

# **End-User Perspectives on remote pool control of houses**

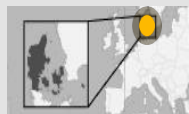
**Thomas Kiildsen, Group Business  
Development Manager at NOVASOL**



# Agenda for end user perspectives

- About NOVASOL
- Our operating model – what we do and value proposition to our end users; owners & guests
- Why we joined the SmartNet
- Some marketing material produced toward end users (Owners & guests)
- Some examples from SmartNet project
- Owner tax example
- Vision for the future

# Company Highlights



**1968**

Founded in  
Denmark

**2001**

Acquired  
**dansommer.**

**2005**



Part of  
**Wyndham  
Worldwide**



Acquired  
**2009**

**2016**

Nearly **47.000**  
holiday homes  
for rental

Now present in  
29 countries



across Europe

More than

**2+** million



happy  
guests

**50** years

as specialists  
in holiday home  
rentals

**2016**

Acquired



**7** brands

multi-channel  
marketing  
strategies

**2016**

Acquired



**2,500+**

dedicated  
employees &  
free-lancers

Acquired

**WIMDU**

**2017**

**NOVASOL**

50th Anniversary

**2018**



# Types of Property Categories



The classical  
holiday homes



Villas with  
private pool



House boats



Cottages in  
parks



City  
apartments



Group  
accommodation

# NOVASOL Business Foundation

## - in SmartNet context



### Value to Owners

- Specialist knowledge of rentals; handling, laws etc.
- Local presence, **decentralize**
- **Services** at different levels – CI/CO, maintenance, advise
- Free online-offline marketing
- **No sign-up costs for house owners**
- **Monthly pre-payment of the rent**
- Possibility to participate in research like **SmartNet, IoT**
- **We care** about the owners asset – the investment

### What we do

- We rent out ***privately owned*** holiday homes to tourists
- Owners have supply responsibility towards **electricity supplier** but NOVASOL handle guest utility **consumption** and **payment** flows
- In 2018 we had more than **150k bookings** only for DK
- Other NOVASOL offices acts as agents, service centers or representatives – hence **many different stakeholders**

### Value to Guests

- Wide range of holiday homes
- Security
- Local presence
- Services
- Various concepts with price offers and values
- House inspection guarantee
- Guarantee of quick help in case of problems



# Remote control of houses – pilot overview



## NOVASOL objective – why we joined SmartNet :

Being able to offer **lower energy cost** for house owners with pool and thereby **attract more owners**, while at the same time ease our pool handling services.

We service around **1000 pool houses** in Denmark and do pool inspections **55.000 times a year** – this includes heating adjustment tasks prior and after arrivals/departures

Typical pool house uses around 35.000 kWh a year – huge saving potential !



Henrik Madsen<sup>a,1,\*</sup>, Loui Algren<sup>b</sup>, Sisse Carlsen<sup>b</sup>, Miguel Marroquin<sup>c</sup>, David Sanchez<sup>c</sup>, Nikita Zemtsov<sup>a</sup>, Rune Grønberg Junker<sup>a</sup>, Armin Ghasem Azar<sup>a</sup>, Mario Dzamaraja<sup>a</sup>, Stig Mortensen<sup>d</sup>, Torben Skov Nielsen<sup>d</sup>, Claus Amtrup Andersen<sup>e</sup>, Thomas Saabye<sup>e</sup>, Johan Ungermann Poulsen<sup>f</sup>, Olivier Corradi<sup>g</sup>, Thomas Kieldsen<sup>h</sup>

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<sup>h</sup>Novasol, Denmark



Interview - Henrik Madsen SmartNet

# Blåvand

Intelligent strømforbrug i poolhuset – et pilotprojekt

Det koster at opvarme vandet i poolen. Et forskningsprojekt under DTU kan være med til at reducere omkostningerne for fremtidens sommerhusgæster.

## Timeafregning i 2020

Ingen grund til at komme ind på de meget tekniske detaljer her, men det intelligente styringssystem vil være en fordel for både sommerhusejere og feriegæsterne. Når netelskabene i år 2020 forventes at blive pålagt timeafregning af elforbruget, vil det kunne blive lettere at indrette sit forbrug efter prisen på el. Den dyre opvarmning af svømmebassiner kan til den tid foretages, når priserne er lave. Det må naturligvis ske automatisk og uden at vores gæster lider et komforttab samt uden gene for vores husejere.

