SINTEF

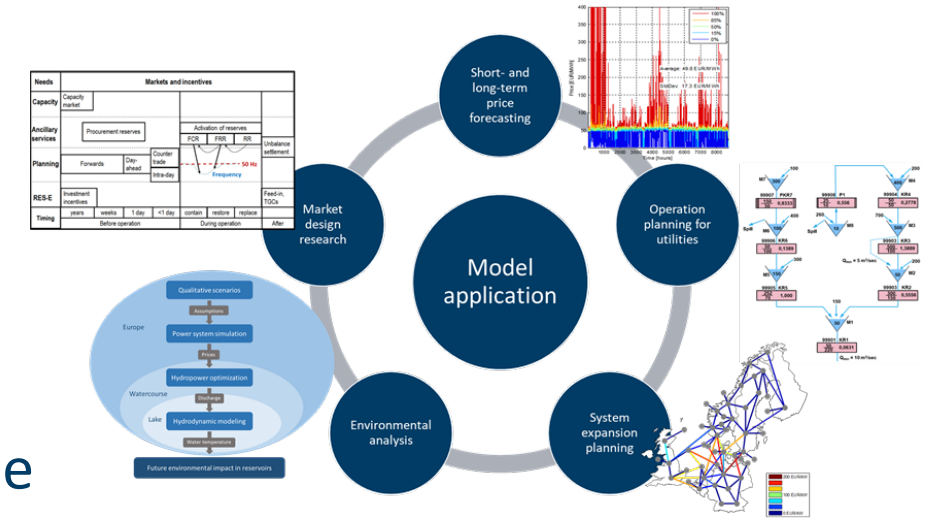
70 years
1950-2020

PRE-PROJECT NEXT GENERATION MARKET MODELS

Stefan Jaehnert, PhD
Sintef Energy Research, Energy systems, 25/09-2020

Background and objective for the pre-project

- Transformation into a renewable and integrated European power system
  - Need for suitable analysis tools
  - Weakened confidence in existing models
  - Research environment for hydropower optimization and energy system analysis
- Prepare a decision basis for the development of the next generation of market models based on:
  - Needs and requirements for future market models
  - Evaluation of a number of different concepts for collaboration



Structure and time horizon

WP1 — High level description, challenges/functionality, robustness/support, flexibility/speed in deliveries, thriving research community

WP2 — Implementation and modularization, guidelines & standards, delivery standards & quality, support & documentation, additional model services

WP3 — Organizational solutions, organizational challenges & requirements, additional services, recommendations

April

Juni

August

September

Project meetings:

- ~23 working meetings (via Teams 1.5 hours each)
- Preparation and finishing work
- ~12 steering group meetings
- 4 interviews
- 6 workshops

Status og preliminary results

Established meeting forum for continuous discussion

- WP1: Memo prepared – status quo and future needs and requirements
- WP2: Memo prepared – processes, tools, infrastructure, language

Technical evaluation, external advisor	FanSi prototype is promising, requires commitment to be operational	Further development and reuse of methodology from SHOP

- WP3: Ongoing discussion – memo under preparation

➢Common understanding of:

- Status quo (area of application, value, challenges) and future needs (requirements, transperancy, …)

