Findings and deliverables of IEA demand side management program Task 17

"Today and tomorrow for DER in Korea"

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Content of the presentation

- Introduction to IEA DSM Agreement
- Introduction to Task XVII
- Outputs and deliverables
- Some findings

The IEA DSM Programme (1)

http://ieadsm.org/

- Work begun in 1993
- With 19 OECD Countries (but open to all countries in the world)

Programme Vision: In order to create more reliable and more sustainable energy systems and markets, demand side measures should be the first considered and actively incorporated into energy policies and business strategies.

Programme Mission: To deliver to our stakeholders useful information and effective guidance for crafting and implementing DSM policies and measures, as well as technologies and applications that facilitate energy system operations or needed market transformations

The IEA DSM Programme (2)

The Programme's work is organized into two clusters:

- The load shape cluster, and
- The load level cluster.

The 'load shape" cluster includes Tasks that seek to impact the shape of the load curve over very short (minutes-hours-day) to longer (days-week-season) time periods.

The "load level" cluster includes Tasks that seek to shift the load curve to lower demand levels or shift loads from one energy system to another.

The IEA DSM Programme (3)

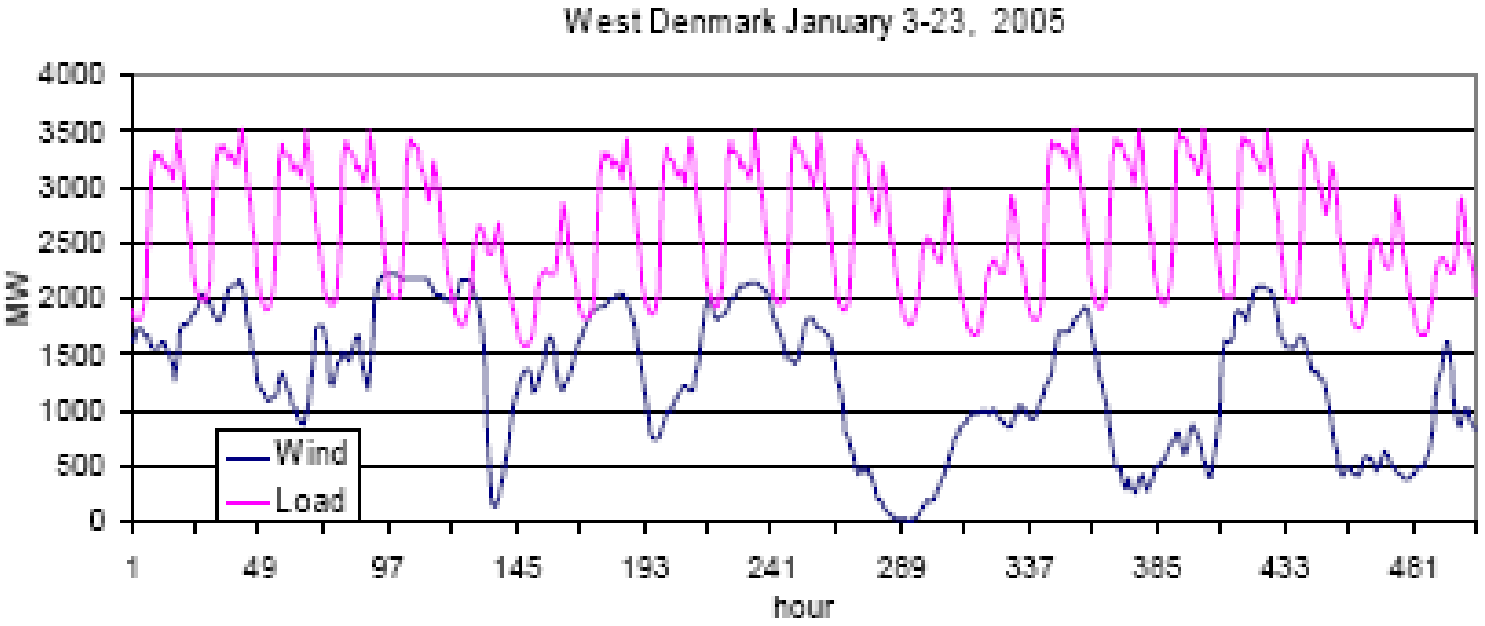
A total of 18 projects or “Tasks” have been initiated since the beginning of the DSM Programme and a couple of new ones are in starting phase

The overall program is monitored by an Executive Committee consisting of representatives from each contracting party to the Implementing Agreement. The leadership and management of the individual Tasks are the responsibility of Operating Agents

