Energy Efficiency Agreements in Finland – Monitoring, Reporting and Verification system

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SOPIMUKSET

Energy Efficiency Agreements (EEAs) – essential role in energy policy in Finland

Companies join the EEA system via accession document with their association, and municipalities with the Energy Agency

FIRST PERIOD STARTED 1997 – LONG BEFORE ANY EU ENERGY EFFICIENCY LEGISLATION WAS NEGOTIATED

INDUSTRIES
ENERGY EFFICIENCY AGREEMENT

ACTION PLANS - INDUSTRY

Energy Intensive Industry I Food and Drink Industry I Chemical Industry I Technology Industry I Wood Product Industry I Industry - General

MEAE

ACTION PLANS - ENERGY SECTOR

Energy Production I Energy Services

MEAE

ACTION PLANS - SERVICE SECTOR

Commerce Sector I Hotel and Restaurant Sector I Motor Trades & Repairs I Services – General

MEAE

PROPERTY SECTOR
ENERGY EFFICIENCY AGREEMENT

ACTION PLANS

Commercial Properties

Housing Properties

MEAE | ME

MUNICIPAL SECTOR
ENERGY EFFICIENCY AGREEMENT

Cities & Municipalities &

Joint Municipalities

MEAE

HÖYLÄ IV – OIL SECTOR
ENERGY EFFICIENCY AGREEMENT

DISTRIBUTION OF LIQUID HEATING FUELS

Oil-heated real estates

MEAE | ME

Responsible ministries:
MEAE = The Ministry of Economic Affairs and Employment
ME = The Ministry of Environment

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Agreement parties and other "key-players"

ROLES IN ENERGY EFFICIENCY AGREEMENTS 2017−2025

GOVERNMENT
(Ministry and Authority*)
- overall aims and targets
- targets for agreements
- development
- EU directive interfaces
- financial incentives
- evaluation

Participating party
Implementing public authority

ASSOCIATIONS
- targets in sectoral action plans
- development
- marketing
- motivation of companies
- participation in reporting process
- co-operation forums
- guidance, training

Participating party

* Energy Authority Finland/ Energy Efficiency Unit − Established 1.1.2014 due to EED requirements

** Motiva Oy, State own Sustainable Development Company − acting in EEAs like an Energy Agency in Finland – commissioned by the Energy Authority

COMPANIES/COMMUNITIES
- target setting
- organising and planning the implementation
- figure out the possibilities to improve energy efficiency / energy audits
- implementing savings measures
- monitoring of energy consumption
- training of the staff
- cooperation and communication
- annual reporting

Participating party

OPERATOR
Motiva**
(ENERGY AGENCY)
- assistance for government parties
- advice, guidance, training
- joint projects with participants
- marketing, motivation
- monitoring system development & operation, coordination of annual reporting, annual summarries
- impact assessments
- communication activities

Entrusted party

OTHER
- parties assisting and helping implementation in companies/communities and participating in development projects within the EEA scheme e.g.
  - energy auditors
  - consultants
  - ESCO's

Third parties

ENERGY EFFICIENCY AGREEMENTS

Monitoring and reporting is essential

FORTUNATELY WAS UNDERSTOOD FROM THE BEGINNING IN THE MINISTRY

- **Well functioning monitoring system** for voluntary Energy Efficiency Agreement scheme (EEA) as well as for Energy Audit Programme (EAP) **has had a central role** to:
  - Reveal the results
  - Create trust and credibility to all parties – not only for Government
- **Long term top-level commitment by the Government**
  - **EEAs** have been part of all national energy and climate policy and strategy papers **since** they were launched **1997** and **EAPs** already before, **since 1992**, **investment subsidies for energy efficiency** (EE) measures available continuously **since 1998**
  - **Reasonable recourses** targeted **for programme administration** and continuous maintenance and **development of the monitoring system available**
- **Reporting obligations** for companies/municipalities in EEAs and in granted subsidy schemes **were planned at the same time as the policies**