## Fremtiden er nu...

Aktuelt bliver der stadig foretaget målinger, udregninger og optimeringer, og lige nu indgår 30 sommerhuse i projektet. NOVASOL deltager bl.a. aktivt sammen med DTU i projektet, som støttes af Europa Kommissionen. "Vi deltager i forsknings- og udviklingsprojektet, fordi vi gerne vil skabe værdi for husejerne og feriegæsterne. Vores håb er, at vi via erfaringerne fra projektet kan nedbringe elregningerne med op mod 20 procent" forklarer projektleder Thomas Kieldsen



## Brug strømmen smart

Et aktuelt forskningsprojekt handler om at skabe sammenhæng mellem Vestkystens store produktion af vindenergi og det lokale elforbrug ved at bruge intelligente løsninger. Det handler om at mængden af vindenergi afhænger af, hvor meget det blæser, mens forbruget af strøm afhænger af årstiden, og hvornår vi er aktive. En del af løsningen kan måske findes i de mange sommerhuse med pool, som ligger på Vestkysten.

## Om natten når vi sover

Hvad gør vi med den strøm, som produceres om natten? En smart udnyttelse kunne være at opvarme de mange NOVASOL sommerhusenes med swimmingpools på det tidspunkt, og DTU's SmartNet samt CITIES projekter forsøger at undersøge: "Med erfaringerne fra projektet i poolen og dermed være med til at løse nogle af de problemer, som vi står over for med stadig mere vindenergi i netværket, så det ikke skal

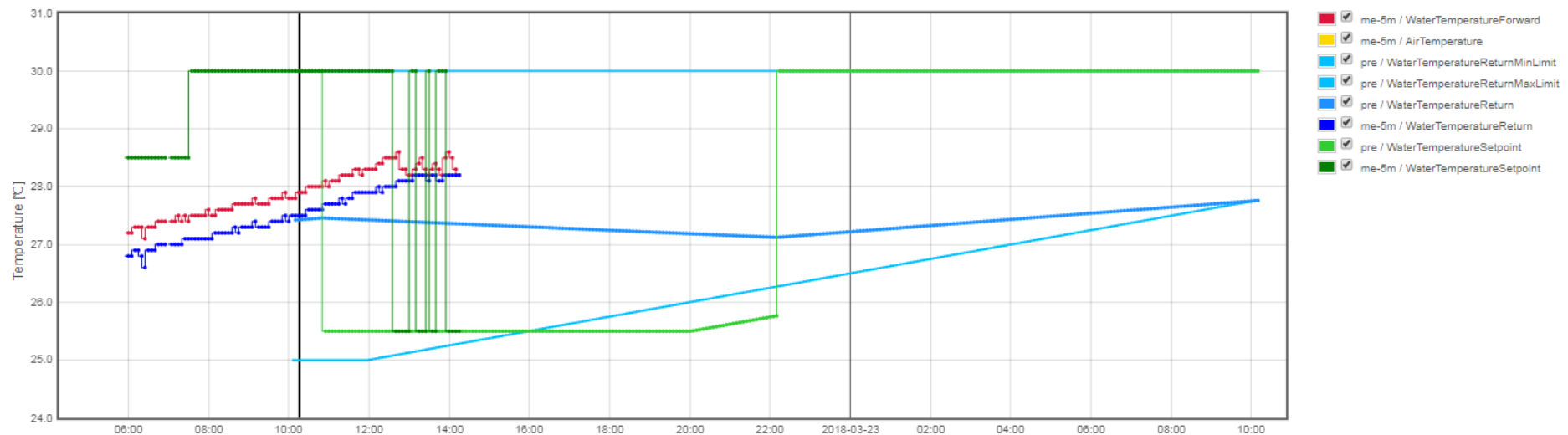
Danish Pilot, which is Task 5.3 of the H2020 SmartNet project for provision of ancillary services from an energy storage system. Summer houses have a relatively high thermal load used to heat pool water can easily be adapted to the provision of ancillary services. The system in 30 summer houses. This setup will handle the large penetration of the fluctuating wind power. As are to a great extent handled by the large power plants. On the other hand, the report introduces how the results of the project will be adapted in the simulation of the use of summer houses will be used.

