



**RED**  
**ELÉCTRICA**  
DE ESPAÑA

## Is DSM the answer for intermittent renewable generation?

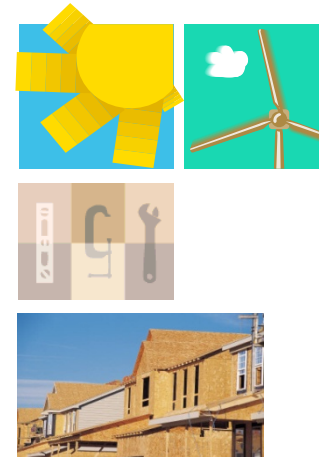
K-ER14-IDAIE DGD

Carmen Rodríguez Villagarcía,

**REE**

Contribution to Chester IEA, Cooperative  
seminar.

*20 Oct 2010*





## Do we ask to day, in 5 years or 10 or 20?

Just now?

**A demand response portfolio to operate jointly with an intense wind generation employed on the electric delivery will be a paradigm for some countries as Spain.**

**The technical viability is not in debt.**

**How much are the benefits and how much is the cost and the results?**

**Red Eléctrica de España, Spanish system operator, is developing specific data sets and methodologies to do the estimations**





## To concrete cases

**Demand response in the lower valley period with intense wind generation. How to operate it?**

**High level of Demand Response provided by households, First estimations for 2020**

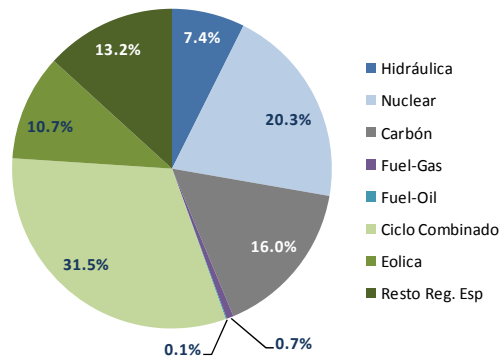




## Contexto energético. Mix de generación eléctrica

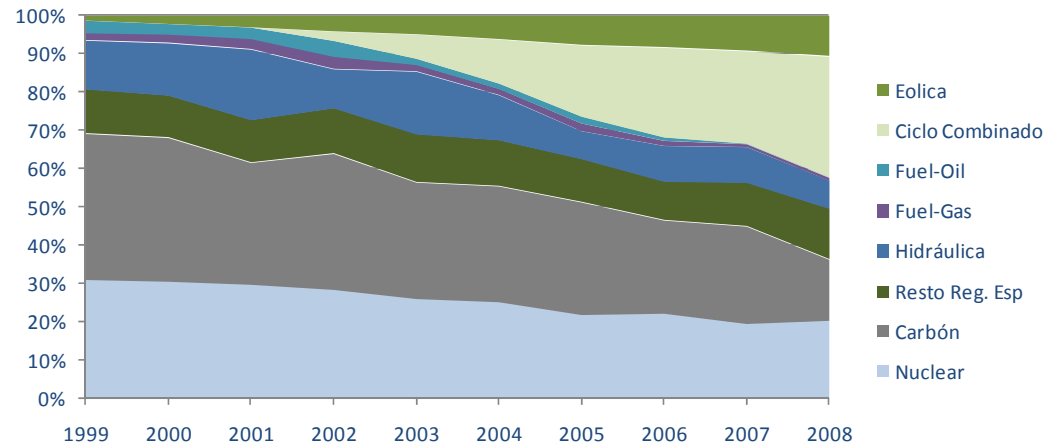
El sistema eléctrico español sigue siendo altamente dependiente de los combustibles fósiles

Mix de generación eléctrica 2008



En 2008 las principales tecnologías fueron los ciclos combinados, la nuclear y el carbón.

Evolución del mix español de generación



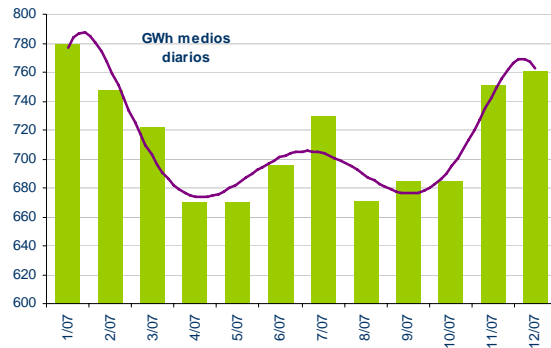
En los últimos años se observa un incremento de la participación de la eólica y los ciclos combinados, mientras que el carbón, la nuclear y la hidráulica reducen su contribución.



## Caracterización de la demanda eléctrica

3

### Comportamiento estacional a lo largo del año

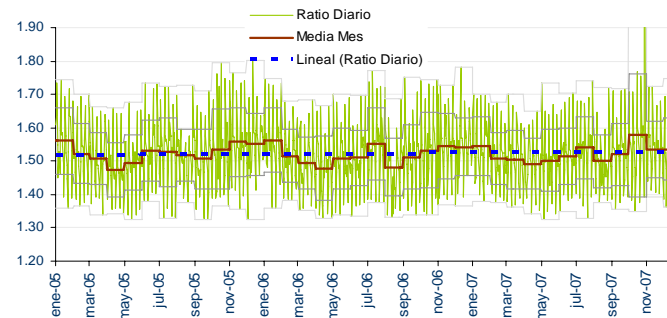
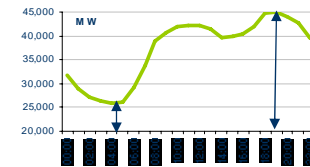


Mayor demanda en Invierno y verano que en primavera y otoño. Fundamentalmente asociada a la temperatura y al número de horas de luz solar.