Energy Efficiency Agreements in Finland

Evolution of monitoring & reporting

AGREEMENT PERIODS 1997 → 2008 → 2017 → 2025 → …

- Period 1997−2007 – **Paper forms/Excel sheets** and **Access database** in Motiva
  - **Paper forms sent by mail** from Motiva to participant companies and municipalities
  - Quite early during the agreement period **paper forms and mailing moved to emails and excel sheets**
  - **Data** from annual reports **filled in/moved electronically** from the Excel sheets **to the Access database in Motiva**
  - **Printed and pdf summary report** published annually
- Period 2008−2016 – **Online database**
  - New common **relational database** with **web interface for participants** was developed
  - **Monitoring system for Energy Audits an Energy Efficiency Agreements was integrated**
  - **Reported data** was **adapted** to the requirements in the new period planned **to fulfil ESD requirements**
  - All **data filled in by participant** companies and municipalities **via user interface**
  - First time some **participant-specific feedback data** developed form their reported data **in addition to the pdf-summary report**
- Period 2017 − 2025 – **Online database**, ongoing
  - **Reported data was slightly reduced** and adjusted to the new period
  - **Technical updates** and **updates to the user interface**
  - **2nd generation feedback data** for participants from the reported data developed
  - A **new platform to publish the overall results** (Tableau) instead of pdf –summary reports

ENERGY EFFICIENCY AGREEMENTS

Energy Efficiency Agreements in Finland

Annual reporting for period 2017-2025 - overview

- Annual reporting in the beginning of the year
  - First reporting in 2018 concerning data from 2017, last in 2026 concerning data from 2025
- Recurring neglect of reporting obligation can lead to dismissal from the EEA
  - In such cases state subsidies granted on the grounds of being in EEA can be claimed for recovery
  - First neglect -> yellow card, second neglect ->red card, red card leads to dismissal if no action taken
- Reporting obligation starts on the accession year
  - So no need to report earlier years if participants join in later during the agreement period
  - All energy efficiency measures carried out during the agreement period 2017-2025 can be reported regardless of the accession year
- Data collected in annual reporting varies in detail on different action plans but most participants report on
  - Energy consumption, Energy efficiency improvement measures, Continuous improvement
- Response rate in EEA's annual reporting is high; on average over 95% and 100% on many action plans

Energy Efficiency improvement measures

INFORMATION TO BE REPORTED IN ANNUAL REPORTS BY PARTICIPANTS

- Measure by measure:
  - Short description of the implemented EE measure
  - Measure category - Technical/Operational
  - Classification of the measure based on the drop down menu e.g. related to heating system, air conditioning, lighting etc. (new feature),
  - Investment cost (eur)
  - Pay back time
  - Annual energy savings – Electricity, Heat and Fuels
  - Year of implementation
  - Savings lifetime
  - Information if energy subsidy is granted to the measure
  - Information if the measure no longer generates savings
  - Possible additional information (text field for open remarks)

Energy Efficiency Agreements in Finland

Confidentiality of the data

COMPANIES AND MUNICIPALITIES – ANNUAL REPORTING

- **All data gathered from the companies/municipalities is confidential**
  - Applies to all data gathered via the EEA's annual reporting and from Energy Audits
- **Confidentiality rules used by the Statistics Finland are applied**
  - There must be **enough participants** (minimum 3) **in a group to avoid** a possibility **to identify individual companies/municipalities**
  - **Company/municipality specific data** is **not given** or published **without a permission of this party**
    - Permission can be asked by Motiva for communication purposes – e.g. to share good experiences
- In the current agreement period 2017−2025 companies are asked to give **an authorization for Motiva to forward the company/site level energy consumption data to the Statistics Finland**
  - **Reduces administrative burden** especially for the biggest energy users to provide similar information to many places
  - Improves the data coverage for energy consumption data for different branches in national statistics

Energy Efficiency Agreements in Finland

Annual reporting tasks in the process

PROVIDED MAINLY BY MOTIVA – COMMISSIONED BY THE ENERGY AUTHORITY AND ASSOCIATIONS

Co-ordination and monitoring system

- Notifications and deadlines (e-mail)
- Reminders (e-mail and phone calls)
- Monitoring system maintenance and development
  - User administration
  - Site management (new, sold, etc.)
  - …

