STATUS FOR API-UTVIKLING FOR LANGTIDSMODELLENE OG PLANER FOR VIDERE IMPLEMENTASJON

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Agenda

- What is API

- API development EMPS

- New input flexibility

- Calendar functionality

- Version 10

- Plan for future API development

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What is API (Application Programming Interface)

- **What:**

  Set of subroutines, data objects, protocols and tools for building application software.

  A *set of rules* and specifications that serve as an *interface* and allow software programs to *communicate*

- **Why:**

  Make it *easier to use* programs, interfaces and technologies
  e.g. use of libraries written in other programming languages
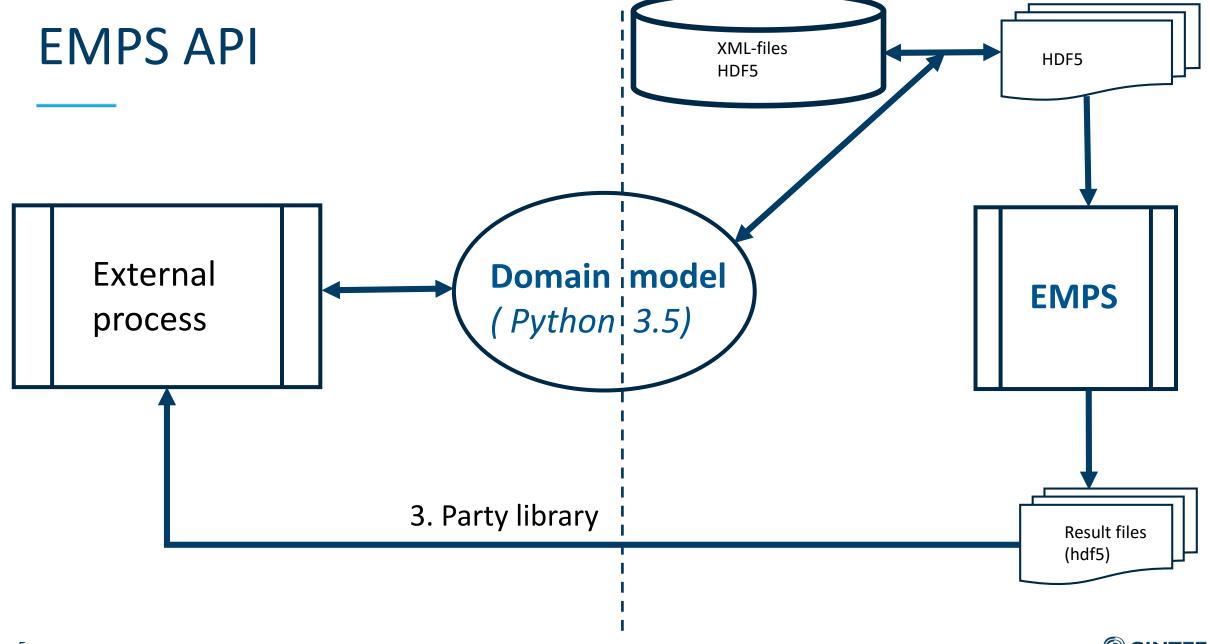
- **Use:**

  Software library

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Examples of API's

- Solve LP's using CPLEX, Gurobi or COIN-LP

- MPI (message passing interface)

- Powel's TSS-API (inflow, temperature, etc)

- ProdRisk & EOPS API

- SHOP API

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EMPS API

XML-files
HDF5

HDF5

External process

Domain model
(Python 3.5)

EMPS

3. Party library

Result files
(hdf5)

5

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New input flexibility

- New time series input

- One separate value for each time step in planning period -> (Calendar correct)

  - Firm contracts   ->   model.area[id].pm[id].set_data(TS)

  - Price dependent contracts (det.)   ->   model.area[id].pm[id].set_data(TS)