4

### Ratios punta-valle elevados

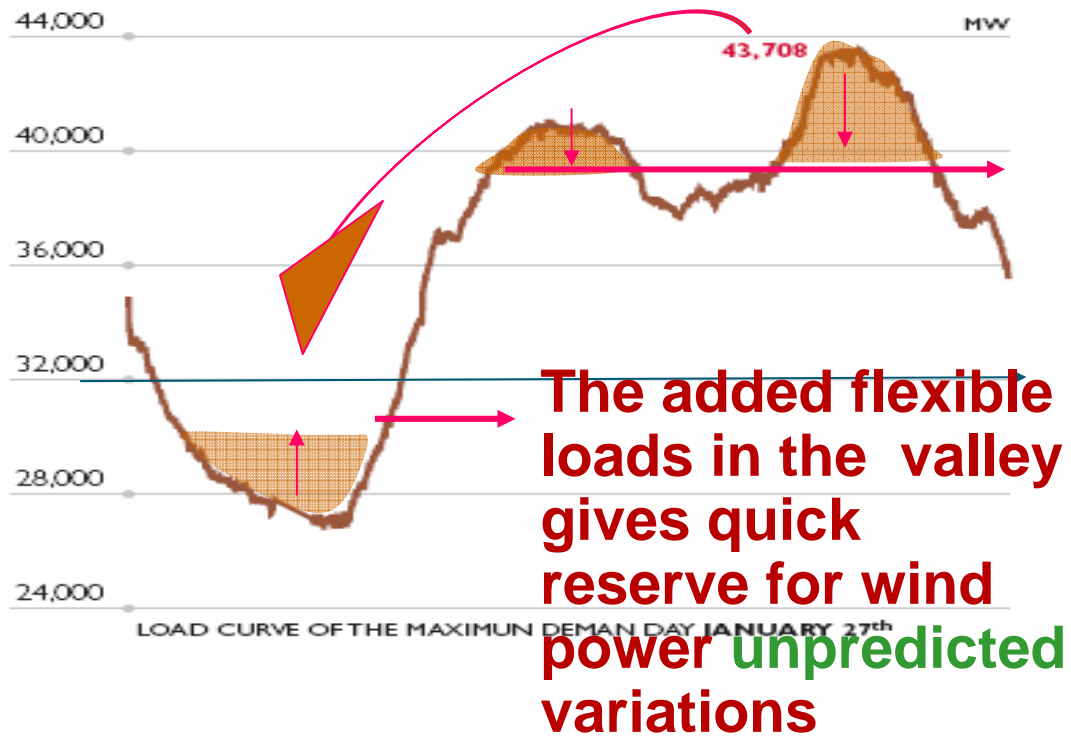
El día de la punta de invierno de 2.007 el ratio punta-valle fue de 1,73



Ratios elevados para el cociente entre demanda punta y demanda valle diaria, con valores comprendidos entre 1,35 y 1,75 (Valor medio de 1,52)



## Demand response in the lower valley period with intense wind generation



**Translating consumption from System peak periods to valley implies:**

**Less grid energy losses**

**Less spinning reserves energy consumption**

**Less CO<sub>2</sub> emissions from the peak generation mix**

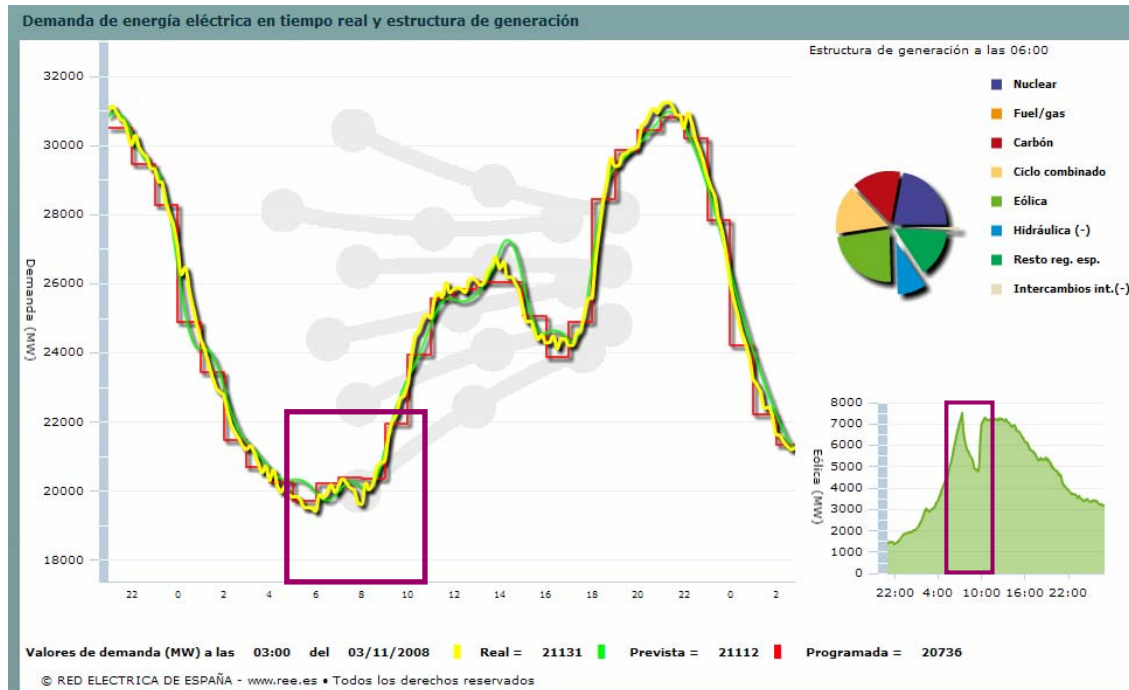
**Less need of new generation and grid investments**





## Retos para el sistema eléctrico

### Integración de la generación renovable no gestionable



**Demanda baja junto con alta producción de eólica y elevado error de predicción obligaron a reducir la producción de eólica el día 03/11/2008**