Guidance and training

- Annual webinars and reporting clinics
- Help-desk for reporting (and EEA in general)
- Material on web-site
  - Information and instructions for reporting, webinar recordings, guidelines for savings calculations and reporting, export files, etc.
- Instructions in the monitoring system
- One-on-one Teams support meetings

Data control

- Every site report is checked
  - Missing data
  - Big changes
  - Potential errors (compared to others or given limit values e.g., in energy use or measures)
- Excel, Access and/or Tableau in use for error checks
- E-mail with revision requests and deadline for corrections sent to person in charge of the reporting in the participant organisation
- If needed phone calls to participants to correct significant errors in energy use or measures

Publishing the results

- Reported data from Access database (daily created copy of data from Oracle database)
- Data preparation with Tableau Prep
- Additional data calculated (e.g,. estimated cost savings, estimated CO_2 emissions savings)
- Summary dashboards produced with Tableau Desktop, published at Tableau Public and embedded in the EEA website
- PowerPoint info graphs produced with Tableau Desktop

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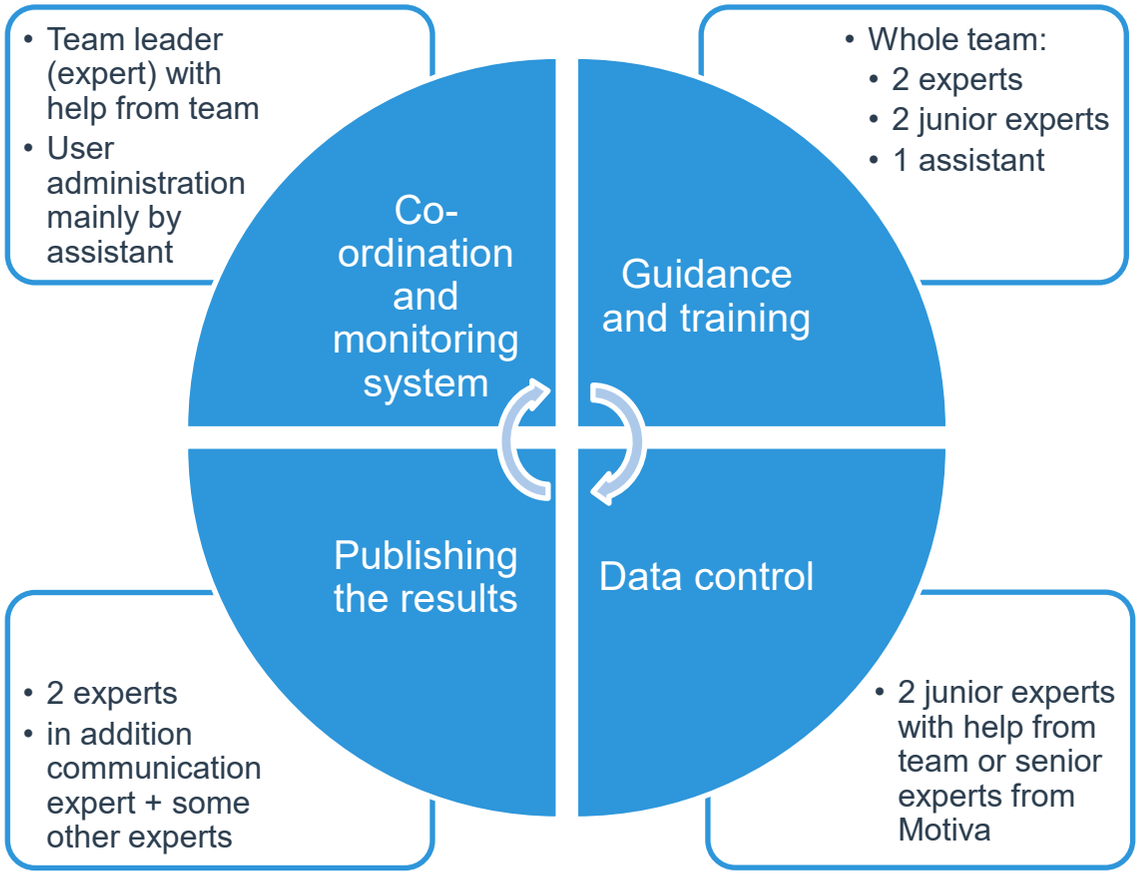
Resources for the annual reporting process