    - Purchase, Sale

  - Re-purchase

  - Exogenous prices

  - Non-controllable power (e.g. wind)

  - Transmission Capacities   ->   model.transmission[id].set_data(TS)

- API for these data

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Time series data - properties

- Flexible formats
  - Hour, day, week, step-function, internal EMPS format: sequential load segments
  - Common format for new data types
  - Easy to extend functionality

- Data automatically converted to internal representation when read

- Stored in HDF5 (Hierarchical Data Format)
  - Effective for large quantities of data
  - Easy to organize and store/read
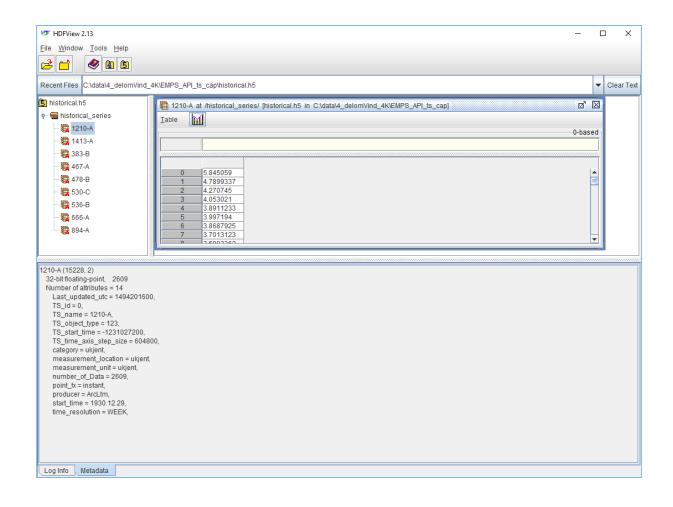 - 3. party applications (e.g. viewer) and library routines

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Modified inflow archive

- Use all historical inflows (day 365 and leap year)

- New format for forecasts
  - One separate value for each individual time step in planning period
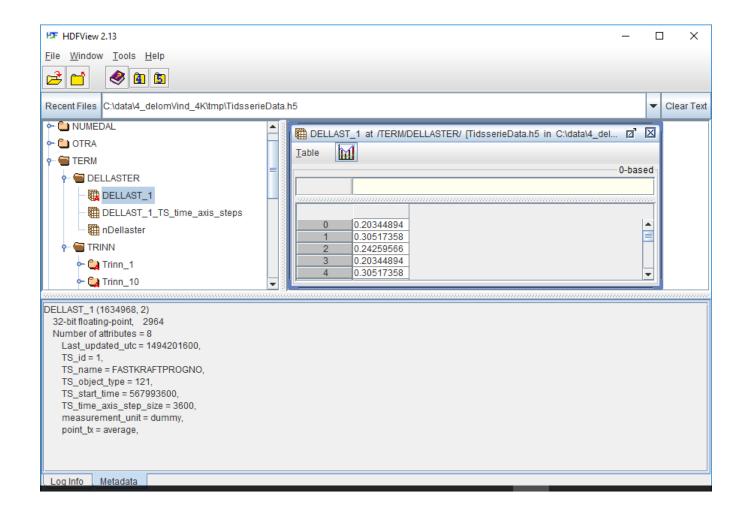 - Possible with a forecast for whole period
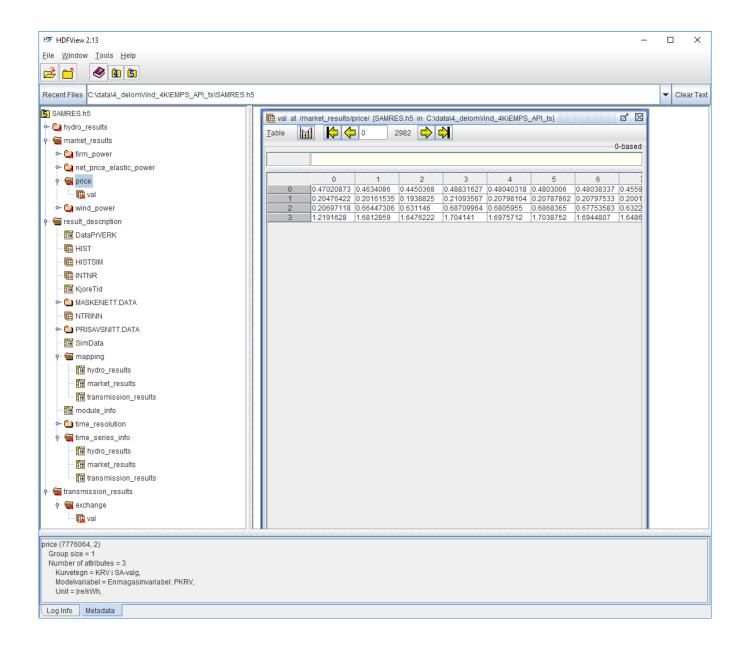
- API for inflow

