THE PRINCIPLES OF SCIENCE AND RESEARCH FUNDING, TYPES OF FINANCIAL SOURCES

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Financing - one of the essential issues in the operation of each research organization.

All types of financing research organizations are based on its scientific performance, none of the funds are allocated using flat rate.

Therefore, the ability of the organization to raise funds for its activities belongs to the basic abilities that the organization must have to secure its existence.

International comparison of public expenditures on research and development (figures of 2018):

South Korea: 4,553% of Gross Domestic Product (GDP)
Israel : 4,545% of GDP
Sweden: 3,397% of GDP
Switzerland: 3,373% od GDP
France: 2,185% of GDP
EU28 – average: 1,974% of GDP
Czech Republic: 1,791% of GDP
Italy: 1,352% of GDP
Russia: 1,106% of GDP
Slovakia: 0,883% of GDP
Chile: 0,355% of GDP

Expenditures on research and development in the Czech Republic from the state budget in the last 5 years (excluding the EU funds)

2014: 26,635 billion CZK

2015: 26,905 billion CZK

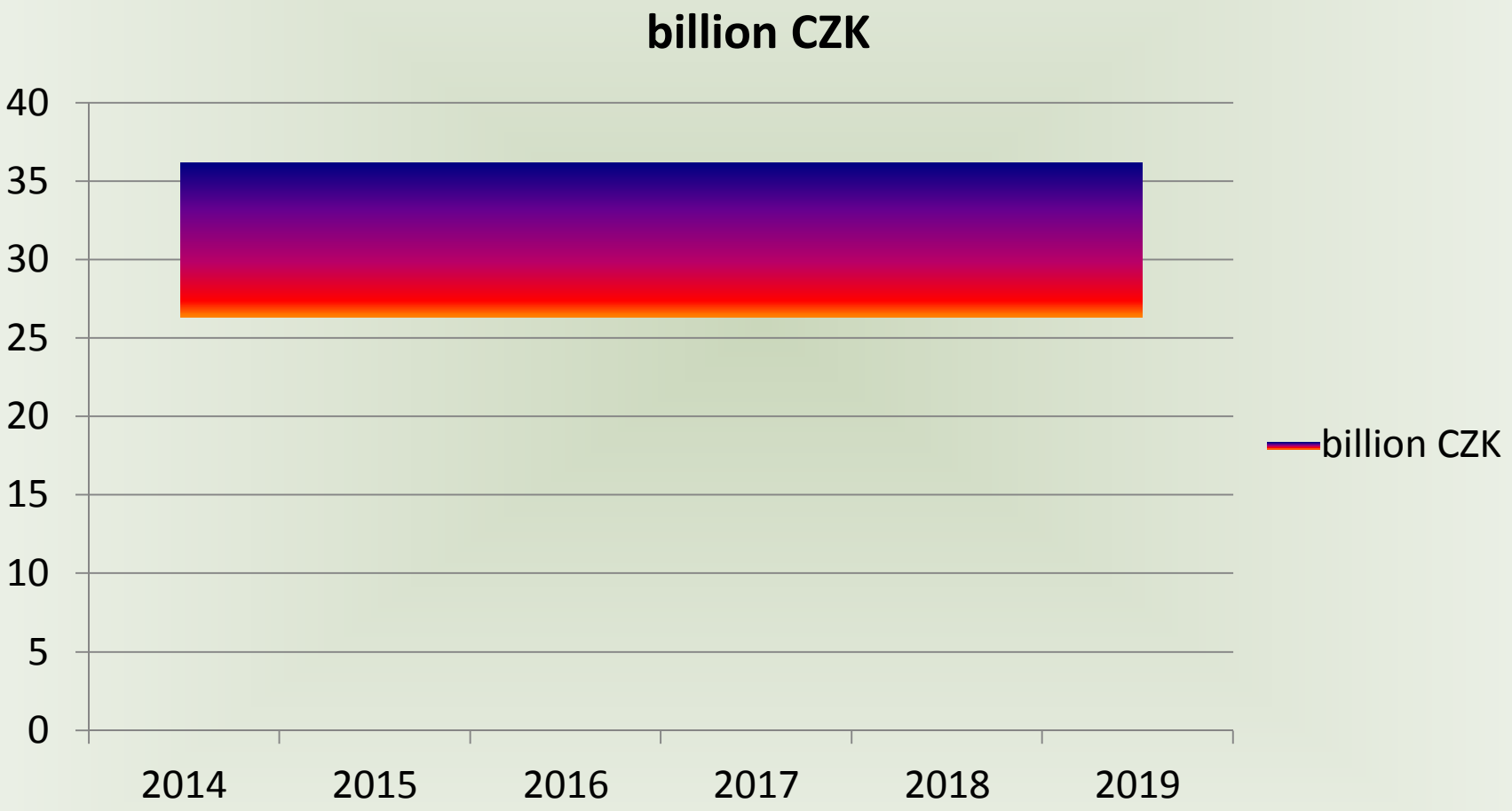
2016: 29,092 billion CZK

2017: 32,661 billion CZK

2018: 34,797 billion CZK

2019: 35,965 billion CZK

Public expenditures on research and development in the Czech Republic from 2014 to 2019



BASIC DEFINITIONS AND TERMS

Research types:

Basic research – theoretical and experimental work, aimed particularly at achieving **new** knowledge about the basic characteristics of observable natural principles; this type of research is not primarily performed for the needs of practical utilization

Applied research - theoretical and experimental work, aimed at achieving **new** knowledge and skills, that would be usable for the development of new or significantly upgraded products, processes or services; this type of research is primarily performed for the needs of practical utilization

Experimental development - acquiring, combining and using of **existing** scientific, technological, business and other knowledge and skills for the purpose of producing plans, arrangements or designs for new, altered or improved products, processes or services

Innovation – introducing new or significantly upgraded products, processes or services into practical use

„Research turns money to knowledge, innovations turn knowledge to money.“

Research organization - a legal person, either a public organization or a government organization, that occupies itself with science, research and development and fulfils 3 basic requirements:

1. its main aim is to perform basic research, applied research or development and it disseminates its results through education, publications or technology transfer,
2. it invests all the profit back to activities listed in point 1,