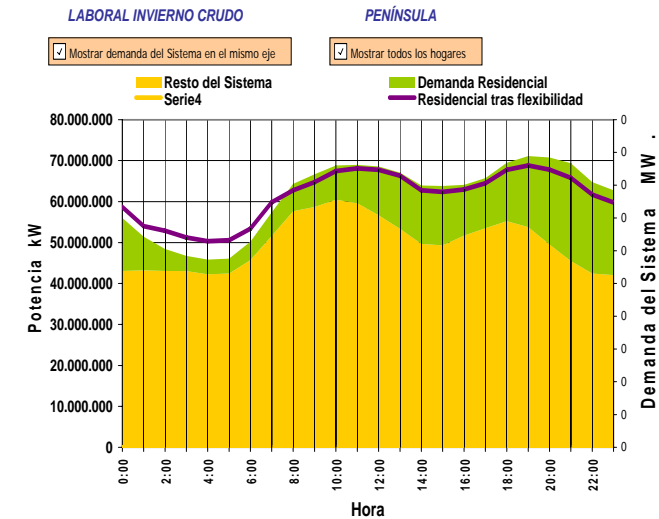


## RED ELÉCTRICA DE ESPAÑA

### High level of Demand Response provide by households, First estimations for 2020

All domestic direct heating in Spanish households is replaced by a system with storage capacity

The reduction of the electric consumption is sharply reduced in the ES peak periods. The system load curve will be significantly less pronounced and the consumption in the valley will rise







## RED ELÉCTRICA DE ESPAÑA

### All domestic direct heating in Spanish households is replaced by a system with heat storage capacity, in 2020 scenario

The domestic onsite metered energy consumption, will not be reduced significantly

But

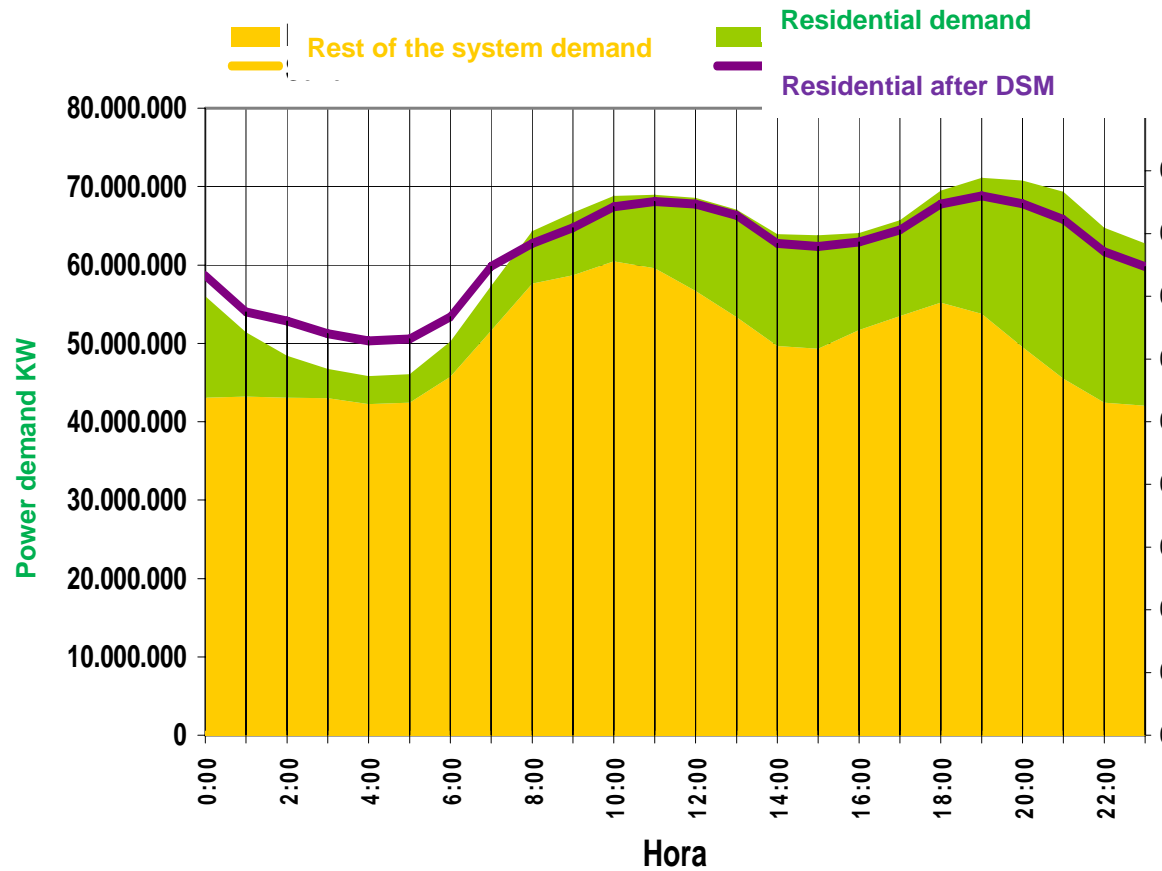
- taking account of just the **network loses** the aggregated savings are estimated in:

.15 million of MWh of energy consumption

261 thousand of CO2 Tm

- The system peak is reduced by 2.3 thousand of MW
- The system valley 5 hours power average rise by 1.12 thousand of MW