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Historical inflow archive

Firm and price dependent contracts

Result file: Market results

Calendar functionality

- Calendar (UTC) correct interpretation of input data

  - New market data contracts

  - Exogenous prices

  - Wind

  - Transmission constraints

  - Hydro plant maintenance

  - Inflow

- Simulation results

- Other hydro data

  - data for weeks 1 to 52 placed in calendar weeks 1 – 52

  - For calendar week 53: uses data for week 52

- Licensed functionality

Automatic generation of dataset from EMPS

- "New" application: PREPRO

- Copies data from EMPS dataset
  - To EMPS (series)
  - To EOPS/ProdRisk (parallel or series)

- Licensed functionality

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Version 10

- EMPS, EOPS and ProdRisk results on HDF5 files

  - 3 party API for reading results

- API for (new) time series input data

  - Firm and price dependent contracts

  - Inflow forecast for whole planning period

  - Non-controlled production (e.g. wind, solar) and exogenous stochastic prices

  - Transmission capacities

- New applications (LTM and EOPS) replace Vansimtap application

  - Allows for running using XML input (not data input)

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Version 10

- **Licensed functionality**

  - Calendar correct input and output

  - Copy of series dataset (from parallel): PREPRO

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Release plan

- Statkraft version 10.0 : June 2017

- 10.0 official: First half 2018.
  - ProdRisk (inflow handling, special development 9.6 and 9.9)
  - ProdRisk API adaption
  - New TSS API from Powel
  - Tilpro functionality. e.g. manual forecasts
  - Upgrade ArcLTM (Hydark, ID-Batch)
  - Adapt LTM/EOPS to EMPS
  - More testing of functionality

- Available funding for 2017

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Future development

- Separate man – machine from computations
  - Allow for XML based running
  - Saminn, Stfil, Detmod, Samtap, Samoverskudd, Samutskrv

  - Work scope: 6 man months

- Error message handling (all LTM models)
  - Work scope: 6 man months

Future development

- API for missing input

  - Hydro data

  - Full transmission description
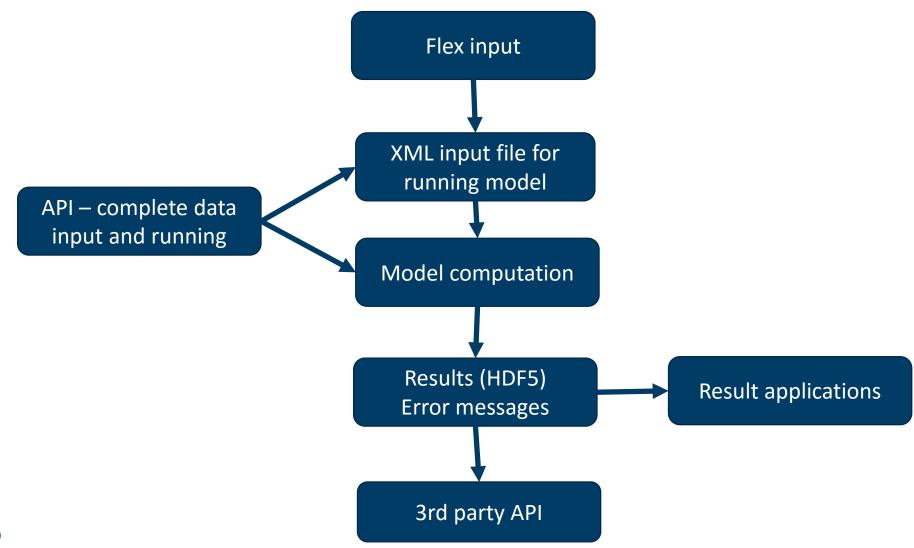
  - Some non time series market input