3. its scientific and research capacities are not influenced by or preferentially available to any private business subjects (everyone has to have equal access to all its results financed from public budgets).

e.g. universities, public research organizations, institutes of the Academy of Sciences etc.

Basic types of public support of research and development (R&D) at research organizations in the Czech Republic

The public support of R&D in the Czech Republic is provided basically by **two means**:

1. ***Competitive grant funding*** *– provided on the basis of public competition*
2. ***Institutional funds*** *– provided on the basis of evaluation of scientific results*

(Note: public support = funding provided from public budgets)

The principles of competitive grant funding of R&D

Grant funding is provided to recipients on the principle of PUBLIC COMPETITION OF PROJECTS.

Basic terms related to providing competitive grant funding to R&D

Provider – government department or public foundation that:

1. provides funds from the financial sources under its administration,
2. manages the process of the public competition,
3. selects the projects to be supported,
4. checks and audits the process of projects investigation.

Applicant – legal person, applying through a project proposal for the grant support from the provider.

Recipient – a successful applicant, whose project has been chosen to be supported and who has received funding from the provider.

Programme – a complex of conditions, stated for the scientific and research activities to be performed to reach the defined objectives of basic or applied research, development and innovations; a programme includes individual calls

Call – a specified assignment within a programme, stating particular practical, time and financial conditions for placing project proposals (eligible applicants, description of supported and excluded activities, time span of project investigation, minimum or maximum total cost per project, budget limits, …)

Project – generally, a project means temporary effort focused on generating a planned product; anyway, in the context of research organizations, it has a specific meaning - usually a project means a structured piece of scientific work plan, used by an applicant as a proposal in a public competition for grant funding

Grant – a purpose-built funding for publicly beneficial purposes, the funding is obtained on the basis of a successful project proposal in a public competition

The project investigation process

1. **Preparation of the project proposal** – a complex document that introduces the project in all its aspects; the crucial document evaluated in the public competition. The proposal must convince the evaluators that the project is worth of being financed.