- Work carried out by 5 person team
  - last few years team has been 4 persons (2 experts, one junior expert and one assistant)
  - one additional new junior expert started 2022 to lighten the workload during the spring
  - junior experts (engineers) supported by other experts responsible for data control
- Annual workdays for monitoring around 2-3 person years, first half of the year is the busiest time
  - in addition September is busy related to publishing the final results and communication activities in combination with agreements parties related to the results



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Energy Efficiency Agreements in Finland

Publishing the results have evolved

Period 1997–2007

- Printed and pdf summary report published yearly

Period 2008–2016

- Pdf summary report
- 1st generation **feedback data for participants** form their own reported data in the monitoring system

Period 2017 – 2025

- A new platform to visualize the overall results (Tableau, only in Finnish) in use
- 2nd generation **feedback data for participants** form the reported data in the monitoring system

Why data visualizations instead of pdf reports?

- pdf-reports were heavy reading and quite labour intensive to produce
- The work to produce the data visualisations in the first year is considerable, however relatively easy and quick to update afterwards annually
- With data visualisations it is easy to
  - Show main results in a few dashboards
  - Use published data for further analyses or presentations (government or participants)
  - Offer some interactive features to users
  - Link to a specific graph on the summary dashboards and easily distribute either link to the whole summary or just a selected dashboard

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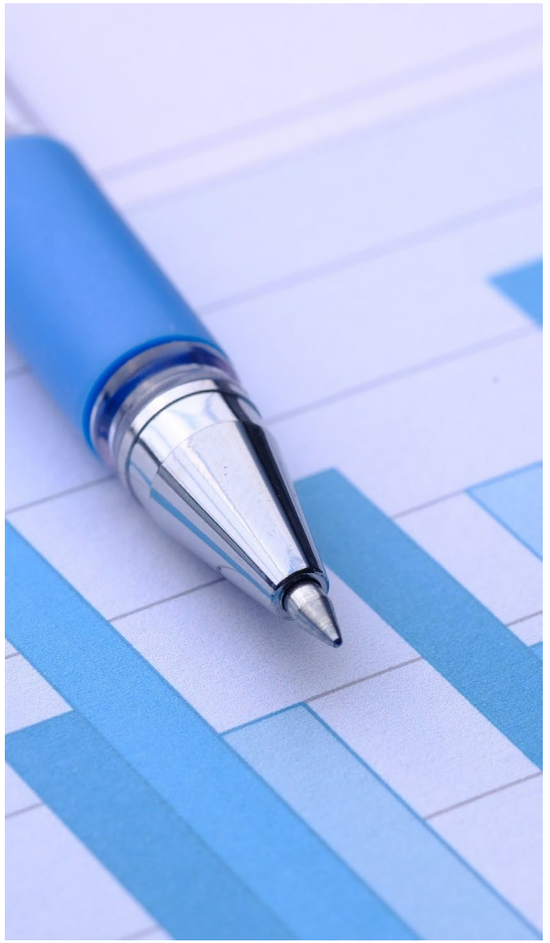
Monitoring system for period 2017-2025