re; thermal load; price-based control; TSO-DSO coordination; electricity

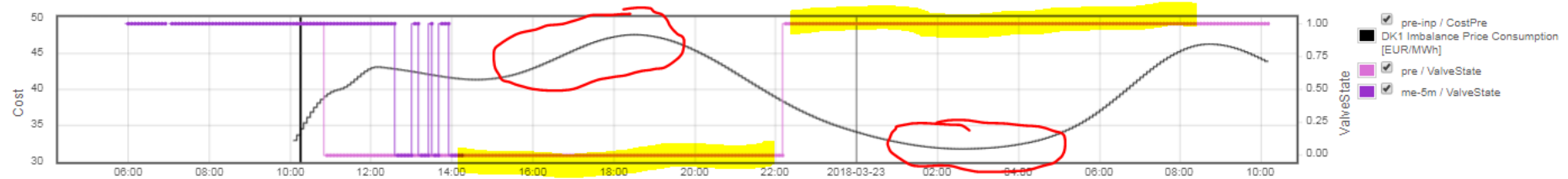
# Heat pool when kWh is cheap

## C7224 Controller

Cost: DK1 Imbalance Price Consumption [EUR/MWh]



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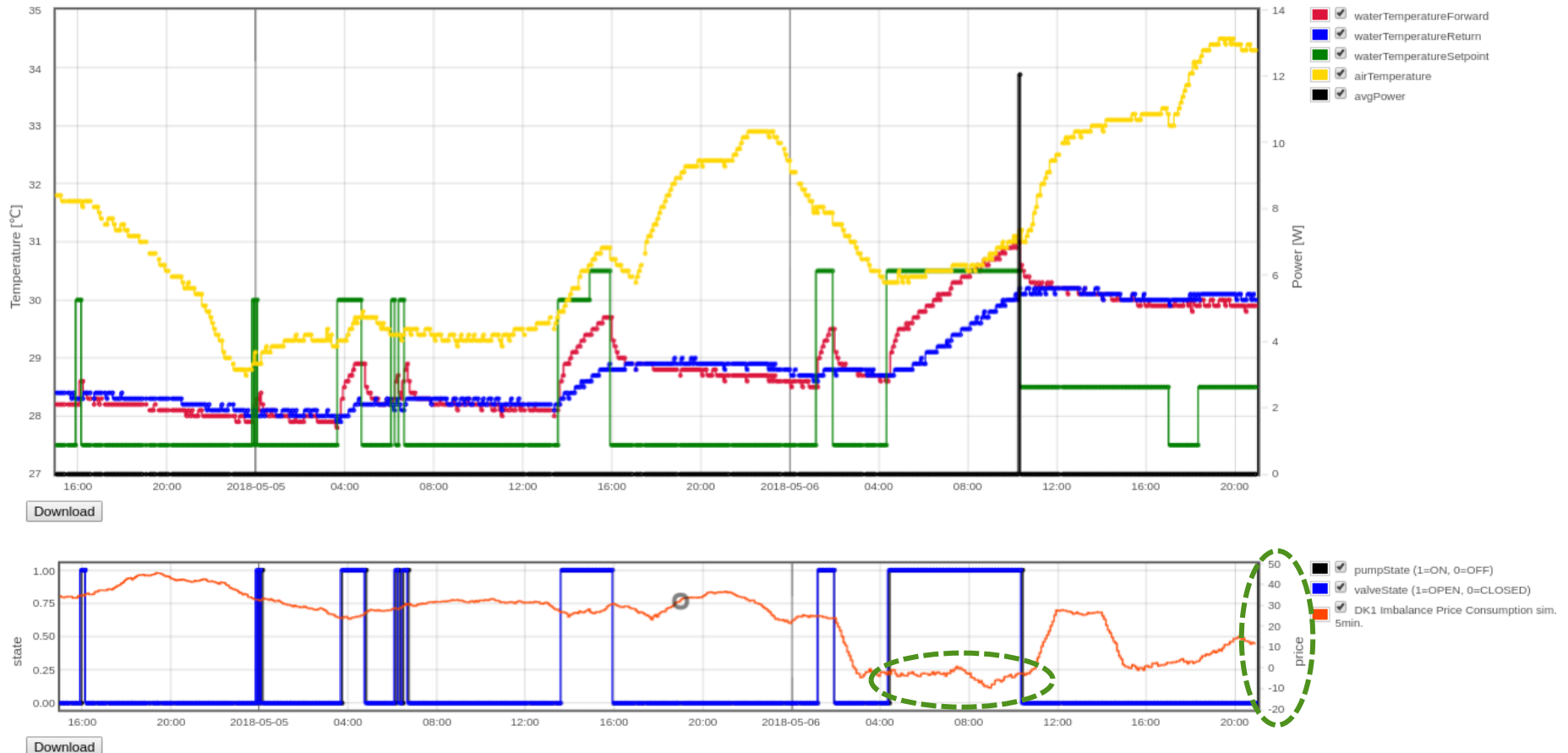