Preparation of the project proposal includes the following steps:

- precise **description of the scientific part** - the most important point (includes: definition of the research aims, definition of the expected project outcomes, description of planned processes and methods to be used in the project, explanation of the importance of the project investigation, its practical goals etc.)

- **Calculation of the project budget** – precise definition and justification of all the project costs. The main budget chapters are:

Purchase of equipment

Purchase of material

Services

Personnel costs (wages and related costs)

Travel expenses

Energy (electricity, water etc.)

Overheads (participation in financing the central departments of the organization (e.g. accountants, HR department, maintenance and cleaning etc.) – departments that serve to the whole organization, but do not have their own incomes, therefore, their financing has to be shared by all the financially active units)

The provider might set various budget limitations, e.g. of personnel costs (cannot exceed 50% of the project budget), outsourced services etc.

The purpose of all budget chapters must be well explained and the amounts must be well calculated and justified.

Often, research organizations co-operate on investigation of projects (they are partners, co-investigators). In this case, the financial share of each co-investigator has to be precisely defined in the budget.

- **Definition of the project team:**

How many members will the team have?

What will be each member´s role?

What will be each member´s work load?

Who will be the key researchers, who will be the principle investigator (PI)?

⇒ each team member´s participation must be well specified and justified (the larger team - the higher cost)

- **The time-line of the project:**

When exactly will the project start?

When will it finish?

How long will each project activity last?

How will the project activities follow each other?

When will the partial goals of the project be reached?

The requirements as for the content and form of the project proposal can differ with individual grant providers and programmes – it is highly advisable to study the respective provider´s and programme requirements before starting with preparation of a project proposal.

The **formal correctness** of the project proposal is very important and must not be underestimated! It is the first aspect to be checked and the proposal can be excluded from further evaluation if it is formally incorrect!

Finally, the project proposal is sent to the provider.

2. Evaluation of the project proposals

– is conducted by the expert body of the respective grant provider. The evaluators examine each aspect of the received project proposals and they range the projects into an order according to the results of their evaluation.

The best evaluated projects are awarded the grants – support is provided to projects from the top of the rank up to expending the total volume of financial sources disposable in the respective call.

3. Implementation of the project

The project must be implemented in strict accordance with the project proposal. No changes can be made without previous agreement of the provider!

During the project implementation, the provider monitors the process, mostly in the form of regular reports, elaborated by the project investigator (e.g. once a year).

After the project finishes, the final report has to be elaborated and also the financial part is settled.

During the project investigation (and also after its finish), the provider can carry out inspections and audits of the project implementation.

Project management at research organizations

For research organizations, it is advantageous to have a specialized department for project and grant management, that can:

- help with identification of suitable grant opportunities,
- co-operate on preparation of project proposals,
- assist with projects administration,
- assist with monitoring and auditing of the projects investigation,
- etc.

At PU: Project Service

At FS PU: Department of Project Support

The most important grant providers within grant funding in the Czech Republic

CZECH SCIENCE FOUNDATION (CSF; Grantová agentura České republiky - GAČR)

- The CSF was established in 1993 by the Czech government as **an independent research funding organization** with two main goals:

- to fund **basic research** on the competition basis,
- to promote international co-operation in basic research.

The CSF distributes financial assets from the national budget chapter no. 321, that is under its administration.

- **The CSF provides grants (on the basis of public competition) to the best projects of basic research from all the scientific branches. It guarantees the whole process of the projects administration:**
- It evaluates the project proposals and selects the project to be financed.
- On the annual basis, the CSF monitors the process of investigation of the funded projects and it checks, how the declared project goals are fulfilled.
- The CSF evaluates the overall results of the funded projects after their termination.
- The CSF audits the correctness of the funded projects investigation in all its phases (during the investigation and also after its termination) – it has the inspectional and auditing role.

