

# Horizon 2020 and FP9 Looking beyond the Horizon

Experiences & expectations of Siemens

JBCE – Seminar | Nov 13<sup>th</sup>, 2017  
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[siemens.com/innovation](http://siemens.com/innovation)

## Our innovative power in figures – Siemens as a whole and Corporate Technology

### Expenditures for research and development



Expenditures for R&D in fiscal 2016



**33,000**

R&D employees<sup>1</sup>

### Inventions and patents – securing our future



**7,500**

inventions<sup>1</sup>



**3,500**

patent applications



**8**

CKI universities<sup>2</sup>



**17**

principal partner universities

1 In fiscal 2016

2 Centers of Knowledge Interchange

### Corporate Technology – our competence center for innovation and business excellence<sup>3</sup>



**7,400**

employees worldwide



**4,800**

software developers



**1,600**

researchers



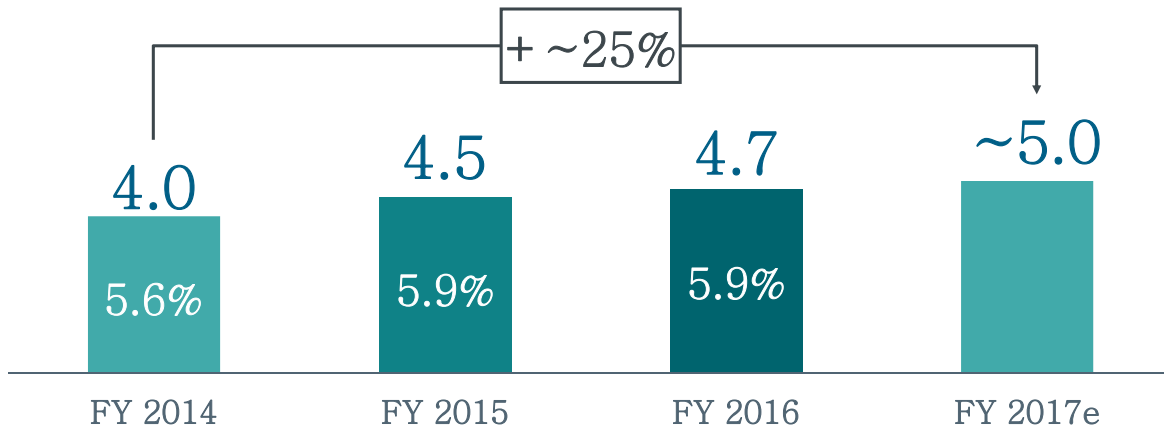
**400**

patent experts

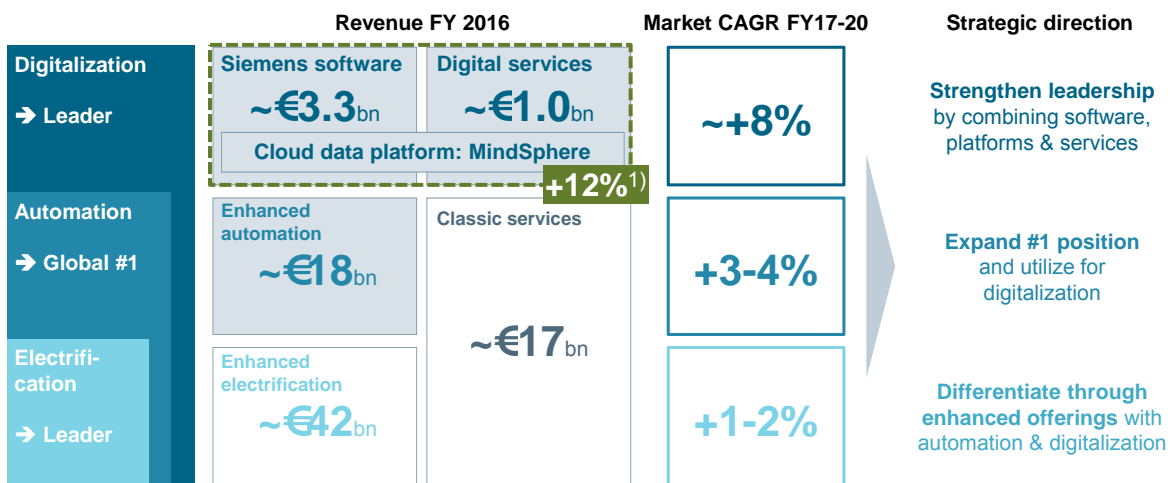
3 Employee figures: Status Sept. 30, 2016