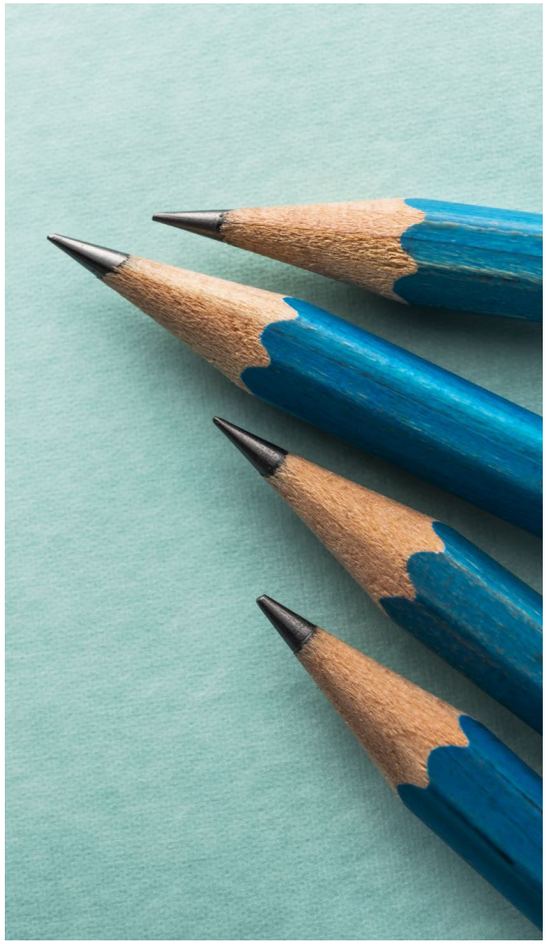
- Web-based user interface, Oracle database
  - An Access database with copy of reported data from Oracle database updated daily for monitoring teams use
- Personal user identification for all users
  - Read-only access can be granted to persons not directly involved in reporting in the organisation
  - User administration requires significant amount of resources
- EEA monitoring system has a link to energy audit monitoring system
  - Measures found in audits are shown on annual reports
  - This helps to prevent double counting of the effects of the two policy measures
- User can see all previously reported data and feedback from reported data at all times from the monitoring system
  - Feedback data can be exported to Excel, Word or pdf-file
- Some data can be reported with export files
  - Energy efficiency measures, energy use in service sector and building sector action plan reports

Reporting templates, reporting sites and users



- In practice the monitoring system has 8 main different reporting templates
  - Energy intensive industry
  - Small and medium sized industry
  - Energy production
  - Energy services
  - Services
  - Commercial properties
  - Rental housing
  - Municipalities
- Currently 714 companies and 123 municipalities with over 4 300 eporting sites
- Well over 2 000 individual users for monitoring system in companies and municipalities

Annual data control process



- Every annual site report is checked for
  - Missing data
  - Big changes compared to previous years
  - Potential errors (compared to others or given limit values e.g., in energy use or energy efficiency measures)
- **Main emphasis in data control is on the desk check of all reported energy efficiency improvement measures**
  - In average of 3 800 new measures reported every year during current period
  - Desk check includes e.g., magnitude of the savings (decimals, share of savings compared to energy use), category, information on lifetime, reported investment cost etc.
  - Further clarifications on savings calculations and missing data is asked when needed
  - Excel, Access and/or Tableau in use for error checks
- E-mail with revision requests and a deadline for corrections is sent to the person named to be in charge of the reporting in the participating organisation
- Reminders sent if no answers or corrections made. If this does not produce results, phone call to person responsible of the reporting (only for critical errors).
- When data is ok (after corrections or if no corrections are needed), a thank you note is sent, to let the person in charge of reporting know that the data is ok
  - Instructions for future reports sometimes added if report has only minor issues and no revisions are required

Verification consists of several elements

ENERGY EFFICIENCY AGREEMENTS (EEA)

In addition to the control process described in previous slides (desk check -process):

- annually almost 200 measures − 5% of all reported measures and 7% of technical measures − will get investment subsidy
  - all these will be due to the Government rules checked by an independent expert
- some EEA branches have energy advise support for joint companies
  - in the adviser contacts reported measures and savings calculations are also covered
  - advise support and contacts have extensively increased at least for the period 2022…2026
- additional “Reliability Study” made annually - one element in the verification process
  - aim is, in addition to other actions, to help to ensure that reported savings are in compliance with the principles for calculating savings to fulfil their use in EED implementation.
  - individual interviews are made annually for a representative sample chosen from the branch
    - always 10 participants having biggest reported savings
    - in addition, a representative sample of the other participants
    - Webropol-questionnaire is sent to all the others reporting (same questionnaire frame used as in individual interviews)
  - gives also additional information and input for developing e.g. advice services for participants.