The CSF provides grant funding mainly to scientific projects within the following types:

- **Standard grant projects** (2 – 3 years, topic chosen by the applicant),
- **Junior Star** (for researchers within 8 years after obtaining Ph.D.),
- **Bilateral grant projects** (international projects),
- **Support of ERC Grants Applicants** (3 – 6 months, only for principal investigators of running / completed CSF projects, to increase the success rate in obtaining funds from the European structures),
- **EXPRO projects** (for support of excellent research).

Annually, the CSF obtains ca. 3000 project proposals.

The ratio of successful project proposals is about 25%.

Discipline Committees and Panels – the evaluation bodies of the CSF

Discipline Committees are permanent professional advisory bodies, which assist the CSF Presidium during the evaluation process. Panels are expert bodies for Discipline Committees.

Discipline Committees and Panels together undertake the work of evaluating the grant proposals received each year, as well as evaluating the results of ongoing or finished grant projects.

Discipline Committees are set up for five general scientific areas:

1. **Technical Sciences** (e.g. mechanical engineering, metallurgy, materials science etc.)
2. **Physical Sciences** (e.g. mathematics, informatics, physics, chemistry etc.)
3. **Medical and Biological Sciences** (e.g. genetics, pharmacology etc.)
4. **Social Sciences and Humanities** (e.g. philosophy, economy, law, politology, music sciences, history, arts etc.)
5. **Agricultural and Biological-Environmental Sciences** (e.g. phytosanitation, veterinary pharmacy, food-processing etc.)

Technology Agency of the Czech Republic (TA CR; Technologická agentura České republiky)

The Technology Agency of the Czech Republic is an organizational unit of the state that was founded in 2009.

The aim of its establishment was to simplify the **state support of applied research and experimental development** which was before fragmented and implemented by many bodies.

Activities assigned to TA CR are:

- preparation and implementation of its own programmes of applied research, experimental development and innovations,
- evaluation and selection of project proposals,
- administration of financial support to applied research from the national budget,
- monitoring of fulfilment of project contracts,
- evaluation of fulfilment of the programmes objectives and monitoring of their results,
- counselling (legal, financial and in the field of intellectual property) for programmes and projects of applied research, experimental development and innovations,
- support of communication between research organizations and the private sector,
- cooperation with similar foreign institutions.

TA CR funds projects through following programmes:

<u>Currently open calls:</u>

- **TREND programme** – the main objective of the Program is to increase the international competitiveness of enterprises, especially by expanding their markets abroad, penetrating new markets or moving up the global value chains (call open until 2 April, 2020)

- **M-ERA.NET programme** – the aim is to support international cooperation in material research and innovations, which will enable Czech researchers to share knowledge across Europe, gain experience and international contacts, which can then be used for further cooperation or preparation of joint projects for other programmes (call open until 16 June, 2020)

- **AquaticPollutants Call 2020** – research and innovation projects on risks posed to human health and the environment by pollutants and pathogens present in the water resources (call open until 18 May, 2020)

Calls within the following TA CR programmes currently under preparation:

DELTA 2 programme - aimed at supporting international collaboration in applied research and experimental development

DOPRAVA 2020+ - support to modernizing the transport sector with regard to sustainability, security and societal needs

NATIONAL COMPETENCE CENTRES – aimed at supporting the building of a stable and long-term basis for applied research

Existing programmes where calls are not currently open:

- **GAMA 2 programme -** focused on promoting new systems of transfer knowledge from research organizations to the application sphere
- **ZÉTA programme -** focused on supporting cooperation between academia and companies

- **THÉTA programme -** the aim is to contribute in the medium and long term to fulfilling the vision of transformation and modernization of the energy sector
- **BETA 2 programme –** a programme dealing with the practical research needs of the government authorities (e.g. The Czech Mining Authority, Ministry of Transport, Ministry of the Environment or The State Office for Nuclear Safety).

