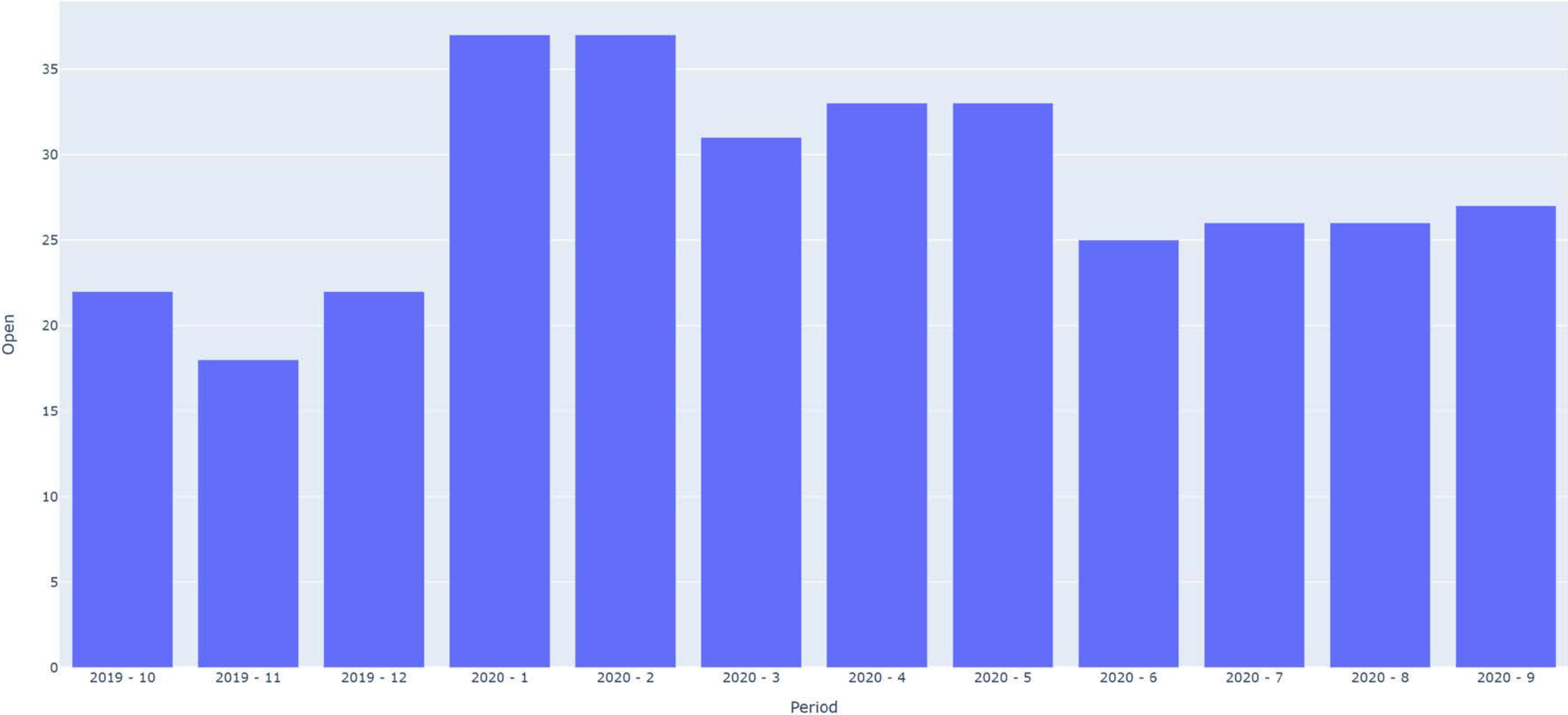
### Closed bugs LTM



# Reported bugs SHOP

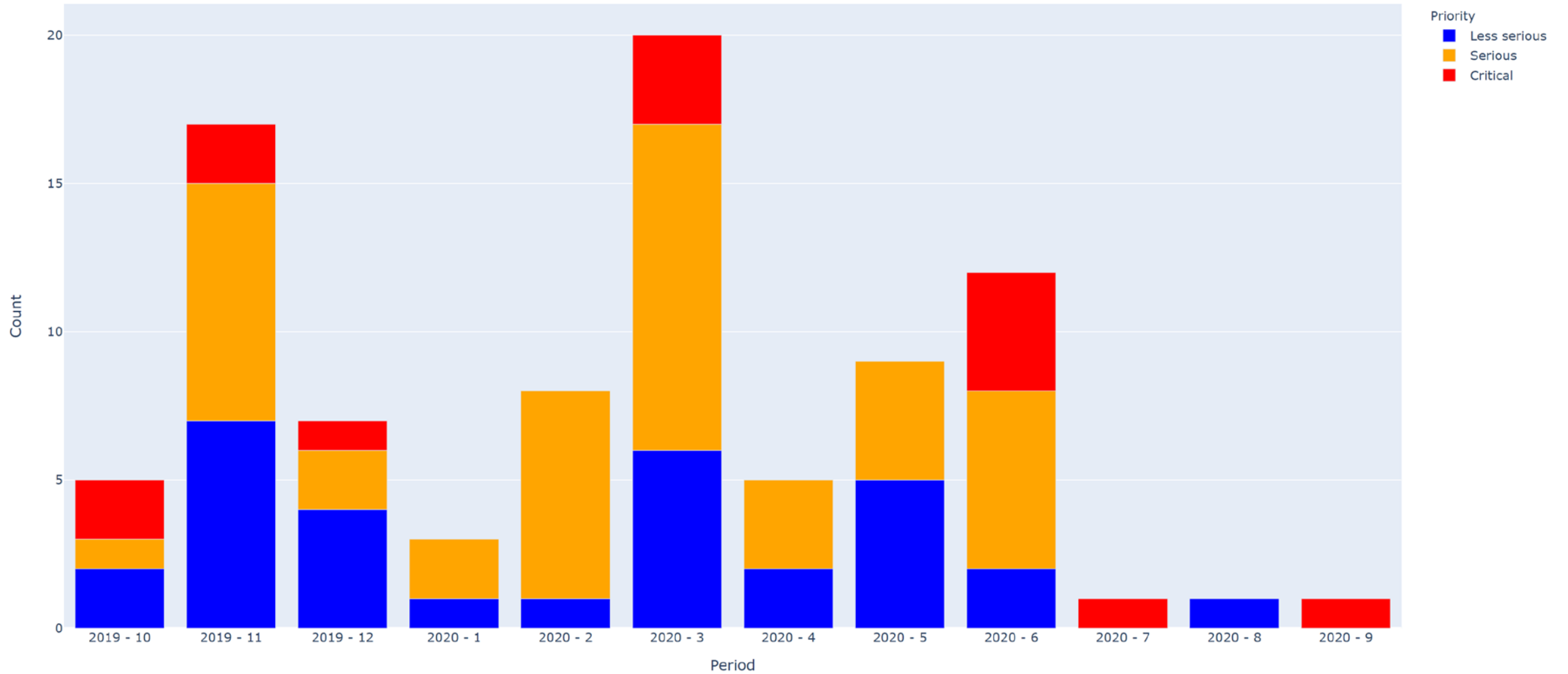


# Open bugs SHOP





# Closed bugs SHOP





# New contracts

Arnt Ove Eggen  
Brukerforum 2020-09-25

# Background and objective

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- Background

- All customers signed a maintenance agreement valid from 2015 (based on template from Agency for Public Management and eGovernment (Difi) December 2013).
- Only a few customers have signed a purchase agreement.

- Objective

- All customers should have a purchase agreement accompanied with a maintenance agreement (based on newest template from Agency for Public Management and eGovernment (Difi) 2018).

# Why change to the 2018 templates?

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- Standard terms and conditions (not to be changed)
  - An updated template is presumably improved.
  - The actual intention and content is the same, but the language/terminology is improved and more clear.
  - The part describing third party software is extended.
- Appendices (deviations and details)
  - Emphasises that this is research-based software (and not "off-the-shelf").
  - Terms and conditions updated describing the current practice.
  - Intended to cover all models, and hence be common for all customers.
  - User specific deliverances are included in appendices.



# The road ahead ...

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- SINTEFs project team has prepared templates for both purchase agreement and maintenance agreement based on the newest templates from Difi (2018), and in dialog with SINTEF's lawyer
- The primary objective is that all customers sign the purchase agreement (followed by the maintenance agreement when needed).
- SINTEF sends the template to the customer, who approves or comments.
- SINTEF updates the template with spesific requirements if necessary.
- Agreement are electronically signed by both parties.



# Reference group turning into model forums

Michael Belsnes

# SHOP-forum, ProdRisk-forum, EMPS-forum

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- In the User Forum 2019 we had a discussion and a vote regarding establishment of a reference group for the model project.
- In the project management group we have discussed the possible mandate of this group and decided that we would rather put more effort into the model forums after a similar approach used for the SHOP forum.
- We have had model-forum meetings for ProdRisk and SHOP in 2020, and a V10 meeting for the EMPS model which is sort of similar to a model forum.
- This will be organised individually for the models. It is an additional cost in the project but we believe it is worth it.

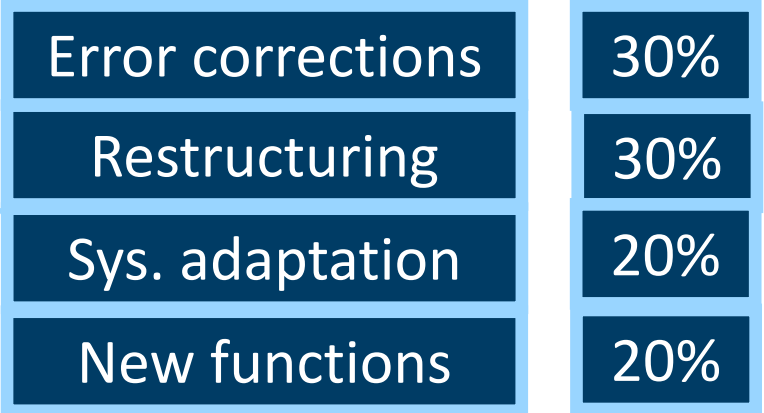
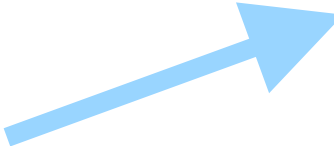
# Planned model forum meetings

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- SHOP -4th of November 2020
- ProdRisk – January 2021
- EMPS V10, including ProdRisk V10 meeting November 2020

# What happens in a SHOP forum meeting

- What is new in SHOP
- Presentations from the users
- Status for ongoing activities and projects
  - Activities in the model project
  - Development and Research projects