One of the ongoing Tasks is

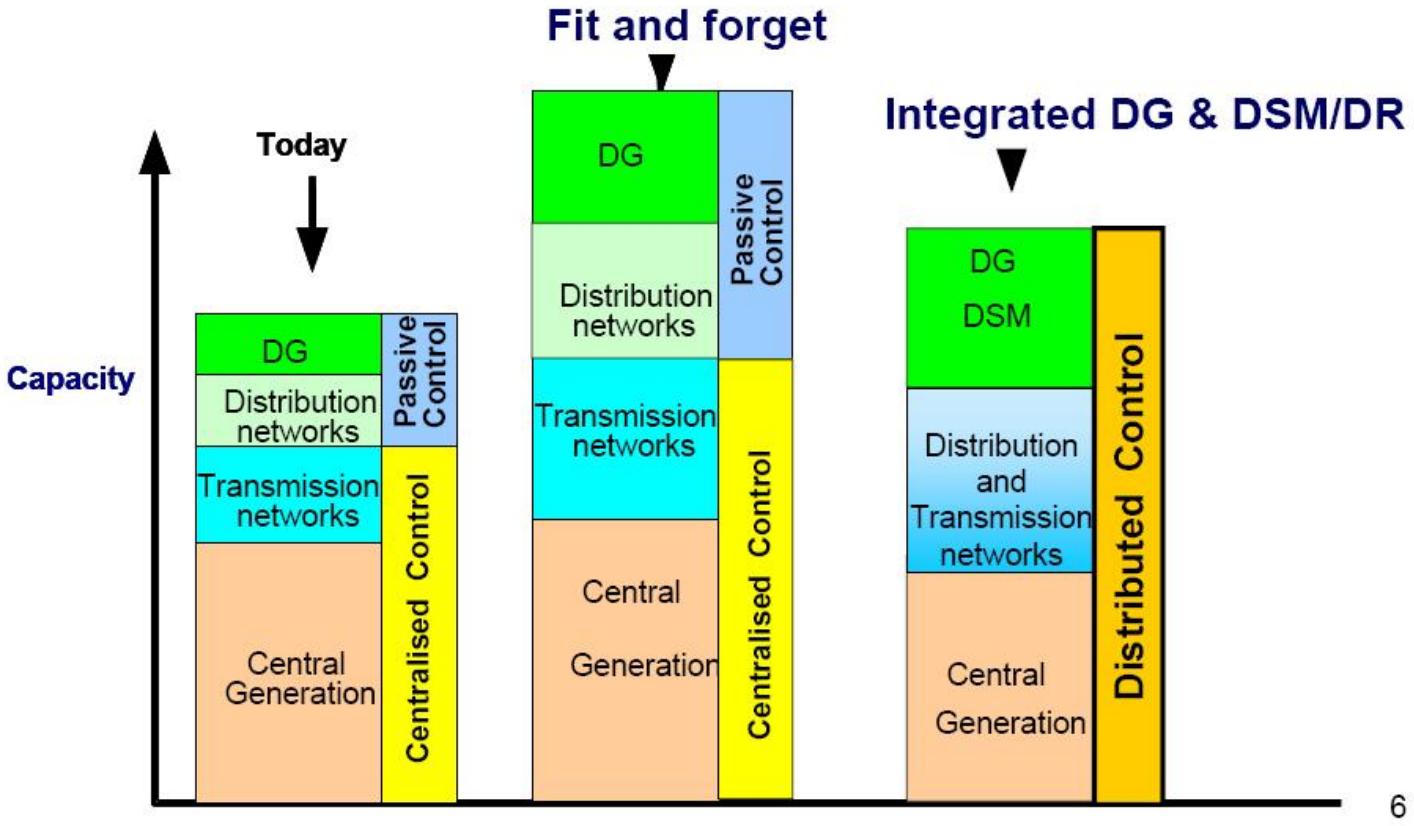
Task 17: Integration of Demand Side Management, Distributed Generation, Renewable Energy Sources and Energy Storages

Task XVII Background: Problems from intermittent type of generation



Example: Wind power production (2400 MW wind power) and load in Western Denmark

Task XVII Background: Challences of SmartGrid concepts



Objectives of the Task

The main objective of the Task is

- to study how to achieve the optimal integration of flexible demand with Distributed Generation, energy storages and Smart Grids, and thus increase the value of Demand Response, Demand Side Management and Distributed Generation and decrease problems caused by intermittent distributed generation (mainly based on RES) in the physical electricity systems and at the electricity market The Task deals with distributed energy resources both
  - at local (distribution network) level and
  - at transmission system level where large wind farms are connected.
- The Task will also provide the integration based solutions and examples on successful best practices to the problems defined above.