- **KAPPA programme** - support of knowledge and research through international cooperation between institutes from the Czech Republic, Norway, Liechtenstein and Iceland
- **EPSILON programme** - focused on improving the position of Czech, as well as European industry in the global context

- **ENVIRONMENT FOR LIFE** – support of healthy and high-quality environment and sustainable use of natural resources
- **EURO-NANO-MED** – research in the field of nanomedicine
- **ERA-MIN 2** – support to projects in the field of non-energetic non-agricultural raw materials

- **TA CR - ÉTA PROGRAMME** - promoting the innovative potential of social sciences, humanities and arts
- **TA CR – GENDER-NET Plus** – support to gender in research and innovation content
- **CHIST-ERA -** research on Long-term Information and Communication Technologies (ICT) and ICT-based scientific challenges

Research programmes of individual ministries

- Ministry of Culture
- Ministry of Defence
- Ministry of Industry and Trade
- Ministry of Interior
- Ministry of Health
- Ministry of Agriculture
- Ministry of Education, Youth and Sports

The most important body of the state administration in the field of science and research ⇒

Ministry of Education, Youth and Sports

⇒ it deals with secondary and tertiary education, it co-creates the policy of science, research and development

⇒ it deals with international cooperation activities within research and development

⇒ it is the most significant distributor of funding for research and development (ca. 50%)

Ministry of Education, Youth and Sports currently operates

The National Programme of Sustainability (2014 – 2020)

- funds for development and sustainability of new centres of excellence and regional research centres that were realized in 2007 – 2015 from the funds of the EU Operational Programme Research and Development for Innovations (at Palacký University e.g. Centre of the Region Haná for Biotechnological and Agricultural Research; Regional Centre of Advanced Technologies and Materials; Biomedreg)

Support of Czech research and development from the European Union structural funds

- The structural funds are the instrument for **implementation of the policy of economic and social solidarity** within the European Union.
- The aim of the policy is **to minimize the gaps in levels of development** among the EU regions and individual member states.
- Czech Republic is a recipient of massive support from these funds (typically, e.g. projects of transport infrastructure)

Programmes supporting the Czech research and development from the EU structural funds

- **Operational Programme Enterprise and Innovations for Competitiveness (2014 – 2020)** – the aim is to reach competitive and sustainable economy, which is based on knowledge and innovations, the focus is mainly on the ability of local enterprises to become successful on global market and create significant number of work positions, both with respect to environmental issues. This OP is meant mainly for enterprises. The OP is operated by the Ministry of Industry and Trade.

Operational Programme Research, Development and Education (2014 – 2020):

The aim is to contribute to economy based and educated, motivated and creative workforce, on production of quality research results and their use for increasing competitiveness. The OP is operated by the Ministry of Education, Youth and Sports.

Priorities of the OP:

1. Strenghtening capacities for quality research
2. Development of higher education and human resources for research and development
3. Equal access to quality pre-school, primary and secondary education

OP RDE at Faculty of Science

Several successful projects in implementation – e.g.:

Advanced Hybrid Nanostructures for Renewable Energy Applications

Nanotechnologies for Future

(Regional Centre of Advanced Technologies and Materials)

Plants as a Tool for Sustainable Global Development

(Centre of the Region Haná for Biotechnological and Agricultural Research)

Development of Pre-Applied Research in Nanotechnogy and Biotechnology

(joint project of both centres together)

The disadvantage of the EU structural funds is high complexity of the grants administration and very strict conditions for the finance management.

Therefore, it is strongly recommended to have a specialized team for administration of these projects, as absolutely precise knowledge of all the administrative rules (ranging from administration of procurements to accounting requirements) is necessary.

The international co-operative activities of the Czech Republic in the field of research and development

Basically, there are two main types of international co-operative activities:

- **joint projects in research and development** – performed in the form of bilateral co-operation between a Czech and a foreign research organization (based on bilateral governmental agreements on co-operation between the countries, e.g. the Inter-Excellence programme)

- **participation in international multilateral projects** – performed in the form of participation in the EU framework programmes within research and development, e.g. Horizon 2020, Horizon Europe; the framework projects are rather large complicated structures with participation of many research organizations, each of which is responsible for investigation of a precisely defined part of the research activities and expends a precisely defined part of the total project budget

Horizon 2020

- the EU framework programme for research and innovation support,
- €77 billion of funding available over 7 years (2014 to 2020),
- focused on securing Europe's global competitiveness, removing barriers to innovation and making it easier for the public and private sectors to co-operate in delivering innovation,
- the motto is taking great ideas from the lab to the market.