  - Status on SHOP - economy
- New development proposals are discussed and degree of individual user commitment is
- Advices and suggestion from the users for activities and priorities in the model project





# Releases and planned activities

Model Managers

# SHOP v13 main features

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- Generator schedules are always fixed
  - Reduced calculation time
  - Higher numerical stability
- Explicit handling of gross- and net power
  - => power loss in shared tunnels not dependent on results in previous iterations
  - => can have precise limits on both power and discharge

# Maintenance activities 2020

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- Robustness check of varying time resolution – 31/3-20
- Ability to start SHOP at any minute within the hour – 31/3-20
- Restructuring of the best profit module – 01/04-20
- Consistent handling of end values 31/10-20
- Restructuring of the Pelton model – 30/9-20



# Roadmap 2020/2021

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- YAML file format – v13.4, October 2020
- Tunnel module – v13.5, November 2020
- New naming system – v14.0, February 2021
  
- **Next SHOP Forum November 4th**

# ProdRisk activities 2021

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1. Admin
2. Bug fixes and support
3. Communication with users (Portal project + ProdRisk Forum)
4. Smaller developments (Extended cut format, suggestions from users)
5. Reduce number of versions through transition to v10 (support for users for upgrading and testing)
6. Improved testing (consistency checks on input through API)

# ProdRisk 2021 – Plans

## 2. API for version 10

- Robustness and testing of API for v10
- Update documentation for API

## 5. Reduce number of versions through transition to v10

- Assisting users in upgrading to v10 and v10 API
- Implement saving of results on finer time resolution for bypass and spill in v10

## 3. Communication with users

- ProdRisk Forum
- ProdRisk Portal

## 6. Improved testing

- Improved logging in order to recreate cases for bug fixing (DETD file from API)
- Consistency tests on input from API, ProdRisk\_tester as first call in ProdRisk
- Message system for status codes and error messages to the user via the API

## 4. Smaller developments

- Extended cut format
- User requests
- Other

## 8. Bug fixes and support

## 1. Admin

1. April

1. July

1. Oct

31. Des

# ProdRisk - Planned releases

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- ProdRisk core follows same release plan as LTM (Birger's presentation)
- Release of new version of v-10 API end of March 2021

# Release plans EMPS

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- Version 9.9
  - New releases only if serious errors reported.
  - No planned development
- Input\_version:
  - Release after agreement
- Version 10
  - More details follows

# Release details v10

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- Release schedule
  - Adopted new release plan, currently new releases approximately two months apart.
  - Hotfixes dependent on severity and user need.
- Next releases:
  - v10.0.6 available Monday 28 September.
  - v10.0.7 planned ultimo november
  - v10.0.8 planned ultimo february 2021
  - ...