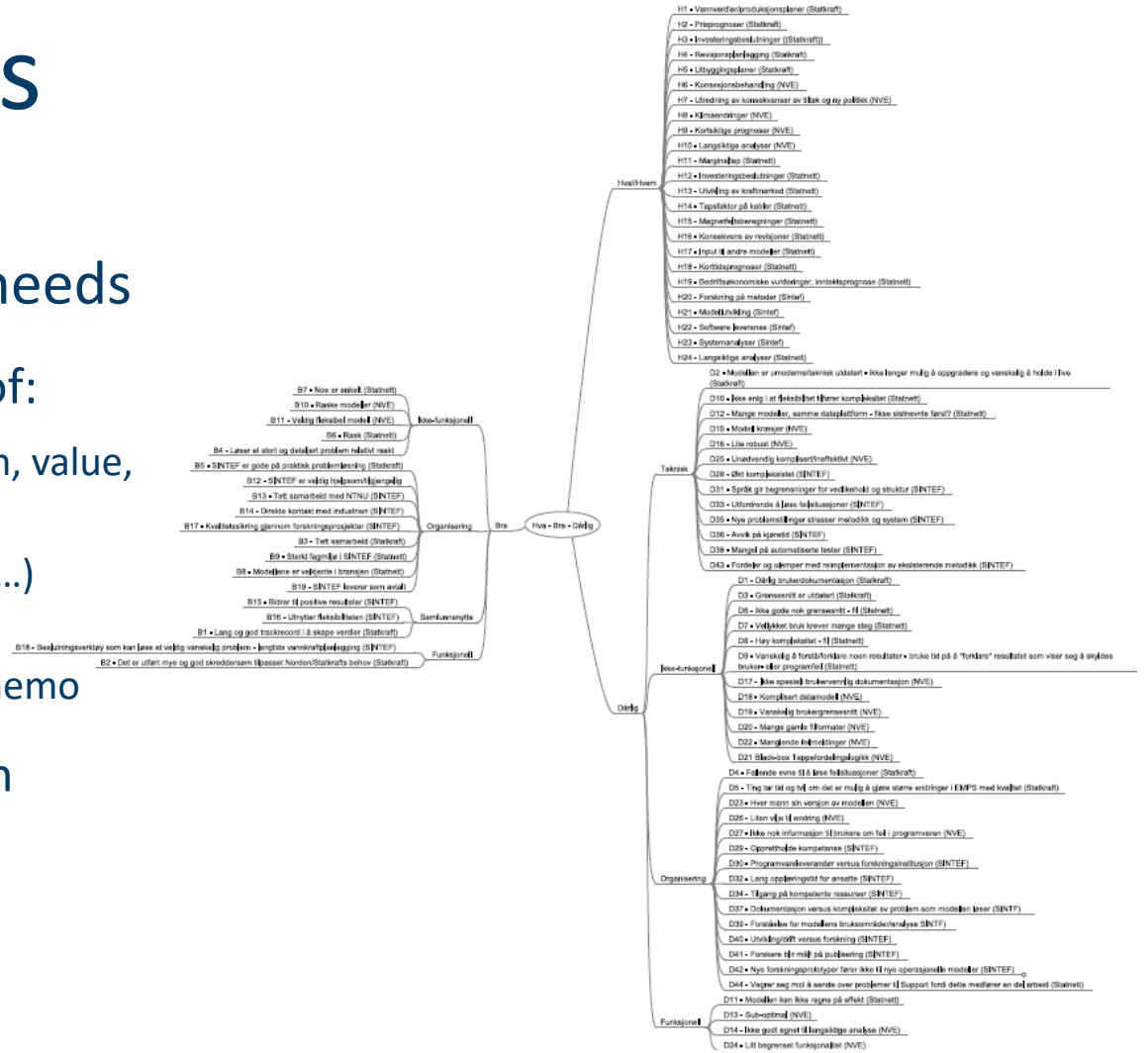
➢Discussion: "how to implement / organise"

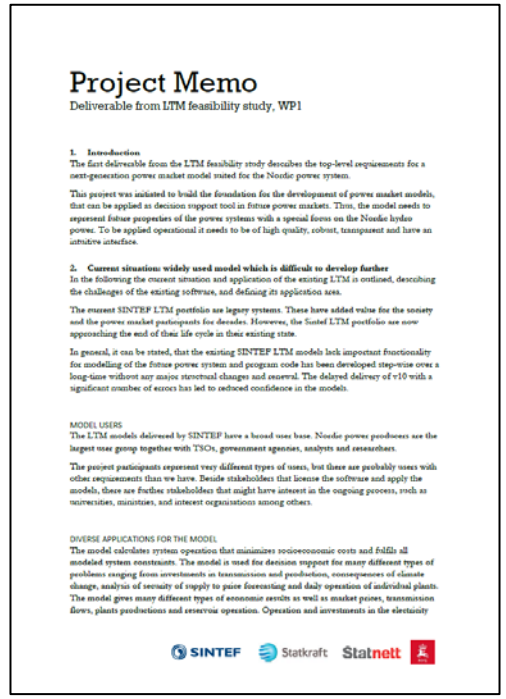
WP1 - Analysis

Status quo and future needs

- Common understanding of:
  - Status quo (area of application, value, challenges) and future needs (requirements, transperancy, …)