Cold labor winter day



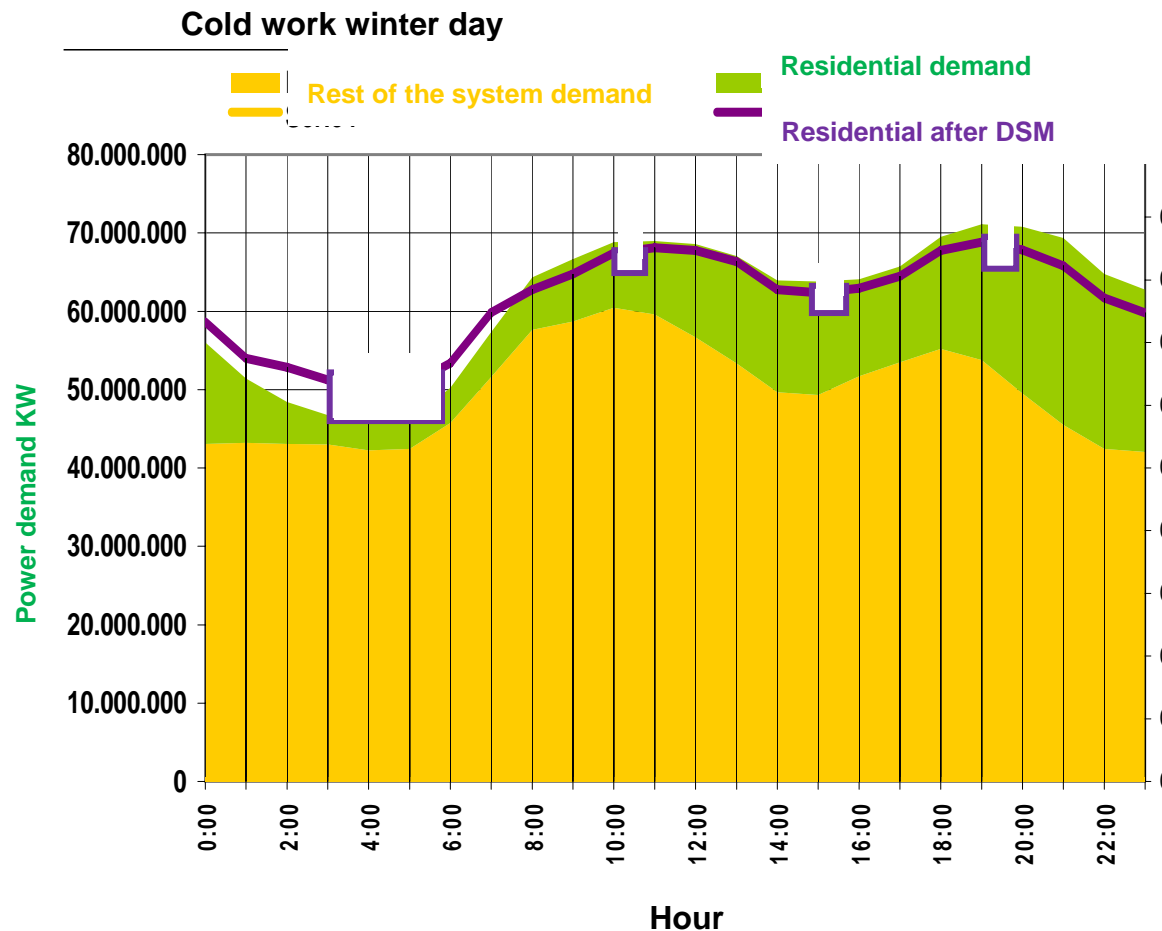


# RED ELÉCTRICA DE ESPAÑA

The household permit some consumption interruption by an ES signal emitted by EE or environmental impact criteria

In the system there will be 1.3 MW interruptible power to avoid spinning reserve energy consumption

Source, DERED simulation Tool, ADERE project, Residential Demand Operability Analysis. Red Eléctrica de España, Department of DSM, 2008

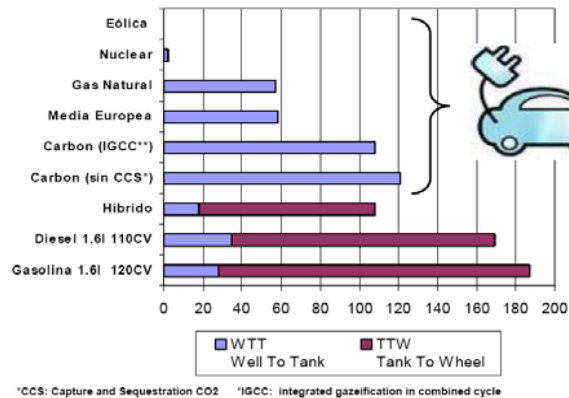




## Anexo I. Caso especial: El vehículo eléctrico

**El vehículo eléctrico constituye una oportunidad de mejorar la eficiencia del sistema energético**

**El vehículo eléctrico puede suponer una mejora de la eficiencia en el uso final de la energía**



El uso del EV puede reducir el consumo de combustibles fósiles y de emisiones de CO<sub>2</sub> ya que la energía eléctrica demandada puede proceder de fuente renovables

**Mejora de la integración de generación eólica en el sistema eléctrico**



- 1 millón de vehículos eléctricos (EV) previstos en 2014
- Mayor producción eólica en periodos valle
- Capacidad de integración de esa mayor producción de eólica mediante la gestión de la carga de los EV.