We're increasing R&D spending

Research and development spending in billions of € and in % of revenue



Vision 2020 – Our focus is E-A-D – and there is strong growth in “D”



Note: Figures based on Industrial Business 1) Growth FY15 to FY16, rebased

## Siemens' interests in Horizon 2020

Pillar I: Excellent science

- Siemens' interest mainly in FET, and (few) Marie Skłodowska-Curie Actions (MSCA)

### Pillar II: Industrial Leadership

- Main interests in "Leadership in Enabling and Industrial Technologies" (LEIT) because it helps Siemens to strengthen its more basic technological competencies and helps to build up new ones where necessary, e.g. ICT, Robotics, Factories of the Future (Advanced Manufacturing), Big Data Value, Embedded Systems (ECSEL),...

### Pillar III: Societal challenges

- Well aligned with Siemens' original "Megatrends" (Climate Change, Demographic Change, Urbanization and Digitalization), here R&D is coupled to innovation (from idea to market) with help of pilots, large-scale demonstration projects and uptake → **clear improvement compared to FP7!**

→ Proven Track of this 3-pillar setup (reflects the innovation pipeline from low to high TRLs)

→ **Further use of a balanced 3-pillar setup for FP9 strongly recommended!!**

## Publicly funded R&D cooperations with Siemens & Japanese companies

### Horizon 2020

#### **VirtuWind** (<http://www.virtuwind.eu/index.html>)

Virtual and programmable industrial network prototype deployed in operational Wind park. With anticipated exponential growth of **connected devices**, future networks require an **open solutions architecture** facilitated by standards and a strong ecosystem

**Partner: NEC Europe Ltd. (UK)**

#### **InRel-NPower** (<http://www.inrel-npower.eu/>)

Innovative Reliable Nitride based Power Devices and Applications. The main objective of this proposal is to develop reliable GaN-based power devices and systems for high and medium **power electronics** targeting industrial and automotive applications and bringing the GaN power devices another step towards the wide usability in the energy saving.

**Partner: MIE University & Kyushu University**

### BMBF Project

#### **GanMobil** (<http://www.elektronikforschung.de/projekte/ganmobil>)

Galliumnitride based Power electronics module for efficient electro-mobility

**Partner: Fujitsu Electronics Europe GmbH (D)**

## Feedback from passed Horizon 2020 Call Waves

### What we liked:

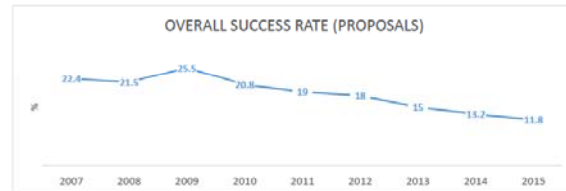
- H2020 = world's largest public funding R&D Framework Program, with a clear 3-pillar structure along the innovation pipeline
- New H2020 Internet Portal (submission, LEAR,...) worked very well already from the start
- **Major incentives** to participate are:

Building up **know-how**, acquiring **new ideas**, achieving **synergies and critical mass**, pre-competitive **cross-border cooperation and networking** with (potential) customers and suppliers, and **acquiring skilled people and talents** internationally...  
 Funding is a relatively small (but stimulating) incentive for the many used resources (e.g. many proposal preparations that lead to rejections)... but is not the main motivation to participate