Main priorities of Horizon 2020:

- Excellent science
- Leading position of European industry
- Social challenges

Horizon Europe

- Currently prepared research and innovation framework programme,
- for the period 2021 – 2027,
- funding of € 100 billion.

3 pillars of the programme:

1. Excellent Science
2. Global Challenges and European Industrial Competitiveness
3. Innovative Europe

5 mission areas have been identified to increase the effectiveness of funding by pursuing clearly defined targets:

1. Adaptation to climate change including societal transformation
2. Cancer
3. Climate-neutral and smart cities
4. Healthy oceans, seas, coastal and inland waters
5. Soil health and food

There are also several private foundations for funding projects from various fields, e.g.:

Tomáš Baťa Foundation

Foundation of Karel Janeček

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PRINCIPLES OF INSTITUTIONAL FUNDING OF SCIENCE, RESEARCH AND DEVELOPMENT

Institutional support is aimed mainly at providing funds to research organizations for the purpose of their long-term conceptual development (not as support to individual specified projects).

The factual financial volumes granted to individual research organizations are calculated and **allocated on the basis of evaluation of their scientific results – not on the basis of public competition.**

Evaluation of research and development results

- **is crucial for the distribution of institutional funds**.
- The process of evaluation is conducted by the **Research, Development and Innovation Council** (RDIC), which is an advisory body to the government of the Czech Republic.
- Evaluation of research results is based on **pre-defined categories of accepted results**.

Results reached in research, development and innovations

1. **Within basic research:** new knowledge about the basic characteristics of observable natural principles, the results are published mainly in the form of scientific papers (articles, books etc.);
2. **Within applied research:** new knowledge and skills, usable for the development of new or significantly upgraded products, processes or services; this kind of knowledge or skills is represented by results, copyrighted as intellectual property (e.g. patents, methodologies, new breeds etc.);
3. **Within development:** plans, arrangements or designs of new, altered or significantly improved products, processes or services (industrial models etc.);
4. **Within innovations:** new, altered or significantly improved products, processes or services, applied in practical use (functional samples, treatment procedures etc.).

The categories of research results:

- article in a specialist periodical (the most frequent type of result)
- specialist book
- chapter in a specialist book
- article in proceedings
- patent
- utility model or industrial model
- trial operation, verified technology, breed, variety
- prototype, functional sample
- results reflected in legislation and norms
- treatment procedure
- certified methodology
- software
- specialized map with scientific content
- others

- Until 2016, each of the result categories was awarded with corresponding **point rating (certain number of points)**.
- The total institutional funds for the respective year were allocated in the state budget and distributed among the research organizations in the proportion, copying the proportion of the total point scores, that have been reached by the individual organizations.

Evaluation methodology „M17+“ (since 2017)

Basic principles of the M17+ methodology:

- Division of research institutions into 3 segments:

a) higher education,

b) CAS institutes,

c) departmental research organizations.

- **Common frame for quality assessment represented by 5 basic evaluation modules:**

1. Quality of selected results
2. Research performance
3. Social relevance
4. Viability
5. Strategy and conception

- Periodicity of evaluation – 5 years cycles;
- 3 levels of evaluation;
- 3 basic instruments of evaluation;
- Specialized panels for research disciplines;
- …

Most research organizations are financed with a combination of institutional funding and competitive grant funding.

Co-operation with the business sector

Recently, research organizations have been encouraged and motivated to co-operate with commercial sector to bring the research issues closer to its practical needs, so that the research activities are not isolated from the practical life.

Performing **contractual research** is one of the ways of effective co-operation between research organizations and the business sector and it is also a financial source that has been becoming important for the financing of research organizations.

Contractual research – providing research services for clients from the business sector on the commercial basis (order – invoicing).

In the case of providing contractual research, **the issue of intellectual property has to be precisely treated**.

Co-operation with the commercial sector and commercialization of research results is encouraged also through specialized grant programmes (e.g. of Ministry of Industry and Trade etc.).

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