

Learning Outcomes – Run-of-River

Level	Run-of-River
Basic	<p>On successful completion of this module you will be able to:</p> <ul style="list-style-type: none"> • Understand the basic physical processes that result in the water cycle • Recognise that the movement of water associated with rivers is a renewable resource • Recognise that run of river resources are widely but not evenly distributed across Europe and that local geographical features and climate affect the resource level • Recall the different technology types used to extract energy from river systems • Identify the different project phases such as Design and Planning, Construction and Installation, Operation and Management, and Decommissioning • Understand the importance of taking into consideration of all these project phases when evaluating the impacts and feasibility of a particular development • Explain how energy extraction leads to a number of possible interactions (both negative and positive) with the surrounding environment • Understand that the surrounding environment includes physical processes, wildlife and habitats, conservation interests, communities and social features, as well as commerce and economic activities • Outline how negative impacts can be minimised • Name specific examples where run-of-river hydro energy is being extracted
Intermediate	<p>On successful completion of this module you will be able to:</p> <ul style="list-style-type: none"> • Describe a few key developments in the use of hydro energy • Describe the hydrological cycle • Identify which areas have high resources in terms of geographical features and climate • Explain why different areas favour the different run of river technologies • Describe the different technology types used to extract energy from river systems • Outline the important factors in each phase of the project • Outline the key types of environmental interactions associated with Run-of River developments • Explain how these may change through a project lifecycle, in different locations and at different times • Outline some of the factors which influence the overall cost of the project for the different technologies • Name examples where run-of-river hydro energy is being extracted

Basic – Equivalent to EQF (European Qualification Framework) Level1 and Bloom’s Taxonomy “Knowledge” category. This level requires the student to have basic general knowledge of the subject, be able to recall important information.

Intermediate – Equivalent to EQF level 2 and Bloom’s Taxonomy “Comprehension” category. This level requires the student to be able to explain basic factual knowledge.

Learning Outcomes – Tidal Impoundment

Level	Tidal Impoundment
Basic	<p>On successful completion of this module you will be able to:</p> <ul style="list-style-type: none"> • Understand the physical processes that result in tides and tidal flows • Recognise that the movement of water associated with tides is a renewable resource • Recognise that tidal energy resources are widely but not evenly distributed across Europe and that local topography affects tidal range • Recall the two broad technologies (tidal barrages and tidal lagoons) that could be used for tidal impoundment • Identify the operational regimes used for tidal impoundment plants such as ebb generation, flood generation and two-way generation • Identify the different project phases such as Design and Planning, Construction and Installation, Operation and Management, and Decommissioning • Understand that the surrounding environment includes physical processes, wildlife and habitats, conservation interests, communities and social features, as well as commerce and economic activities • Explain how energy extraction leads to a number of possible interactions (both negative and positive) with the surrounding environment • Understand that the surrounding environment includes physical processes, wildlife and habitats, conservation interests, communities and social features, as well as commerce and economic activities • Outline how these negative impacts can be minimised • Name specific examples where tidal energy is being extracted
Intermediate	<p>On successful completion of this module you will be able to:</p> <ul style="list-style-type: none"> • Describe the key development in the use of tidal energy • Describe in general terms the periodicity of tidal cycles • Outline the topological factors which affect tidal range • Describe the different operational regimes used for tidal impoundment plants (ebb generation, flood generation and two-way generation) • Outline the basic steps involved in energy conversion by a tidal energy converter • Outline the important factors of each phase of a project • Outline the key types of environmental interactions associated with aquatic renewable technologies • Explain how environmental interactions may change through a project lifecycle, in different locations and at different times • Outline some of the factors which influence the overall cost of the project for the different technologies • Describe specific examples where tidal energy is being extracted

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Intermediate – Equivalent to EQF level 2 and Bloom’s Taxonomy “Comprehension” category. This level requires the student to be able to explain basic factual knowledge.