# Release details v10

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- v10.0.6 still classified as beta.
- Currently 13 open cases of known bugs of severity serious/less serious.
- No open critical cases (for any versions).
- 14 new error corrections in v10.0.6.



# V10 – own evaluation

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- Moving in the right direction, but slower than what we would like and expected two years ago
- Expect an operative version by the end of this year.
- Version 10 would still need improvements in 2021



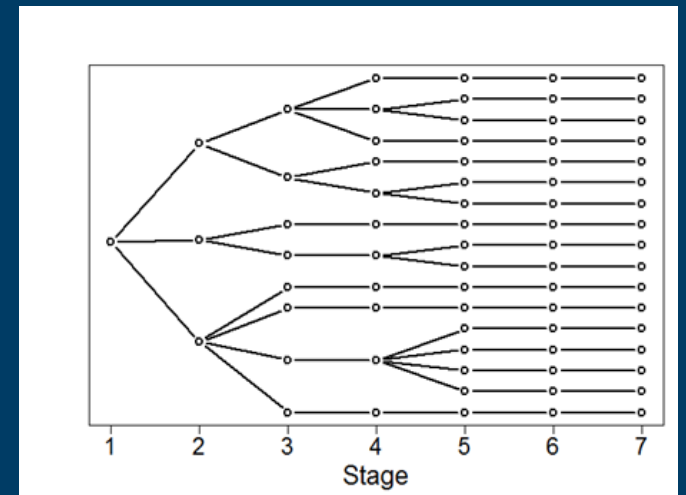
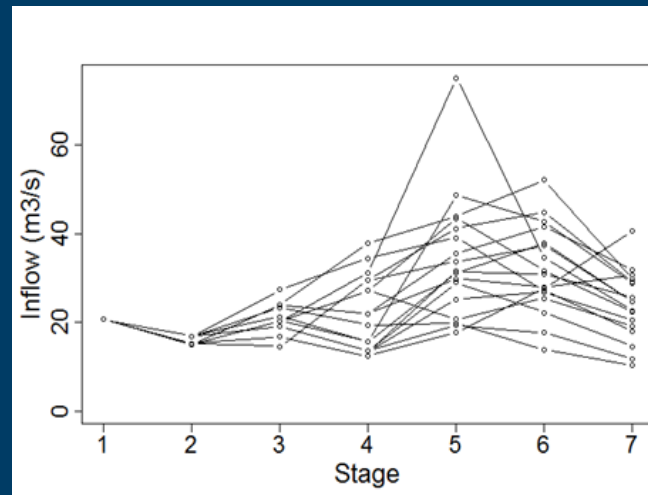
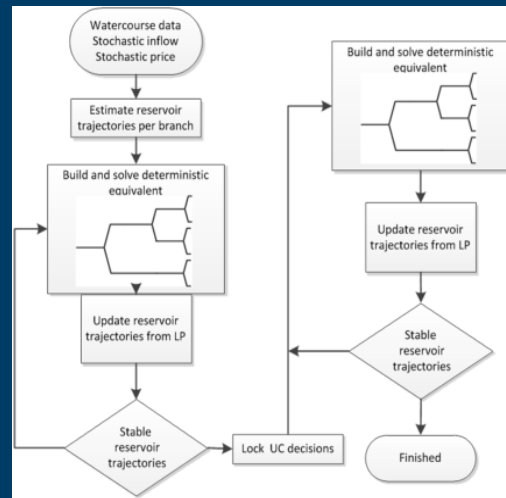
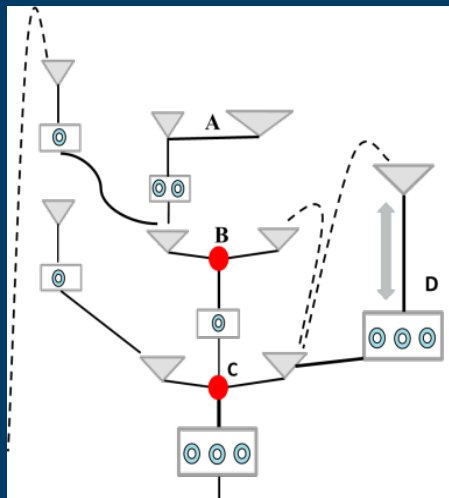
# Further plans V10