### Observations & improvement potentials:



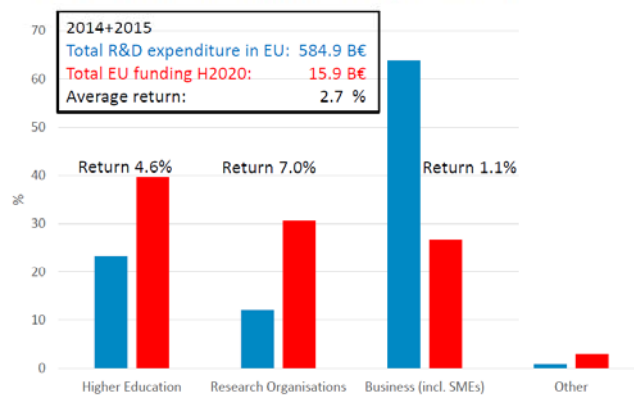
[Source: DG RTD Annual Monitoring Reports]



[Source: DG RTD Annual Monitoring Reports]

## Industry participation in Horizon 2020 has to be strengthened

### Business R&D is still underrepresented in H2020



2014+2015  
 Total R&D expenditure in EU: 584.9 B€  
 Total EU funding H2020: 15.9 B€  
 Average return: 2.7 %

*In 2016 Siemens invested ca. €4.7 Bn in R&D. In fiscal year 2017 we increased our R&D investments to > €5 billion with a **clear focus on digitalization**.  
 Consortium member in > 180 H2020 proposals. Currently > 80 projects running.*

## How to maximize impact of FP9? Definition of Impact

**Definition of impact** as provided by the European Commission :

“The term impact describes **all the changes which are expected to happen due to the implementation and application of a given policy option/intervention**. Such impacts **may occur over different timescales, affect different actors and be relevant at different scales** (local, regional, national and EU). In an evaluation context, impact refers to the changes associated with a particular intervention which occur over the longer term.”

**There are multiple ways in which research achieves impact and creates value**

E.g.

1. **Increasing the stock of useful knowledge** (e.g. Publications, Patents)
2. **Training skilled people** (Developing human capital)
3. **Creating new scientific instrumentation and methodologies and collaborating with users** in the use of such facilities or processes – e.g. CERN, or the use of MRI what originates from use first in analytical chemistry
4. **Collaborating in research projects and networks with users** (Co-Production of knowledge, interdisciplinary approaches)

*Remark: Impact cannot always be measured quantitatively, sometimes impact can only be described qualitatively (eg. for EIT KICs it can look at the ability to create networks)*

## 8 points on impact (Summary)

**How to Maximize Impact – our 8 Points / recommendations:**

1. **Mission driven approach** is supported (continuation of SC pillars under Horizon 2020 – ensure **interdisciplinary approach / Technology neutrality** – non prescriptive (how to achieve the mission) – see also Lamy Report)
2. Further **increase industry participation** in cooperation R&D projects (2/3 R&D exp in EU, only ca. 26% funding goes to Industry)
3. **Further measures to increase the success rates, to reduce administrative burdens** to get more industry on board.  
**Introduce higher flexibility in the calls.**
4. **Use existing good practices** in PPPs or JTIs to measure or evaluate impact (“Hard” or “Soft” KPIs)
5. Need for **systemic innovation to transform whole systems through an interdisciplinary approach** – new KETs as building blocks required (we call these CCTs – eg. Cybersecurity as one of them)
6. **Right framework conditions for innovation are needed: a more risk-taking culture, skilled labor force and an innovation-friendly regulatory environment.** Consistent application of the “**Innovation Principle**”
7. **For mission driven R&D, often regulatory/policy initiatives will be needed to stimulate the intro of new technologies or the phasing out of older ones**, e.g. more polluting technologies, when addressing Climate Change (e.g. EPS of 550 g CO<sub>2</sub>/KWh).
8. Enhanced **coordination/synchronization of EU R&D&I work programs** (H2020/ FP9) and Structural & Cohesion funds (ESIF) & EFSI (Juncker Plan) **with national and regional efforts** (especially for mission driven R&D)

## HOW to maximize impact? → 8 Points

1. **Mission driven approach is supported** - because this would imply some kind of **continuation** of what was already started under Horizon 2020 (3-pillar structure, FET Flagships,...)

**Guiding principles from Lamy report:** easy to communicate, open to all actors, have a breakthrough or transformative potential, allow additionality of other funding sources

**From industry perspective** we like to add:

- Having a **clear EU added-value**
- Ensure an **interdisciplinary approach**
- **Technology neutral** on how to reach the mission's objective
- Create sufficient links for **all businesses to participate**.