## Next Questions

**Is that advantage in the windy valley enough to justify DSM?**

**How to quantify the overall effects at any system operation case and in any of the heterogeneous electric systems infrastructures and operational conditions?**





## **An Objective for the DSM IEA agreement**

**To establish the framework to develop initial specification of the statistics and calculus instruments for the additional effects of DSM on the global energy efficiency and environmental impact, via the electric systems**

**These instruments should:**

**Work easily on the diversity of system scheme resources and operation**

**Be persistent in the quick evolution of electric systems**





**The task XXI of the DSM Agreement is in charge on the process of standardization of energy saving calculations.**

**The experts agree in their work plan to consider:**

**The induced effects on the Electric Systems Energy Efficiency and Global Energy Efficiency**

**The induced effects on CO2 emissions**

**But it is considered that previous to introducing these concepts in the task development of formulae, a work on standardization should come from the DSM System Operation scope.**





**The task XVIII; DSM and climate change is in charge on the recognition of the cross effects between climate change actions and EE and DSM Actions**

**Calculations on the effects of DSM on CO2 emissions of some concrete Electric Systems have been carried out.**

**The principles, methodologies and tools that will eventually give generalized and comparable results for DSM effects on ES emissions and energy efficiency have an important degree of coincidence**

**The task XVIII provides a privileged background to the new proposed task**





**To answer if DSM is the solution.**

**As wider is the scope more recourses dedicated to DSM are justified**

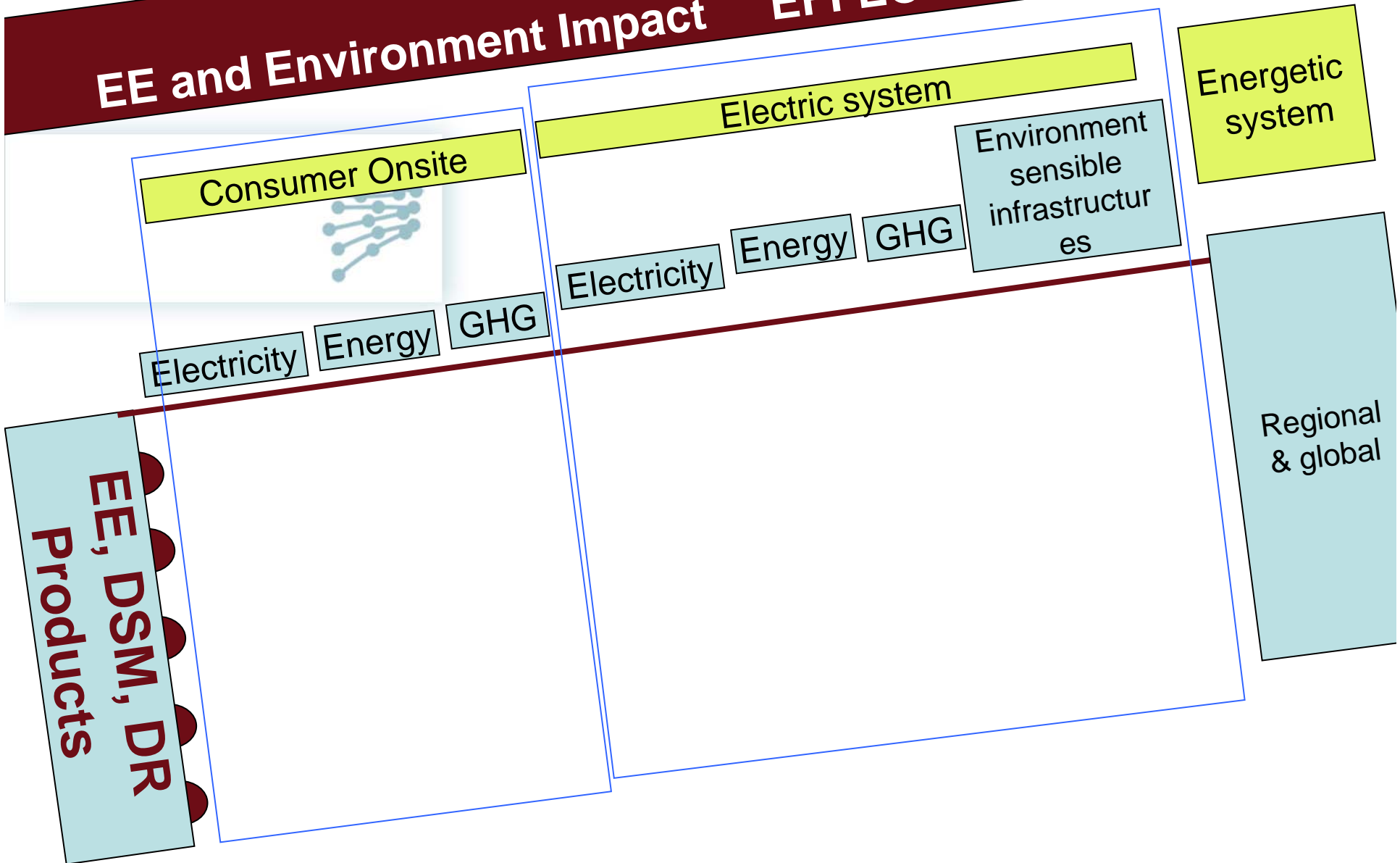
**The wide Scope of the DSM effects on the Global efficiency and environmental impact.**