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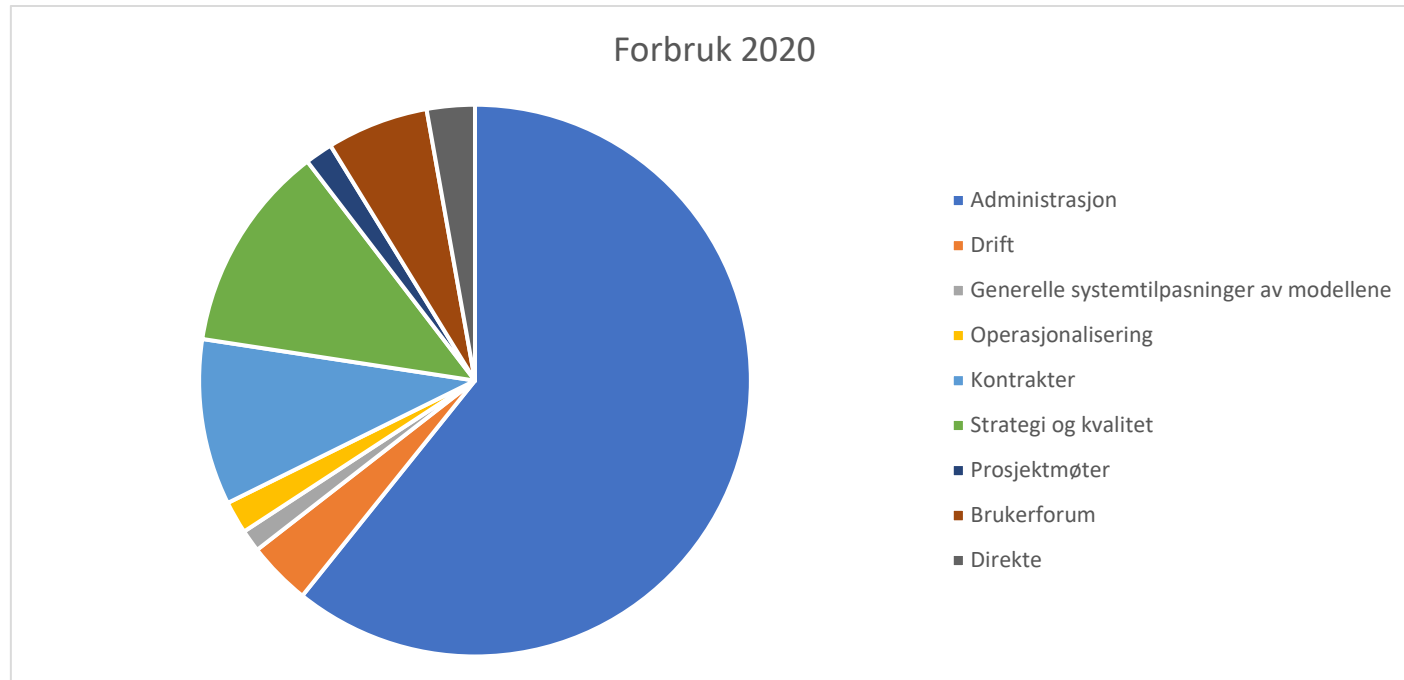
- Improved automatic testing (2021)
  - Input testing, run combinations, functionality, improved comparisons
  - Reduce costs/time and risk of providing new versions
- Documentation, continuous improvement
- Remove obsolete features
  