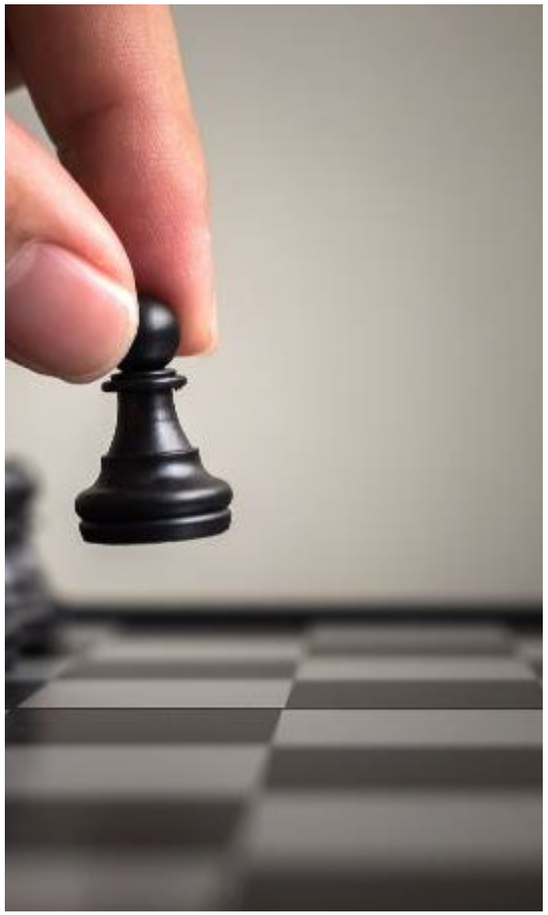
Success factors and Lessons Learned – reporting process 1/2

- Help desk for reporting is essential
  - Without help and advice the response rate would be lower and quality of data poorer
- Annual reporting webinar is good practice
  - At first for this period idea was to have one webinar at the beginning of 2018 or perhaps one every second year
  - Every year approximately 100 participants and feedback is very positive
- Reporting clinics are growing in popularity every year
  - E-mail help desk is good, but sometimes people want to talk
  - Remember to advertise or people won't now to come
- User administration requires significant amount of work
  - Could this be done in a less labour-intensive way?
  - Data confidentiality and data protection must be ensured (remember GDPR)

Success factors and Lessons Learned – reporting process 2/2

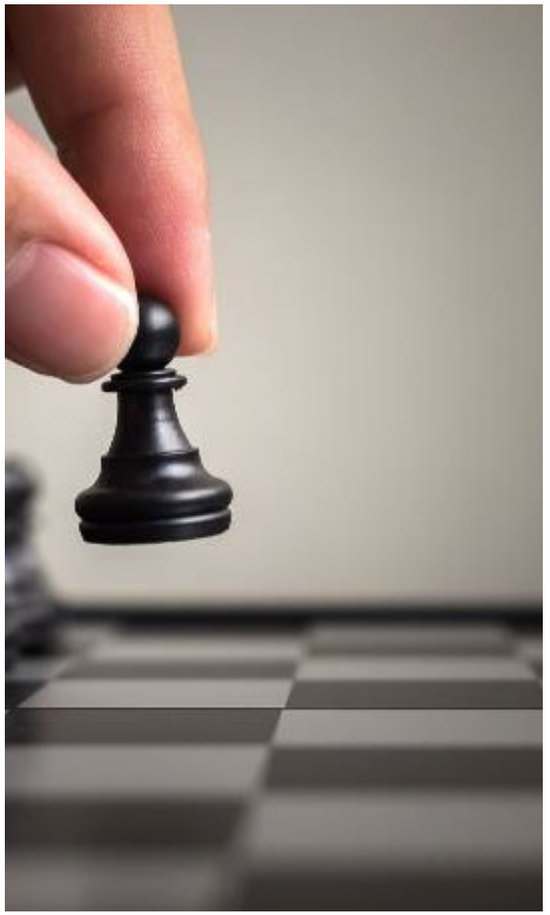
- Export files make reporting easier in many cases
  - Export file for energy efficiency measures makes it possible to easily gather data on energy saving measures from multiple sources through out the year
  - Also consider the possibility to use data transfer interfaces (API)
- Data checks in the monitoring system make reporting easier
  - Try to include them from the beginning as much as possible
- If you transfer data from or to the monitoring system from other systems always remember to ask authorisation to make the transfer both ways
- Staging environment for testing developments for monitoring system is a big help
  - at first this was missing so developments were published straight to production environment - not ideal...