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# Example with negative power price

## P32788 Measurements



# Danish tax rules on rentals



- Guest kWh usage is the same but cost for owner is different or perhaps the kWh usage is lower
- Economic effect of response demand for the house owner
- Need meter measurements to be accurate and timely
- Wish to help the house owner to be energy flexible
- Kwh and money savings now due to optimized heating and in “2020” when market turns to variable rates per hour

Rental income	200.000
Energy consumption (kWh)	60.000
<b>Total Owner gross income</b>	<b>260.000</b>
Fixed Deduction (2018)	-40.000
<b>Total Owner net income</b>	<b>220.000</b>
40% deduction (tax free)	-88.000
Tax base (skattegrundlag-kapitalindkomst)	132.000
<b>Tax amount (34% ved negativ kapitalindkomst)</b>	<b>44.880</b>
<b>Owner income after tax - DKK</b>	<b>215.120</b>
Utility cost	-60.000
<b>Net effect - income to owner after energy cost</b>	<b>155.120</b>

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<b>Owner income after tax - DKK</b>	<b>215.120</b>
Utility cost 20% lower due to demand response	-48.000
<b>Net effect - income to owner after energy cost</b>	<b>167.120</b>

# Energy in summer houses – visional points

- Sales concepts – energy saving(35.000 kWh/year/house)
- Coastal near houses in areas with high variation in energy demand – hence the flexibility is needed
- Electrification of summerhouses, cars, heat pumps etc.
- What if NOVASOL could tell DSO/TSO about our booking patterns in 10.000 houses? (Energy sector value chain integration)
- Adaptive estimation (ML) – learn the dynamics per house
  - The model is learning from the pool in order to handle speed of heating and cooling – hence lower usage
  - Remote pool management to align pool temp. with guest arrival in order to optimize usage
- Smart House implementation – kWh, access control, Ph & chlorine value measurements



**Thank you !  
... and stay in touch**



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# Learnings



- **Adaptive estimation (ML) – learn the dynamics per house**
  - Pool cover – on/off affects model (Algorithm set up)
  - Exception handling vs. respect research results – we do research while house is occupied
  - The model is learning from the pool in order to handle speed of heating and cooling
- **Communication between service colleagues onsite in Blokhuis & Blaavand and DTU engineers**
  - Manual vs. auto
  - Call for heat or not
  - Owner setting
  - Sensor calibration – manual measured vs. system measure
  - Forecast window – 24h vs. 48h to guest arrival – faith in adequate pool temperature at guest arrival time
- **Equipment learnings**
  - Equipment from various suppliers on market
  - Eurisco - SN-10:
    - Disadvantage with SIM card as this tends to be less environmental resistant. - prefer to use Wi-Fi signal
    - Not proprietary protocol
- **Operational experiences**
  - If you don't integrate the IT you do not harvest efficiency (booking no., door key, meter reading)
  - Scenario building; brain storm on exception handling. What to do when guest gets reallocated to another house etc.



# Solution set up

- Upper level (high voltage)

- Co2
- Price
- Demand Response

- Lower level (low voltage)

- Eurisco solution (EL-patron / Heat pump)
- Flex-Control solution

## A typical house



- $T_{sh}$  – summerhouse temperature
- $T_a$  – temperature of air in the pool area
- $T_{in}$  – water temperature into the swimming pool
- $T_{out}$  – water temperature out of the swimming pool (controlled)
- $T_o$  – outdoor temperature
- $T_g$  – ground temperature
- $Q_s$  – solar heat gain
- $w$  – wind speed

# Tavle installation

Tavlen blev skruet op på væggen i teknikrummet, termoaktuatoren blev monteret og tilsluttet og temperatur følerne blev monteret. Temperaturføleren til luft ligger oven på tavlen og måler derved temperaturen i teknikrummet.



Billede 3: Tavlen + aktuator + fremløbstemperaturføler



Billede 4: Returløbstemperaturføler

# How does it work?

Data measurement and  
information gathering