- Complete API
  - Error messages
  - All inputs
  - Run programs



# Technology for a better society



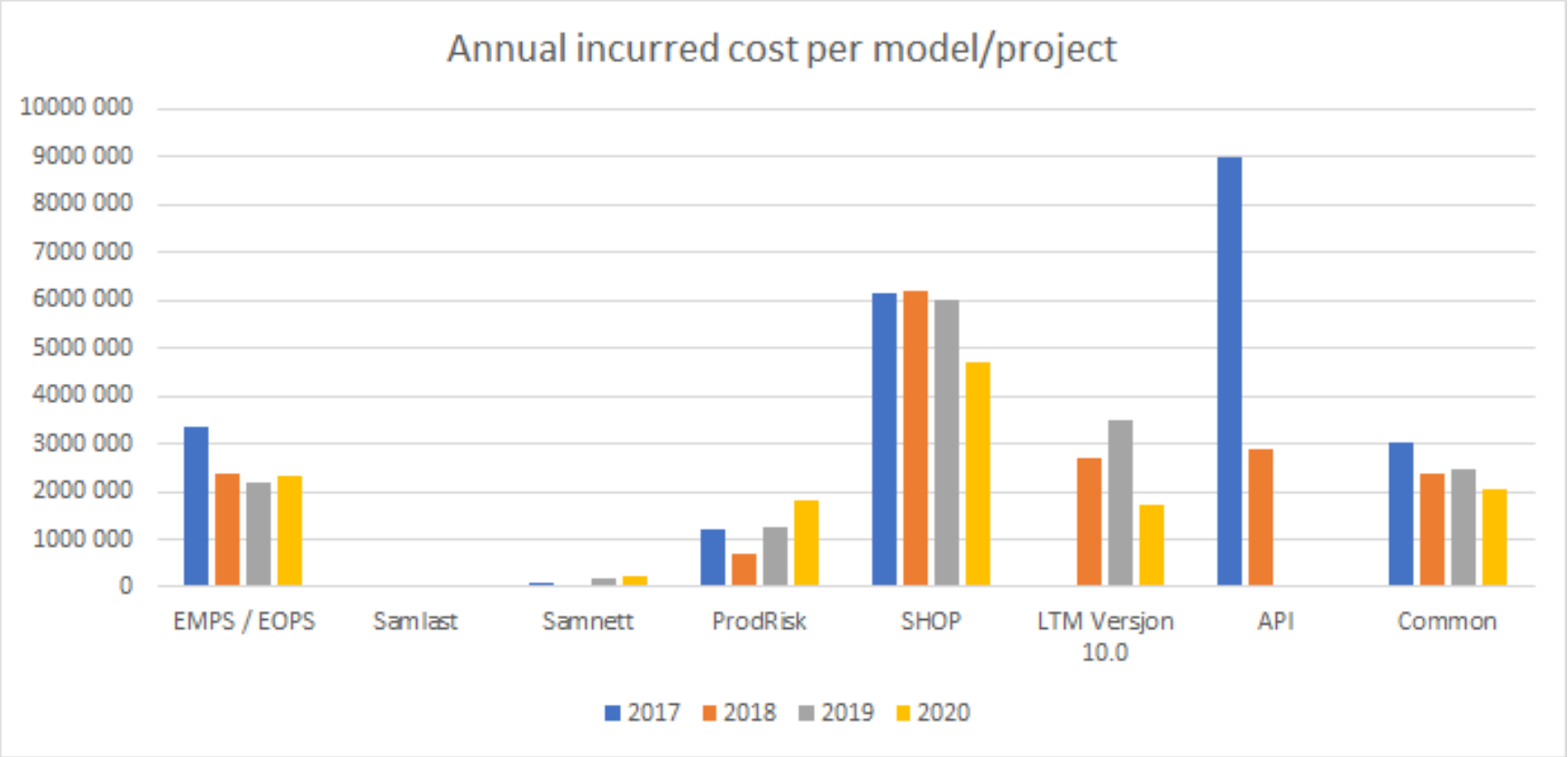
# Incurred cost in the common project



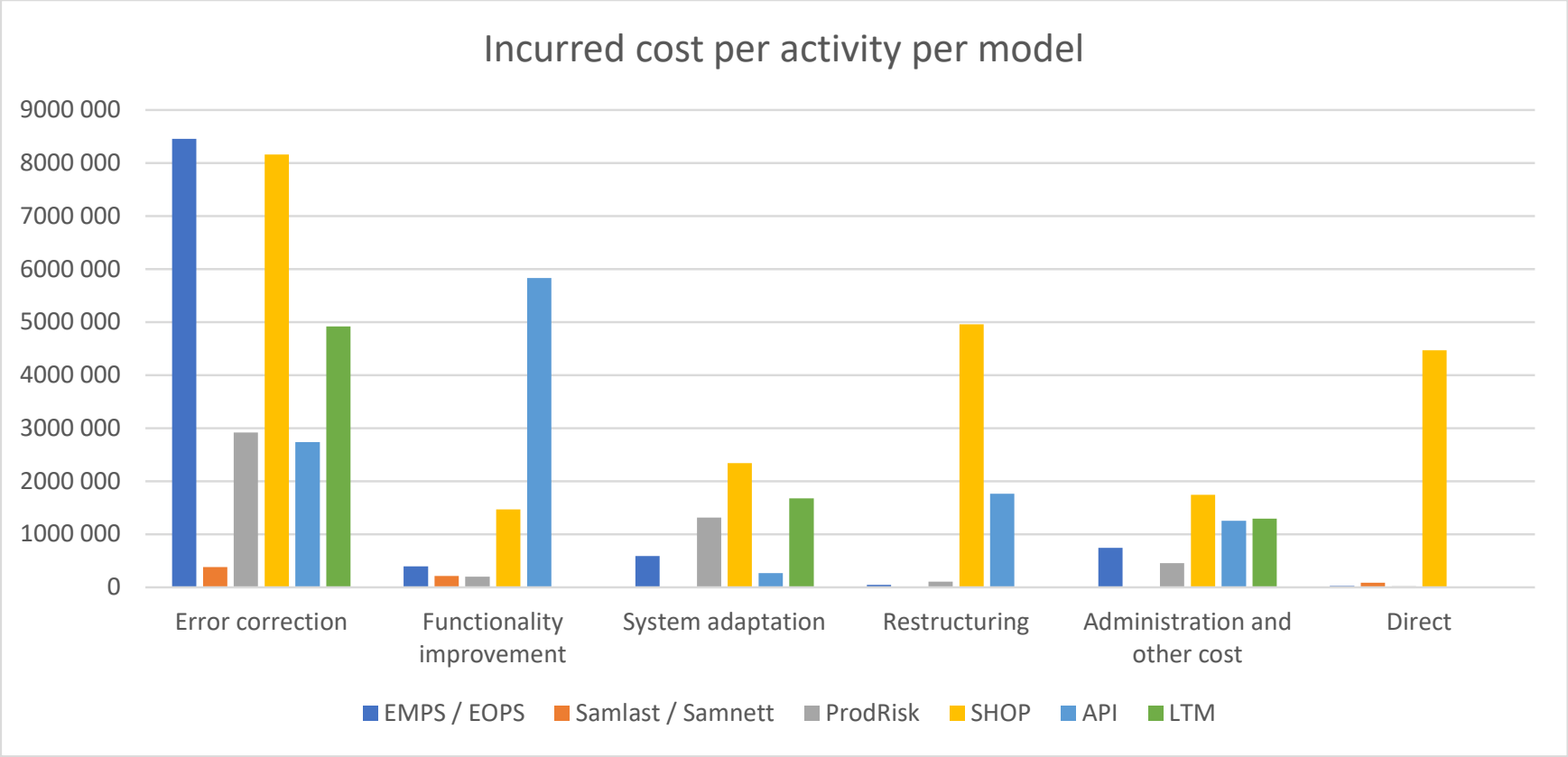
Slå sammen drift, operasjonalisering og generelle systemtilpasninger

Timer for Ellen, Christian, Stefan hvis det er noen på adm bør inngå i strategitasken.