**How wide should it be?**

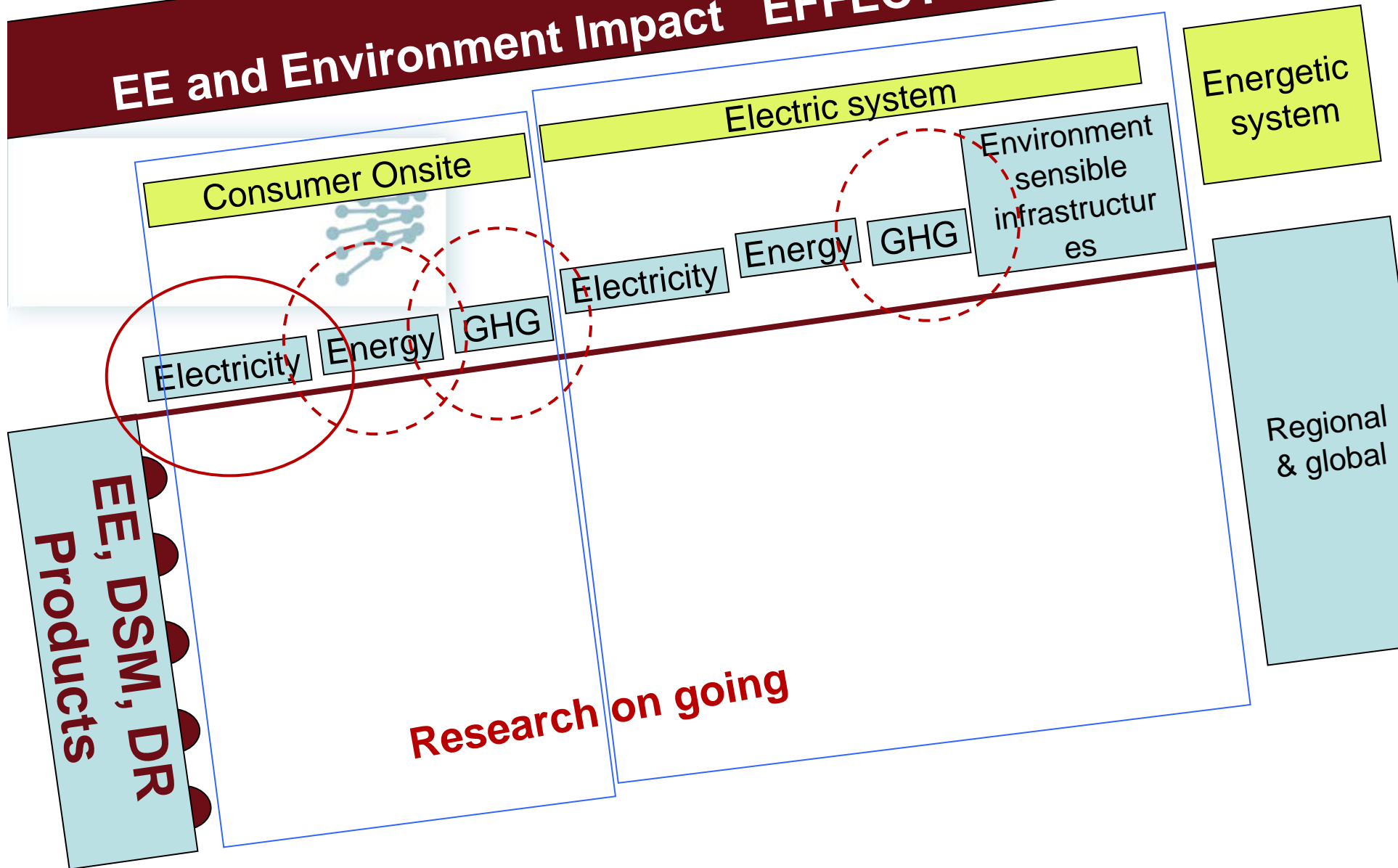




# DSM GLOBAL EE and Environment Impact EFFECT COMPONENTS

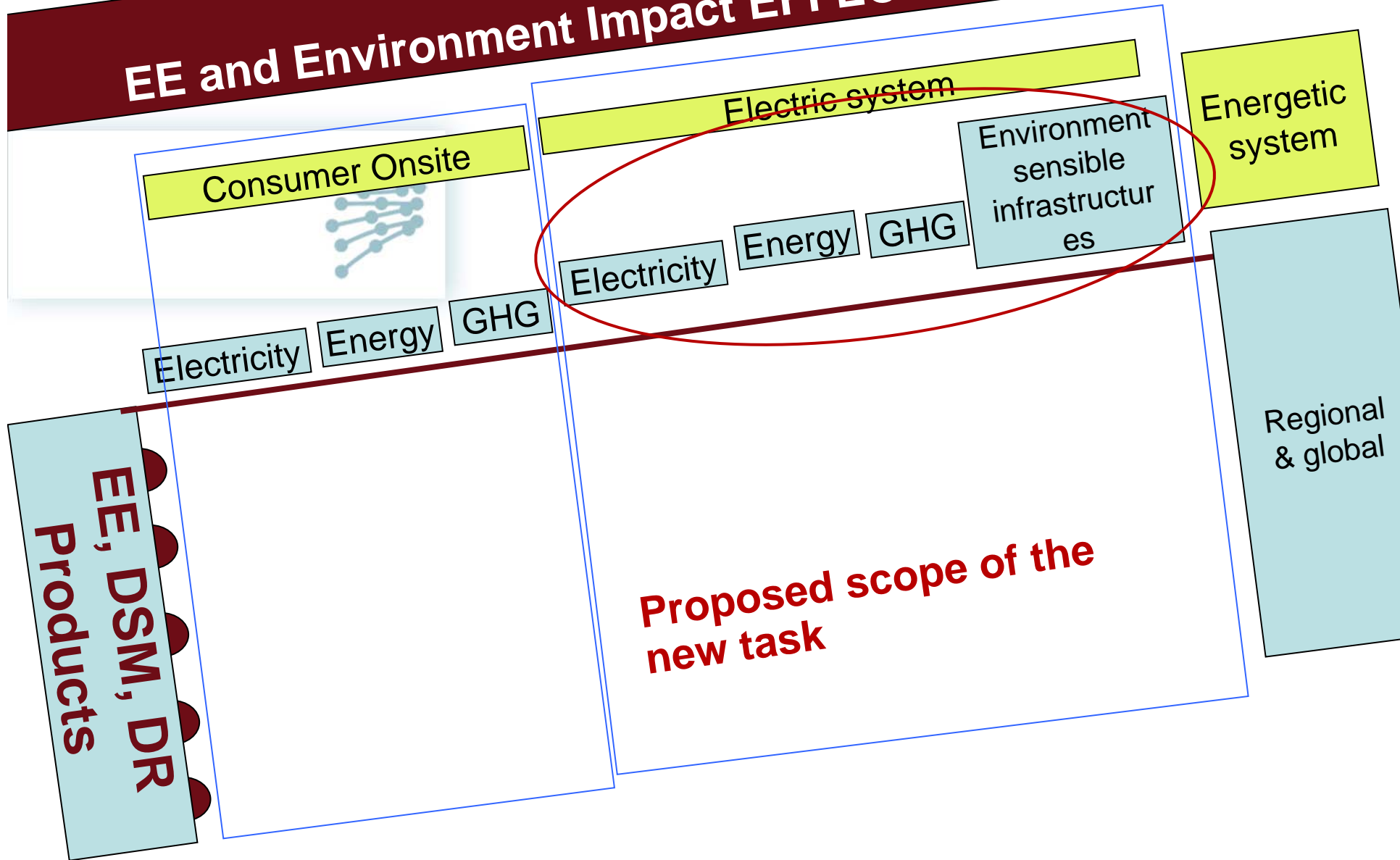


# DSM GLOBAL EE and Environment Impact EFFECT COMPONENTS

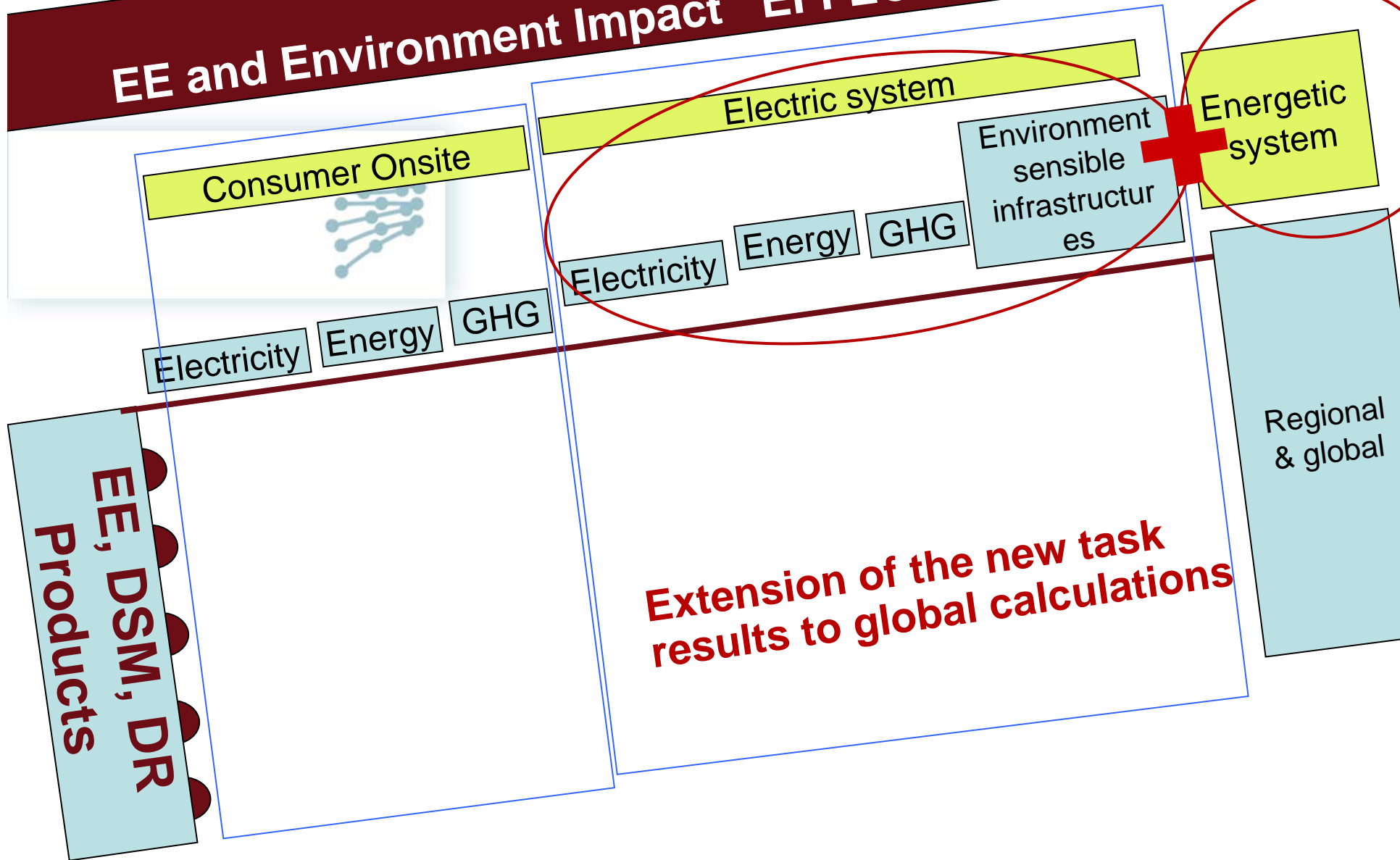




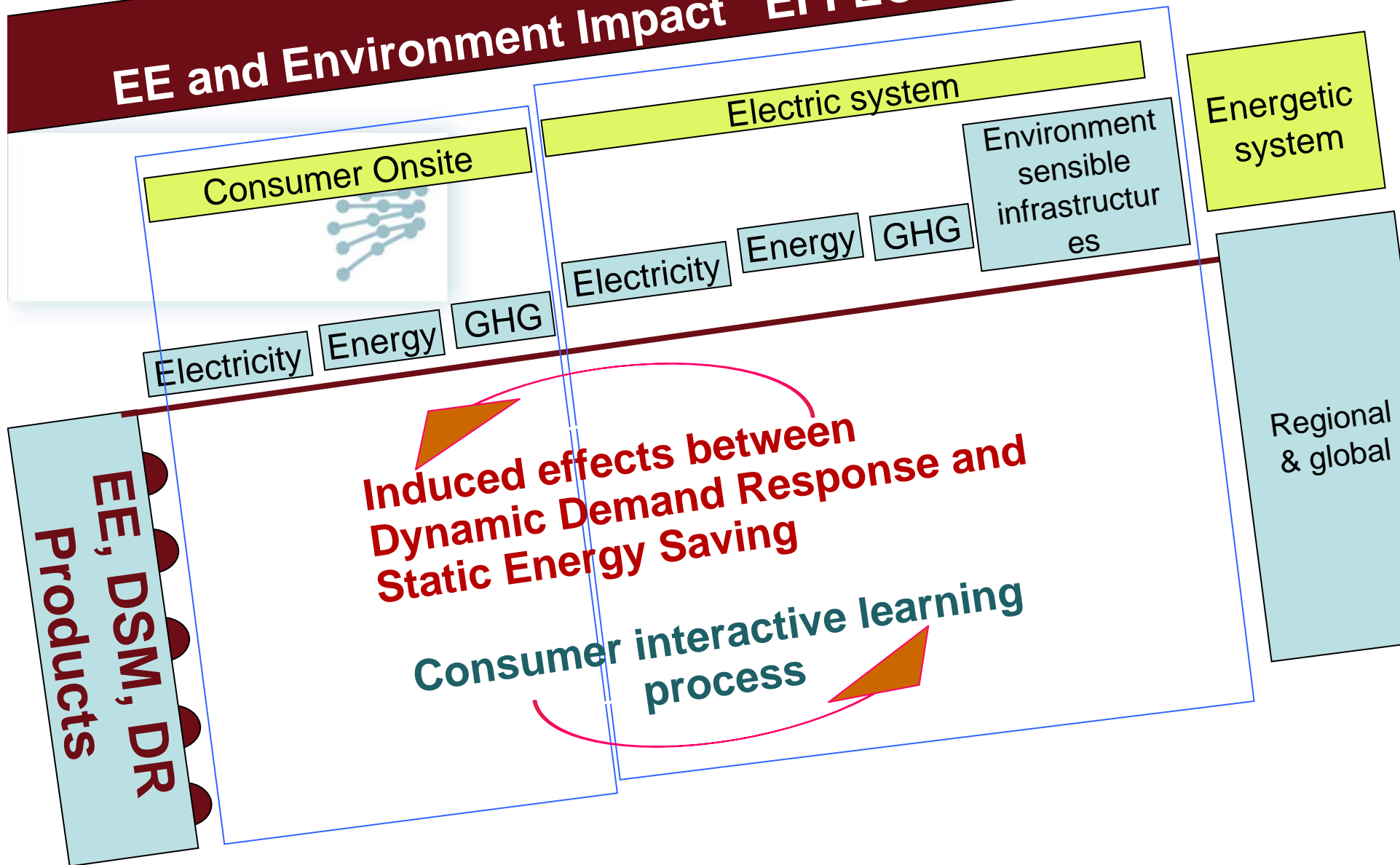
# DSM GLOBAL EE and Environment Impact EFFECT COMPONENTS



# DSM GLOBAL EE and Environment Impact EFFECT COMPONENTS



# DSM GLOBAL EE and Environment Impact EFFECT COMPONENTS





## Added global effects of DSM via Electric System. A LIST

- ❑ **Less grid energy losses**
- ❑ **Less spinning reserves energy consumption**
- ❑ **Less primary energy consumption per MWh produced on the power station portfolio.**
- ❑ **Less CO2 emissions per electricity unit produced on the power station.**
- ❑ **Less need of new generation and grid investments**
- ❑ **Effects on the viability of the development of SMART GRIDS, VIRTUAL POWER PLANTS, MICROGRIDS, that are oriented to reduce the energy consumption and the environment impact of the Electric System.**
- ❑ **Reduction of other energy consumptions out of the ES; natural gas and other fuel systems: Fuel shifting.**