## HOW to maximize impact?

2. Further **increase industry participation** in cooperation R&D projects.

Industry provides 64% of the R&D expenditure in Europe (only 14% comes from SME's).

But today only 26,5% H2020 funding goes to industry (50-50 between large & small) → large industry provides 50 % R&D expenditures, only receives 13% of the FP Funding.

This relatively "small" incentive doesn't even compensate for all proposal preparatory work, for 3-4/5 rejected proposals (at these low success rates!).

**Increasing the number of Evaluators from industry** is also strongly advised !

*Rationale:*

*If a research institute or a start-up develops a technology alone, **without a strong industrial partner**, it **often lacks the capital, experiences and an international sales network** that are necessary to rapidly deploy an innovative technology.*

*The FPs have exactly helped to develop an effective eco-system with effective synergies between research institutes, SMEs and large corporations. **This symbiosis needs to further develop in the next FP9.***

## HOW to maximize impact?

3. **Introduce further measures to increase the success rates and to reduce administrative burdens** to get more industry on board. (We repeat this at each occasion).

**Simplify cost claiming and align with industry accounting practices.**

**Introduce higher flexibility in the calls** so that FP9 responds in a more dynamic way to actual needs of actors in innovation (both in terms of timeline and topics). E.g. in the ICT area speed is essential for success.

*Remark: funding cycles need to be in line with industry R&D (typically ROI expected <2yrs) and innovation related to digitalization is even faster (2-week review gateways)*

## HOW to maximize impact?

4. **Focus on impact highly welcomed by industry!**

**Use existing good practices** in public-private-partnerships (PPPs or JTIs) – Siemens is active in several of them - as benchmark.

Projects under PPPs and JTIs foster cooperation between different public and private actors and have ambitious research and innovation agendas.

E.g. the use of key performance indicators (KPIs) like in each Joint Technology Initiative (JTI) can help to estimate or describe its impact: they have specific measurable objectives and KPIs allowing monitoring and evaluation (Nr of Publications, Patents, Financial Share of Private, ...etc).

*Remark:*

**Measuring impact is very difficult** and should also **include a "soft factor"** "such as e.g. "degree of perceived satisfaction among R&D&I stakeholders": if key players feel well supported by the relevant structures and funding mechanisms/bodies, this also leads to more activity and thus more "impact"

## HOW to maximize impact?

5. There is need for **systemic innovation to transform whole systems through an interdisciplinary approach**. e.g. interdisciplinary cooperation **between engineering, ICT and economy** is required for addressing challenges related to smart grid or smart city projects, where of course also Cybersecurity aspects have to be integrated from the very beginning

### Need for new KETs !

**KETs (key enabling technologies )** are important and required **technology building stones** (in Pillar 2).

At Siemens we have defined **14 so-called Company-Core Technologies (CCTs)** reflecting our company's main technology areas that our R&D activities are focused on. For these CCTs we try to find a good match with public R&D programs and participate in those programs where synergies and critical mass with the project partners can be achieved.

Examples:

4 of these CCTs are **directly related to the fight against climate change**: **Distributed Energy Systems, Energy Storage, Power Electronics and Materials**, but **also** other technology areas play an important role like R&D in **Additive Manufacturing, Data Analytics (including Deep Learning and AI), and not to forget Cybersecurity**.

This clearly illustrates that **an interdisciplinary approach is highly necessary** as all these technology areas (+ several others) are required to achieve the targeted system transformation.

## HOW to maximize impact?

6. Europe needs the **right framework conditions for innovation**, starting from a **more risk-taking culture, to skilled labor force and an innovation-friendly regulatory environment**.

It would be of great value, if the **"Innovation Principle" is consistently applied** throughout the policymaking process.

*The Innovation Principle states: "Whenever legislation is under consideration, the impact on innovation should be taken into full account in the policy and legislative process."*

7. **For Mission driven R&D, often regulatory/policy initiatives will be needed to stimulate the intro of new technologies or the phasing out of older ones**, e.g. more polluting technologies, e.g. when addressing Climate Change.