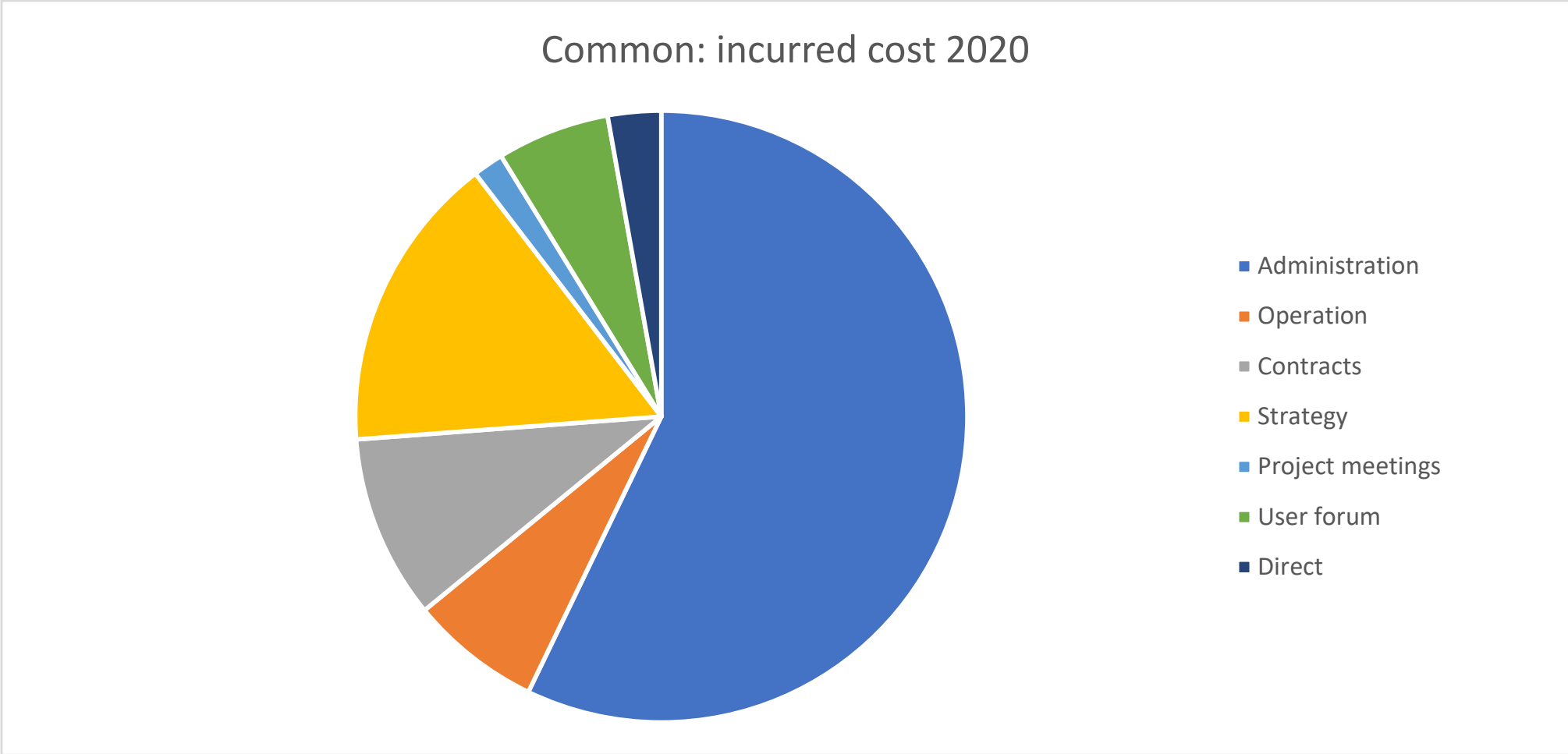
# Incurring cost per project



# Incurring cost per delivery per model

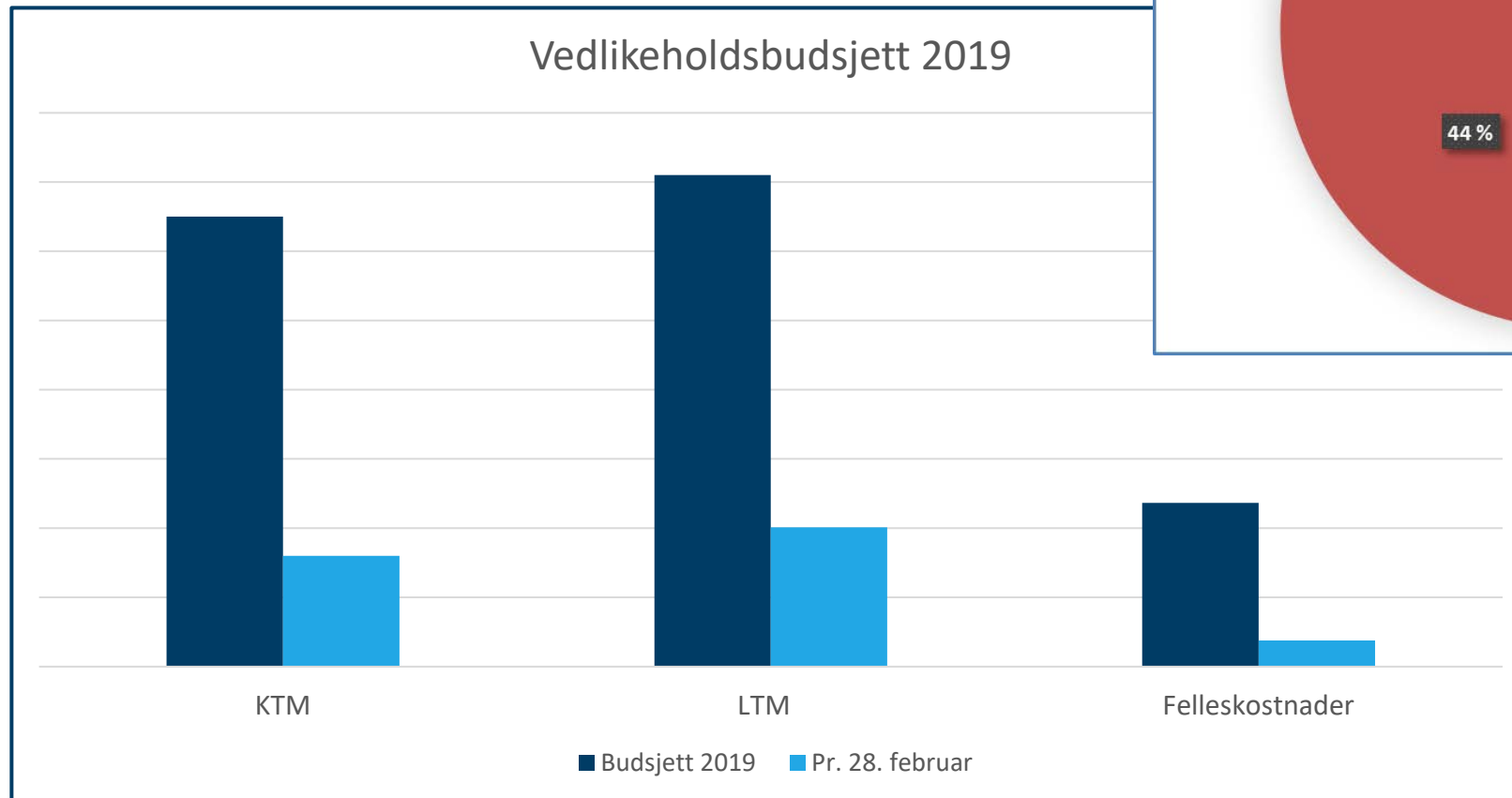
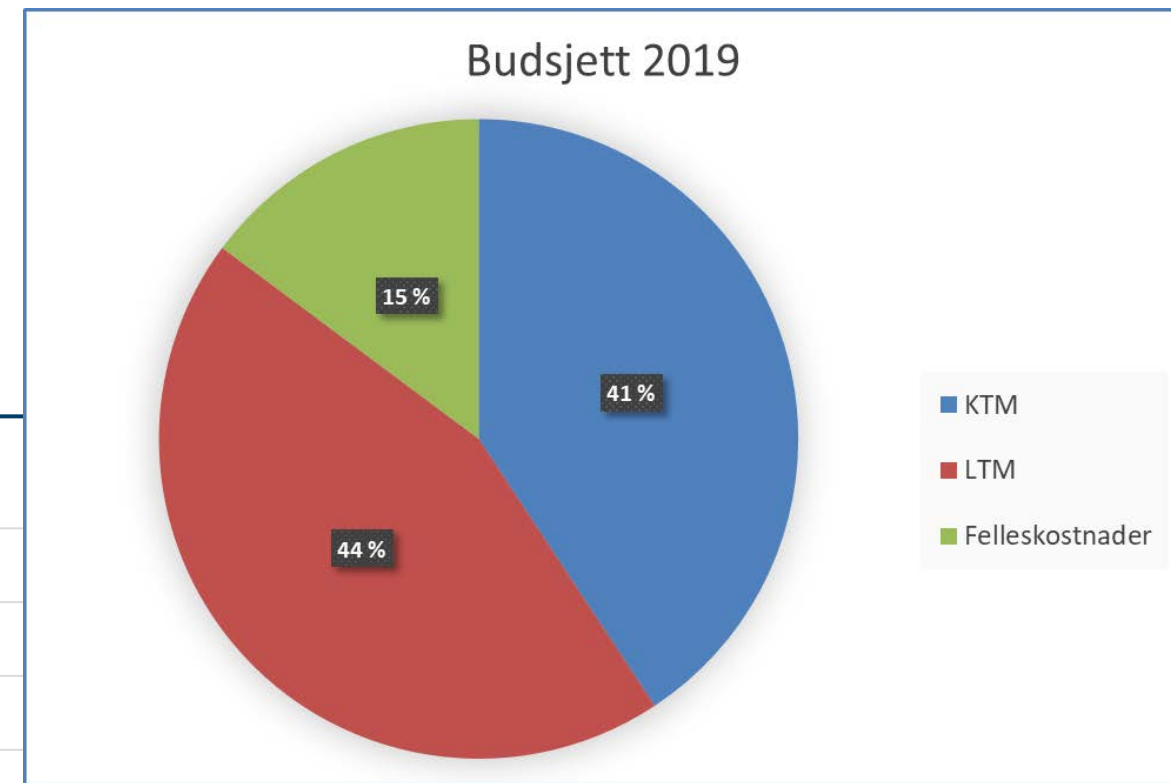