## Trade off DSM - Electric System accounts

- ❑ **Electric System efficiency (energy and environment) – Electric market demand response**
- ❑ **Electric system efficiency (energy and environment) – Electric utilities (generators, TSO, DSO) Retailers investments and expenditures**







## Background

**The task XXI of the DSM Agreement is in charge on the process of standardization of energy saving calculations.**

**The experts agree in their work plan to consider:**

**The induced effects on the Electric Systems Energy Efficiency and Global Energy Efficiency**

**The induced effects on CO2 emissions**

**But it is considered that previous to introducing these concepts in the task development of formulae, a work on standardization should come from the DSM System Operation scope.** CRV1







## Background

**The task XVIII; DSM and climate change is in charge on the recognition of the cross effects between climate change actions and EE and DSM Actions**

**Calculations on the effects of DSM on CO2 emissions of some concrete Electric Systems have been carried out.**

**The principles, methodologies and tools that will eventually give generalized and comparable results for DSM effects on ES emissions and energy efficiency have an important degree of coincidence**

**The task XVIII provides a privileged background to the new proposed task**





**To answer if DSM is the solution.**

**What are the costs of the DSM  
integration on the system  
operation?**





## **Keys of reduced cost on the current technology framework.**

**Smart plugs/smart appliances. Standard or customized control boxes. Combining, electric appliances, isolation mechanisms, blinds and onsite generation**

**Cheap and universal communications for control, mobile phones and or internet?**

**Direct control by the operator of aggregations of million of medium or small loads**

**Simple DR delivery quantification procedures**

**ESCO´S And Aggregators he example of the banking business in the Mobile**





## Background

**Some tasks of the DSM Agreement research the business models to reach demand response .**

***Task VI Competitive energy services***

***Task XIX: Micro Demand Response and Energy Savings***

***Task XX: Branding on Energy efficiency***

CRV2







## Next step to answer the question

**Probably we should begin to draft the first Income Statement methodologies, in terms of currency and physical units; KWh, CO2 Tons, Km of lines, etc**







# Thank you

<http://www.ree.es>

[Carmenrodri@ree.es](mailto:Carmenrodri@ree.es)