    => documented in a project memo
- Disagreement / discussion on how to implement





Project Memo

Deliverable from LTM feasibility study, WP1

1. Introduction

The first deliverable from the LTM feasibility study describes the top-level requirements for a next-generation power market model suited for the Nordic power system.

This project was initiated to build the foundation for the development of power market models, that can be applied as decision support tool in future power markets. Thus, the model needs to represent future properties of the power systems with a special focus on the Nordic hydro power. To be applied operational it needs to be of high quality, robust, transparent and have an intuitive interface.

2. Current situation: widely used model which is difficult to develop further

In the following the current situation and application of the existing LTM is outlined, describing the challenges of the existing software, and defining its application area.

The current SINTEF LTM portfolio are legacy systems. These have added value for the society and the power market participants for decades. However, the Sintef LTM portfolio are now approaching the end of their life cycle in their existing state.

In general, it can be stated, that the existing SINTEF LTM models lack important functionality for modelling of the future power system and program code has been developed step-wise over a long-time without any major structural changes and renewal. The delayed delivery of v10 with a significant number of errors has led to reduced confidence in the models.

MODEL USERS

The LTM models delivered by SINTEF have a broad user base. Nordic power producers are the largest user group together with TSOs, government agencies, analysts and researchers.

The project participants represent very different types of users, but there are probably users with other requirements than we have. Beside stakeholders that license the software and apply the models, there are further stakeholders that might have interest in the ongoing process, such as universities, ministries, and interest organisations among others.

DIVERSE APPLICATIONS FOR THE MODEL

The model calculates system operation that minimizes socioeconomic costs and fulfills all modeled system constraints. The model is used for decision support for many different types of problems ranging from investments in transmission and production, consequences of climate change, analysis of security of supply to pure forecasting and daily operation of individual plants. The model gives many different types of economic results as well as market prices, transmission flows, plants productions and reservoir operation. Operation and investments in the electricity

SINTEF Statkraft Statnett

WP2 - Software implementation

- Source code analysis and estimate of ressources
- Development environment and -infrastructre
- Agile implementation processes
- Analysis software languages

SINTEF

SINTEF Energi AS
SINTEF Energy Research
Address:
Postboks 4761 Torgarden
NO-7465 Trondheim
NORWAY

Switchboard: +47 45456000

energy.research@sintef.no

Enterprise /VAT No:
NO 939 350 675 MVA

Project memo

Pre-project LTM

WP2

VERSION	DATE
0.9	2020-09-16

AUTHOR(S)
Stefan Jaehnert
Stein Inge Dale
Hans Ivar Skjelbred
Arild Helseth

CLIENT(S)	CLIENTS REF.
Project participants	Client's reference

PROJECT NO.	NO. OF PAGES AND APPENDICES:
Project No.	25 + appendices

ABSTRACT

Within the pre-project "Accelerating the development of next generation market model" the aim is to prepare a decision basis for the future development of a new set of power market models with a focus on hydropower.

Defining the basis for developing the next generation market models, which are:
- Robust, Efficient, Flexible, Transparent
- Assess large-scale hydropower production for power markets with variable RES.

The focus within the pre-project is on preparing a number of alternative concepts. The main deliverable of the pre project is a decision basis for planning the main project.