What to consider when planning a new monitoring system 1/2



- Only ask things that you need/want to monitor – less is more ☺
  - These requirements should be defined in the agreement
  - Consider that participants must be able to collect and report the data with reasonable effort
- Try not to make radical changes in data collection during the agreement period
  - In fact, change as little as possible
- Survey what data is already collected related to agreement requirements
  - Is there some data source that could already provide some of the data needed? Where and how it could be acquired?
  - Is it possible to use data collected for the agreement as data source for other uses? This lightens the reporting load on the participants.
  - Remember to get authorisation for possible data transfers (for example in the accession document).
- What kind of feedback or outputs participants will need or want from the monitoring system
  - Often participants want detailed feedback or outputs but are reluctant to report with required level of detail
  - Good feedback data motivates participants to report better data

What to consider when planning a new monitoring system 2/2



- Will you be offering data transfer interfaces or export files to help reporting?
- The monitoring system must function the whole agreement period
  - Maintenance and technical support are continuing functions through the lifetime of the monitoring system
  - There will likely be need for some development work during the agreement period
- Take data confidentiality and GDPR into account at every turn
- Audit the data security of the monitoring system regularly
- Consider how to make reporting easy for participants and monitoring team
  - Well planned user interface with built-in guidance
  - Built-in checks for data quality during the reporting with clear information on errors
  - Comparison to earlier reports or indicators calculated from reported data in the monitoring system help participants to notice possible errors
  - Export files or data transfer interface can help automate reporting for participants
  - Offer a place to comment reported data but ask structured data as much as possible
- Consider how you can access the reported data
  - It is more cost effective to be able to further process the raw data yourself for various needs that will arise during the agreement period than to try to guess in advance all the different variation of data needs for future and making ready reports for these needs

What to take into consideration when you're building a monitoring application from scratch

Highlights are based on discussions with our IT service provider (Consultor) for the Efficiency Agreements and the Energy Audits monitoring system

- When developing an IT application for a scheme with lifecycle of several years (in our case 20+ years), it is worth considering
  - Maintainability
  - Potential needs for the development of new features / functions
  - Data security and data protection
  - Accessibility requirements

What to take into consideration when you’re building a monitoring application from scratch?

Lifetime of system, Data Security and Protection

- Lifetime of systems and components, etc.
  - Application components needs to be updated several times during the application lifecycle
    - Some needs to be modified, some needs to be modernized and some needs to re-implemented – almost everything needs to be re-built at some point
  - Security-related threats are typical reasons for the need for updates
    - You need to be able to make security updates quickly
  - Good software configuration management (SCM) is a prerequisite for effective component management and a way to quickly identify components that need to be updated
- Data security and data protection
  - Risk-based approach
    - The desired level of security must be identified first, based on which a risk analysis is performed, and implementation is planned from the beginning of the architecture.
  - Continuous verification of the achievement of objectives during development work
  - Security updates for systems, applications, and components provide the foundation for ongoing security
    - Regular security scans are required to ensure the system is working as planned

What to take into consideration when you’re building a monitoring application from scratch?

Solutions

- Use today's web technology as the basis for the solution
  - Not necessarily the latest technology but a proven technology from provider who offer security updates actively
  - For example, the interface could be built with a modern Javascript library such as React or Vue and interacts with the database through the Rest API’s. The database could be implemented in a cloud-based service in Azure, for example.
- The benefits of a cloud-based service
  - Wide scalability
  - Monitoring is often a built-in feature
  - Logging functions are in principle comprehensive in cloud services - log monitoring and data protection must be taken into account
  - The ownership and transferability of the data must be considered when choosing a service provider
- Modularity
  - User Interface - APIs - Service Layer – Database
  - Modularity supports maintainability and facilitates the migration of updates to production

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AGREEMENTS

Thank You!

energiatehokkuussopimukset2017-2025.fi
(in Finnish)

energyefficiencyagreements2017-2025.en
(limited content in English)

Platform to visualize the overall results
(Tableau, only in Finnish)

Key results 2017-2021 in English - infographs

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