*Example: Decarbonization of the current power generation mix.*

*Today coal represents 24% of our power mix but 80% of its emissions. An important contribution to decarbonization can also come from generating molecules for the chemical industry via electrolysis.*

*In our efforts for making power clean, a **mandatory Emission Performance Standard of 550 g CO<sub>2</sub>/kWh for power plants** (as upper threshold) would in our view be very helpful.*



## HOW to maximize impact?

8. An **enhanced coordination/synchronization of the European R&D&I work programs** (like H2020 and FP9 but also the Structural & Cohesion funds (ESIF) & EFSI (Juncker Plan) ) with national and regional efforts, especially for the mission driven actions addressing societal challenges, is strongly recommended.

*Remarks:*

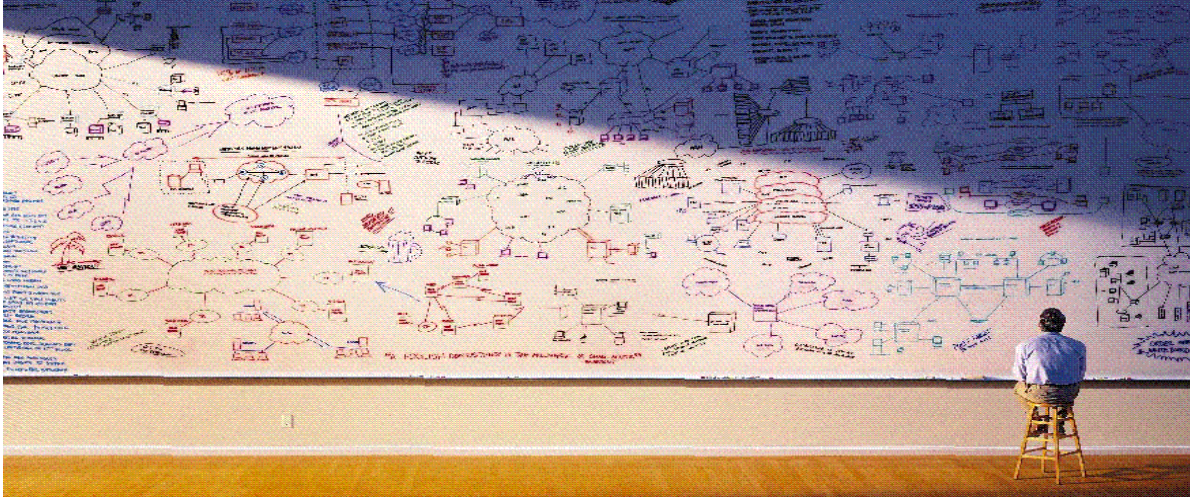
- *This desire for synergy is already there since at least one decade – in practice it turned out that the feasibility was very difficult.*
- *The proposal in the Lamy report for the EU R&I program to set the agenda for R&I investments within the structural funds makes sense.*
- *It also correctly stresses the need to make EU State-Aid rules more innovation-friendly. The proposal to extend exemptions to innovation-oriented projects of cross-border nature should be developed further.*

## General recommendations for FP9

- **Increased budget** for FP9 compared to Horizon 2020, in order to strengthen the EU in the global knowledge economy
- Continue with a **well-balanced 3-pillar structure**, including EIC & LEIT in the central pillar
- **Retain financial incentives (grants) for large firms** to join FP9 (question addressed to the FP9 HLG!)
  - To continue the proven innovation ecosystem and collaborative R&D environment of large firms, SMEs, universities and research institutes built up in 30+ years of successive FPs
  - To keep Europe attractive as location for research and innovation
    - Large firms account for half of EU R&D, but receive no more than 13% of H2020 funding – “small” incentive compensates for all proposal preparatory work, for 3-4/5 rejected proposals
  - To ensure impact on economy and society
- **Continue (and expand where appropriate) successful contractual PPPs and JTIs** with their industry driven strategic R&D agenda
- **Continue addressing societal challenges**; a mission-oriented approach could be considered

→ **No “revolution” but evolution !**

## Questions?



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THANK YOU !

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