# Incurring administration cost 2020

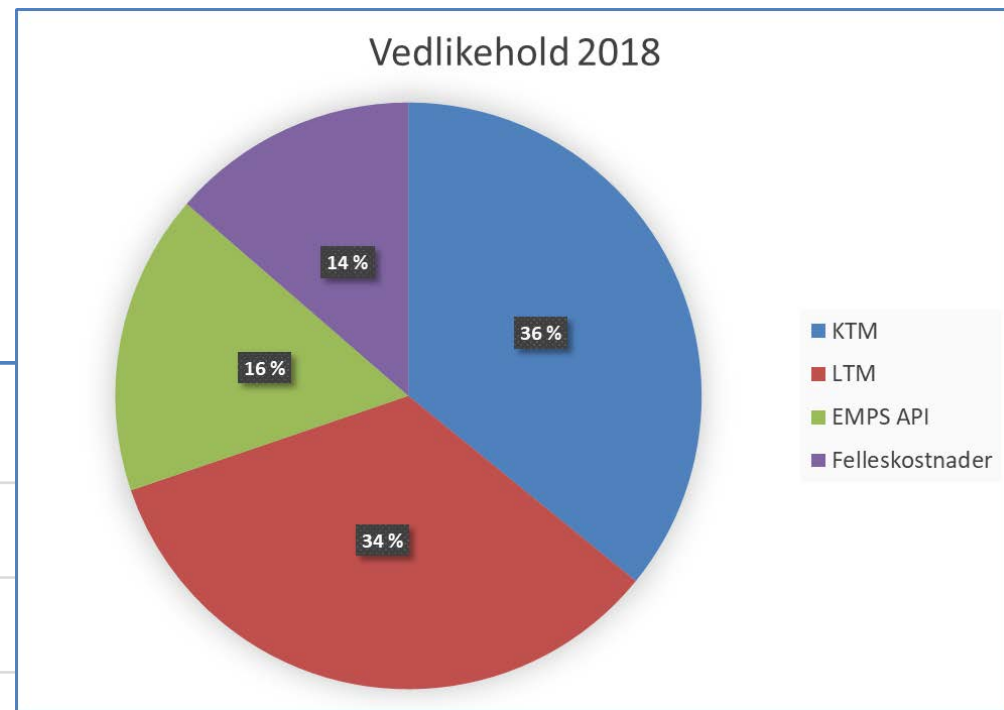
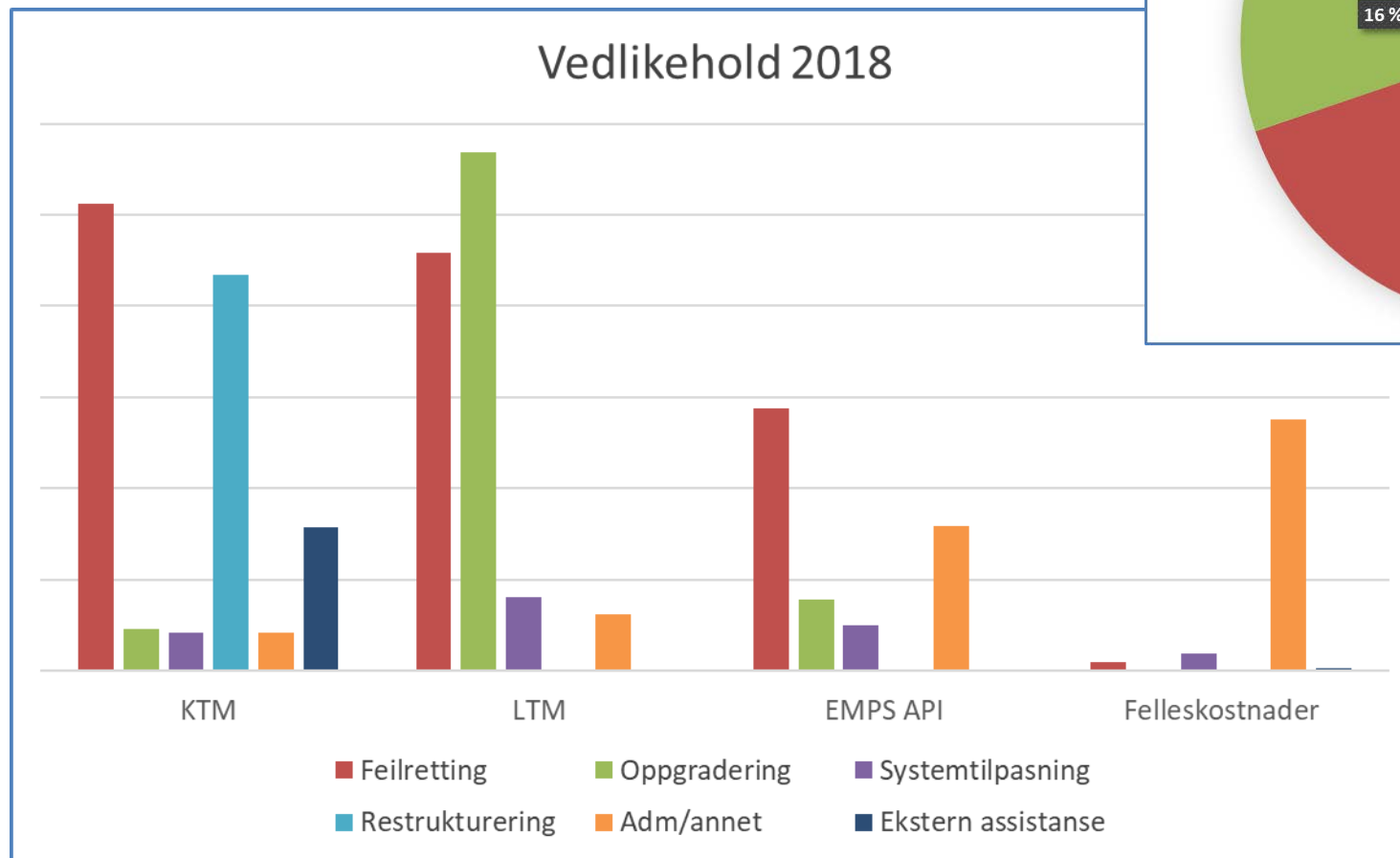