PREPARED BY	SIGNATURE
Stefan Jaehnert	

APPROVED BY	SIGNATURE
Knut Samdal	

PROJECT MEMO NO.	CLASSIFICATION
Project Memo No.	Restricted

1 of 25

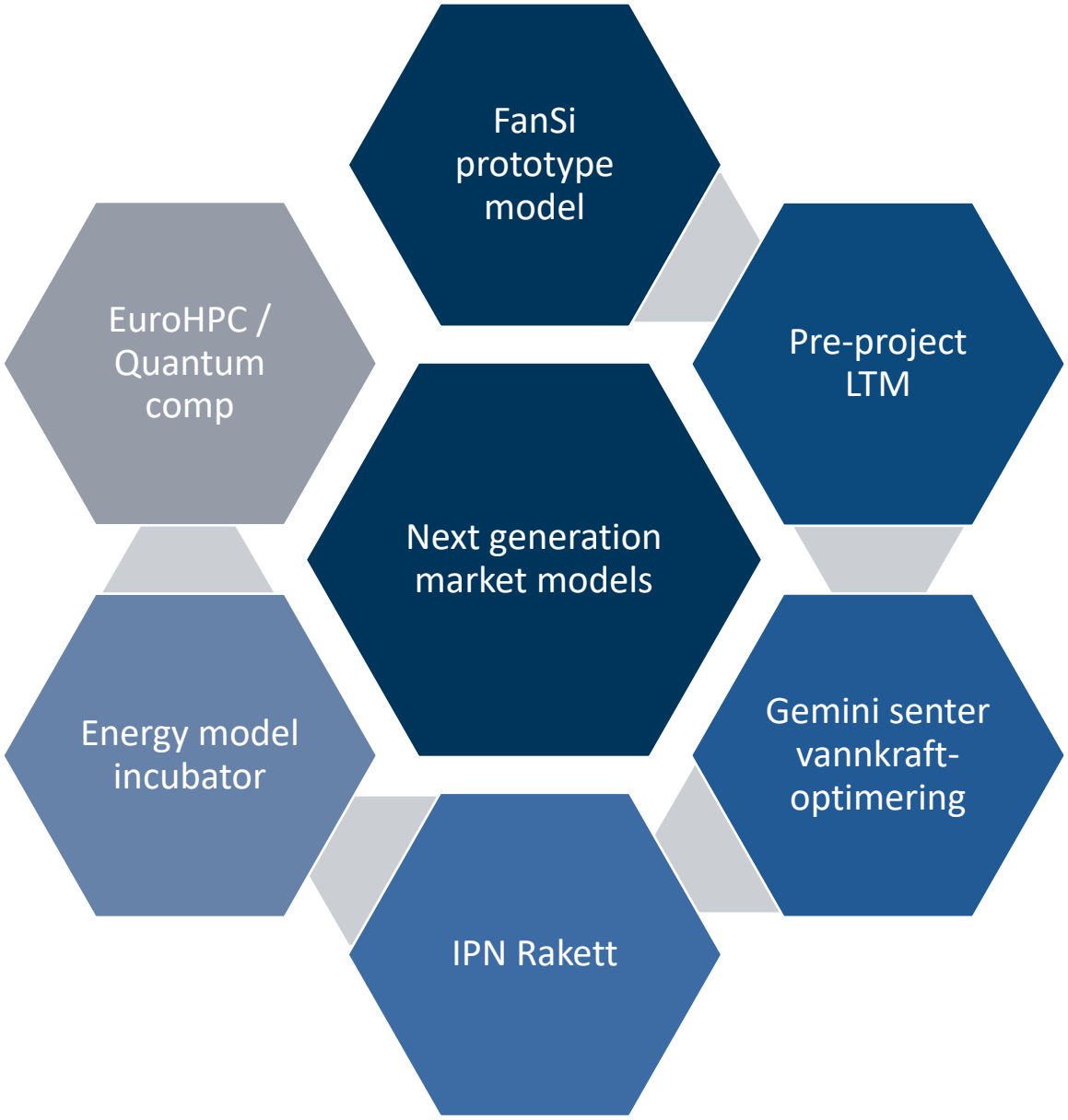
SINTEF

WP3 - Organisation

- Focus on how future model development should be organized to deliver robust and valuable software and ensure a world-leading research environment.
- Description and evaluation of potential future organisation / collaboration models

- Preparation of decision basis

Pre-project is part of a larger initiative



SINTEF

SINTEF

70 år

1950-2020

Teknologi for et bedre samfunn