



Rijksdienst voor Ondernemend  
Nederland

# The New Energy Reality

## Connected, Integrated, Resilient

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# The perspective

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## ***Connected, Integrated, Resilient***

- Connection and integration *benefits* the economy and the energy system *on any scale* - from the individual household to the world as a whole.
- On each scale integration can *accelerate the transition* to sustainability, and it can also *improve* the stability and *resilience* of the energy system.
- A resilient energy system is a prerequisite for a *resilient society*.





# New Energy Reality – on any scale

## Households

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### *Nodes in the network*

- Households evolve from consumers to ‘nodes in a network’.
- Nodes in the power network, nodes in the heat networks of tomorrow, and perhaps even in hydrogen networks.
- Possibilities to produce, to store, to use and perhaps even trade energy.
- Pervasive electrification ‘unifies’ the energy demand for mobility, comfort, security, work, entertainment and more.
- Both thermal storage and power storage allow economic optimization and increase system stability.





# New Energy Reality – on any scale

## City quarters

### ***New connections***

- Integration of functions, such as living, moving, sharing, enjoying.
- Possibilities to make collective choices for infrastructure, be it a heat network or a smart power grid.
- Additional possibilities of energy production on public buildings.
- Local energy storage to stabilize the local power system and maximize use of locally produced power.
- Strengthen the connectivity between people, with joint responsibilities and joint decisions.
- *Alignment of interests is challenging!*





# New Energy Reality – on any scale

## Cities

### *Beyond energy*

- Integration means addressing ‘in one go’ the energy future, the quality of housing, the social structure, and the resilience of city quarters
- Each of these domains has specific budgets; the positive pay-back of energy investments may become an economic backbone of broader city renewal
- Cities can also pursue energy investments as employment and economic opportunity.
- Specific attention for the integration of energy developments and mobility developments
- Cities have to reflect on their position w.r.t. the surrounding region, and the local industries – either within city borders or in the vicinity.





# New Energy Reality – on any scale

## Industries

### *Integration is circularity*

- Internal optimization are insufficient for the transition to zero ecological impact.
- Zero means – a.o. - circularity, fully integrated process where every waste (thermal or material) is a resource. *Circularity means that industries are always part of an integrated and connected 'network'.*
- Excess heat may feed fellow industries or nearby cities, hydrogen may blur the distinction between 'renewable resource' and 'renewable energy supply'



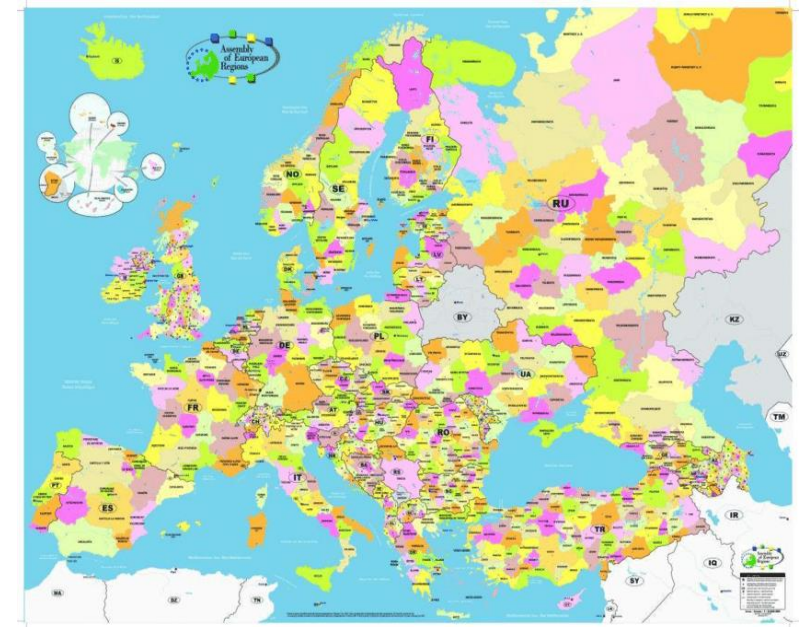


# New Energy Reality – on any scale

## Regions

### *The scale to optimize*

- Regions offer connection and integration possibilities *beyond* that of cities and industries may not have.
- Regions as a whole are ‘nodes’ in connected and integrated networks.
- Regions offer opportunities for producing thermal energy (e.g. through aqua- or geothermal sources), electrical energy and green gas, *beyond* that of cities and industries.
- Regions begin to offer the right scale for major infrastructure choices (heat, gas, DC power, etc), and infrastructure is an integrator by nature.
- On a regional scale excesses and shortages for energy – in whatever form – can be balanced (to a degree).





# Countries

## *Shaping the backbone*

- Infrastructure decisions – notably for ‘backbones’ – require (at least) the national scale.
- Total system stability and resilience requires national decisions, particularly with the growing fraction of volatile energy resources.
- Hydrogen can be the ‘glue’ in a large scale integrated system, and indeed decisions on a hydrogen infrastructure will quickly have national repercussions.







# Continents

## ***Cross border stability***

- Integration on too small a scale can be costly, and it makes sense to look for international integration and balancing
- *Example: the power storage capacity of Norway (hydro) that is coupled with the more volatile wind power from Denmark, and the dispatchable bio-energy from Sweden and Finland. Optimization in each of the countries alone would be far more expensive.*
- Cross border integration is more economic and more robust than national integration.





# New Energy Reality – on any scale

## Global

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### *The best of all worlds*

- Renewable energy is far more dispersed than the classical resources such as gas, coal and power. This means that resilience can be achieved on a more regional and local scale than in the conventional system.
- Yet it seems logical to benefit from the vast ‘renewable energy endowments’ some countries have. Solar power from deserts can be converted into hydrogen and shipped to less sunny countries.
- International integration and optimization makes economic sense
- For many countries it seems impossible that they can transition to sustainability with domestic resources only.





## *Guiding policy implementation*

- Integration and connection is beneficial on any scale, for resilience and sustainability.
- It can be used as a ‘guiding principle’ for us, agencies that implement energy policies in our respective countries.
- Integration per country on every scale – and perhaps together for Europe.





Thank you

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*See you in the future*  
*Connected, sustainable, resilient*

Bert Stuij