# Budget 2019



# Dist. between activities 2018





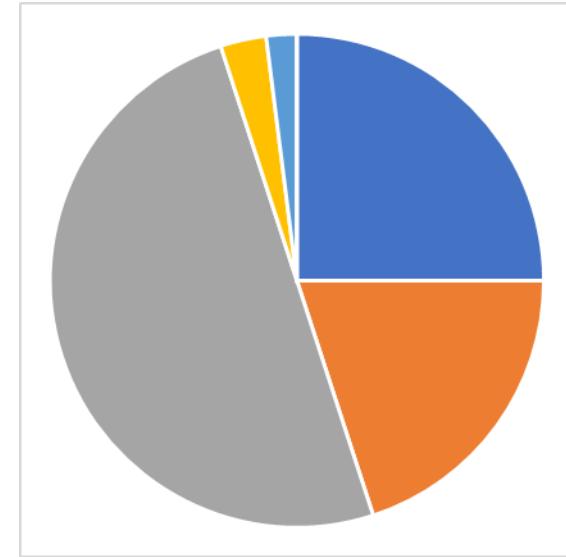
# 2019 – achievements on EMPS/EOPS

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Feilretting Input API

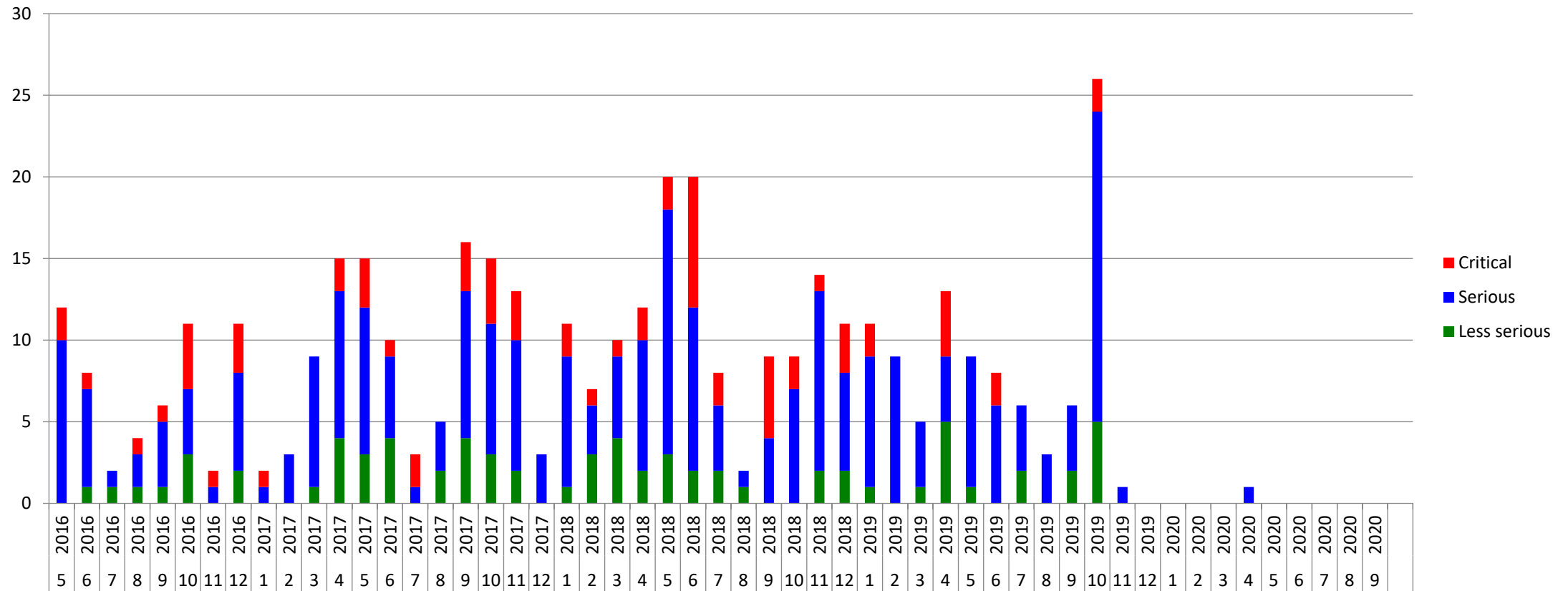
Feilretting V9.9

Feilretting V10



# Reportet errors before the SHOP-portal

Reported bugs SHOP



# High Performance Option in the models

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- SINTEF and Powel both has signed agreements with IBM regarding optimization capacity to our software. The agreements a bit different in coverage.
- Wherever Powel and SINTEF has a common delivery we practice an joint dialog about how this can be handled in the best way for all involved parties.
- In models where SINTEF delivers optimization capacity this add-on has the name High Performance Option and includes interfaces and structures in the model that enables runtime use of CPLEX.
- In case of questions contact Michael Belsnes or Bjørn Holmvik



# Technology for a better society