  Work scope: 6 man month

- Setup of whole dataset
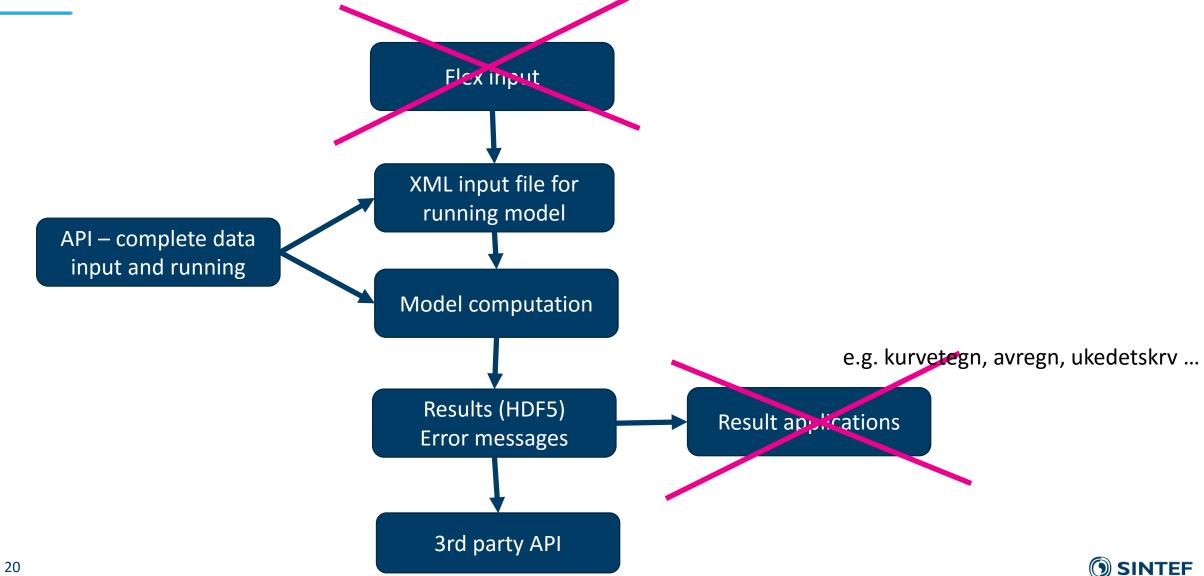
  Work scope: 12 man month

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Principle – e.g. samtap

Future reduction of source code ?

Flex input

XML input file for running model

API – complete data input and running

Model computation

Results (HDF5) Error messages

Result applications

e.g. kurvetegn, avregn, ukedetskrv …

3rd party API

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After version 10

- Complete API
  - All input
  - Running model including error handling
  - Results

- Using only financing from maintenance

- 1-2 years from mid 2018. Best estimate 1 January 2020

User interface strategy

- Believe modern user interface is needed

- SINTEF makes API to kernel models

  - Open APIs

- Initiate and help developers

- Non-exclusive sales rights to our models for software vendors

- Next presentation by Powel is an example of a user interface initiative

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