Approach

The first step in the Task is to carry out a scope study collecting information from the existing IEA Agreements, participating countries and other sources (research programmes, field experience, information collected through Cigre working groups, etc), analyse the information on the basis of the above mentioned objectives and synthesize the information to define the more detailed needs for the further work.

Especially information exchange and coordination with Wind and ENARD IAs is organised, and possibility to have common workshop is considered.

Subtasks

Four subtasks are planned

- Subtask 1: Information collection on the characteristics of different types of DER in the integrated solutions
- Subtask 2: Analysis of the information collected and preliminary conclusions (state of the art)
- Subtask 3: Feedback from the stakeholders: Workshop
- Subtask 4: Final conclusions and the detailed definition of the further work

Participating countries and time schedule

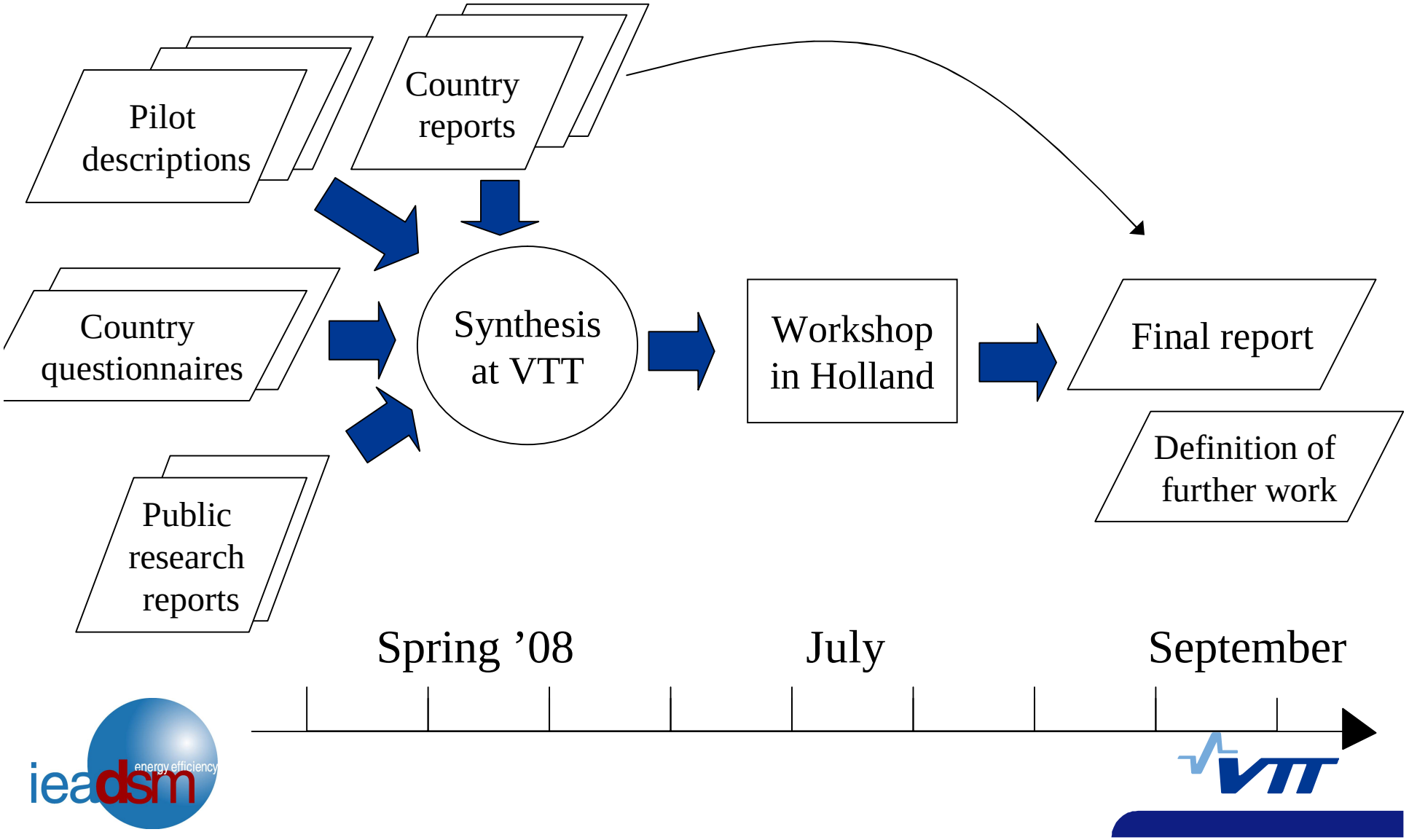
Participants

- Austria
- Finland
- Italy
- Korea
- The Netherlands
- Spain
- USA

Time schedule:

October 2007 – end of September 2008

Progress of work in IEA DSM Task 17



Outputs and deliverables

The following results will be delivered by the Task:

- State of the art report on the integration aspects
- Annex report including country reports from participating countries and description of analysis tools and methods
- Description of over 50 case studies, pilots and research projects
- Workshops: main workshop in the Netherlands, country specific workshops in Spain and Korea
- Proposal for the future work

Structure of our main report

- The report was restructured after the July workshop according to country expert recommendation. The structure is as follows:
- Introduction of Task 17 and its objectives
- Electricity supply
  - Different DG and energy storage technologies are briefly described. Overview of power quality measurements. Protection of DG equipment, and the measurements needed for this.
- Electricity demand
  - The chapter concentrates on demand response. The situation in different countries is presented.
- Communications and IT
  - Discusses things such as needs for communication, DER automation, smart metering and interconnection standards.

Structure of our report (continued)

- Integration analytics
  - Discusses the tools used for analyzing different ways of integrating DR, DG, RES and storages from the point of view of reliability and costs.
- Regulation and policy
  - Discusses costs and benefits to different actors; different incentives which are used to promote DER are listed; situation in different countries is examined.
- Experiences from case studies
  - Classification of projects which we have found. More information is available in the annex.

Distributed generation and storage technologies

- We note that although pilot projects have been launched, customer-level DG and most types of energy storages are still not suited for commercial operation without heavy subsidies
  - At the moment they are used as emergency generators and for power quality applications
  - Larger DG units, such as small combined cooling, heating and power (CCHP) units or small hydro power, can be profitable (we have placed 20 MW_e limit for distributed generation)
  - We have compiled a table of the current situation of DG and energy storages in the participating countries
- Standardization work regarding the connection of DG and storages (the type of generation is irrelevant) to electrical network is going on in IEC and IEEE

Demand response

- At the moment interest is targeted at commercial and residential customers because industrial customers have largely been activated
- Problems:
  - There is little knowledge about customers' response to DR incentives (flexibility prices)
  - Certification of load response requires smart meters with small enough measurement interval
- Standardization of contracts, controllers and installation procedure is important for cost-effectiveness
- We have listed different types of DR and compiled of table of the current situation of DR in the participating countries
- Heating and cooling applications are the main parts of DR potential

Metering

- Smart meter deployment is on-going in many countries either in compulsory or voluntary basis
- No common requirements at the moment
  - European smart meter alliance has compared different definitions of smart meter
- The investment lifetime for the DSO is long, therefore the investment should be carefully planned
  - ”smartness level” should be high enough, for example load control may be desirable
  - But cost should not be too high
- There can be benefits also to other parties except the DSO

Tools for analyzing DR & DG, RES and energy storages integration

- We have considered high-level software tools, which can be used as an aid in planning or operation of DER (some hardware tools for communication and meters are discussed in other parts of the report)
- We have broken down the tools into following classes
  - policy analysis and resource planning,
  - mathematical power system simulation,
  - network simulation,
  - operation optimization,
  - customer-level simulation and
  - forecasting
- Tools which we have found have been listed in our annex report. Most of them have been targeted to the MS Windows operating system.
- Most of these are also available as services, so that a small business does not have to acquire an expensive tool.
  - For example forecasting of transmission tariffs (”triad”) in UK

Readiness level assesment

- We have undertaken the attempt to define the readiness level of different components, which are necessary in DR & DG, RES and energy storages integration. We have used a simple four-level scale, early…mature.
- These components are e.g. DG and storage technologies; software tools for analyzing DR, DG, storages and RES integration; smart meters and automated DR devices
- If some component is not on par with the others in readiness level, it may be a bottleneck in business development
  - However, feasible business models will normally drive development and implementation of technology and not vice versa

Experiences from research projects, demonstrations and field tests

- We have collected some 50 projects which combine DER or smart grid technologies.
- DER technologies allow higher intermittent renewable energy penetration
- They allow building microgrids, which increase reliability of weak networks
  - For example in Dutch pilot project interruption time decreased by 60 %
- Power imbalances can be reduced
  - This is not always the most attractive way to use DER. Revenues can be higher when operating flexible units based on requirements of the power system.
- Stress on networks can be reduced, e.g. so-called technical virtual power plant concept
- Voltage quality can be improved (no quantitative results were mentioned)

Work continuation

- This week we will have the last country expert meeting here in Seoul
- We will draw the final conclusions from our work
- In the end of September we will make a proposal to IEA about the continuation project. In the new work there may be a new group of countries – each country in the IEA DSM program can decide to join.
- Ideas and proposals for the future work are welcome