Learning Outcomes – Tidal Stream

Level	Tidal Stream
Basic	<p>On successful completion of this module you will be able to:</p> <ul style="list-style-type: none"> • Understand the physical processes that cause tides and tidal flows • Understand that the movement of water associated with tides is a renewable resource • Recognise that tidal energy resources are widely but not evenly distributed across Europe and that local topography affects tidal currents • Identify several different technology types used to extract energy from tidal streams • Recall the main technology types • Recall the basic steps involved in energy conversion by a tidal energy converter • Identify the different project phases such as Design and Planning, Construction and Installation, Operation and Management, and Decommissioning • Understand the importance of taking into consideration of all these project phases when evaluating the impacts and feasibility of a particular development • Recognise the equation used to calculate power in a tidal stream • Recall some of the foundation types that have been considered for tidal turbines • Explain how energy extraction leads to a number of possible interactions (both positive and negative) with the surrounding environment • Understand that the surrounding environment includes physical processes, wildlife and habitats, conservation interests, communities and social features, as well as commerce and economic activities • Explain how negative impacts can be minimised • Name specific examples where aquatic renewable energy is being extracted or has been tested
Intermediate	<p>On successful completion of this module you will be able to:</p> <ul style="list-style-type: none"> • Describe a few key developments in the use of tidal stream energy • Describe some of the factors which affect the speed of marine currents • Describe the different technology types used to extract energy from tidal streams • Outline the basic steps involved in energy conversion by a tidal energy converter • Describe some of the factors important for each phase of the project for the different technologies • Use the equation used to calculate power in a tidal stream to solve simple problems • Describe some of the foundation types that have been considered for tidal turbines • Outline the important factors in the operation and maintenance phase of the project • Describe the various impacts and opportunities associated with the technology • Outline the key types of environmental interactions associated with aquatic renewable technologies and to explain how these may change through a project lifecycle, in different locations and at different times • Outline some of the factors which influence the overall cost of the project for the different technologies

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Learning Outcomes - Wave

Level	Wave
Basic	<p>On successful completion of this module you will be able to:</p> <ul style="list-style-type: none"> • Understand the physical processes that result in the formation of waves and the factors which affect this resource (wind speed, its duration, and the distance of water over which it blows (the fetch) • Understand that wave energy is a renewable resource • Recognise that tidal energy resources are widely but not evenly distributed across Europe • Recall the main technology types currently being tested to extract wave energy • Identify the different project phases such as Design and Planning, Construction and Installation, Operation and Management, and Decommissioning • Understand the importance of taking into consideration all of these phases when evaluating the impacts and feasibility of a particular development • Explain how energy extraction leads to a number of possible interactions (both positive and negative) with the surrounding environment • Understand that the surrounding environment includes physical processes, wildlife and habitats, conservation interests, communities and social features, as well as commerce and economic activities • Outline how these negative impacts can be minimised • Name specific examples where wave energy devices are being tested
Intermediate	<p>On successful completion of this module you will be able to:</p> <ul style="list-style-type: none"> • Describe key developments in the development of wave energy • Describe in general terms the process by which waves are formed • Outline the different categories of wave energy devices • Describe the factors which affect wave resources • Describe the different technology types used to extract energy from tidal streams • Outline the basic steps involved in energy conversion by a tidal energy converter • Outline the important factors in each phase of projects for the different technologies • Describe factors important in the operation and maintenance phase of the project • Describe the various impacts and opportunities associated with the technology • Outline the key types of environmental interactions associated with aquatic renewable technologies • Explain how environmental interactions may change through a project lifecycle, in different locations and at different times • Outline some of the factors which influence the overall cost of the project for the different technologies • Describe specific examples where wave energy devices are being tested

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Learning Outcomes - Offshore Wind

Level	Offshore Wind
Basic	<p>On successful completion of this module you will be able to:</p> <ul style="list-style-type: none"> • Understand the basic physical processes that result in wind formation on land and sea • Understand that wind energy is a renewable resource. • Recognise that wind energy resources are widely but not evenly distributed across Europe and that local topography affects wind speeds • Recognise that modern wind turbines fall into two basic categories (horizontal and vertical axis) though only horizontal axis turbines have been used offshore to date • Identify the different project phases such as Design and Planning, Construction and Installation, Operation and Management, and Decommissioning • Understand the importance of taking into consideration of all these project phases when evaluating the impacts and feasibility of a particular development • Explain how energy extraction leads to a number of possible interactions (both negative and positive) with the surrounding environment • Understand that the surrounding environment includes physical processes, wildlife and habitats, conservation interests, communities and social features, as well as commerce and economic activities • Outline how negative impacts can be minimised • Name specific examples where offshore wind energy is being extracted
Intermediate	<p>On successful completion of this module you will be able to:</p> <ul style="list-style-type: none"> • Describe key developments in the use of offshore wind energy • Describe how winds are formed by the uneven heating of the Earth's surface by the sun • Describe how sea breezes are formed by the uneven absorption of the sun's heat by the land and the sea • Describe some of the factors which are important at each phase of the project • Describe the various impacts and opportunities associated with the technology • Outline the key types of environmental interactions associated with aquatic renewable technologies • Explain how these may change through a project lifecycle, in different locations and at different times • Outline some of the factors which influence the overall cost of the project for the different technologies • Describe specific examples where offshore wind energy is being extracted

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Intermediate – Equivalent to EQF level 2 and Bloom's Taxonomy "Comprehension" category. This level requires the student to be able to explain basic factual knowledge.